PERFECT SCORE

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MODULE

Sekolah

Berasrama Penuh

2013

NAME: .....

CLASS:.....

PHYSICS

PHYSICS PERFECT SCORE 2013 PANELS

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SECTION B : LEARNING AREA

Question	Mark	Set 1 *(Topic 1 & 2)*	Set 2 *(Topic 3)*	Set 3 *(Topic 4 & 5)*	Set 4 *(Topic 6 & 7)*	Set 5 *(Topic 8 & 9)*
1	4	*MOTION GRAPH*	*UNDERSTANDING thermal equilibrium*	Waves: Barton pendulum - resonance	Series and Parallel Circuit	Radioactive detector
2	5	*Resolution of force*	*Specific latent heat*	Waves – d t graph	Electric – Series/Parallel circuit	Maltese Cross Tbe
3	6	*Impulsive force*	*Specific heat capacity*	Refraction of water waves	Electromagnet – The interaction between 2 magnetic field	Transistor
4	7	*Atmospheric Pressure*	*Specific latent heat*	Convex mirror	Electric – Effective resistance	Logic gates
5 or 6	8	***Q5 –*** *Archimedes' Principle*	***Q5 -*** *Pressure Law*	***Q5 -*** Refraction of light waves – Snell's law ***Q6 -*** diffraction of water waves	***Q6 –*** Electromotive Force	**Q5** – Radioactive emission & electric field strength **Q6**- half life
7	10	*Pascal's Principle*	*Specific heat capacity*	Periscope and total internal reflection	Trabsformer	GM tube- detect Pipe leakage
8	12	*Liquid Pressure*	*Pressure Law*	Concave mirror	Electric: Energy & Power	Transistor –automatic switch
9 or 10	20	**Q9 -** *Bernoulli's Principle*	**Q9 -** *Latent heat , specific heat capacity*	**Q10 -** Sound waves – waves propagation	**Q10** Electromagnet: Factors that affect the strength of magnetic field; Application of electromagnet; Generator	**Q10 -** I_b and I_c, Transistor circuit
11 or 12	20	**Q11** *Resolution Of Forces* *Resultant Forces*	**Q11 -** *Boyle's Law*	**Q11 -** Telescope and Overhead Projector	**Q12 -** Electromagnet – Heating element	**Q12 -** *Diod; Semiconductor*

SECTION C : LEARNING AREA

Question	Mark	Set 1 (Physics Form 4 Topics)	Set 2 (Physics Form 5 Topics)
1	16	Simple Pendulum • Measurement using stopwatch	Waves • Measurement using CRO
2	12	Pressure in Liquid	Electricity • The relationship between length and resistance
3	12	Heat: • The relationship between mass and heat energy	Transformer: • The relationship between number of turn and voltage output
4	12	Light : • The relationship between u and v	Interference of Sound Waves: • The relationship between D and x

SECTION A – Fundamental Physics

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1. Prefix and Physical Unit

(a) Write the following physical quantities in the unit given.

(i) 1 m^2 = ... cm^2

(ii) 5 m^3 = ... cm^3

(iii) 8 cm^2 = ... m^2

(iv) Speed of the car = 120 km j^{-1} = ... m s^{-1}

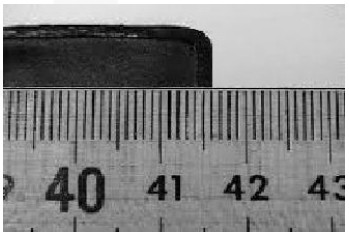
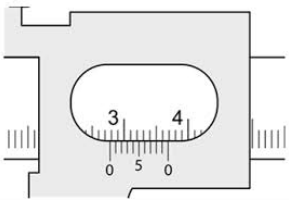
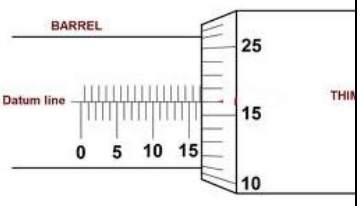
(b) An object moves along straight line for time *t*. The length of the line, *s* is given by the equation

$$s = \frac{1}{2} gt^2 .$$

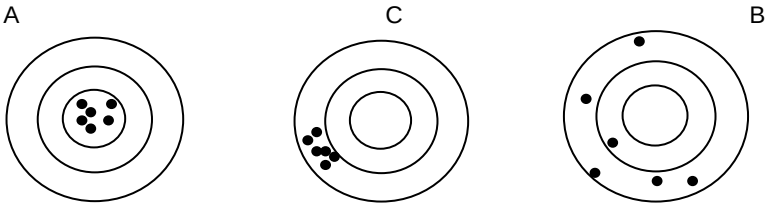
What is the SI unit for g?

2. Understanding Measurements – Sensitivity, Precision and Accuracy

(a)

Measuring instrument	*Smallest scale division*	*Accuracy*	*Measurement*
metre rule			 .....
venier callipers			 .....
micrometer screw gauge			 .....

(b) In a shooting competition, three participants A, B and C each take six shots at a target..



Compare the precision and the accuracy of three shooters

From the diagram,

i) Whose shots are more ***consistence (precise)***? ……..

ii) Whose shots are more ***accurate***? …….

(c) The **consistency** of measurement:

Example:

Reading P	24 g	24 g	25 g
Reading Q	24 g	26 g	27 g

Reading P has higher / less * consistency than Reading Q

(d) The **accuracy** of measurement:

Example:

The acceleration due to gravity = 9.81 m s^{-2}

The experimental value: R - 9.76 m s^{-2}

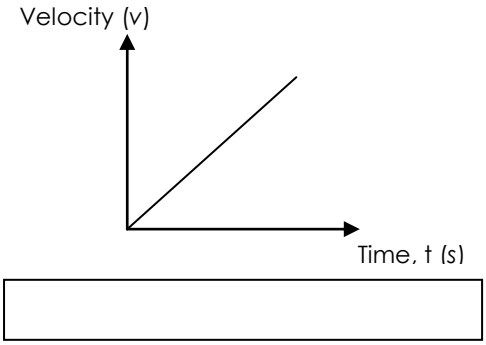
S - 9.62 m s^{-2}

Reading R is ……accurate than Reading S.

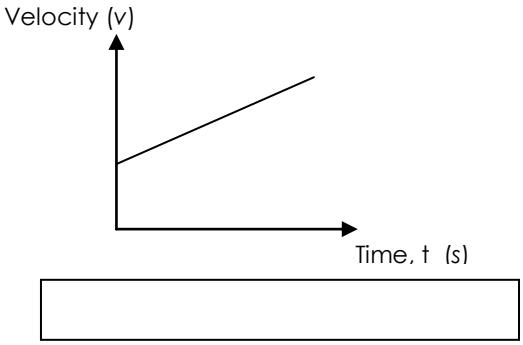
3. Graph

a. The relationship between two physical quantities

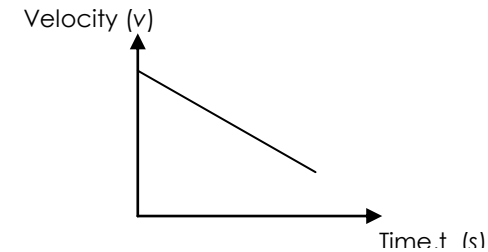
(i)



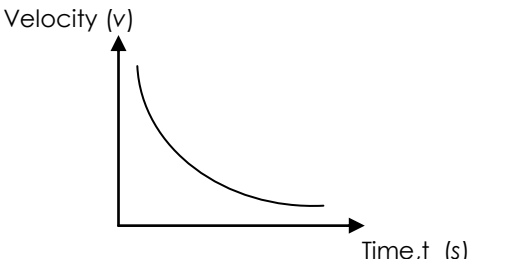
(ii)



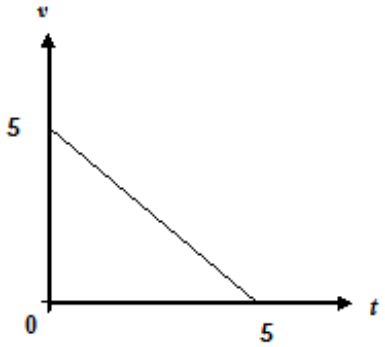
(ii)



(iv)

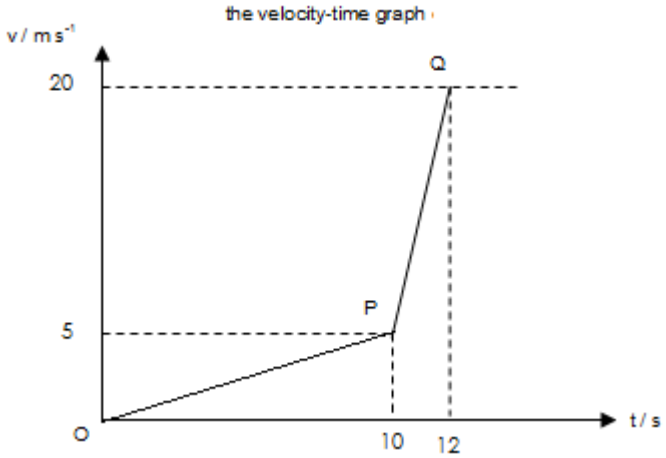


b. The graph shows the relationship between v and t.



What is the equation represents the relationship between v and t ?

c. Determine the gradient of the graph



(i) OP

(ii) PQ

SECTION B – Physics Paper 2

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SET 1 – Force and Motion; Forces and Pressure

Question 1

Diagram 1 shows the velocity-time graph for a moving object.

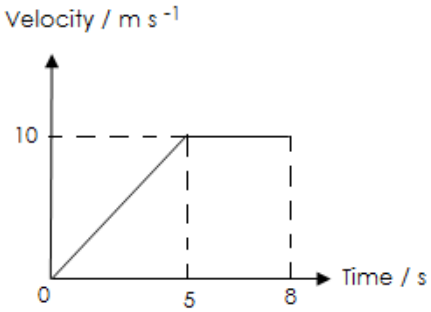


Diagram 1

(a) State the type of motion of the object from 5 to 8 seconds.

.....

[1 mark]

(b) Calculate the acceleration of the object from 0 – 5 seconds.

[1 mark]

(c) Sketch the acceleration-time graph for the graph in Diagram 1.

[2 marks]

Question 2

Diagram 2 shows a man pulling a trolley with a force of 150 N at an angle of 60° from the horizontal line.

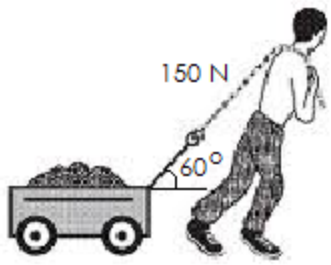


Diagram 2

(a) What is the meaning of force?

.....

[1 mark]

(b) Calculate the force that causes the trolley to move forward.

[2 marks]

(c) The trolley in Diagram 2 moves with constant velocity. What is the frictional force acting on the trolley?

.....

[1 mark]

(d) Give a reason for your answer in (c).

.....

[1 mark]

Question 3

Diagram 3 shows a softball player hitting a ball of mass 100 g which is moving with a velocity of 40 m s^{-1}. After the ball is hit, the ball moves in the opposite direction with a velocity of 50 m s^{-1}. The collision time is 20 ms.

Diagram 3

(a) What is meant by impulsive force?

.....

[1 mark]

(b) State how the time of impact affects the impulsive force.

.....

[1 mark]

(c) Calculate the impulsive force acting on the ball when it is hit.

[2 marks]

(d) (i) After striking the ball, should the player continue to swing his bat (follow-through) or stop the bat after hitting the ball?

.....

[1 mark]

(ii) Explain your answer in (d)(i).

.....

[1 mark]

Question 4

Diagram 4 shows a hand suction cup being used to change a windshield glass without cracking it. The suction cups are pressed onto glass surface, the levers are squeezed and the rubber pads clamp securely to the glass.

Diagram 4

(a) What is pressure?

.....

[1 mark]

(b) Explain how the hand suction cup is used to lift the windshield glass.

.....

.....

.....

.....

[2 marks]

(c) The total area covered by the suction cups is 0.002 m^2. The pressure in the suction cup is reduced to 45 000 Pa. The atmospheric pressure is 1 x 10^5 Pa.

(i) What is the difference between the pressure inside the cups and the atmospheric pressure?

[1 mark]

(ii) Calculate the force acting on the windshield glass due to the pressure difference in (c)(i).

[2 marks]

(iii) What is the maximum mass of the windshield glass that can be carried by this suction cup?

[1 mark]

Question 5

Diagram 5.1 and Diagram 5.2 show the same boat floating on the seawater and river water. The density of seawater and river water is 1025 kg m^{-3} and 1000 kg m^{-3} respectively.

Diagram 5.1

Diagram 5.2

(a) What is meant by density?

.....

[1 mark]

(b) Based on Diagram 5.1 and Diagram 5.2,

(i) Compare the level of the boat in the seawater and in the river water.

.....

[1 mark]

(ii) Compare the volume of water displaced by the boat in the sea and in the river.

.....

[1 mark]

(iii) Compare the density of sea water and river water.

.....

[1 mark]

(c) Relate the volume of water displaced to the density of water.

.....

[1 mark]

(d) (i) Mark the forces acting on the boat in Diagram 5.1.

[1 mark]

(ii) Deduce the relationship between the forces in (d)(i).

.....

[1 mark]

(e) Name the physics principle that explains the situation above.

.....

[1 mark]

Question 7

Diagram 7 shows a hydraulic jack used to raise a 2 000 N load on piston B when a force of 50 N is applied on piston A. The cross sectional area of piston A is 15 cm^2.

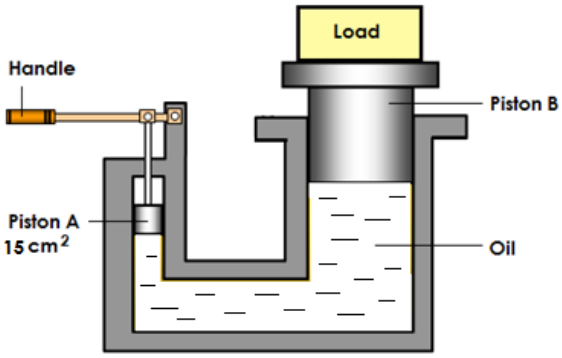


Diagram 7

(a) (i) Name the physics principle involved in the hydraulic system.

.....

[1 mark]

(ii) Compare the pressure at piston A and at piston B.

.....

[1 mark]

(iii) Calculate the cross sectional area of piston B.

[2 marks]

(b) The hydraulic jack in Diagram 7 is not suitable to be used for lifting a car in a workshop. Using suitable physics concepts, explain the required modification that need to be done to enable the machine to lift a car easily in a workshop.

(i) Component to control the flow of oil in the hydraulic jack.

.....

Reason :

.....

[2 marks]

(ii) The ratio of cross-sectional area of piston B to piston A that enables the jack to lift a heavier car.

.....

Reason:

.....

[2 marks]

(iii) Component in the hydraulic jack to lower down the car.

……
Reason:

……
[2 marks]

Question 8

Diagram 8.1 shows a patient being fed with medicine from an *intravenous injection* (IV) bottle.

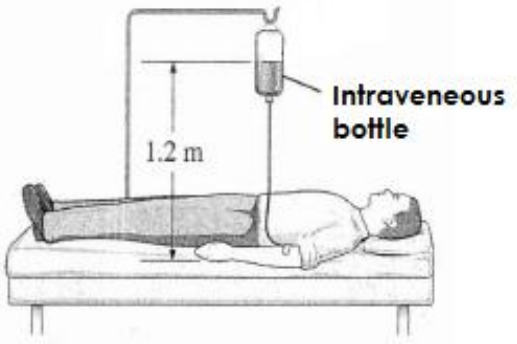


Diagram 8.1

(a) State one factor that affect the pressure in liquid.

……
[1 mark]

(b) State the relationship between the factor in (a) and the pressure in liquid.

……
[1 mark]

(c) What causes the medicine from the IV bottle able to enter the patient's vein?

……
[1 mark]

(d) If the intravenous bottle is placed at a height of 1.2 m from the point of injection, calculate the pressure of the medicine at the point of injection. Given the density of the medicine is 1120 kg m-3.

[2 marks]

(e) Diagram 8.2 shows a dam.

Diagram 8.2

Table 8 shows the specifications of 3 dams P, Q and R that can be constructed to generate electricity.

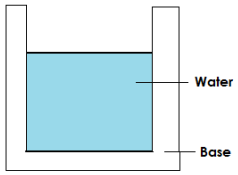
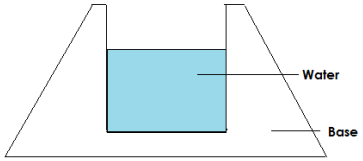
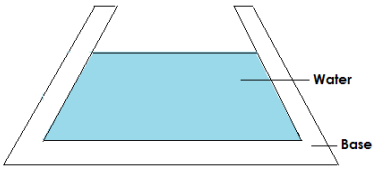
Dam	Thickness of wall	Height of dam from the base / m	Design
P		10	With spillway (overflow channel)
Q		50	With spillway (overflow channel)
R		40	Without spillway (overflow channel)

TABLE 8

Explain the suitability of the following characteristics :

(i) The thickness of wall

.....

Reason

.....

[2 marks]

(ii) The height of dam from the base

.....

Reason

.....

[2 marks]

(iii) The design of the dam

.....

Reason

.....

[2 marks]

(iv) Which is the most suitable dam to be constructed?

.....

[1 mark]

Question 9

Diagram 9.1 shows the stroboscopic picture of a ball travels in a curved path.

Diagram 9.1

(a) (i) Name the physics principle involved in Diagram 9.1

[1 mark]

(ii) When a ball is stroked at the side, the ball moves in a curved path. Explain.

[4 marks]

(b) Air is blown into a venturi tube as shown in Diagram 9.2

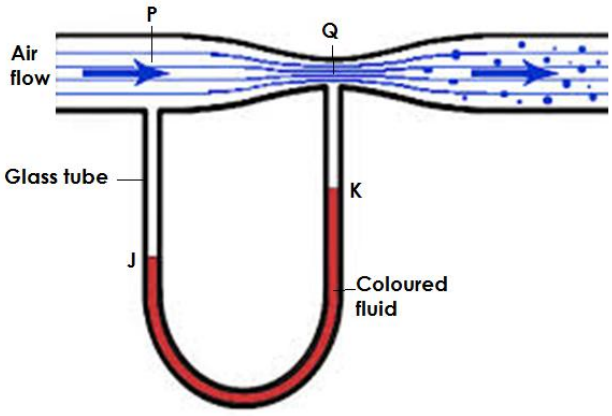


Diagram 9.2

Based on Diagram 9.2, compare the cross-sectional area of venturi tube at P and Q, the speed of air flow at P and Q, and the water level in glass tube J and K.
Relate the water level in the glass tube with the pressure in the venturi tube. Hence deduce the relationship between the speed of the air and pressure.

[5 marks]

(c) Diagram 9.3 shows the structure of a paint sprayer.

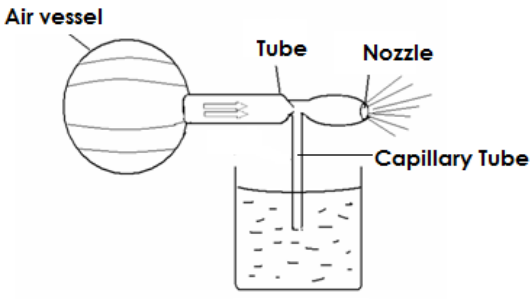


Diagram 9.3

You are required to give some suggestions to design a paint sprayer which can last long and work efficiently.

Using the knowledge in fluid dynamics and the properties of materials, explain the suggestions based on the following aspects :

(i) The size of the air vessel
(ii) Material used for the vessel
(iii) The shape of the tube
(iv) Material used for the capillary tube
(v) Size of the nozzle

[10 marks]

Question 11

Diagram 11.1 shows a cargo barge being towed by two identical towing boats, A and B, using the same force of 1500 N each. The resultant force from the two boats causes the cargo barge to move forward.

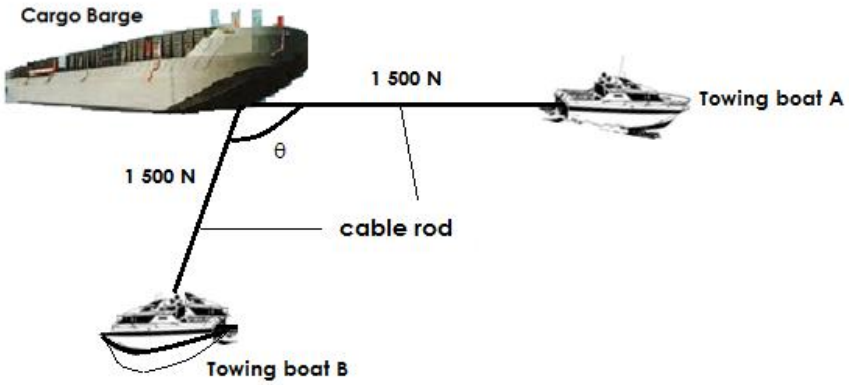


Diagram 11.1

(a) What is the meaning of resultant force?

[1 mark]

(b) Based on Diagram 11.1,

(i) Sketch the resolution of force 1500 N to its components for towing boat A.

[1 mark]

(ii) Calculate the horizontal component of force acting on the cargo barge by towing boat A if the angle between the cable rod, $\theta = 40^{\circ}$.

[2 marks]

(iii) Calculate the resultant force acting on the cargo barge by the two towing boats.

[2 marks]

(c) Table 11 shows four methods of towing the cargo barge in Diagram 11.1 to the harbour. You are required to determine the most suitable method to tow the cargo barge effectively.

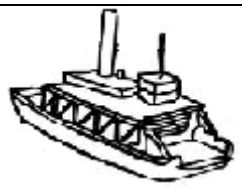
Method	Angle between the two towing boats	Type of cable rod	Material of cable rod	Shape of towing boat
J	30°	nylon	Elastic	
K	30°	Steel	Inelastic	
L	60°	nylon	Inelastic	
M	60°	Steel	Elastic	

Table 11

Study the specifications of the four methods based on the following aspects:

(i) Angle between the two towing boats
(ii) Type of rope
(iii) Material of the rope
(iv) The shape of the towing boat

Explain the suitability of each aspect and determine the most suitable method.
Give a reason for your choice.

[10 marks]

(d) Diagram 11.2 shows a wheelbarrow.

Diagram 11.2

Explain why it is easier to pull a wheelbarrow than to push the wheelbarrow when moving on a soft ground.

[4 marks]

SET 2 - Heat

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Question 1

Diagram shows a mercury thermometer used in a clinic.

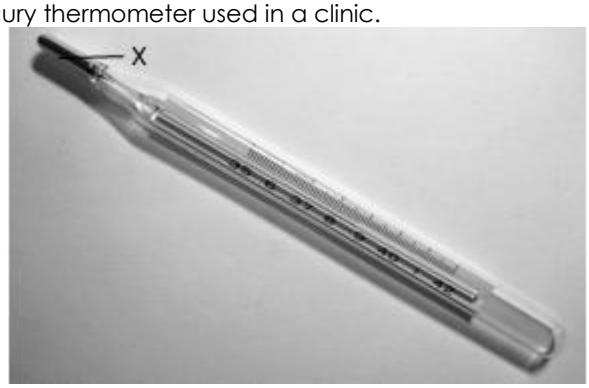


Diagram 1

(a) (i) Name the component label X

.....

[1 mark]

(ii) Why is mercury used in the thermometer?

.....

[1 mark]

(b) (i) What is the principle used in a mercury thermometer?

.....

[1 mark]

(ii) State the physical change in the mercury when the thermometer increases.

.....

[1 mark]

Question 2

Diagram 2 shows the heating curve of a solid substance X which has a mass of 0.25 kg and is heated by a heater 12V 70 W.

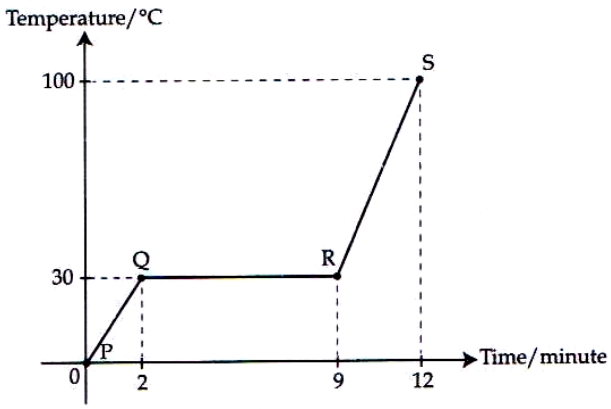


Diagram 2

(a) Based on the graph above, name the state of substance

(i) QR

.....

[1 mark]

(ii) RS

.....

[1 mark]

(b) Explain why the temperature of substance X remains constant at QR although heat is supplied?

.....

[1 mark]

(c) Based on the graph, calculate the specific latent heat of fusion of substance X.

[2 marks]

Question 3

Diagram 3 shows the set up of an experiment to study the specific heat capacity, c of an aluminium block.

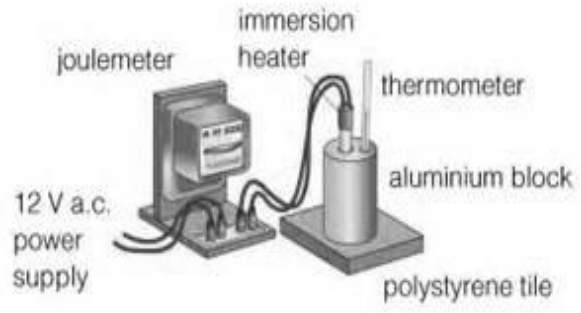


Diagram 3

(a) Define the meaning of specific heat capacity of an object.

.....

[1 mark]

(b) Suggest way to ensure more perfect heat conduction.

.....

[1 mark]

(c) Why is the aluminum block is covered with felt?

.....

[1 mark]

(d) 0.5 kg liquid M at 40°C is mixed with 2 kg liquid N at 25°C. The mixture is stirred.
(The specific heat capacity of liquid M = 8.4 x10^3 J kg °C^{-1} . The specific heat capacity of liquid N = 4.2 x10^3 J kg °C^{-1}

What is the temperature of the mixture?

[4 marks]

Question 4

Sweating is one of the ways our body maintains the body temperature about 37°C. Sweat is a largely made up of water and it comes from sweat glands in Diagram 4.1

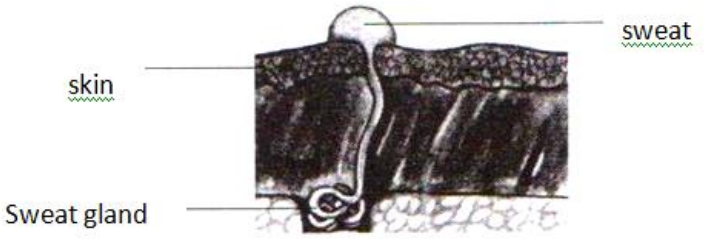


Diagram 4.1

(a) When sweat evaporates, it takes heat away from our body.
(i) What is meant by latent heat of vaporization.

.....

[1 mark]

(ii) Using kinetic theory of matter, explain how our body becomes cold after tremendous exercise.

.....

.....

.....

[3 marks]

(b) While playing badminton, 0.05 kg of sweat was evaporated from Lin Dan's body. Calculate the quantity of heat lost from his body due to evaporation.
The latent heat of vaporization of sweat is 2.3 X 10^6 Jkg^{-1}

[3 marks]

Question 5

Diagram 5.1 and 5.2 show trapped air in two identical flasks heated with different quantity of heat. Bothe stoves are turned off after 10 minutes.

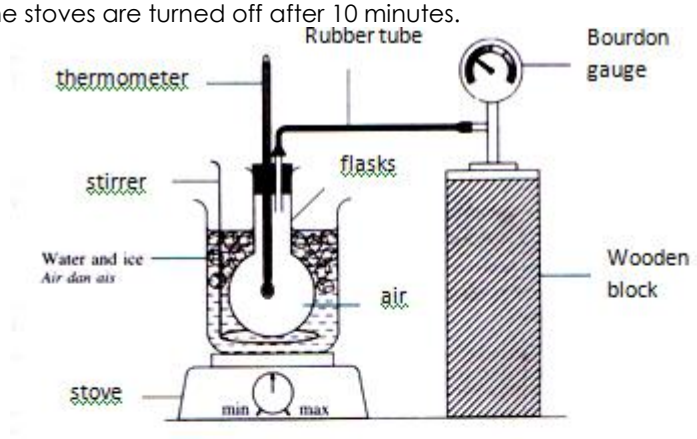


Diagram 5.1

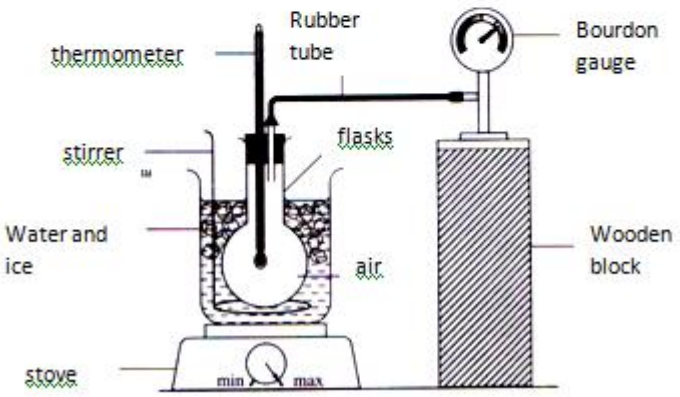


Diagram 5.1

(a) State the physical quantity measured by a Bourdon gauge

.....

[1 mark]

(b) Based on Diagram 5.1 and Diagram 5.2

(i) compare the readings of both the Bourdon gauges.

.....

[1 mark]

(ii) compare the readings of both thermometer.

.....

[1 mark]

(iii) State the relationship between the heat supplied and the temperature.

.....

[1 mark]

(iv) State the relationship between the pressure of air in the flask and the temperature.

.....

[1 mark]

(c) Based on kinetic theory, explain the reason for the answer in 5(b)(iv)

.....

.....

.....

[3 marks]

(d) Name the law involved.

.....

[1 mark]

Question 6

Diagram 6 shows two types of pans and their characteristics. Both pans are heated with same amount of energy and time.

Copper pan

Specific heat capacity = 390 J kg^{-1} °C^{-1}

mass = 3.0 kg

final temperature = 85°C

Clay pan

Specific heat capacity = 900 J kg^{-1} °C^{-1}

mass = 3.0 kg

final temperature = 71°C

Diagram 6

(a) Thick the correct answer, specific heat capacity is

☐ Energy required to increase the temperature of substance by 1 degree Celcius

☐ Energy required to increase the temperature of 1 kg substance by 1 degree Celcius

[1 mark]

(b) Based on Diagram 6

(i) Compare the specific heat capacity of copper pan and clay pan

.....

[1 mark]

(ii) Compare the mass of copper pan and clay pan

.....

[1 mark]

(iii) Compare the increase of temperature of copper pan and clay pan

……
[1 mark]

(c) Based on the answer in 6(b) state the relationship between specific heat capacity and increase of temperature

……
[1 mark]

(d) Explain why sea water is colder during day time compare to the beach.

……
……
……
[3 marks]

Question 7

Diagram 7 shows the pressure-temperature graph for a fixed mass of gas at constant volume.

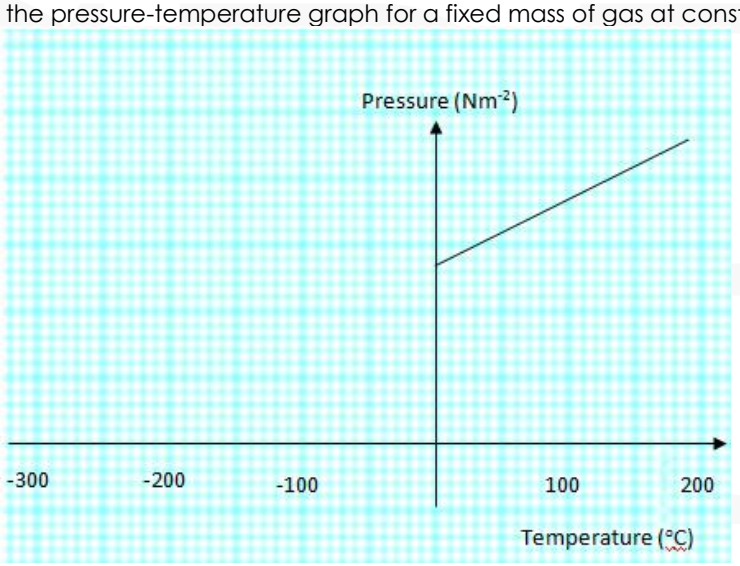


Diagram 7

(a) What is absolute temperature?

……
[1 mark]

(b) Name **two** variables that are kept constant in this experiment

……
[2 marks]

(c) On the graph above

(i) What is the temperature when P = 0 Nm^{-2}

……
[1 mark]

(ii) Label with T the absolute temperature

……
[1 mark]

(d) Name the gas law applied here.

……
[1 mark]

(e) The air pressure in a car tyre is 200 kPa at t temperature of 25^0C. What is the air pressure in the tyre at a temperature of 37^0C? [Assume the volume of the air in the tyre is constant]

[3 marks]

Question 8

Diagram 8 shows 2 models of frying pan.

Diagram 8

(a) What is meant by specific heat capacity?

……
[1 mark]

(b) Based on the information in Diagram 8, state the suitable characteristics of the frying pan that is used to cook food faster.

(i) Type of surface

……
[1 mark]

Reason

……
[1 mark]

(ii) Specific heat capacity

……
[1 mark]

Reason

……
[1 mark]

(c) Based on the answer in 8(b) determine which model in Diagram 8 will absorb heat effectively. Give reason for your choice.

……

……

[2 marks]

(d) A kettle contained 0.5 kg of water. The average heat absorb by the water is 16 Js^{-1} in 25 minutes.
Calculate:
(i) The amount of heat absorbed by the water.

[1 mark]

(ii) The increase in temperature of water.
[Specific heat capacity = 42 000 J $kg^{-1}{}^{0}C^{-1}$]

[2 marks]

Question 9

Diagram 9.1 shows ice in a beaker changes to water. Diagram 9.2 shows water in a beaker changes to ice

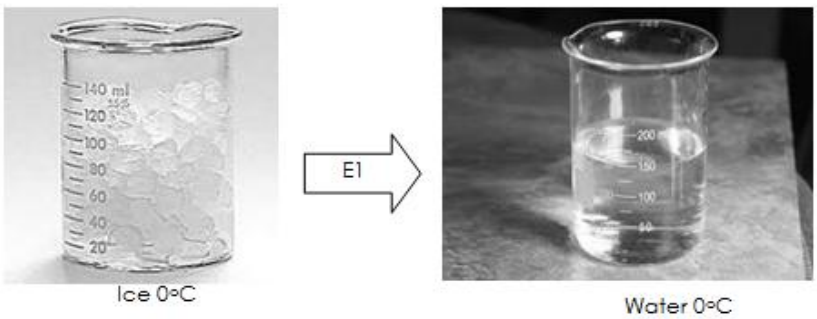


Diagram 9.1

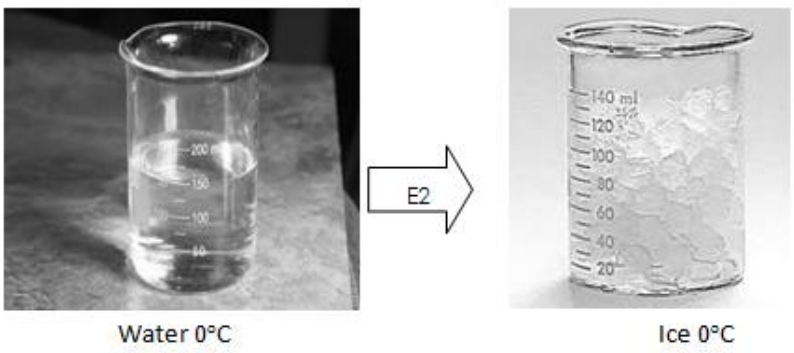


Diagram 9.2

(a) What is temperature?

[1 mark]

(b) Based on Diagram 9.1 and 9.2 compare the change in

(i) Energy involved

[1 mark]

(ii) Phase of molecule

[1 mark]

(iii) Temperature

[1 mark]

(c) Based on your answer in (b), deduce a relationship between energy, phase of molecules and temperature.
Name the physics concept involved.

[1 mark]

(d) Diagram 9.3(a) shows a cross section of a pressure cooker and 9.3(b) shows a normal pan.

Diagram 9.3 (a)

Diagram 9.3 (b)

(e) Explain the reason why food cook faster in a pressure compare to normal pan?

[5 marks]

(f) Diagram 9.4 shows a thermos flask used to keep the temperature of cold drink for a long time.

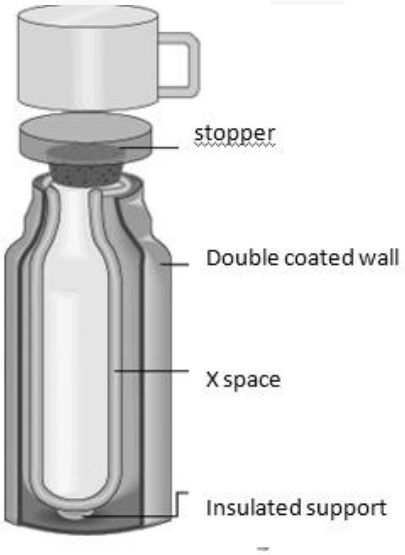


Diagram 9.4

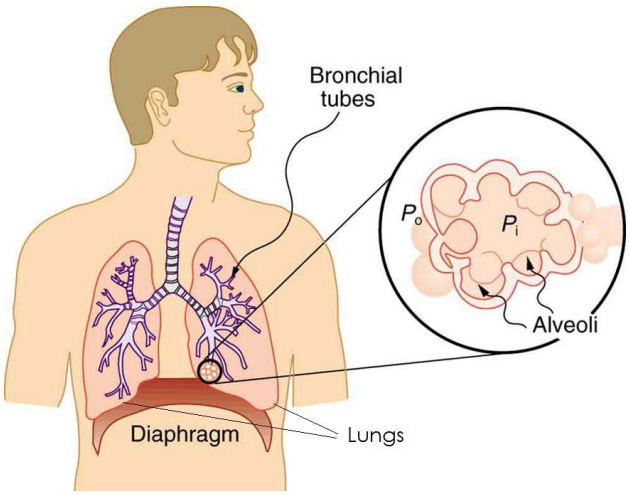
Using appropriate physics concepts, explain the use of suitable equipments to design a flasks that keep the temperature of cold drink for a long time. Your answer should include

- type of stopper
- X space
- double coated wall
- specific heat capacity

[10 marks]

Question 11

Diagram 11.1 shows the respiratory system of human body. The pressure in the alveoli rises and falls during respiration, but always eventually equalizes with atmospheric pressure.



(a) (i) What is atmospheric pressure?

[1 mark]

(ii) Explain why lungs expand as they fill with air.

[4 marks]

(b) Bicycle pumps are used to inflate tyre. Diagram 11.2 shows a hand pumps and 11.3 shows a floor pumps. Floor pumps are the most effective pumps. They are large, generally have a pressure gauge and are capable of high pressure inflation [up to 200psi]

Diagram 11.2

Diagram 11.3

You are required to investigate the characteristics of a pump as shown in Table 1.

Pump	Handle	Hose	Base	Pump Size
P	Short	Aluminium	Plastic	Small
Q	Long	Stainless Steel	Stainless Steel	Big
R	Short	Stainless Steel	Plastic	Big
S	Long	Aluminium	Stainless Steel	Small

Explain the suitability of each characteristic to change a hand pumps to a floor pump. Determine the most suitable pumps. Give reason for your choice.

[10 marks]

(c) (i) A balloon with a volume of 2000.0 cm^3 is filled with a gas at 3 atmospheres. If the pressure is reduced to 0.5 atmospheres without a change in temperature, what would be the volume of the balloon?

[3 marks]

(ii) Plot a graph to describe the situation in c(i) above.

[2 marks]

SET 3 – LIGHT and WAVES

http://cikguadura.wordpress.com/

Question 1

Diagram 1 shows a Barton's pendulum which consists of five simple pendulums hanging on a horizontal string. When A is pulled and released, it will cause the other four pendulums to oscillate.

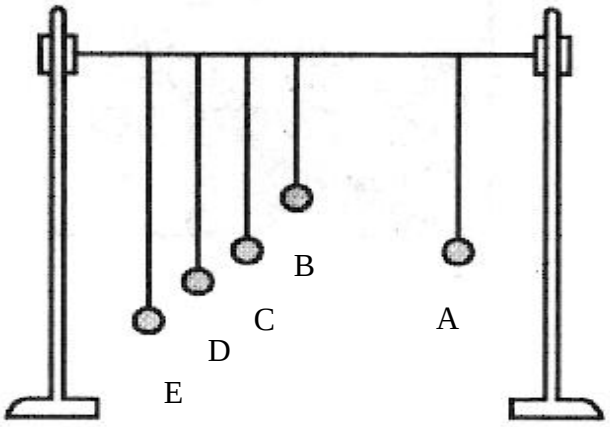


Diagram 1

It is observed that the four pendulums B, C, D and E will oscillate with different amplitudes but with the same frequency.

(a) What is meant by amplitude?

.....

[1 mark]

(b) (i) Which pendulum oscillates with the maximum amplitude?

.....

[1 mark]

(ii) State **one** reason for your answer in 1(b)(i).

.....

[*1 mark*]

(c) Name the phenomenon stated in (b)

.....

[*1 mark*]

Question 2

Diagram 2.1 shows the displacement-time graph of an oscillating spring.

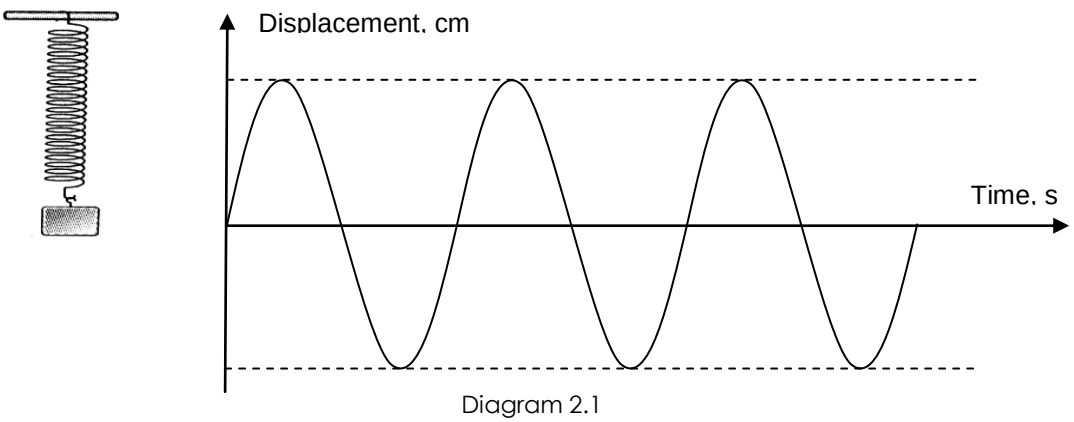


Diagram 2.1

a) What is meant by period?

.....

[1 *mark*]

b) On Diagram 2.1, mark the period of the oscillation. Label it with T.

[1 *mark*]

c) After certain time the oscillating spring will slow down.

(i) Name the physics concept involved in this situation.

.....

[1 *mark*]

(ii) Explain your answer in c(i)

.....

[1 *mark*]

(iii) On the graph in Diagram 2.1, sketch the graph of the slowing down oscillating spring.

.....

[1 *mark*]

Question 3

Diagram 3.1 shows a ripple tank. The motor makes 5 rotations per second. The dipper touches the surface of the water in the ripple tank and produces a series of circular waves. The pattern of the wave formed on the screen as shown in Diagram 3.2 is seen through a stroboscope.

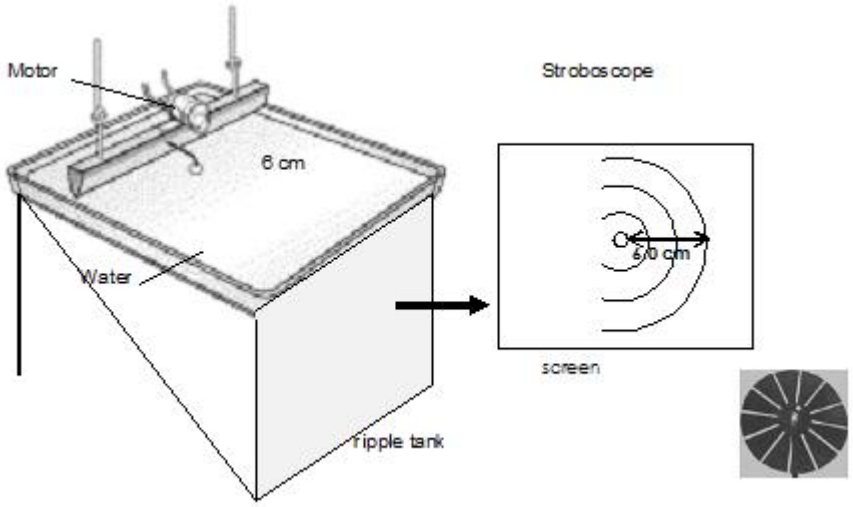


Diagram 3.1

(a) What is the frequency of the motor?

.....

[1 mark]

(b) Calculate the speed of the water wave.

[1 *mark*]

The waves then travel towards a deep region as shown in Diagram 3.2

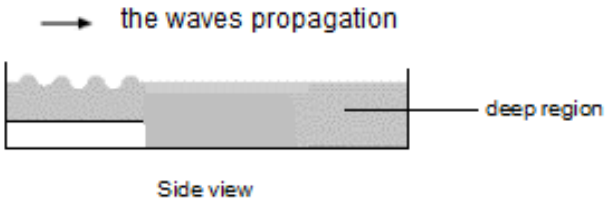


Diagram 3.2

(c) Determine the wavelength as the waves passing through the deep region if the speed of water waves at the deep region is 18 cm s^{-1}.

[1 *mark*]

(d) Explain briefly how stroboscope can make the waves appear stationary.

.....

.....

[1 *mark*]

(e) In Diagram 3.3 draw the wave pattern formed when the waves passing through the deep region.

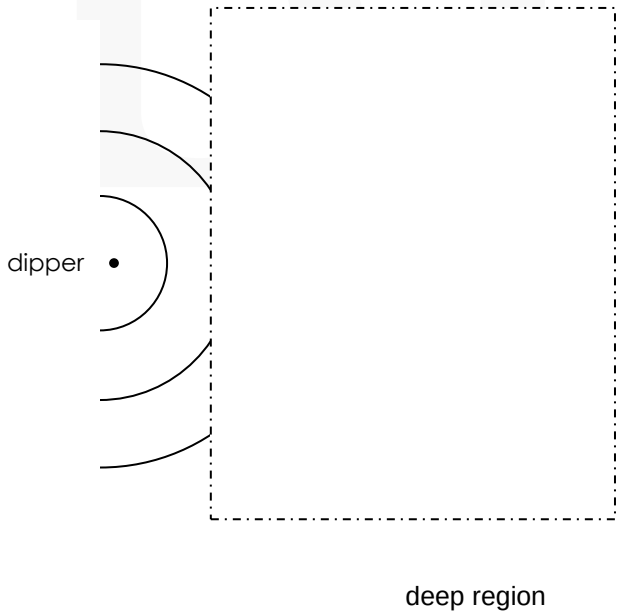


Diagram 3.3

[2 *marks*]

Question 4

Diagram 4.1 shows a mirror that is fixed in certain area in a mini market. The purpose of the mirror is to help the owner of the mini market to monitor their customer.

Diagram 4.1

(a) State the type of mirror used.

.....

[1 mark]

(b) What is the advantage of the mirror as mentioned in (a) compared to plane mirror?

.....

[1 mark]

(c) In Diagram 4.2, C is the centre of curvature and F is the focal point of the mirror.

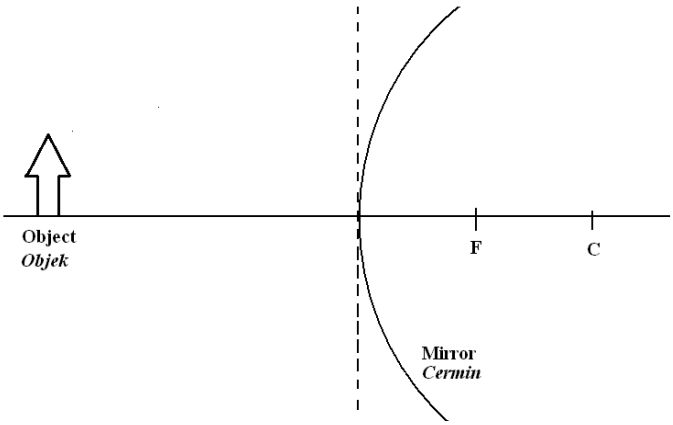


Diagram 4.2

(i). In Diagram 4.2, draw a ray diagram to show the position of the image.

[3 marks]

(ii). State the characteristics of the image formed.

.....

[1 mark]

(d) What happens to the size of image when the curvature of convex mirror is decreased?

.....

.[1 mark]

Question 5

Diagram 5.1 and Diagram 5.2 show a light ray passing through two different mediums, medium A and medium B.

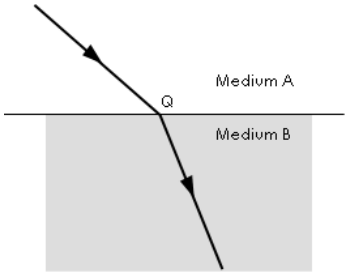


Diagram 5.1

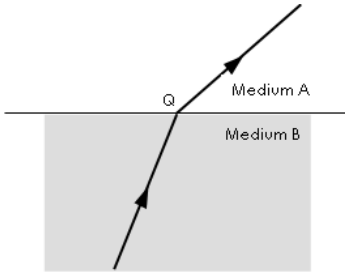


Diagram 5.2

(a) What is meant by refraction?

.....

.....

[1 *mark*]

(b) The refractive index for medium A is 1.00 and the refractive index for medium B is 1.50. Compare the density of medium A and medium B

.....

[1 *mark*]

(c) Using Diagram 5.1 and Diagram 5.2,

(i) compare the effects on the refracted ray after passing point Q.

.....

[1 *mark*]

(ii) compare the sine of incident angle and the sine of refracted angle after passing point Q.

.....

[1 *mark*]

(d) The sine of incident angle and the sine of refracted angle are linked mathematically by an equation. State the equation.

.....

[1 *mark*]

(e) Name the physics principle or physics law involved.

.....

[1 *mark*]

(f) Diagram 5.3 shows a coin in a beaker filled with water.
In Diagram 5.3, complete the ray diagram to show how the image of the coin is formed.

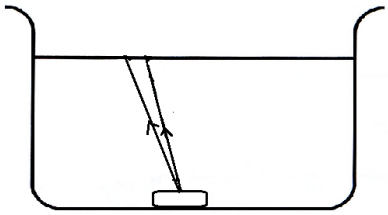


DIAGRAM 5.3

Question 6

Ali and Nina bought a concert ticket each without looking at the seating chart. Diagram 6.1 shows the seat for Ali and Nina in the concert hall. The average frequency of the sound waves produced is 1000 Hz.

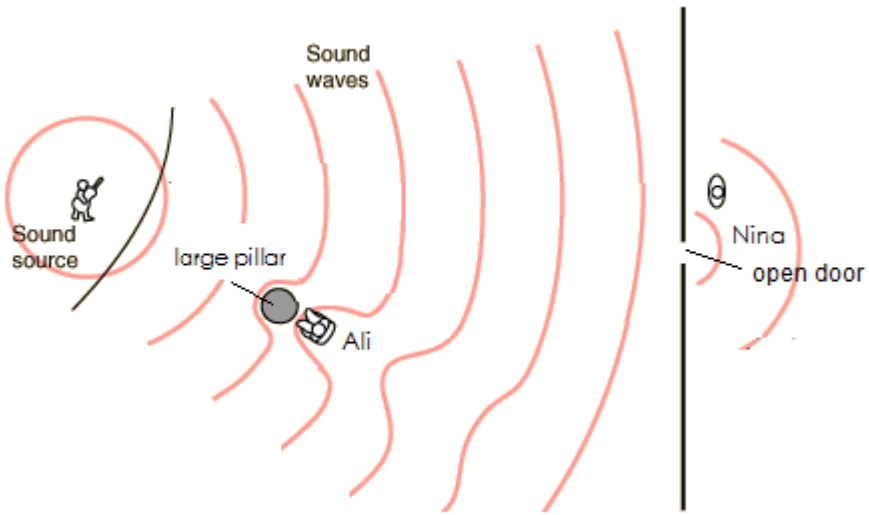


Diagram 6.1

(a) What is meant by *frequency*?

.....

[1 mark]

(b) Observe Diagram 6.1.

(i) Compare the position of Ali and Nina in the concert.

.....

.....

[1 mark]

(ii) What happens to the propagation of the sound waves after passing through the large pillar and the open door?

.....

[1 mark]

(iii) Compare the energy of the sound waves before and after passing through the large pillar and the open door.

.....

[1 mark]

(c) (i) Based on the answers in(b)(i), (ii) and (iii), state the conclusion about the propagation of the sound waves.

.....

[1 mark]

(ii) Name the physics concept involved in (c) (i)

....

[1 mark]

(d) The frequency of the sound wave is then doubled,

(i) What happens to the propagation of the waves?

.....

[1 mark]

(ii) Explain your answer in d(ii)

.....

[1 mark]

Question 7

Ahmad wants to see an object from behind tabletops. Diagram 7.1 shows how he uses a mirror periscope to see the object without being seen.

Diagram 7.1

(a) (i) In Diagram 7.2, complete the path of light ray from the object to the Ahmad's eye.

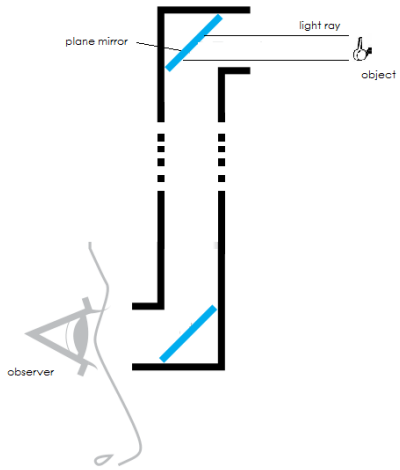


Diagram 7.2

[2 marks]

(ii) State the characteristics of the image observed.

.....

[1 mark]

(b) What is the light wave phenomenon shown in Diagram 7.2?

.....

[1 mark]

(c) Diagram 7.3 shows a glass prism.

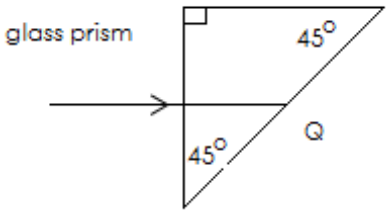


Diagram 7.3

(i) The critical angle of the glass prism is 42^0. Calculate the refractive index of the glass prism.

[2 marks]

(ii) What happens to the light ray when it strikes the prism surface at Q?

.....

[1 mark]

(iii) In Diagram 7.3, complete the path of the light ray.

[1 mark]

(d) The mirror periscope in Diagram 7.2 cannot be used to produce a clear image.

(i) In the space below, draw the arrangement of the glass prisms in Diagram 7.3 to enable the periscope produces a clearer image.

[1 mark]

(ii) Give **one** reason for the answer in 7(d)(i).

.....

[1 mark]

Question 8

Diagram 8.1 shows a man is standing in front of a curved mirror. His distance from the mirror is 0.7 m and the focal length of the mirror is 1.0 m. His image that formed in the mirror is bigger in size and virtual.

Diagram 8.1

(a) What is meant by virtual image?

.....

[1 mark]

(b) Draw a ray diagram to show how the image is formed by the mirror,

[4 marks]

(c) The man then moves 0.7 m backward away from the mirror.
Tick (√) the correct characteristics of the image formed.

Diminished	☐	Inverted	☐
	and		
Magnified	☐	Upright	☐

[2 marks]

(g) Table 8 shows three types of reflector and their characteristics.

Type of reflector	Type of reflector	Material of the reflector
S	Convex	Aluminium
T	Concave	Copper
U	Concave	Aluminium

Table 8

Based on Table 8, state the suitable characteristics of the reflector that can be used by dermatologist for obtaining the image of skin.

Give reason for the suitability of the characteristics.

(i) Type of reflector

.....

Reason

.....

[2 marks]

(ii) Material of the reflector

.....

Reason

.....

[2 marks]

(iii) Determine the most suitable reflector to be used by the dermatologist to obtain the clear image of skin.

.....

[1 mark]

Question 10

Diagram 10.1shows the different thickness of violin strings.
Diagram 10.2 shows the wave form produced by string P while Diagram 10.3 shows the wave form produced by string Q

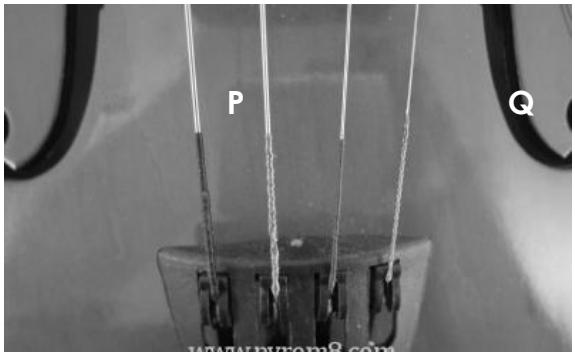


Diagram 10.1

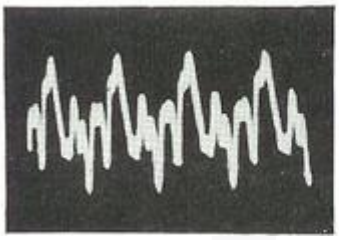


Diagram 10.2

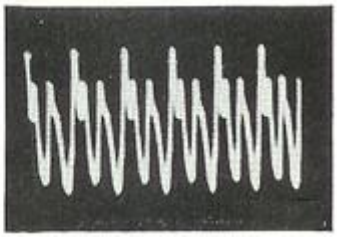


Diagram10.3

(a) What is meant by the amplitude?

[1 mark]

(b) (i) Using Diagram 10.1, 10.2 and 10.3, compare the diameter of string P and Q, the frequency of oscillations and the amplitude of the wave.

(ii) State the relationship between the frequency of sound wave produced and
- the diameter of the string
- the pitch of the sound

[5 marks]

(c) Diagram 10.4 shows a violin and the bow.

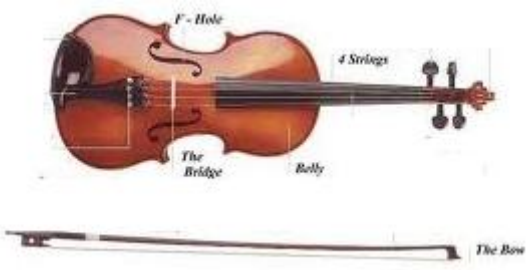


Diagram 10.4

The violin sound can be produced either by plucking the string or by drawing a bow across the strings.

(i) Explain how the sound wave is produced when the violin string is plucked.

[4 marks]

(ii) You are required to design a violin which can produce high pitch sound and will not break easily when it is strummed (the string is plucked). Explain your suggestions based on the following aspects:
- density of the string
- tension on the string
- string material
- size of the sound hole
- the bow

Question 11

Diagram 11.1 shows a simple astronomical telescope at normal adjustment.

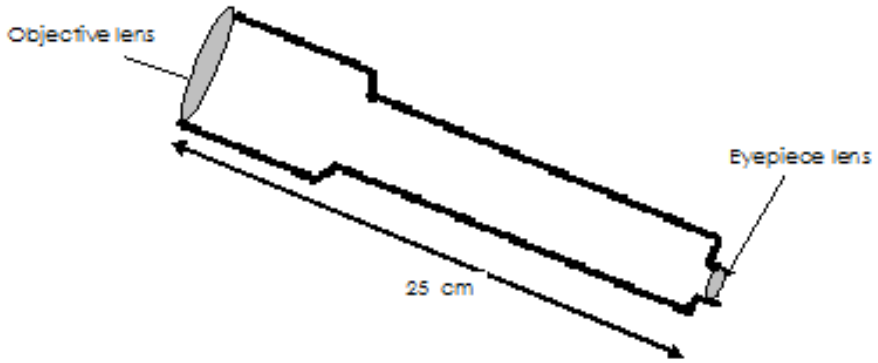


Diagram 11.1

(a) What is meant by the power of a lens?

[1 mark]

(b) Explain how to estimate the power of a convex lens.

[4 marks]

(c) The power of the objective lens is 5 D and the distance between the objective lens and the eyepiece lens is 25 cm.

(i) Calculate the focal length of the objective lens? [2

(ii) Calculate the magnification of the astronomical telescope.

[2 marks]

(iii) What is the relationship between the thickness and the power of a convex lens?

[1 mark]

(d) Diagram 11.2 shows a slide projector that is used to display an image of a picture slide on the screen.

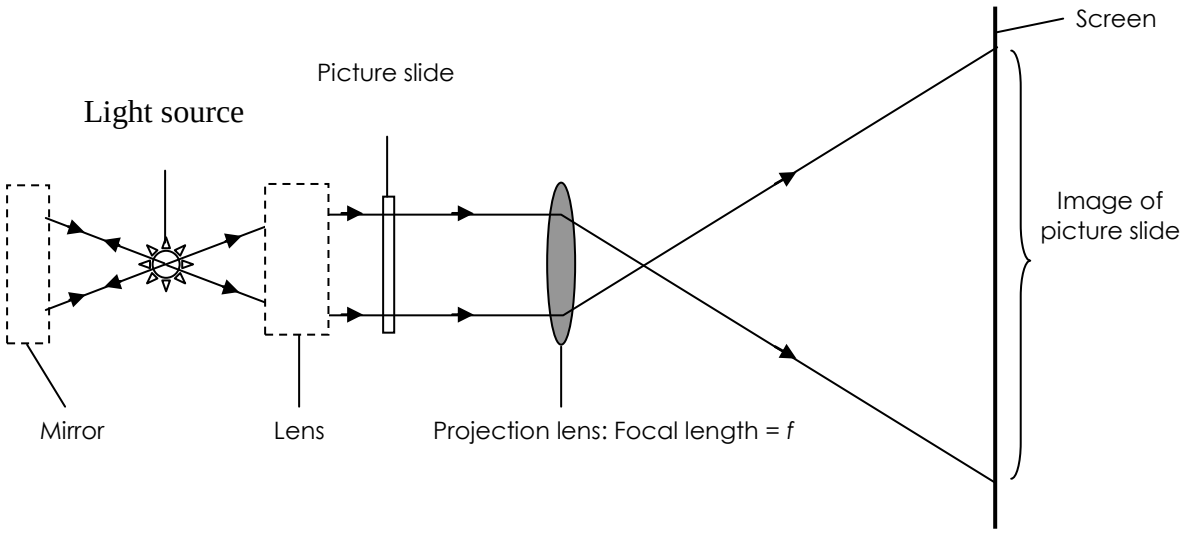


Diagram 11.2

Table 11 gives the characteristics of the components of a slide projector.

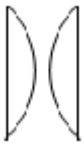
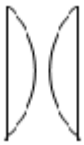
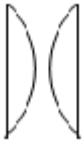
Projektor slaid	Type of mirror	The design of the lens	Distance, u, between picture slide and projection lens	Orientation of picture slide
E	Convex		$u = 2f$	Upright
F	Concave		$u = 2f$	Inverted
G	Convex		$f < u < 2f$	Inverted
H	Concave		$u > 2f$	Upright
I	Concave		$f < u < 2f$	Inverted

Table 11

Explain the suitability of each characteristic of the components of the slide projector to display a sharp and large image.
Determine the most suitable slide projector and give reasons for your choice.

[10 marks]

SET 4 - ELECTRIC AND ELECTROMAGNET

Question 1

Diagram 1(a) and Diagram 1(b) show two electrical circuits containing two identical bulbs of 5 W, 4 Ω each, and a rheostat (0 – 50 Ω).

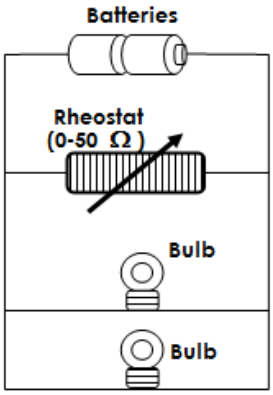


Diagram 1(a)

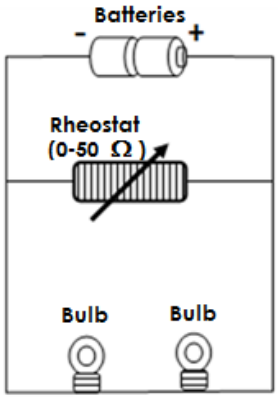


Diagram 1(b)

(a) What is meant by resistance ?

.....

[1 mark]

(b) State the arrangement of the bulbs in diagram 1(a).

Series ☐

Parallel ☐

[1 mark]

(c) Mark the direction of current on diagram 1(b) .

[1 mark]

(d) Compare the effective resistance between diagram 1(a) and diagram 1(b).

.....

[1 mark]

Question 2

Diagram 2 shows an electrical circuit which consists of four identical bulbs, J, K, L and M, connected to four identical new dry cells.

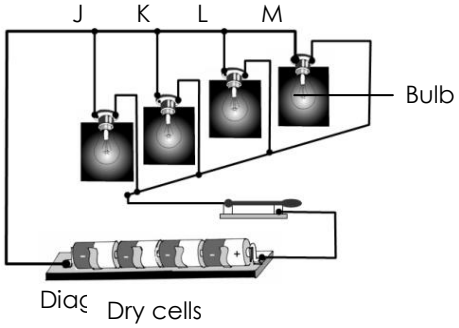


Diagram 2

(a) What is the type of the circuit connection in Diagram 2?

.....

[1 mark]

(b) Draw an electric circuit diagram for the above arrangement of apparatus using appropriate symbols.

[1 mark]

(c) Compare the brightness of the bulbs J , K ,L and M.
Tick (√) the correct answer below.

☐ The brightness of bulb J > bulb K > bulb L > bulb M

☐ The brightness of bulb L > bulb K > bulb J > bulb M

☐ The brightness of bulb J = bulb K = bulb L = bulb M

[1 mark]

(d) Give one reason for your answer in 2(c).

.....

[1 mark]

(e) Explain why the circuit connection in Diagram 2 is used in the house lighting circuit.

.....

[1 mark]

Question 3

Diagram 3.1 shows a conductor placed between two magnets.

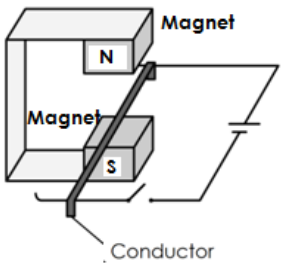


Diagram 3.1

(a) The combination of magnetic field of the current and the magnetic field of magnet produces a resultant force, F.

(i) Name the rule used to determine the direction of the force.

.....

[1 mark]

(ii) In Diagram 3.1, draw the direction of the resultant force by using an arrow, and label with F.

[1 mark]

(b) Diagram 3.2 shows a moving-coil voltmeter.

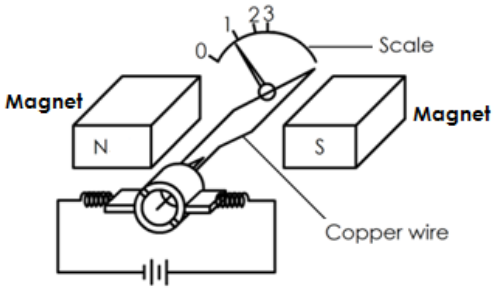


Diagram 3.2

The scale of the voltmeter in Diagram 3.2 is not uniform due to the incorrect shape of the magnets used.

(i) Draw the correct shape of the magnets and the pattern of the magnetic field produced.

[3 marks]

(ii) Give **one** reason why the magnets should have the shape as suggested in 3(b)(i).

.....

[1 mark]

Question 4

Diagram 4 shows a lighting circuit.

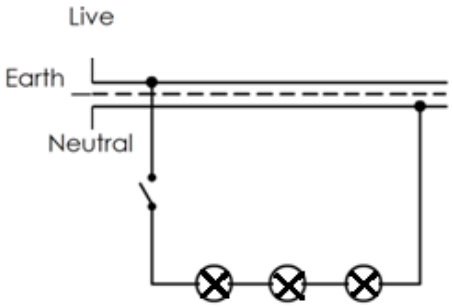


Diagram 4

(a) What type of connection are the bulbs in Diagram 4?
Tick (✓) the correct answer in the box provided.

☐ Series ☐ Parallel

[1 mark]

(b) All the bulbs in Diagram 4 are labelled '24 V, 4.8 W'.

(i) What is meant by '24 V, 4.8 W'?

……

……

[1 mark]

(ii) the current in the circuit when all the bulbs are lit with normal brightness.

[2 marks]

(iii) Calculate the effective resistance of the three bulbs in Diagram 4.

[2 marks]

(iv) How can the bulbs be connected to light up brighter?

……

[1 mark]

Question 6

Diagram 6.1 shows the reading of the voltmeter in a simple electric circuit.
Diagram 6.2 shows the reading of the same voltmeter.

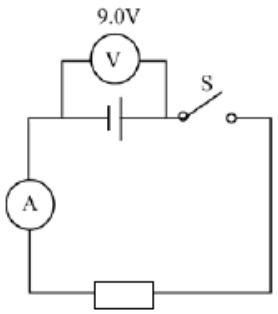


Diagram 6.1

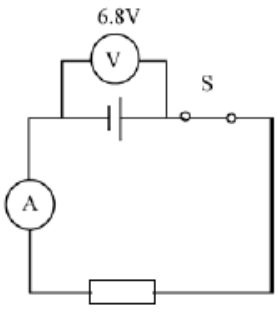


Diagram 6.2

(a) What is meant by electromotive force (e.m.f) of a battery?

……

[1 mark]

(b) Based on Diagram 6.1 and 6.2

(i) Compare the state of switch S.

……

[1 mark]

(ii) Compare the reading of the voltmeter.

……

[1 mark]

(c) Based on the answer in 6(b), state the relationship between current and the voltmeter reading?

.....

[1 mark]

(d) Explain how the value of e.m.f. can be determined by sketching a relevant graph.

[2 marks]

(e) Diagram 6.3 shows a simple electric circuit.

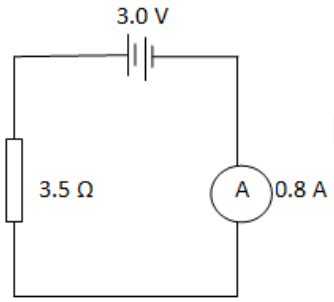


Diagram 6.3

Calculate the internal resistance of the battery in the circuit above.

[2 marks]

Question 7

Diagram 7 shows a transformer.

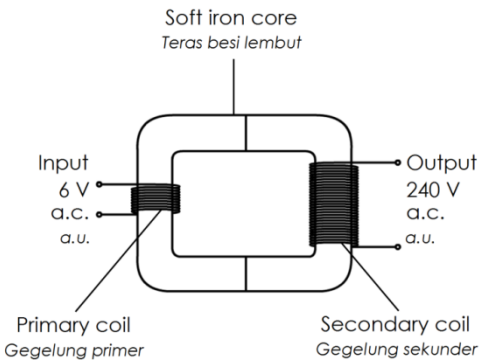


Diagram 7

(a) (i) What is the type of transformer in Diagram 7? Tick (✓) the correct answer in the box provided.

☐ Step-down transformer

☐ Step-up transformer

[1 mark]

(ii) Give **one** reason why soft iron is used as the core of transformer.

……

[1 mark]

(b) The number of turns of the primary coil in Diagram 7 is 20. Calculate the number of turns of the secondary coil.

[2 marks]

(c) The transformer in Diagram 7 is used to switch on an electrical appliance. The current in the primary coil is 7 A and the efficiency is 75%.

(i) Calculate the output power of the transformer.

[2 marks]

(ii) An electrical appliance which needs 38 W of power is connected to the output of the transformer. Suggest a modification to the transformer so that the appliance functions effectively.

……

[1 mark]

(d) A radio which uses direct current is connected to the output of a transformer. The radio does not function when the switch is on.

(i) Why is the radio not functioning?

……

[1 mark]

(ii) An electronic component is connected to the output of the transformer so that the radio can be functioned.
Name the electronic component and state how the connection is made.

……

[2 marks]

Question 8

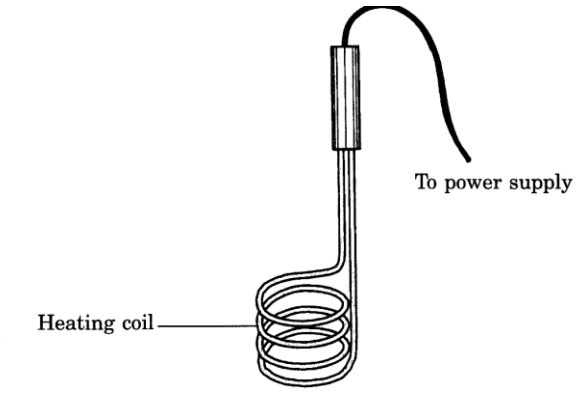


Diagram 8.1 shows an immersion heater with specification of 240 V, 1 000 W.

(a) Name **one** suitable material to be used as a heating element in the immersion heater.

.....

[1 mark]

(b) The immersion heater is connected to a 240 V supply. Calculate

(i) the current passes through the immersion heater.

[2 marks]

(ii) the resistance of the immersion heater.

[2 marks]

(c) A student conducts an experiment to compare the heating effect of immersion heaters P, Q and R. The volume and initial temperature of the water is fixed. Table 8.1 shows the result of the experiment.

Immersion heater	Potential difference / V	Current / A	Time for the water to start boiling / minute
P	240	6.0	8.0
Q	240	5.0	10.0
R	240	4.0	9.0

Table 8.1

(i) State the energy change that occurs when the immersion heater is switched on.

.....

[1 mark]

(ii) Calculate the energy supplied by each of the immersion heaters P, Q and R to start boiling the water.

[4 marks]

(iii) Using your answer in (c)(ii), suggest which immersion heater is the most suitable to boil the water. Give **one** reason for your answer.

.....

.....

[2 marks]

Question 10

(a) Diagram 10.1 and Diagram 10.2 show the pattern of iron filing formed when the solenoids are connected to the battery.

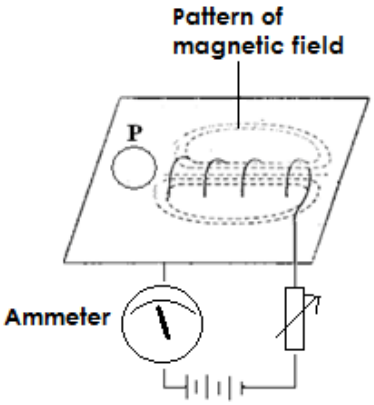


Diagram 10.1

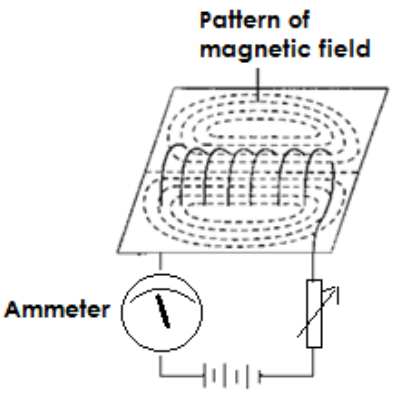


Diagram 10.2

(i) What is electromagnet?

[1 mark]

(ii) A compass is placed at P in Diagram 10.1. By using an arrow, mark the direction of the pointer of the compass.

[1 mark]

(iii) Based on Diagram 10.1 and Diagram 10.2, compare the number of turns of the coil, the number of magnetic field lines, and the current passing through the solenoid.

[3marks]

(iv) State the relationship between the number of turns of the coil and the strength of the magnetic field.

[1 mark]

(b) Diagram 10.3 shows a telephone earpiece.

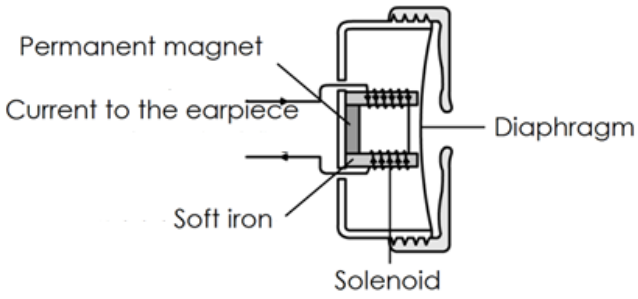


Diagram 10.3

Explain the working principle of the telephone earpiece.

[4 marks]

(c) Diagram 10.4 shows an alternating current generator.

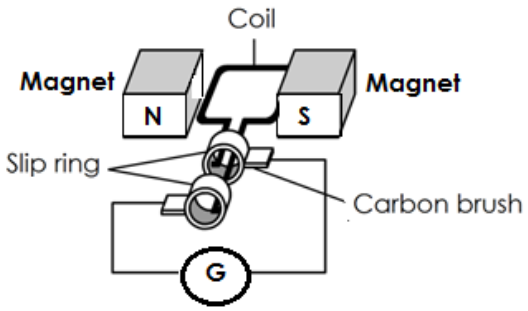


Diagram 10.4

You are required to give some suggestions and modifications to produce an efficient alternating current generator.
Explain the suggestions based on the following aspects:

(i) Shape of the magnet
(ii) Type of core
(iii) Shape of the core
(iv) Number of coils
(v) Rotation power

[10 marks]

Question 12

Diagram 12 shows two birds perching on an electric cable. The birds appeared to be safe although electric current is flowing through the cable.

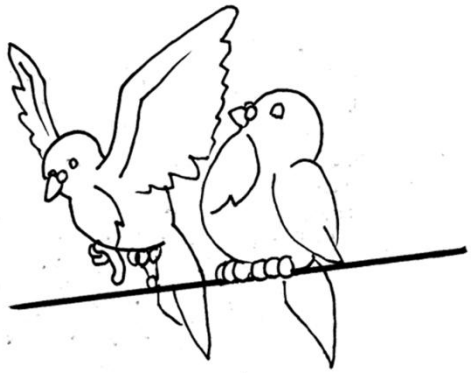


Diagram 12

(a) (i) What is the meaning of electric current?

[1 mark]

(ii) Explain why the birds did not get electrocuted.

[3 marks]

(iii) Explain why the birds can get electrocuted when they touch two different wires at the same time.

[2 marks]

(b) Table 12 shows the characteristics of possible wires that can be used as heating element.

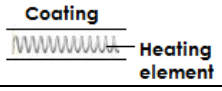
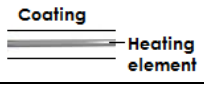
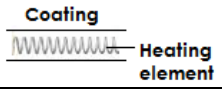
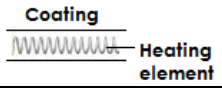
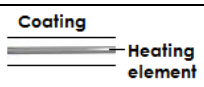
Wire	Resistivity	Resistance	Melting point	Shape of the heating element
U	High	Medium	High	
V	Low	Medium	Medium	
W	High	Low	High	
X	High	High	Low	
Y	Low	Low	High	

Table 12

Explain the suitability of each characteristic of the wires and determine the most suitable wire to be used to make a heating element.
Give a reason for your choice.

[10 marks]

(c) An electric iron has a power rating of 200 V, 1.4 kW. Cynthia irons her clothes for half an hour. If each unit of electricity costs 24 sen, calculate:

(i) the electrical energy used by Cynthia for ironing her clothes.

[2 marks]

(ii) the cost of using the iron for half an hour.

[2 marks]

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Question 1

Diagram 1 shows a detector system which uses a radioactive substance to detect the level of paints in the containers. The containers H, I, J, K, L and M which contain paints are transported on a conveyor belt, passing between the radioactive source and the Geiger-Muller (G-M) tube. The containers which contain less than the standard level of paint are rejected.

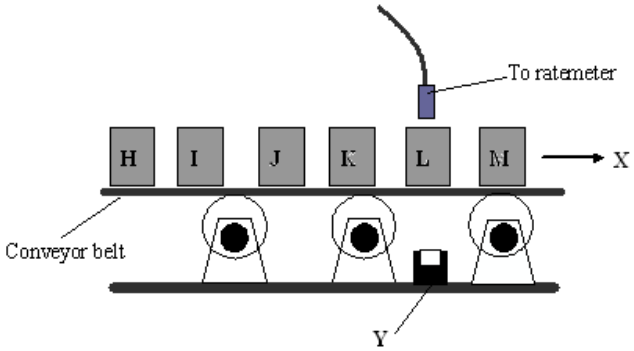


Diagram 1

(a) Name the part labeled Y

.....

[1 mark]

(b) (i) State a suitable type of radiation that can be used in this system.

.....

[1mark]

(ii) Give one reason for your answer in (b) (i)

.....

[1mark]

(c) When the containers and the radioactive source are removed from the system, the ratemeter still records a reading. What cause the reading ?

.....

[1mark]

Question 2

Diagram 2.1 shows a cross section of a Maltese cross tube used to study the characteristics of a cathode ray.

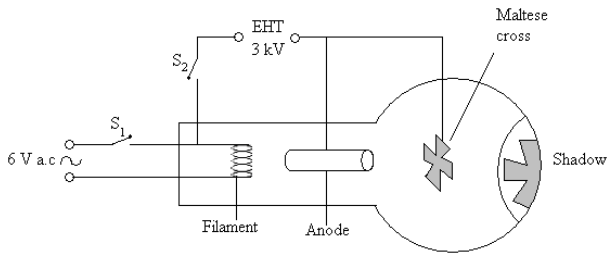


Diagram 2.1

(a) What is the meaning of a cathode ray?

.....

[1 mark]

(b) When switch S1 and switch S2 are turned on, two overlapping shadows are formed on the screen. Explain why the shadows are formed on the screen.

.....

[1 mark]

(c) Calculate the velocity of cathode ray in the Maltese cross tube if 3 kV is applied by EHT [The charge of electron, e = 1.6 x 10^{-19} C and the mass of one electron, me= 9 x 10^{-31} kg]

[2 marks]

(d) Diagram 2.2 shows a pair of magnet with opposite poles are placed at the sides of the Maltese cross tube. One of the shadows deflects.

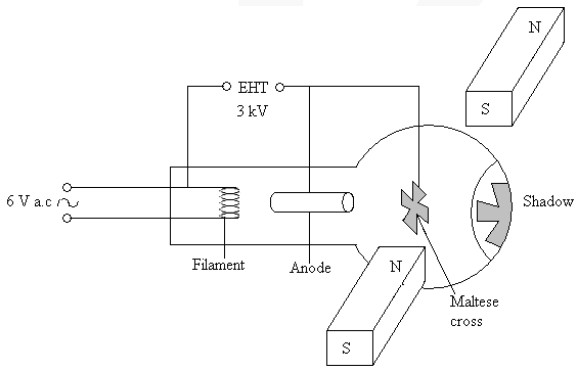


Diagram 2.2

State the physics rule used to determine the direction of depletion of the shadow.

.....

[1 mark]

Question 3

Diagram 3 shows a transistor circuit. The transistor will be switched on when the minimum value of base voltage Vb is 1.0 V .

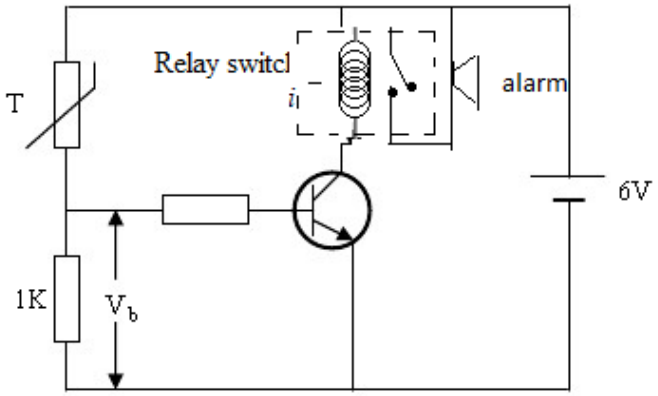


Diagram 3

(ii) Name the type of transistor used in the circuit.

.....

[1 mark]

(iii) Underline the correct word in the brackets to complete the sentence below.

The device T is sensitive to (light / heat / moisture).

[1 mark]

(iv) Calculate the resistance of T when transistor T is switched ON..

[2 marks]

(v) Explain what happens to the transistor circuit above when the temperature of the surrounding increases

.....

.....

[2 marks]

Question 4

Diagram 4 shows an arrangement of logic gates in an electronic device.

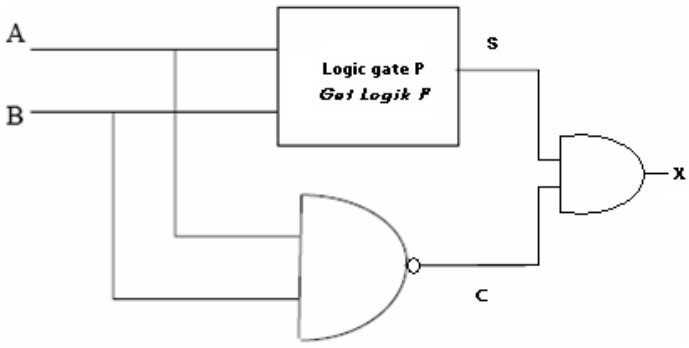


Diagram 4

(a) Table 4.1 shows the truth table for logic gate P.

A	B	S
0	0	1
0	1	0
1	0	0
1	1	0

Table 4.1

(b) Name the logic gate P.

.....

[1 mark]

(c) Draw the symbol for logic gate P.

[1 mark]

(b) Complete Table 4.2 below for the output from the combination of the logic gates in Diagram 4.

A	B	X
0	0	
0	1	
1	0	
1	1	

Table 4.2

[2 mark]

(c) Syafiq wants to invent an alarm system using logic gates in his room. When someone opens the main door , the alarm will give out a siren if he activates the alarm switch The keys and the truth table for the systems as shown below.

Keys

Alarm Switch activated	1
Alarm Switch unactivated	0
Door opened	1
Door closed	0
Alarm siren on	1
Alarm siren off	0

Based on the keys, complete the truth table for the alarm system.

Alarm Switch	Door	Alarm
0	0	
0	1	
1	0	
1	1	

[2 marks]

Using the truth table in c (i), choose a suitable logic gate to fill in the diagram below.

[1 mark]

Question 5

Diagram 5.1 and diagram 5.2 show the deflection of a radioactive emission in an electric field.

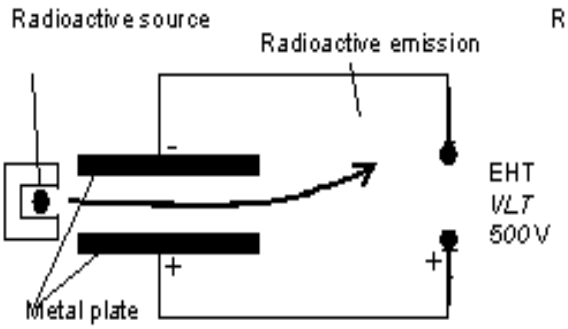


Diagram 5.1

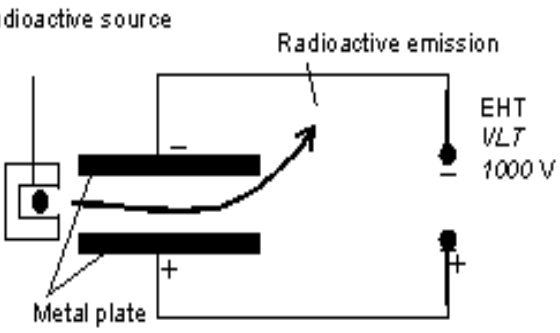


Diagram 5.2

(a) What is meant by radioactivity?

.....

[1 mark]

(b) Using Diagram 5.1 and Diagram 5.2,

(i) state the charge of the radioactive emission

.....

[1 mark]

(ii) compare the voltage of EHT.

.....

[1 mark]

the deflection of the radioactive emission

.....

[1 mark]

(c) state the relationship between

(i) the voltage of EHT and the strength of the electric field between the plates,

.....

[1 mark]

(ii) the strength of the electric field between the plates and the deflection of the radioactive emission

.....

[1 mark]

(d) A radioactive decay involving the Radium nucleus is given by as below.

$$^{226}_{88}\mathrm{Ra} \rightarrow {}^{222}_{86}\mathrm{Rn} + \mathrm{X}$$

(i) What is X?

.....

[1 mark]

(ii) State the change in the proton number in Ra-226 in the above radioactive decay

.....

[1 mark]

Question 7

(a) Diagram 7.1 shows a circuit consists of an automatic switch using a relay to switch on a street light at night.

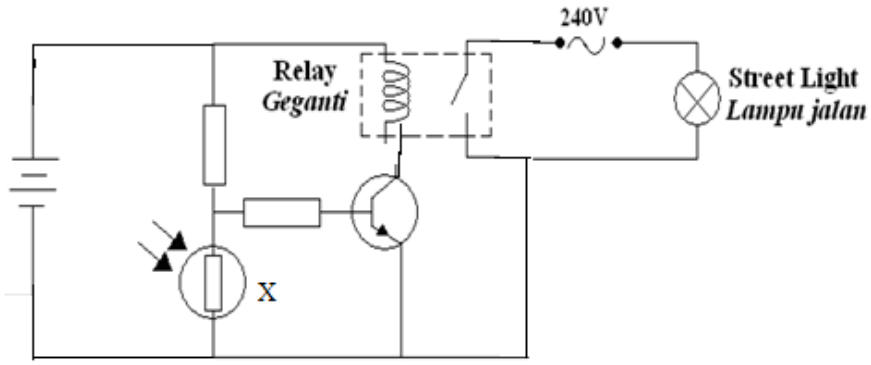


Diagram 7.1

(i) Name the component labeled X

.....

[1 mark]

(ii) State one reason why the relay is used to switch on the street light

.....

[1 mark]

(iii) Explain how the component Q light up the street light at night.

.....

.....

.....

[3 marks]

(b) Diagram 7.2 shows an electrical circuit that consists of transistor to amplify the sound waves from the microphone. P,Q and R are the electronic components that are used to complete the circuit.

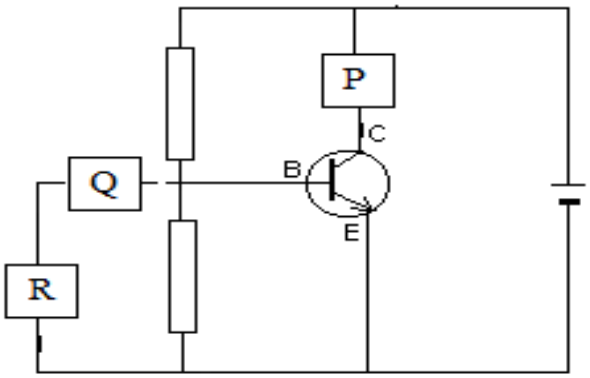


Diagram 7.2

Diagram 7.3 shows an electrical component that is used to complete the circuit in Diagram 7.2

		
Capasitor	Earphone	Microphone

Diagram 7.3

Based on Diagram 7.2 and Diagram 7.3, state the electronic component for P, Q and R and the function of the component.

(i) P: .....

Function: .....

[2 marks]

(ii) Q: .....

Function: .....

[2 marks]

(iii) R: .....

[1 mark]

Question 8

.

Diagram 8.1 shows a technician is tracing water pipe line lay underground to detect leakage point.

Table 8.1 shows three types of radioisotope are suggested to be used to detect the leakage point of the pipe. Small amount of radioisotope is used in the water reservoir.

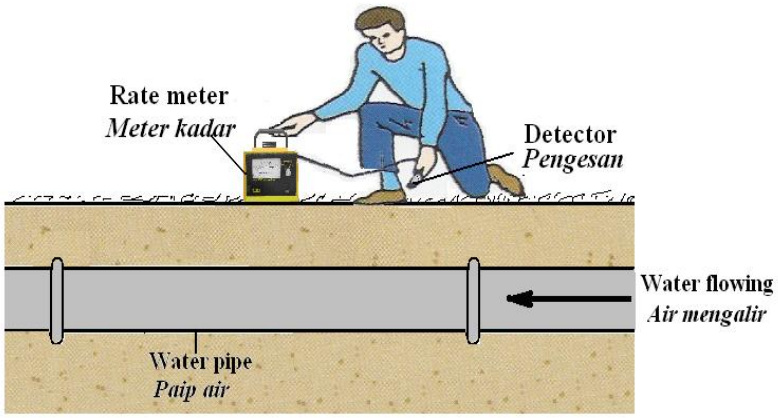


Diagram 8.1

Radioisotope	Half life	Types of radiation	Physical state
Sodium-24	15 hours	beta	Liquid
Iodine-131	8 days	gamma	Liquid
Phosphorus-32	15 days	beta	Solid

Table 8.1

A G-M counter is moved over the pipe according to layout plan. At a point, the G-M counter detected high radiation level indicating the point of leakage.

(a) What is meant by half life?

.....

[1 mark]

(b) The leakage of the water pipe is based on the reading of the rate meter connected to the detector used. The background reading is 50 count /min

From the reading of the rate meter produced state how to identify the position where the leakage occurs.

.....

[1 mark]

(c) Based on table 8.1, state the most suitable properties of the radioisotope used to detect the leakage.
Give reasons for the suitability of the properties.

(i) Half life

……

Reason

……

[2 marks]

(ii) Penetrating power

……

Reason

……

[2 marks]

(iii) Physical state

……

Reason

……

[2 marks]

(d) Based on n your answer in 8(c), determine which of the 3 radioisotope is the most suitable.

……

[1 mark]

(e) The element Strontium-90 has a half life of 28 years.
Calculate
(i) the time for the activity to reduce to 1/16 of the original value.

[2 marks]

(j) The number of Strontium atoms at the beginning is 2400 activity per seconds. Find the percentage of Strontium after 140 years which are decayed?

[1 mark]

Question 10

Diagram 10.1 shows a transistor circuit. Diagram 10.2 and diagram10.3 show the transistor circuit with different microammeter reading and milliammeter reading.

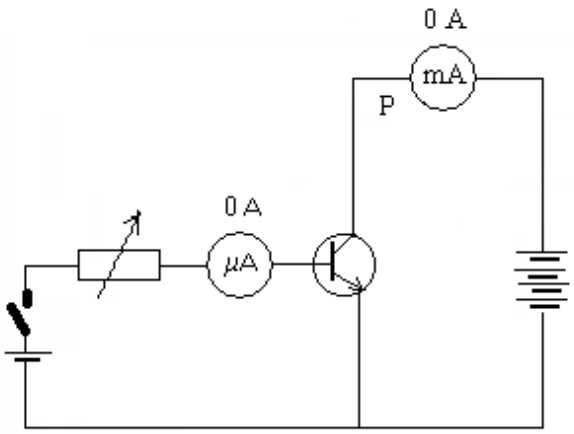


Diagram 10.1

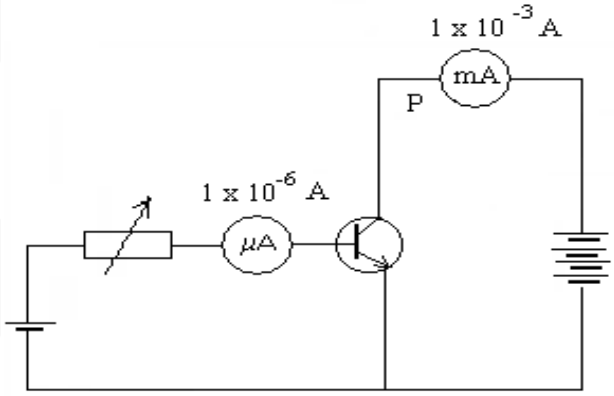


Diagram 10.2

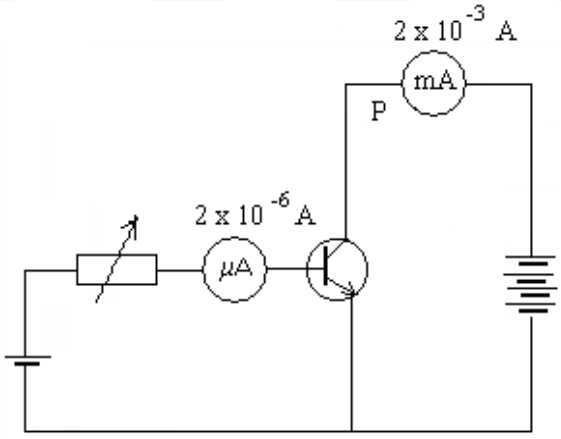


Diagram 10.3

(a) State one of the functions of a transistor? [1 mark]

(b) (i) Using Diagram 10.1, compare the micro ammeter reading and the milliammeter reading.

(ii) Using Diagram 10.2, compare the microammeter reading and the milliammeter reading.

(ii) Using Diagram 10.2 and Diagram 10.3, compare the change in micro ammeter reading and the change in milliammeter reading.

(iv) Relate the microammeter reading, milliammeter reading and deduce a physics concept for base current , Ib and collector current, Ic in a transistor circuit.

[5 marks]

(c) Diagram 10.4 shows a transistor circuit is used to light up a bulb at night.

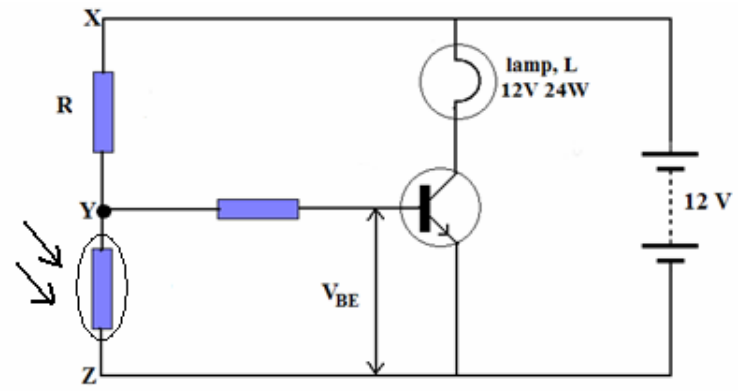


Diagram 10.4

Explain why the bulb light up at night.

[4 marks]

(d) Suggest the modifications need to be done to the circuit in Diagram 10.4 so that it can function as automatically fire alarm switch that needs high voltage.
Explain your suggestions base on the following aspects:

(i) The electrical components that are needed to replace any components in the circuit.

(ii) The position of these components in the circuit

(iii) The electrical components that is connected to the output transistor

[10 marks]

Question 12

(a) What is meant by a semiconductor?

[1 mark]

(b) Diagram 12.1 shows a full wave rectifier circuit.

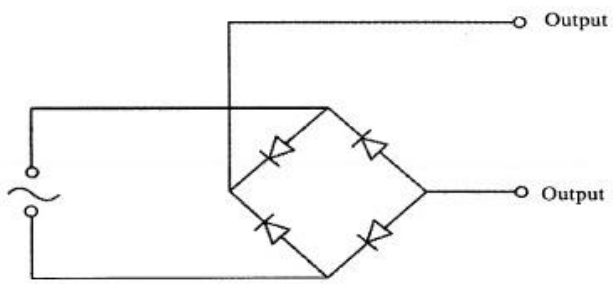


Diagram 12.1

(i) Draw the waveform of a full wave rectification.

[1 mark]

(ii) What modification can do on the circuit in Diagram 12.1 to smooth the current?

[1 mark]

(iii) Draw on Diagram 12.1 the modification you suggest in (a)(ii).

[1 mark]

(iii) Draw the smoothen current.

[1 mark]

(c) The door of the lift is fitted with a light transmitter and a detector which is a light dependent resistor (LDR).
If the LDR detects light, the relay switch is activated and the lift door will close. You are asked to investigate the circuit of the lift, and design suitable circuit to close the door of the lift, if there is no people in front of the lift as shown in Table 12.

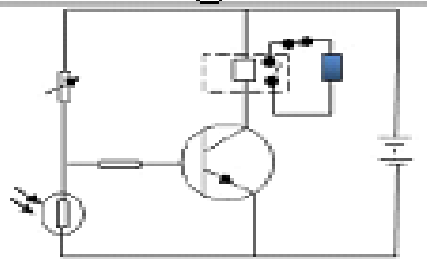
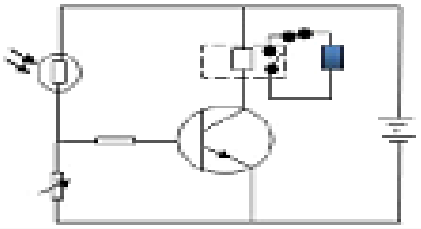
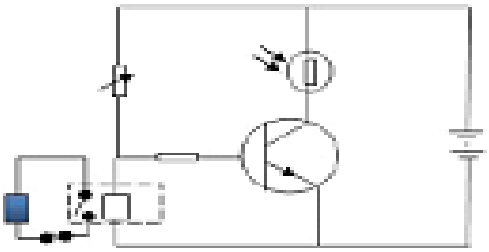
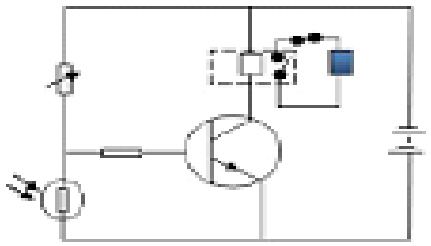
Circuit	Diagram
P	
Q	
R	
S	

Table 12

Explain the suitability of the characteristics in Table 12 and than determine the most suitable circuit for the door of the lift. Give a reason for your choice.

[10 marks]

Diagram 12.2 shows trace of CRO screen when a potential different connected on it. The Y gain setting is 2 V / div and time-base is set to 0.1s /div.

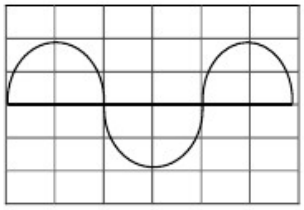


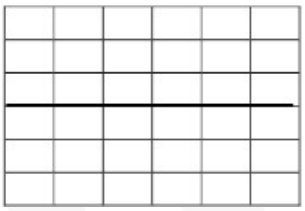
Diagram 12.2

(i) What type of current that is connected to the CRO? [1 mark]

(ii) What is the peak-voltage of the current? [1 mark]

(iii) Calculate the frequency of the current. [2 marks]

(iv) Sketch the trace of CRO screen of the same current if the time-base is off



[1 mark]

SECTION C

SET 1 - FORM 4 TOPICS http://cikguadura.wordpress.com/

Section A
[28 marks]

Answer all question

1. A student carries out an experiment to find the relationship between length, *l* and the oscillation period, *T*, of a simple pendulum. The length of the pendulum used is 10.0 cm. The arrangement of the apparatus for the experiment is shown in Diagram 1.1

.

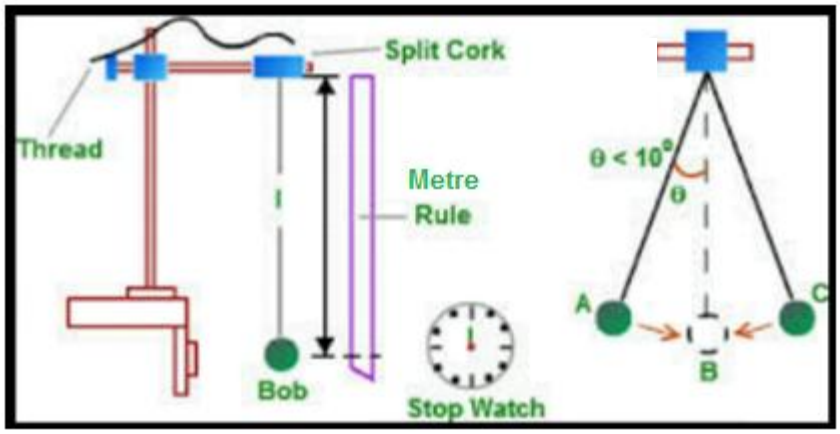


Diagram 1.1

The pendulum is displaced horizontally to one side and then released so that it oscillates. The time for 10 oscillations, t_1, is taken using a stop watch. The pendulum is oscillated again to obtain the time for 10 oscillations, t_2, for the second time. The actual readings of t_1 and t_2 are shown in Diagram1.2 .

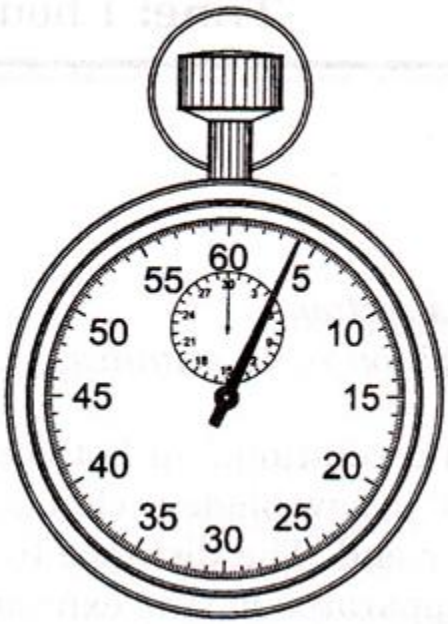
The experiment is repeated by using pendulum with length of 20.0 cm, 30.0 cm,40.0 cm and 50.0 cm. The readings of the stop watch are shown in Diagram 1.3, 1.4,1.5 and 1.6 .

The period of oscillation, *T*, of the pendulum is given by the following equation:

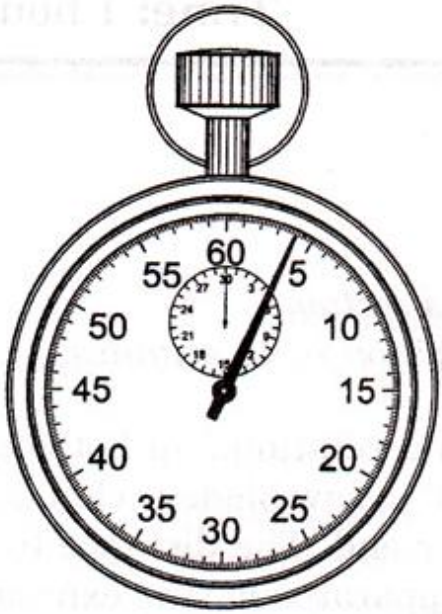
$$T = \frac{t_{mean}}{10}$$

The value of the smallest scale of the stop watch is 0.2 s

Where $t_{mean} = \frac{t_1 + t_2}{2}$

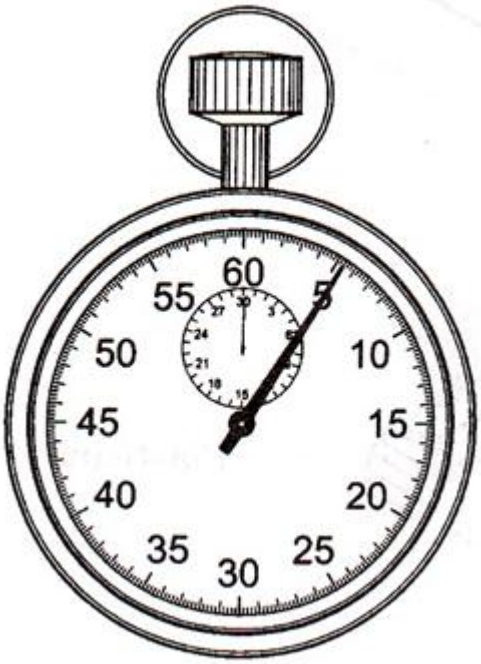


First Reading

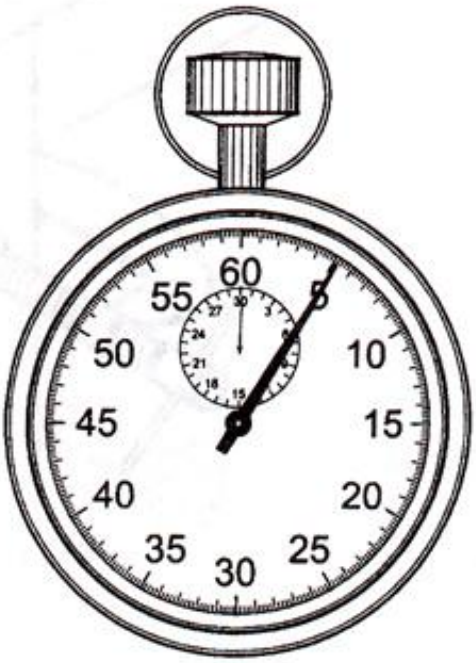


Second Reading

Diagram 1.2 : Length of pendulum = 10.0 cm

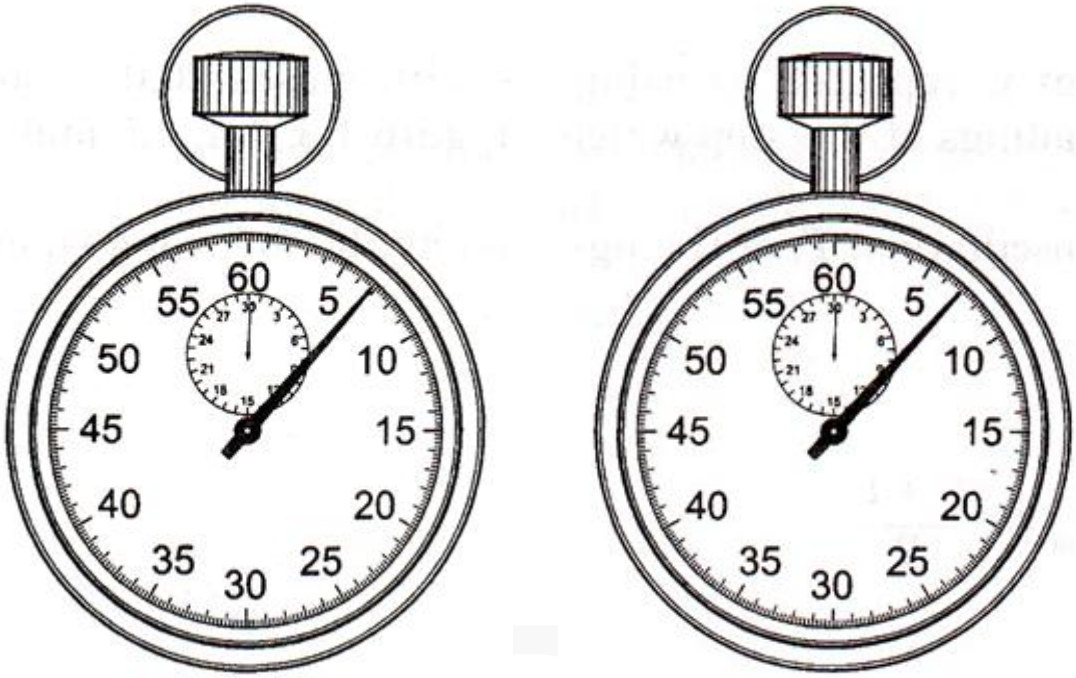


First Reading



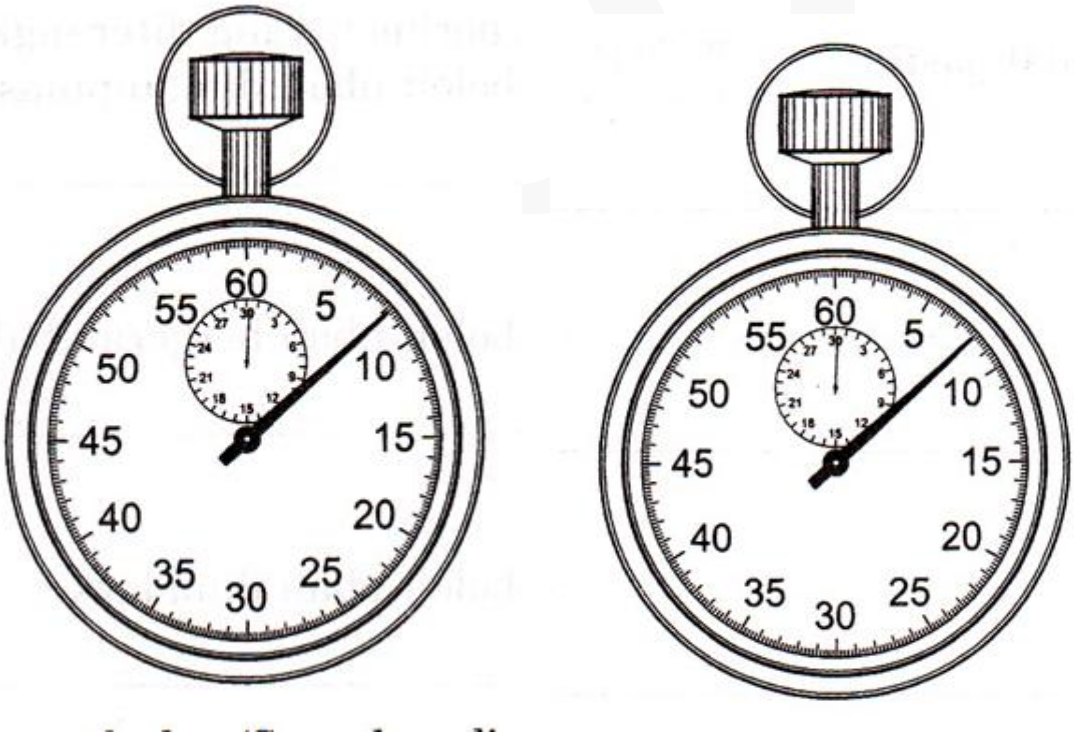
Second Reading

Diagram 1.3 : Length of pendulum = 20.0 cm



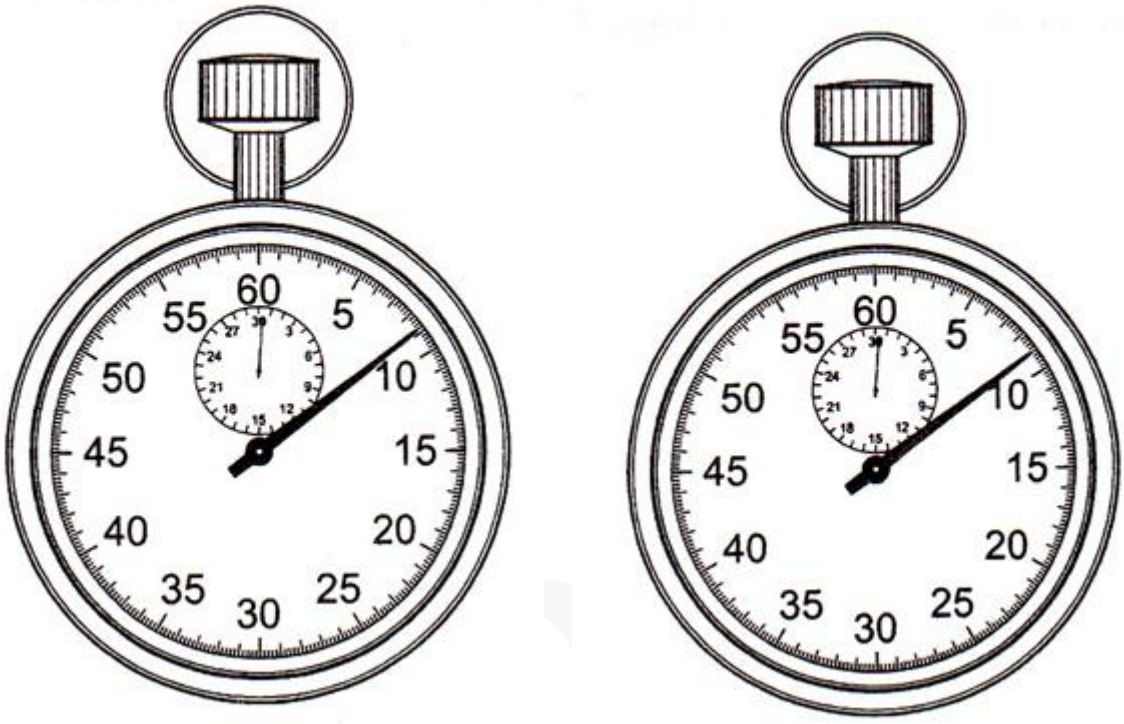
First Reading Second Reading

Diagram 1.4 : Length of pendulum = 30.0 cm



First Reading *Second Reading*

Diagram 1.5 : Length of pendulum = 40.0 cm



First Reading *Second Reading*

Diagram 1.6 : Length of pendulum = 50.0 cm

(a). For the experiment described, identify,

(i) The manipulated variable

.....

[1 mark]

(ii) The responding variable

.....

[1 mark]

(iii) A fixed variable

.....

[1 mark]

(b) Based on Diagram 1.2, 1.3, 1.4, 1.5 and 1.6 , determine t_1, t_2, t_{mean}, T and T^2 when l is equal to 10.0 cm, 20.0 cm, 30.0 cm, 40.0 cm and 50.0 cm.
Tabulate your results for t_1, t_2, t_{mean}, T and T^2 for each value of l in the space below.

[7 marks]

(c) On graph paper, plot a graph of T^2 against I.

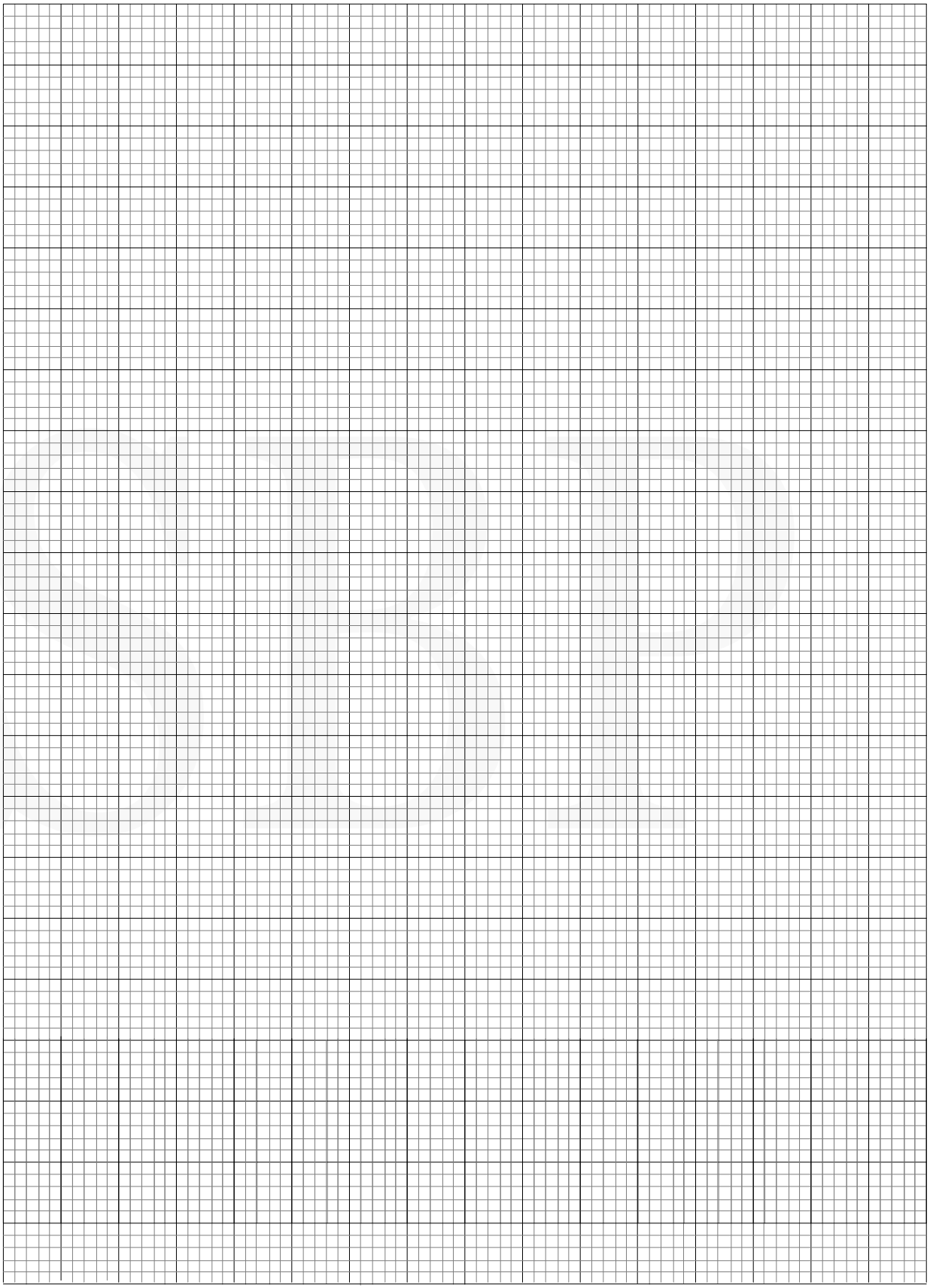
[5 marks]

(d) Use your graph to state the relationship between T^2 and I.

.....

[1 mark]

Graph of T^2 against I



2 A student carries out an experiment to investigate the relationship between pressure, ***P*** and depth, ***h*** of a liquid X at sea level. The results of the experiment is as shown in the graph of ***P*** against ***h***as in Diagram 2.1.

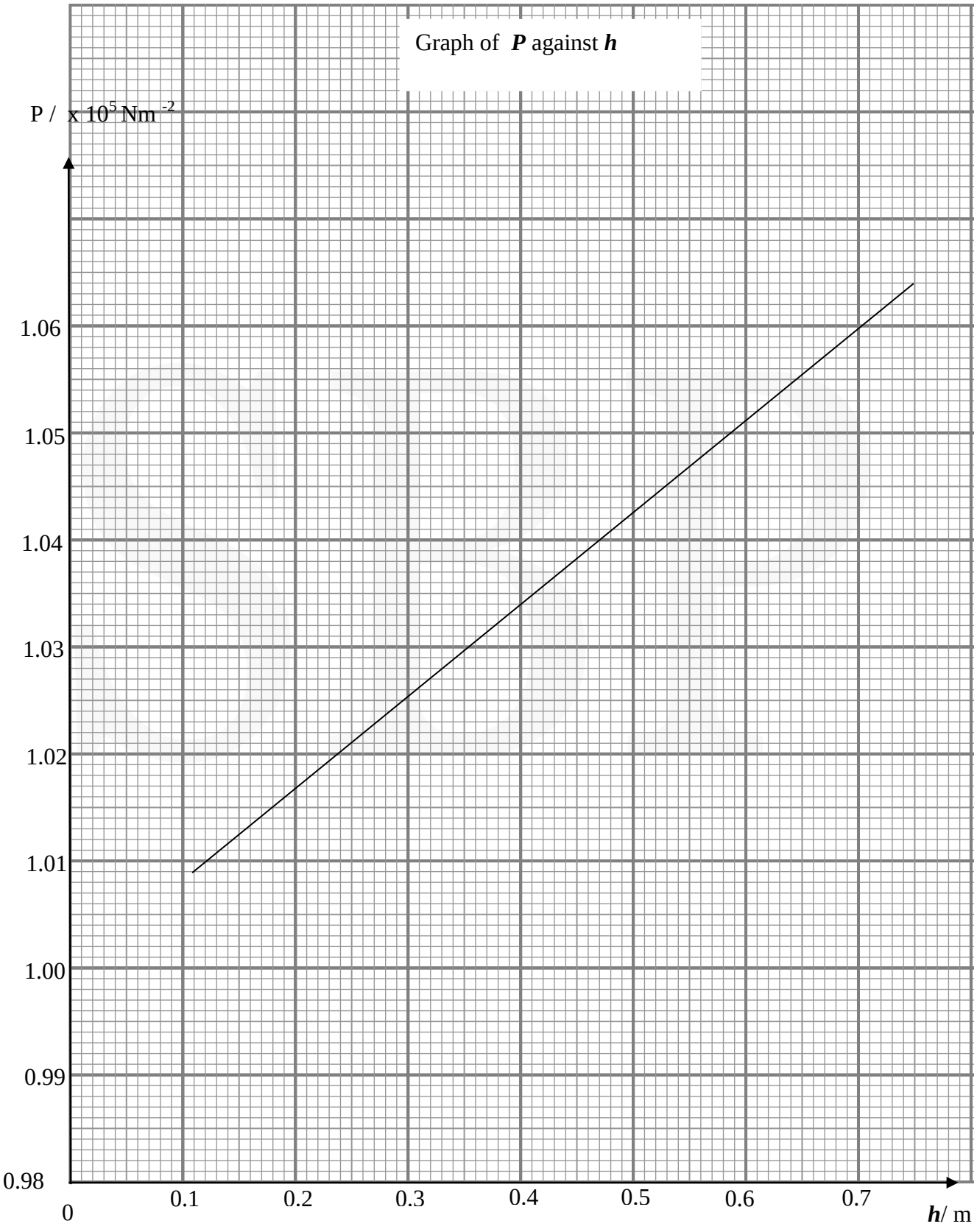


Diagram 2.1

The pressure ***P*** is determined by using the formula : $P = P_{liquid} + P_{atm}$ where

P_{liquid} - pressure by column of liquid X
P_{atm} - atmospheric pressure

(a) Based on the graph in Diagram 2.1, determine the atmospheric pressure, P_{atm} when h = 0 m.
Show on the graph, how you determine the value of the atmospheric pressure.

P_{atm} = ...

[2 marks]

(b) The density of the liquid, ρ can be determined from the formula $\rho = 0.12\ k$ where **k** is the gradient of the graph *P* against *h*

(i) Calculate the gradient, ***k*** of the graph of ***P*** against ***h***.
Show on the graph how you determine ***k***.

K = ...

[4 marks]

(ii) Determine the density of liquid, ρ

ρ = ... kgm^{-3}

[1 mark]

(c) Based on the graph on Diagram 2.1, determine the pressure, ***P*** exerted on the liquid when the depth of liquid, ***h*** = 0.5 m. Show on the graph how you determine ***P***.

P = ...

[2 marks]

(d) (i) If the liquid X is replaced with a denser liquid Y, what will happen to the value of ***k***?

.....

[1 mark]

(ii) Explain your answer.

.....

[1 mark]

(e) State **one** precaution that should be taken to improve the results of this experiment.

.....

.....

[1 mark]

Section B
[12 marks]

3. Diagram 3.1 shows a boy pouring boiling water into a cup. The boy's hand is not scalded by the water droplets splashing out of the cup.
Diagram 3.2 shows the boy accidently pouring the boiling water directly onto his hand. His hand is scalded.

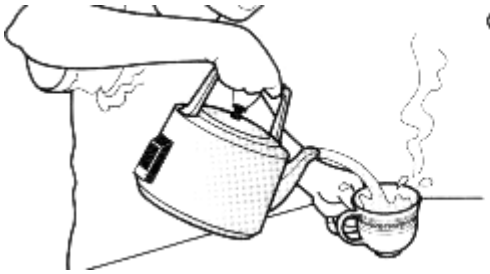


Diagram 3.1

Diagram 3.2

Based on the above information and observation, and your knowledge on heat and the factors affecting heat;

(a) State **one** suitable inference. [1 mark]

(b) State **one** hypothesis. [1 mark]

(c) With the use of apparatus such as an immersion heater, thermometer, beakers and other suitable apparatus, design an experiment to test the hypothesis,

In your description, state clearly the following:

(i) The aim of the experiment.

(ii) The variables in the experiment.

(iii) The list of apparatus and materials.

(iv) The arrangement of the apparatus.

(v) The procedure used in the experiment which should include **one** method of controlling the manipulated variable and **one** method of measuring the responding variable.

(vi) The way to tabulate the data.

(vii) The way to analyse the data.

[10 marks]

4 A student used a slide projector to produce an image on the screen. Diagram 4.1 and Diagram 4.2 show the relative positions of the slide, projector lens and the screen.
It is observed that when the projector lens is moved nearer to the slide as shown in Diagram 4.2, the screen has to be moved further away from the slide to obtain a sharp image.

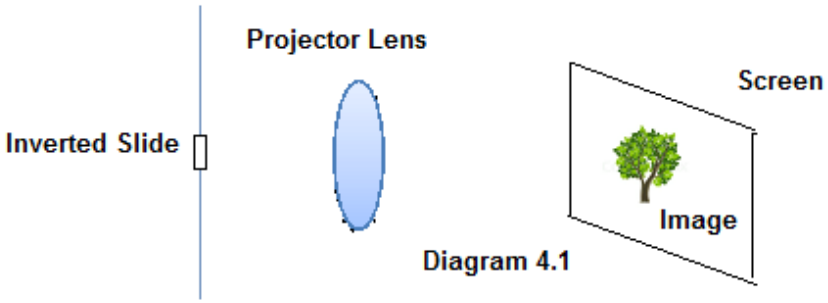


Diagram 4.1

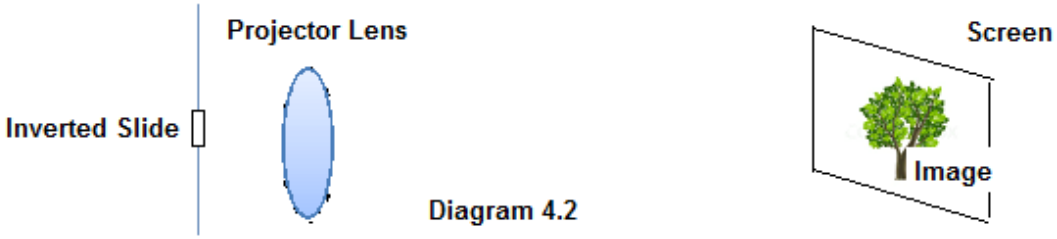


Diagram 4.2

Based on the information and observation:

(a) State **one** suitable inference.

[1 mark]

(b) State **one** hypothesis.

[1 mark]

(c) With the use of apparatus such as convex lens, filament bulb and other apparatus describe**one** experiment to investigate the hypothesis stated in 4(b).

In your description, state clearly the following:

(i) The aim of the experiment.

(ii) The variables in the experiment.

(iii) The list of apparatus and materials.

(iv) The arrangement of the apparatus.

(v) The procedure used in the experiment which should include **one** method of controlling the manipulated variable and **one** method of measuring the responding variable.

(vi) The way to tabulate the data.

(vii) The way to analyse the data.

[10 marks]

SET 2 - FORM 5 TOPICS http://cikguadura.wordpress.com/

Section A
[28 marks]
Answer **all** question

1. An experiment is carried out to investigate the relationship between the height of air inside thetube,***h*** and the frequency of sound wave, ***f*** generated. The air pump is used to blow the air on top of the tube so that it will produce a sound. The sound is then detect by a microphone and the pattern of sound wave is displayed on the screen of CRO. The arrangement of the apparatus for this experiment is shown in Diagram 1.1.

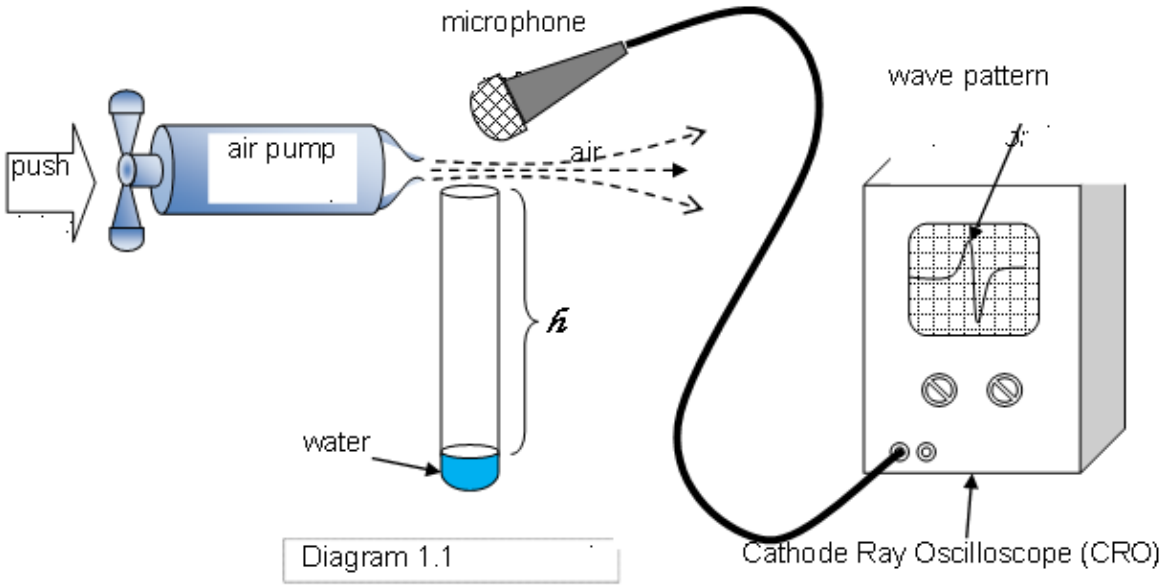


Diagram 1.1

From the pattern of the wave, the period of the wave generated,**T** can be calculated by using the equation,

T = ***d*** (0.05)s cm^{-1},

where***d*** is the length of one wave in cm.

The frequency of the wave,***f*** can be calculated by using equation,

$$f = \frac{1}{T}$$

Diagram 1.2 shows the example of illustration of the wave pattern from the CRO screen.

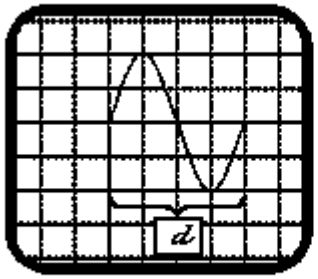


Diagram 1.2

Scale : 1 square = 1 cm x 1 cm

d = 4.0 cm

T = 4.0 cm (0.05 s cm^{-1})
= 0.20 s

The experiment begins with the height of the air, h = 30.0 cm and the pattern of the wave produced on the CRO's screen is shown in Diagram 1.3.
The experiment is then repeated by using different height, h = 25.0 cm, 20.0 cm, 15.0 cm and 10.0 cm and the corresponding pattern of wave is shown in Diagram 1.4, 1.5, 1.6 and 1.7.

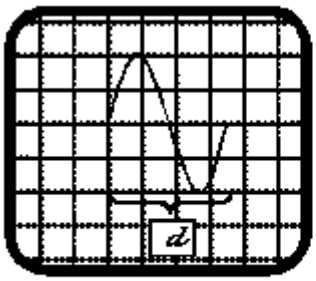


Diagram 1.3

Scale : 1 square = 1 cm x 1 cm

h = 30.0 cm

d= _____

T = _____

f = _____

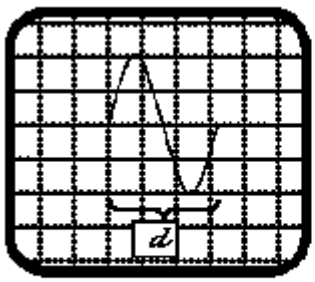


Diagram 1.4

Scale : 1 square = 1 cm x 1 cm

h = 25.0 cm

d= _____

T = _____

f = _____

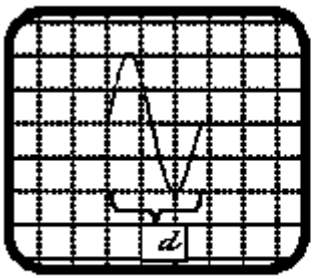


Diagram 1.5

Scale : 1 square = 1 cm x 1 cm

λ = 20.0 cm

d= _____

T = _____

f = _____

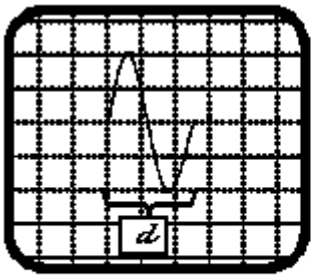


Diagram 1.6

Scale : 1 square = 1 cm x 1 cm

λ = 15.0 cm

d= _____

T = _____

f = _____

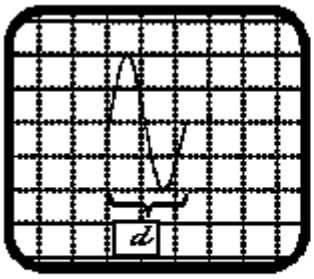


Diagram 1.7

Scale : 1 square = 1 cm x 1 cm

λ = 10.0 cm

d= _____

T = _____

f = _____

(a) For the experiment described above identify:

(i) The manipulated variable,

.....

[1 *mark*]

(ii) The responding variable,

.....

[1 *mark*]

(iii) A constant variable.

.....

[1 *mark*]

(b) Based on Diagrams 1.3, 1.4, 1.5, 1.6 and 1.7, determine the length of one wave, ***d***, and period of wave, **T**, for the corresponding height of air in the tube, ***h***.
For each value of *h*, calculate the frequency of wave ***f***.
Tabulate your results for ***d*** , ***T*** *and* ***f*** for every value of ***h*** in the space below.

[6 *marks*]

(c) On the graph paper , plot a graph of ***f*** against ***h***.

[5 *marks*]

(d) Based on your graph, state the relationship between ***f*** and ***h***.

.....
....

[1 *mark*]

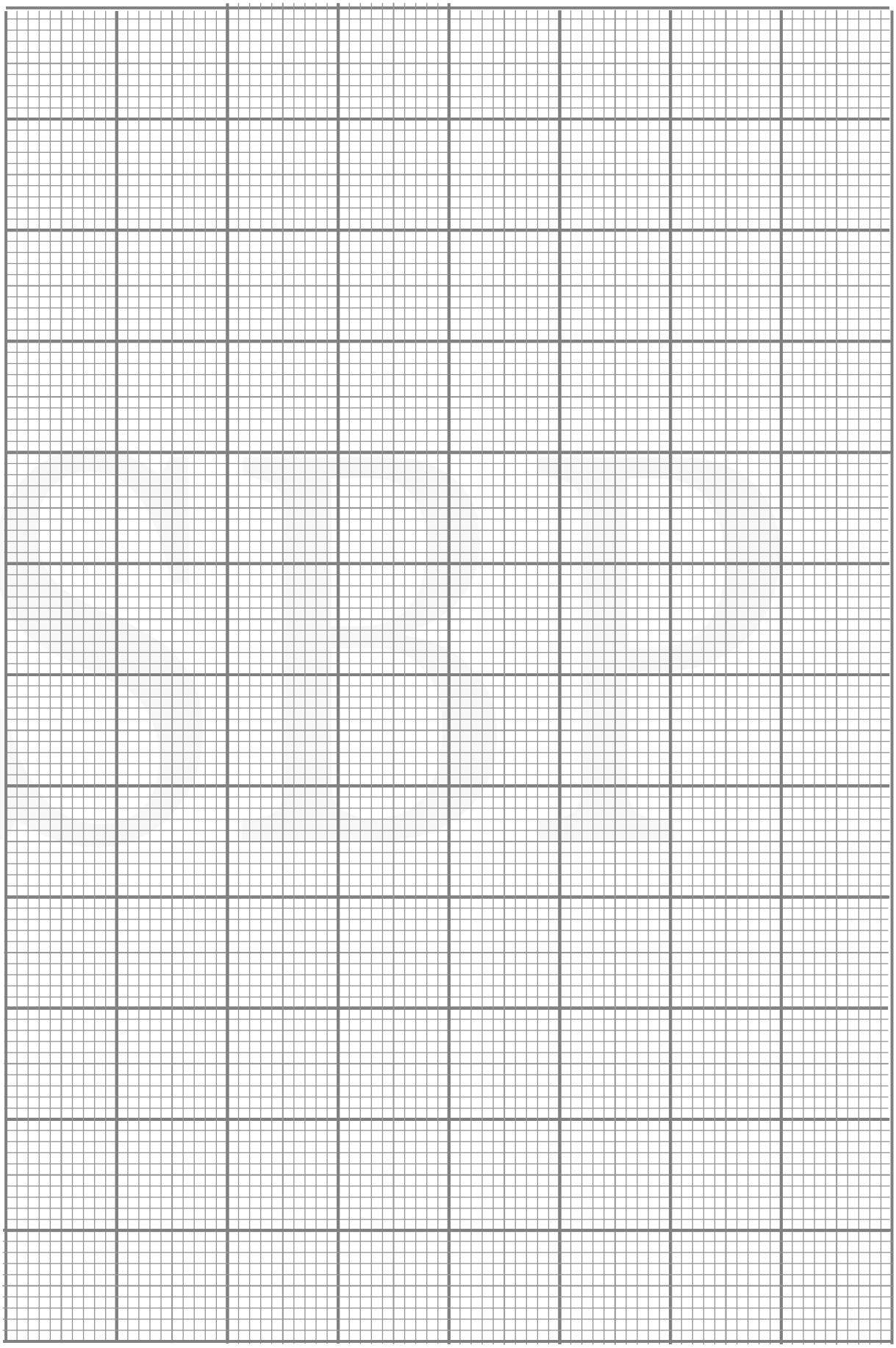
(e) State one precaution that should be taken to obtain accurate readings in this experiment.

.....
....

.....
...

[1 *mark*]

Graph of ***f*** against ***h***



2. A student carries out an experiment to investigate the relationship betweenresistance, *R*, and length of a constantan wire, *l*.

The results of this experiment is shown in the graph of *R* against *l* in Diagram 2.1.

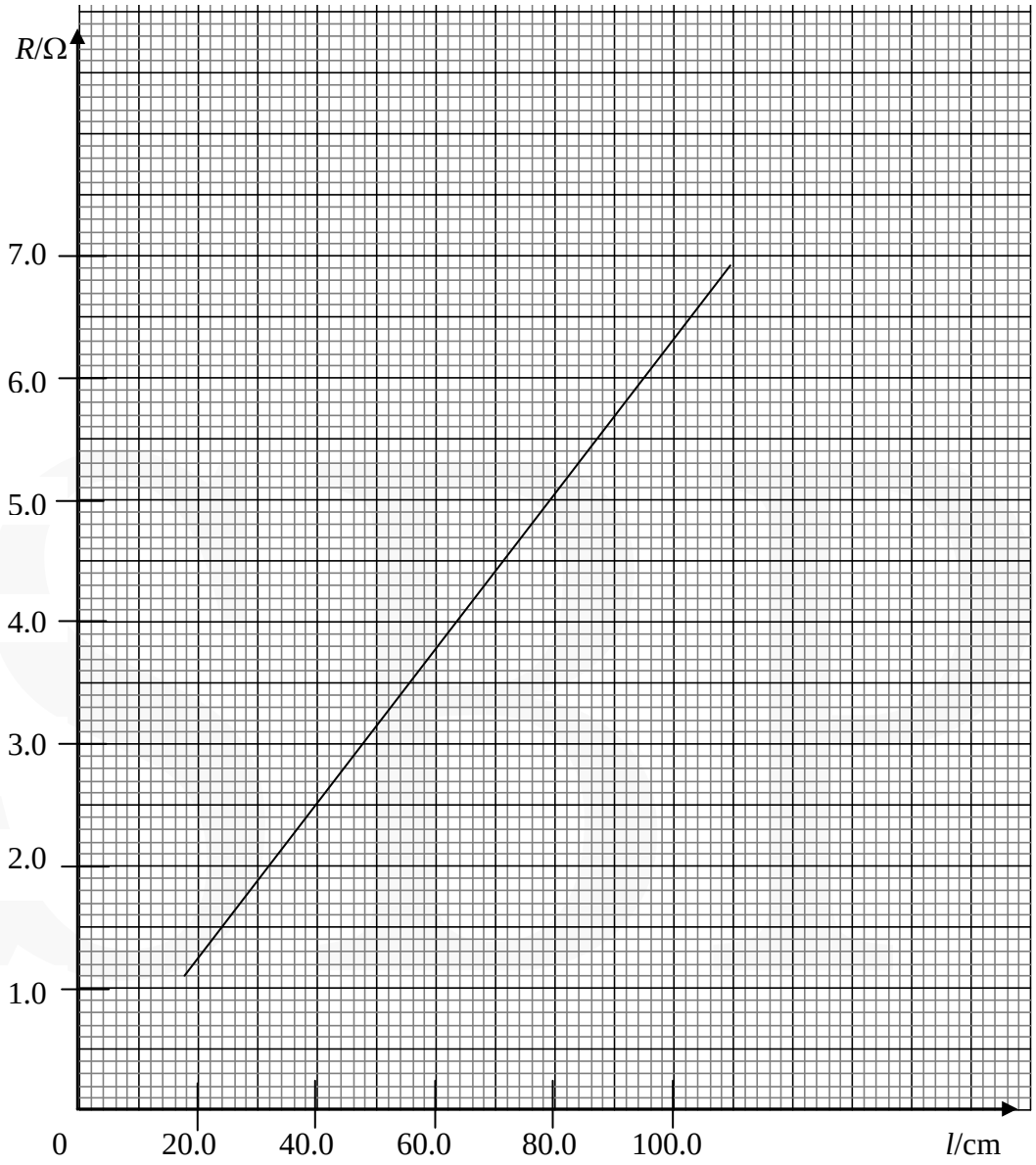


Diagram 2.1

(a) Based on the graph in Diagram 2.1, state the relationship between *R* and *l*.

.....

[*1 mark*]

(b) The resistivity, ρ, is given by the formula $\rho = mA$, where m is the gradient of the graph and A is the cross-sectional area of the wire.

(i) Calculate the gradient, *m*, of the graph
Show on the graph how you calculate m.

m = ...

[*3 marks*]

(ii) Determine the value of ρ, if A = 1.5 x 10^{-5}cm^2.

[2 *marks*]

(c) (i) Based on the graph in Diagram 2.1, determine the value of *R* when *l* = 16.0 cm.
Show on the graph, how you determine the value of R.

[2 *marks*]

(ii) Another identical constantan wire with the same resistance as 2 (c) (i) is connected in parallel to the wire. The effective resistance, R', of two constantan wire in parallel is given by the formula $\frac{1}{R'} = \frac{1}{R} + \frac{1}{R}$.

Calculate R'.

[3 marks]

(d) State **one** precaution that can be taken to improve the accuracy of the readings in the experiment.

.....

.....

[1 *mark*]

.

Section B

(12 marks)

3. Diagram shows a step down transformer. A primary coil is connected to the input supply 240V a.c. Diagram 3.1 and diagram 3.2 shows a bulb that is connected to a secondary coil. It is observed that the brightness of the bulb in diagram 3.2 is brighter than in diagram 3.1

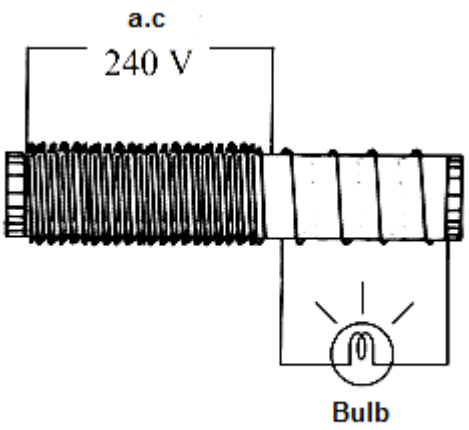


Diagram 3.1

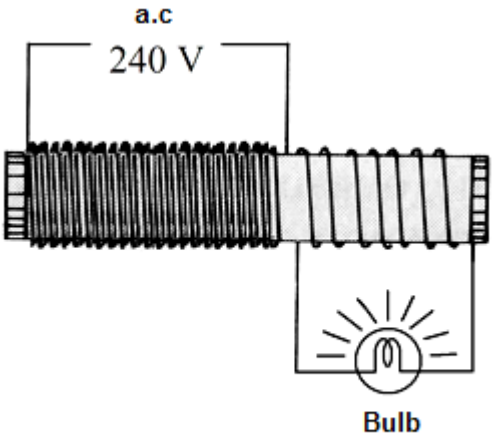


Diagram 3.2

Based on the information and observation:

(a) State **one** suitable inference. [1 mark]

(b) State **one** hypothesis. [1 mark]

(c) With the use of apparatus such as coil, voltmeter, two pieces soft iron core and other suitable apparatus, describe an experiment framework to investigate the hypothesis stated in 4(b). In your description, state clearly the following :

(i) The aim of the experiment.

(ii) The variables in the experiment.

(iii) The list of apparatus and materials.

(iv) The arrangement of the apparatus.

(v) The procedure used in the experiment which should include **one** method of controlling the manipulated variable and **one** method of measuring the responding variable.

(vi) The way to tabulate the data.

(vii) The way to analyse the data.

[10 marks]

4. Diagram 4 shows an audio technician checking and testing the audio system in a mini theatre by changing his seating positions.

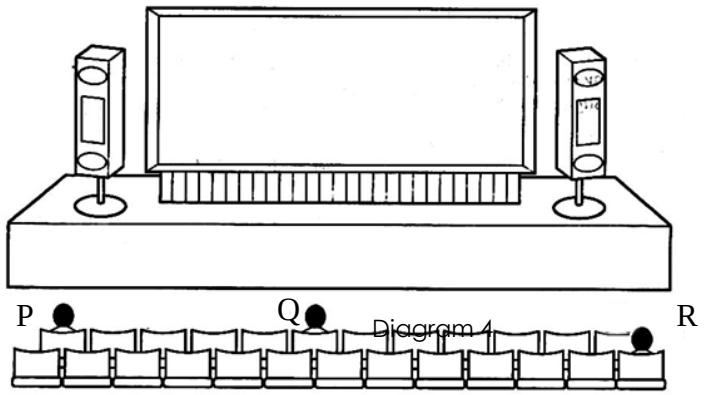


Diagram 4

Clear and loud sound can only be obtained at seating positions P and Q which is equals to 4 seatings away from each other with a certain distance from the loudspeakers. When he moves further away from the loudspeakers, the clear and loud sound can only be heard between Q and R which is equals to 6 seatings away from each other.

Based on the information and observation:

(a) State **one** suitable inference [1 mark]

(b) State **one** hypothesis. [1 mark]

(c) With the use of apparatus such as audio generator, loudspeakers and other apparatus, describe **one** experiment to investigate the hypothesis stated in **4**(b).

In your description, state clearly the following:

(i) The aim of the experiment.

(ii) The variables in the experiment.

(iii) The list of apparatus and materials.

(iv) The arrangement of the apparatus.

(v) The procedure used in the experiment which should include **one** method of controlling the manipulated variable and **one** method of measuring the responding variable.

(vi) The way to tabulate the data.

(vii) The way to analyse the data.

[10 marks]

END OF PERFECT SCORE MODULE

' TOGETHER we must succeed, TOGETHER we will succeed '

Richard Riordan, 39h Mayor of LA, California

….From Physics panels, we would like to wish you all the best in your SPM examination. Make SBP, your parents and teachers proud of you…☺

PERFECT SCORE

http://cikguadura.wordpress.com/

(TEACHER'S GUIDE)

SekolahBerasramaPenuh

2013

NAME: ……

SBP:……

PHYSICS

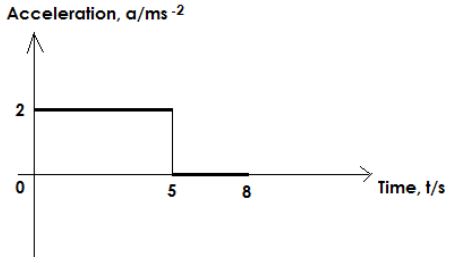
SECTION A

http://cikguadura.wordpress.com/

<table>
<tr><th colspan="3">QUESTION</th><th>ANSWER</th></tr>
<tr><td rowspan="4">1</td><td colspan="2">(i)</td><td>10000 cm^2</td></tr>
<tr><td colspan="2">(ii)</td><td>5 x 10^6 cm^3</td></tr>
<tr><td colspan="2">(iii)</td><td>8 x 10^{-4} m^2</td></tr>
<tr><td colspan="2">(iv)</td><td>m s^{-2}</td></tr>
<tr><td rowspan="6">2</td><td colspan="2">(a)</td><td><table>
<tr><td>metre rule</td><td>0.1 cm</td><td>0.1 cm</td><td>41.6 cm</td></tr>
<tr><td>vernier callipers</td><td>0.01 cm</td><td>0.01 cm</td><td>2.88 cm</td></tr>
<tr><td>micrometer screw gauge</td><td>0.01 mm</td><td>0.01 mm</td><td>16.66 mm</td></tr>
</table></td></tr>
<tr><td>(b)</td><td>(i)</td><td>C</td></tr>
<tr><td></td><td>(ii)</td><td>A</td></tr>
<tr><td colspan="2">(c)</td><td>higher</td></tr>
<tr><td colspan="2">(d)</td><td>more</td></tr>
<tr><td rowspan="6">3</td><td rowspan="4">(a)</td><td>(i)</td><td>v is directly proportional to t</td></tr>
<tr><td>(ii)</td><td>v increases linearly to t</td></tr>
<tr><td>(iii)</td><td>v decreases linearly to t</td></tr>
<tr><td>(iv)</td><td>v is inversely proportional to t</td></tr>
<tr><td colspan="2">(b)</td><td>v = -t + 5</td></tr>
<tr><td rowspan="2">(c)</td><td>(i)</td><td>5/10 = 0.5 m s^{-2}</td></tr>
<tr><td>(ii)</td><td>(20 – 5)/2 = 7.5 m s^{-2}</td></tr>
</table>

SECTION B

SET 1 - Force and Motion, Force and Pressure

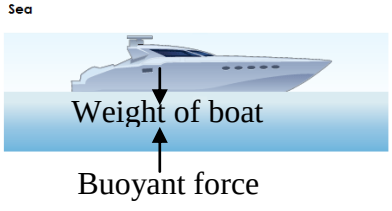
<table>
<tr><th colspan="2">QUESTION</th><th>ANSWER</th><th>MARK</th></tr>
<tr><td rowspan="3">1</td><td>(a)</td><td>Uniform velocity</td><td>1</td></tr>
<tr><td></td><td>Acceleration = $\frac{10}{5}$ = 2 ms^{-2}</td><td>1</td></tr>
<tr><td>(b)
(c)</td><td> 
</td><td>1
correct shape

1
label correct</td></tr>
<tr><td colspan="3">TOTAL</td><td>4</td></tr>
</table>

QUESTION		ANSWER	MARK
2	(a)	Act of push or pull // act that change the shape and velocity	1
	(b)	150 cos 60^0	1
		= 7.5 N	1
	(c)	7.5 N	1
	(d)	The trolley moves with constant velocity, hence resultant force is zero	1
TOTAL			5

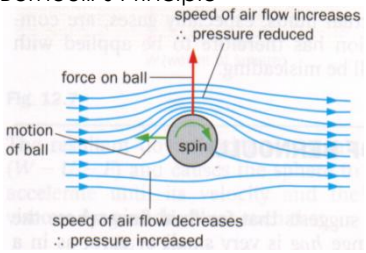
QUESTION		ANSWER	MARK
3	(a)	Force acting over a short time interval	1
	(b)	As time of impact increases, impulsive force decreases	1
	(c)	$Impulsive\ force, F = \frac{m(v-u)}{t}$	
		$F = \frac{0.1\ (50-(-40))}{20\ \times 10^{-3}}$	1
		F = 450 N	1
	(d)	Continue to swing his bat	1
	(e)	To increase the speed of the ball	1
TOTAL			6

QUESTION		ANSWER	MARK
4	(a)	Force acting perpendicularly per unit area	1
	(b)	When the levers are squeezed, air is forced out producing partial vacuum in the cup	1
		Higher atmospheric pressure causes a force acting on the windshield glass	1
	(c)(i)	1 x 10^5 – 45 000 = 55 000 N	1
	(ii)	Force = 55 000 (0.002)	1
		= 110 N	1
	(iii)	$\frac{110}{10} = 11\ kg$	1
TOTAL			7

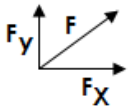
QUESTION		ANSWER	MARK
5	(a)	Mass per unit volume	1
	(b) (i)	Level of boat in seawater is higher	1
	(ii)	Volume of water displaced in seawater is smaller	1
	(iii)	Density of seawater is higher	1
	(c)	As the density of water increases, volume of water displaced decreases	1
	(d) (i)		1
		Buoyant force = weight of boat	1
	(ii)	Archimedes' Principle	1
	(e)		
TOTAL			**8**

QUESTION		ANSWER	MARK
7	(a)(i)	Pascal's Principle	1
	(ii)	The same	1
	(iii)	$\frac{F_1}{A_1} = \frac{F_2}{F_2}$	
		$\frac{50}{15} = \frac{2\,000}{A_2}$	1
		$A_2 = 600\ cm^2$	1
			1
	(b)(i)	Use valve	1
		To ensure oil flows in one direction only // prevent back flow of oil	1
	(ii)	Ratio should be big	1
		Small input force can produce large output force	1
	(iii)	Use release valve	1
		To allow the oil to flow back to oil reservoir, hence lower the car	
TOTAL			**10**

QUESTION		ANSWER	MARK
8	(a)	Depth // density	1
	(b)	As depth increases, pressure in liquid increases // As density increases, pressure in liquid increases	1
	(c)	Difference in pressure	1
	(d)	Pressure = hρg	
		= 1.2 (1120)(10)	1
		= 13 440 Pa	1
	(e)(i)	Thickness increases with depth of water // drawing	1
		To withstand high water pressure	1
	(ii)	High // Low	1
		To store more water / produce higher power // *to reduce the water pressure at the base of the dam*	1
	(iii)	with spillway	1
		to release flood water // to prevent water overflow	1
	(iv)	Q	1
TOTAL			12

QUESTION		ANSWER	MARK
9	(a) (i)	Bernoulli's Principle	1
			
	(ii)	1. When the ball is stroked at the side, the ball spins 2. When the direction of spinning is the same as the direction of air flow, speed of air flow increases, pressure decreases // diagram 3. When the direction of spinning is the opposite to the direction of air flow, speed of air flow decreases, pressure increases // diagram 4. Difference in pressure produces a force, causing ball to move in curved path	4

QUESTION		ANSWER	MARK
	(b)	Cross-sectional area of venture tube at Q is smaller Speed of air flow at Q is higher Water level in glass tube K is higher As the pressure in the venturi tube decreases, water level in the glass tube increases As speed of air flow increases, pressure decreases	1 1 1 1 1
	(c)	Aspect / Explanation Big size / Store more air Rubber // elastic material / Can be squeezed Narrow at the end of tube / To increase speed of air flow Material high strength / Strong // not break easily Small nozzle / Produce fine spray	2 2 2 2 2
TOTAL			**20**

QUESTION		ANSWER	MARK
11	(a)	Resultant force is a single force that represents the combine effect of two or more forces in magnitude and direction	1
	(b) (i)	 F_x– horizontal component of F F_y– vertical component of F	1
	(ii)	Horizontal component of force = 1 500 cos 20° = 1 409.5 N Resultant force = 2 (1500 cos 20°) = 2 (1 409.5) = 2 819 N	1 1 1 1
	(iii)	When pushed, vertical component of force is acting downward Resultant downward force is greater, wheelbarrow sinks more in soft ground When pulled, vertical component of force is acting upward Resultant downward force is smaller, wheelbarrow sinks less in soft ground	1 1 1 1
	(c)	Aspect / Explanation Angle between the two towing boats should be small / To produce greater resultant force	2
	(d)	Use steel rod / Strong // not break easily Inelastic cable rod / Ensure uniform force Streamlined shape / Reduce water resistance K is chosen / Angle between the two towing boats is small, use steel rod, inelastic rod, streamlined shape	2 2 2 2
TOTAL			20

SET 2 Heat

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QUESTION		ANSWER	MARK
1	(a)(i)	Thin walled glass bulb	1
	(a)(ii)	It does not stick to the wall	1
	(b)(i)	Thermometry property	1
	(b)(ii)	When the thermometer increases volume increases.	1
TOTAL			4

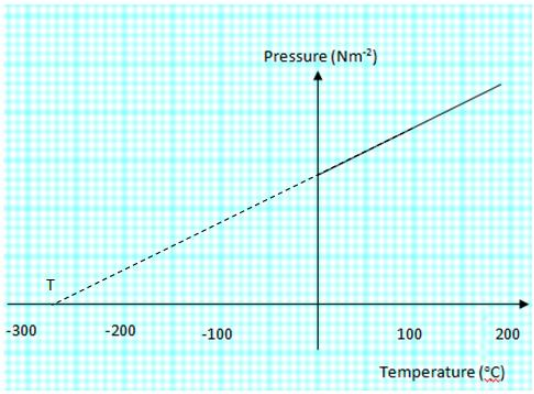
QUESTION		ANSWER	MARK
2	(a)	QR: solid & liquid RS: liquid	2
	(b)	X remains constant at QR although heat is supplied because energy is used to break the bond.	1
	(c)	L = Pt = 70 W (7 x 60 s) = 2940 JKg^{-1}	2
TOTAL			5

QUESTION		ANSWER	MARK
3	(a)	Energy required to increase the temperature of 1 kg substance by 1 degree Celcius.	1
	(b)	Pour some oil in the hole for better conduction.	1
	(c)	prevent heat lost to the surrounding	1
	(d)	$m_M c_M \Delta\theta = m_N c_N \Delta\theta$ $(0.5\ kg)(8.4 \times 10^3\ J\ kg\ ^oC^{-1})(40 - \theta_f) = (2\ kg)(4.2 \times 10^3\ J\ kg\ ^oC^{-1})(\theta_f - 25)$ $\theta_f = 35^0C$	3`
TOTAL			6

QUESTION		ANSWER	MARK
4	(a) (i)	The change of liquid into gas at the surface of the liquid happening at any temperature below the boiling point of liquid	1
	(a)(ii)	When a person sweats, water evaporates from the skin. Evaporation takes place when fast moving molecules near the surface escape to the surroundings. The average kinetic energy of the molecules left behind decreases and this causes a drop in the temperature, hence causing cooling effect on the body.	3
	(b)	1.The flow of air/ humidity of air 2. atmospheric pressure/the surface area of the liquid	2
	(c)	Heat loss = m *l* = (0.05 kg) $(2.3 \times 10^6\ J\ kg^{-1})$ = 1.15×10^5 J	2
TOTAL			8

QUESTION		ANSWER	MARK
5	(a)	Air pressure	1
	(b)(i)	the reading of bourdon gauge in diagram 5.2 is higher than that in diagram 5.1	1
	(ii)	The reading of thermometer in diagram 5.2 is higher than that in diagram 5.1	1
	(iii)	as the heat increases, the temperature increases	1
	(iv)	As the temperature increases, the air pressure in flask increase	1
	(c)	-When molecules receive heat, it will move faster -This will lead to an increase of kinetic energy of the air molecules -The collision between the molecules become more often	2
	(d)	Pressure Law	1
TOTAL			8

QUESTION		ANSWER	MARK
6	(a)	Energy required to increase the temperature of 1 kg substance by 1 degree Celcius	1
	(b)(i)	Specific heat capacity of copper pan is smaller than clay pan	1
	(ii)	The mass of cooper pan and clay pan is the same	1
	(iii)	The increase of temperature of cooper pan is more than clay pan	1
	(c)	When the specific heat capacity is small the increase of temperature is bigger	1
	(d)	During the day, the sun heats up both the ocean surface and the land. Water has greater specific heat capacity and heats up much more slowly than land. The air above the land will be warmer. and will rise throughout the day,	3
TOTAL			8

QUESTION		ANSWER	MARK
7	(a)	Absolute zero is the lowest possible state of a matter. **Definition:** Absolute temperature is temperature measured using the Kelvin scale where zero is absolute zero.at which matter can exist, 0 K or -273.15°C.	1
	(b)(i) (ii)	Volume Mass of gas	2
			
	(b)	On the graph above:	
	(i)	When P = 0 Nm^{-2}, the temperature = 271 - 273^{0}C (is acceptable)	1
	(ii)	Label with T	1
	(c)	[The gas molecules are stationary at -273°C]	1
		ANSWER	MARK
	(d)	Pressure Law	1
	(e)	$P_2 = (T_2/T_1) P_1$ $= \frac{(273 + 37)}{(273 + 25)} \times 200$ kPa = 208 kPa	3
TOTAL			**10**

QUESTION		ANSWER	MARK
8	(a)	Energy required to increase the temperature of 1 kg substance by 1 degree Celcius	1
	(b)(i)	Dark surface Absorb heat easily	1 1
	(ii)	Low specific heat capacity Increase the temperature in short period of time.	1 1
	(c)	Model B Absorb heat easily/Increase the temperature in short period of time.	2
	(d)	$Q = Pt$ $= (16\ Js^{-1})(25 \times 60s)$ $= 24000$ J $\Delta\theta = Q/mC$ $= (24\,000\ J)/(0.5\ kg)(4\,200\ Jkg^{-1}{}^{o}C^{-1})$ $= 11.43\ ^{o}C$	3
TOTAL			10

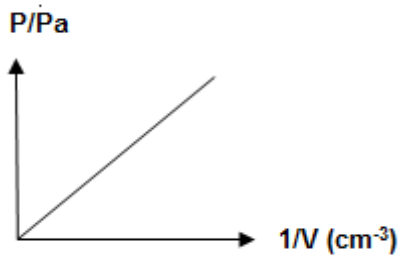
QUESTION		ANSWER	MARK
9	(a)	Degree of hotness	1
	(b)(i)	E1 = energy is absorbed E2 = energy released	1
	(ii)	Diagram 9.1 molecules change from solid to liquid and 9.2 molecules change from liquid to solid	1
	(iii)	Temperature is constant in both diagram	1
	(iv)	Energy is absorbed/released to change the phase of molecules at constant temperature. Latent heat.	2
	(c)	- A pressure cooker woks on vaporization principle in a closed condition. - Pressure build up inside the cooker as the water inside it boils. - It produces steam. - The presence of steam increases the gas pressure above the water, - thus elevating the cooking temperature and accelerating the cooking process	5
	(d)	**Type of stopper** Stopper made from oak, there are more air bubble inside and air is a good insulator **X space** Space X is vacuum so heat cannot be transferred through conduction or convection **Double coated wall** - Walll of the thermos is made from polycarbonate. Its specific heat capacity is high. - The thermos will be more heat resistant and does not crack easily. - The wall must be painted with shiny paint, it will reflect heat **Specific heat capacity** High specific heat capacity, heat does not lost easily	10
TOTAL			21

<table>
<tr><th colspan="2">QUESTION</th><th>ANSWER</th><th>MARK</th></tr>
<tr><td rowspan="5">11</td><td>(a)(i)</td><td>Atmospheric pressure is the force unit area exerted on a surface by the weight of air.</td><td>1</td></tr>
<tr><td>(ii)</td><td>Inhaling inflates the lungs and increase in volume, rate of collision decreases. This activity lowers the pressure in the chest.
Exhaling deflates the lungs decreasein volume of the cavity hence increases the pressure in the chest.
Air from the lungs (high pressure) then flows out of the airways to the outside air (low pressure).
The cycle then repeats with each breath.</td><td>4</td></tr>
<tr><td>(b)</td><td><table>
<tr><td>Characteristics</td><td>Explanation</td></tr>
<tr><td>Long handle</td><td>the longer the handle, the less pumping you will have to do</td></tr>
<tr><td>Stainless steel hose</td><td>Lasting</td></tr>
<tr><td>Steel base</td><td>to provide extra stability while you're filling your tires with air.</td></tr>
<tr><td>large size pump</td><td>Capable of high pressure inflation</td></tr>
<tr><td colspan="2">The best pumps is Q because it has long handle, stainless steel hose, large size pump and steel base.</td></tr>
</table></td><td>10</td></tr>
<tr><td>(c)</td><td>$P_iV_i = P_fV_f$

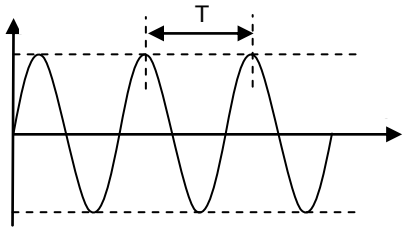
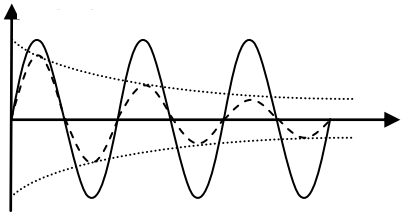
$V_f = P_iV_i/P_f$

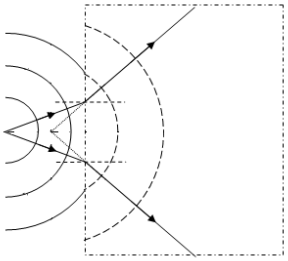
$V_f = (2000.0\ cm^3)(3\ atm)/(0.5\ atm)$

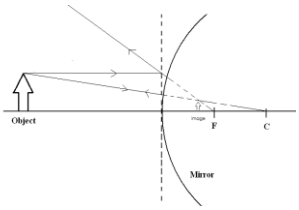
$= 6000.0/0.5$

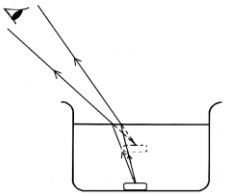
$V_f = 12000\ cm^3$</td><td>3</td></tr>
<tr><td>(d)</td><td> 
</td><td>2</td></tr>
<tr><td colspan="3">TOTAL</td><td>20</td></tr>
</table>

QUESTION		ANSWER	MARK
1	a)	Maximum displacement of any particle/oscillating system from its equilibrium position	1
	b) (i)	C	1
	b) (ii)	Same length// same frequency	1
	c)	Resonance	1
TOTAL			4

QUESTION		ANSWER	MARK
2	a)	The time taken for any particle to make 1 complete oscillation	1
	b)		1 (at any place + label T)
	c) (i)	Damping	1
	c) (ii)	Energy loss due to external resistance//air resistance and internal resistance//compression and extension in the system	1
	c) (iii)		1 (a ↓ and same T)
TOTAL			5

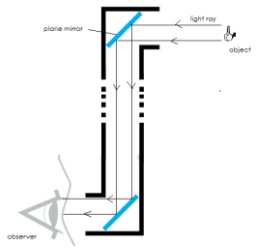
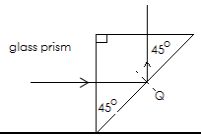
QUESTION		ANSWER	MARK
3	a)	5 Hz	1 (with unit)
	b)	$v = f\lambda$ $= (5)(2)$ $= 10 \text{ cm s}^{-1}$	1 (correct answerwith unit)
	c)	$\frac{v_1}{\lambda_1} = \frac{v_2}{\lambda_2}$ $\lambda_2 = \frac{(18)(2)}{10}$ $= 3.6 \text{ cm}$	1 (correct answerwith unit)
	d)	The speed//frequency of rotation of the stroboscope is the same as the speed//frequency of the waves.	1
	e)		1 (refract away from normal) 1 (bigger wave-length at deep region)
TOTAL			6

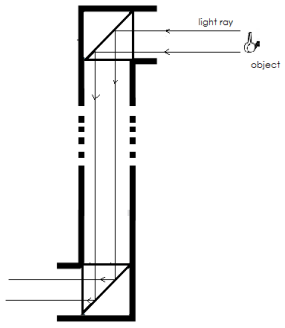
QUESTION		ANSWER	MARK
4	a)	Convex mirror	1
	b)	Wider view can be seen	1
	c) (i)		1 (1st ray) 1 (2nd ray) 1 (image and arrow)
	c) (ii)	Virtual, diminished, upright	1
	d)	Bigger image is produced	1
TOTAL			7

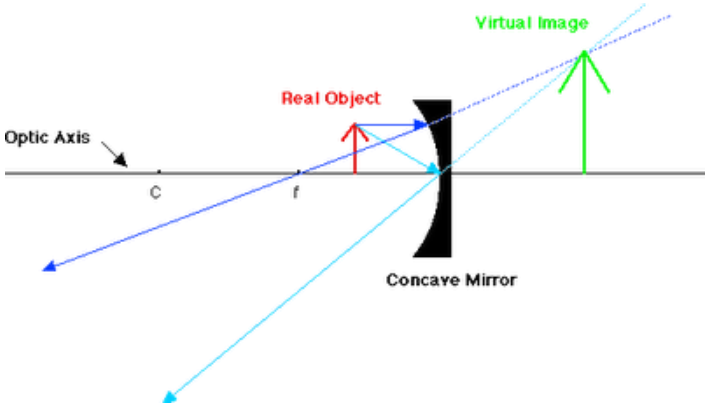
QUESTION		ANSWER	MARK
5	a)	Refraction is the bending of light when it enters a different density of medium where it's speed is different	1
	b)	The density of medium A is less than the density of medium B	1
	c) (i)	In Diagram 4.1, the light ray refracts towards the normal line while in Diagram 4.2, the light ray refracts away from the normal line.	1
	c) (ii)	In Diagram 4.1, the sine of incident angle >the sine of refracted angle while in Diagram 4.2, the sine of incident angle < the sine of refracted angle	1
	d)	$\frac{\text{The sine of incident angle}}{\text{The sine of refracted angle}} = k$	1
	e)	Snell's Law	1
	f)		1 *(light rays refract away from normal at the water surface)* 1 (straight lines to form the image + Image + arrow
TOTAL			**8**

QUESTION		ANSWER	MARK
6	a)	Number of complete oscillation in 1 second	1
	b) (i)	Ali is behind the large pillar/obstacle while Nina is behind the wall outside the open door	1
	b) (ii)	Bend around//spread out	1
	b) (iii)	The energy of the sound waves before passing through the large pillar and the open door Is greater than that after they passing through the pillar and the	1

QUESTION		ANSWER	MARK
	c) (i)	When the waves pass through the small gap or small barrie, the waves will bend around the energy is spread out.	1
	c) (i)	Diffraction of waves	1
	d) (i)	Less bend/ less spread out	1
	d) (ii)	The wavelength is smaller // less diffraction	
TOTAL			**8**

QUESTION		ANSWER	MARK
7	a) (i)		1 (The light rays reflected by the 1st mirror) 1 (The light rays
	a) (ii)	Virtual, upright, same size	1
	b)	Reflection of light wave	1
	c) (i)	n = 1 / Sin c = 1 / Sin 42 = ...	1 (substitute) 1 (correct answer and unit)
	c) (ii)	**Total internal** reflection occurs	1
	d)		1 (ray diagram + arrow)

QUESTION		ANSWER	MARK
	d) (i)		1 (The arrange ment of both prisms + The ray diagram from the object to the eyes)
	d) (ii)	All the light are reflected // not producing double imaged	1
TOTAL			**10**

QUESTION		ANSWER	MARK
8	a)	The image that cannot be formed/captured on/by a screen	1
	b)		1 (concave mirror) 1 (1st ray) 1 (2nd ray) 1 (image + arrow)
	c)	Diminished ☐ Inverted ☑ Magnified ☑ Upright ☐	1 1
	c) (i)	Concave, can produce magnified image	1 1
	c) (ii)	Aluminium, reflect more light	1 1
	e)	U	1
TOTAL			**12**

<table>
<tr><th colspan="2">QUESTION</th><th>ANSWER</th><th>MARK</th></tr>
<tr><td rowspan="4">10</td><td>a)</td><td>The maximum displacement from equilibrium position</td><td>1
(with unit)</td></tr>
<tr><td>b)(i)</td><td>The diameter of string P is greater than the diameter of string Q.
The frequency of oscillation in Diagram 10.2 is less than that in Diagram 10.3.
The amplitude of waves produced are the same.
The greater the diameter, the less the frequency of sound wave.
The greater the frequency, the greater the pitch of the sound.</td><td>1
1
1
1
1</td></tr>
<tr><td>c) (i)</td><td>When the string is plucked, the string will vibrate.
The vibration from the strings is transferred (through the bridge) to the body of the violin
The body of the violin that is a hollow chamber thatvibrates the air particles and produce sound waves.</td><td>1

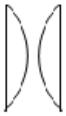
1
1
1</td></tr>
<tr><td>c) (ii)</td><td><table><tr><th colspan="2">Suggestion</th><th>Explanation</th></tr><tr><td>1</td><td>Low density of string ✓1st</td><td>Low mass. Easy to vibrate // vibrate at higher frequency. Therefore higher pitch ✓2nd
[p.s. more massive strings vibrate more slowly]</td></tr><tr><td>2</td><td>High tension of the string ✓ 3rd</td><td>Can produce high frequency. (high pitch) ✓ 4th</td></tr><tr><td>3</td><td>Nylon string//strong material ✓ 5th</td><td>Strong. Therefore can withstand bigger force (not easily break) // can withstand bigger force (not easily break) ✓ 6th</td></tr><tr><td>4</td><td>Sound hole must be big ✓ 7th</td><td>More air can be trapped//The coupled resonance of the front and back plates produces a resonance//air in the body resonating✓ 8th</td></tr><tr><td>5</td><td>The bow must be made from strong material// the bow must be sticky✓ 9th</td><td>Not easily break // to create friction between the bow and the strings (as the bow grips the strings and is drawn across it, they vibrate and produce sound.✓ 10th</td></tr></table></td><td>10</td></tr>
<tr><td colspan="3">TOTAL</td><td>20</td></tr>
</table>

<table>
<tr><th colspan="2">QUESTION</th><th>ANSWER</th><th>MARK</th></tr>
<tr><td rowspan="6">11</td><td>a)</td><td>The reciprocal of focal length in metre</td><td>1
(with unit)</td></tr>
<tr><td>b)</td><td>The lens is focused towards a distant object // Diagram
Adjust the screen to obtain the sharp image formed on the screen.
Measure the distance between the optical centre of the lens and the screen using metre rule, f.
f = focal length.</td><td>1
1

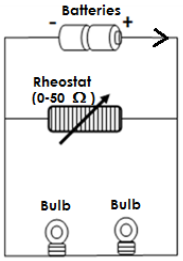
1
1</td></tr>
<tr><td>c) (i)</td><td>P = 1/f
f_o= 1 / P = 1 / 5
= 0.2 m // 20 cm</td><td>1
1</td></tr>
<tr><td>c) (ii)</td><td>Magnification = f_o / f_e

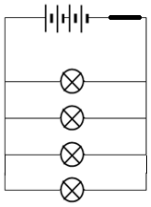
f_e = 25 – 20cm = 5 cm

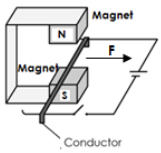
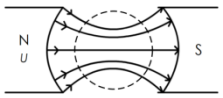
Magnification = 20 / 5 = 4</td><td>1

1</td></tr>
<tr><td>c) (iii)</td><td>The ticker the lens, the more powerful the lens</td><td>1</td></tr>
<tr><td>e)</td><td><table><tr><th></th><th>Characteristics</th><th>Explanation</th></tr><tr><td>1</td><td>Concave mirror</td><td>Reflect the light – the intensity of light is higher</td></tr><tr><td>2</td><td>Condenser lens system
  </td><td>It can be used to focus the light(not the heat).</td></tr><tr><td>3</td><td>f<u< 2f</td><td>To produce real and magnified image</td></tr><tr><td>4</td><td>Inverted</td><td>The image formed on the screen is upright</td></tr></table>The most suitable is I
Because the type of mirror used is concave mirror, condenser lens system, f<u< 2f and and the orientation of picture slide is invented.</td><td>1</td></tr>
<tr><td colspan="3">TOTAL</td><td>20</td></tr>
</table>

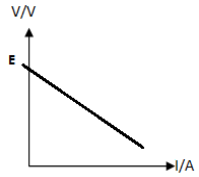
SET 4 Electric; Electromagnet

Question		Answer	Mark
1	(a)	Resistance is the opposition to the flow of current in a conductor	1
	(b)	Parallel circuit	1
	(c)		1
	(d)	Effective resistance of Diagram 1 (a) is smaller	1
TOTAL			**4**

Question		Answer	Mark
2	(a)	parallel circuit	1
	(b)		1
	(c)	The brightness of bulb J = bulb K = bulb L = bulb M	1
	(d)	$V_J = V_K = V_L = V_M$	1
	(e)	If one bulb blows, the other bulb will still light up	1
TOTAL			**5**

Question			Answer	Mark
3	(a)	(i)	Fleming's left hand rule	1
		(ii)		1
	(b)	(i)		3
		(ii)	To produce radial magnetic field so that the force, F, produced on the copper wire is constant	1
TOTAL				**6**

Question			Answer	Mark
4	(a)		Series	1
	(b)	(i)	4.8 J of energy was dissipated per second when the bulb was connected to 24 V of power supply	1
		(ii)	$I = \frac{P}{V} = \frac{4.8}{24}$	1
			I = 0.2 A	1
		(iii)	$R = \frac{V}{I} = \frac{24}{0.2}$	1
			R = 12 Ω	1
			Effective resistance = 12 x 3 = 36 Ω	1
		(iv)	Arrange the bulb in parallel	1
TOTAL				**7**

Question			Answer	Mark
6	(a)		Electromotive force (e.m.f) of a battery is the energy required to move a unit charge in a circuit	1
	(b)	(i)	Switch is open in diagram 6.1 and closed in diagram 6.2	1
		(ii)	The reading of the voltmeter in diagram 6.1 is larger than 6.2	1
	(c)		When there is no current flow, the reading of voltmeter is greater// When there is current flow the reading of voltmeter is smaller	1
	(d)			1
	(e)		E.m.f. is the y-intercept // show on graph	1
			E = I(R +r)	
			r = E/I – R	
			= (3.0/0.8) – 3.5	1
			= 0.25 Ω	1
TOTAL				**8**

Question			Answer	Mark
7	(a)	(i)	Step-up transformer	1
		(ii)	Easy to be magnetized and demagnetized which can reduce loss of energy	1
	(b)		20 x 240 / 6	1
			= 800	1
	(c)	(i)	75 x 7(6)/ 100	1
			= 31.5 W	1
		(ii)	Use laminated soft iron core//wound secondary coil on top of primary coil	1
	(d)	(i)	A transformer supplies alternating current while the radio only works with direct current	1
		(ii)	Diode	1
			Forward biased	1
TOTAL				**10**

Question			Answer	Mark
8	(a)		Nichrome // tungsten	1
	(b)	(i)	1000 / 240	1
			= 4.167A	1
		(ii)	240/4.167	1
			= 57.595 Ω	1
	(c)	(i)	Electrical energy → Heat energy	1
		(ii)	P : 240 x6 x 8 x 60	1
			= 691.2 kJ	1
			Q: 720.0 kJ	1
			R: 518.4 kJ	1
		(iii)	R	1
			Energy supplied is the lowest	1
TOTAL				**12**

Question			Answer	Mark
10	(a)	(i)	A temporary magnet which retains its magnetism as long as an electric current flows through it	1
		(ii)		1
		(iii)	The number of turns of coil in diagram 10.2 is more than in diagram 10.1	1
			The number of magnetic field lines in diagram 10.2 is more than in diagram 10.1	1
			The current passing through the solenoid in both diagrams is the same	1
		(iv)	As the number of turns of coil increases, the strength of magnetic field increases	1
	(b)		1. When there is a call from the telephone, the earpiece receives an alternating current 2. The alternating current produces a varying magnetic field in the electromagnet 3. The varying magnetic field pulls and releases on the diaphragm according to the alternating current	
	(c)		4. The diaphragm vibrates and produces sound waves that we hear	4
			Characteristics: concave-shaped // curved magnet — Explanation: provides radial magnetic field to produce constant current	2
			Characteristics: soft iron core — Explanation: concentrates the magnetic flux through the coil/increase the magnetic field strength	2
			Characteristics: Cylindrical core — Explanation: Increase the speed of rotation/ turning effect	2
			Characteristics: many coils — Explanation: produces larger current/ Increase the speed of rotation/ turning effect	2
			Characteristics: High rotation power — Explanation: speed of rotation is high	2
TOTAL				**20**

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Mark</th></tr>
<tr><td>12</td><td>(a)</td><td>(i)</td><td>Electric current is the rate of charge flow</td><td>1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>Legs of birds are close
Voltage across the two legs of bird is very small/no potential difference
No current flow through the bird</td><td>1
1
1</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>There is a potential difference between the two wires
Therefore current flows through the birds and they get electrocuted</td><td>1
1</td></tr>
<tr><td></td><td>(b)</td><td></td><td colspan="2"><table><tr><th>Characteristics</th><th>Explanation</th></tr><tr><td>High resistivity</td><td>wire no need to be long</td></tr><tr><td>Resistance should be high</td><td>Produce more heat</td></tr><tr><td>Melting point should be high</td><td>Can withstand high temperature</td></tr><tr><td>Coiled shape of wire</td><td>Resistance is high //To produce more heat</td></tr><tr><td>U is chosen</td><td>because it has high resistivity, medium resistance, high melting point and coiled shape of wire</td></tr></table></td></tr>
<tr><td></td><td></td><td></td><td></td><td>2
2
2
2
2</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>1.4 x 0.5
= 0.70 kWh (or unit)</td><td>1
1</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>0.7 x 0.24
= RM 0.168 or 16.80 sen</td><td>1
1</td></tr>
<tr><td colspan="4">TOTAL</td><td>20</td></tr>
</table>

SET 5 Electronic ; Radioactivity

QUESTION		ANSWER	MARK
1	a	GM tube	1
	b(i)	Beta particle	1
		Able to penetrate the paint containers.	1
	c	Background reading	1
TOTAL			**4**

Question		Answer	Mark
2	a	Stream narrow beams of electron	1
	b	Cathode rays travel in a straight line	1
	c	$eV = \frac{1}{2} mv^2$ $v = 3.27 \times 10^7 \text{ m s}^{-1}$	1 1
	d	Flemming left hand Rule	1
TOTAL			**5**

QUESTION		Answer	Mark
3	(a)	npn transistor	1
	(b)	heat	1
	(c)	$\frac{1}{5} = \left(\frac{1}{1+T}\right) 6$ T = 5 K	1 1
	(d)	V_b increase , base current produce, Transistor ON, alarm ringing	1 1
TOTAL			**6**

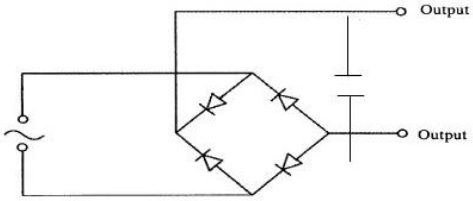
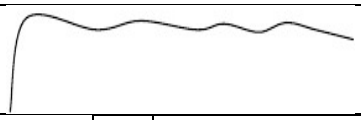
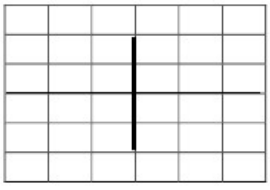
QUESTION		ANSWER	MARK
4	a (i)	NAND	1
	((ii)		1
	(b)	1000 All correct 2 M 1incorrect 1 M 2 incorrect 0 M	2
	c(i)	0 0 0 1 All correct 2 M 1incorrect 1 M 2 incorrect 0 M	2
	c(ii)	OR Gate	1
TOTAL			**7**

QUESTION		ANSWER	MARK
5	a	Spontaneous disintegration of r/active rays of an unstable nucleus to become stable	**1**
	(i)	Positive charge	1
	(ii)	Diagram 5.2 > diagram 5.1	1
	(iii)	Diagram 5.2 > diagram 5.1	1
	c(i)	The higher the voltage of EHT , the higher the strength of the electric field	1
	(ii)	the higher the strength of the electric field, the greater the depletion	1
	d(i)	Alpha particle	1
	(ii)	Decrease by 2	1
	TOTAL		**8**

QUESTION		ANSWER	MARK
7	a(i)	LDR.	1
	(ii)	To switch on a circuit which needs a higher voltage/ Voltage 240 V	1
	(iii)	At night, resistance of LDR is high, Voltage at the base is high, produce base current, Switch on the transistor and relay- street light light on	1 1 1
	b(i)	Earphone To convert electrical signal to sound wave	1 1
	(ii)	Capasitor Block the direct current from entering the transistor	1 1
	(iii)	microphone	1
TOTAL			**10**

QUESTION		ANSWER	MARK
8	a(i)	Time taken for the r/active substance to become half of its original mass/activities.	1
	(ii)	GM tube ratemeter reading record the highest reading	1
	b(i)	8 hours Shorter time taken	1 1
	(ii)	Strong Gamma ray	1 1
	(iii)	Liquid Easier to dissolved	1 1
	(iv)	Sodium -24	1
	c(i)	$\frac{1}{16} = \left(\frac{1}{2}\right)^4$ $4T_{\frac{1}{2}} = 4 \times 28$ $= 112 years$	1 1
	(ii)	5 $T_{1/2}$ = 6.25 %	1
TOTAL			**12**

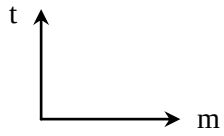
<table>
<tr><th colspan="2">QUESTION</th><th>ANSWER</th><th>MARK</th></tr>
<tr><td rowspan="6">10</td><td>a(i)</td><td>As an automatic switch</td><td>1</td></tr>
<tr><td>(ii)</td><td>10.1 : Microammeter no reading // 0 A, milliammeter no reading // 0 A</td><td>1</td></tr>
<tr><td>(iii)</td><td>10.2 :when Microammeter has a reading, milliammeter has a reading</td><td>1</td></tr>
<tr><td>(iv)</td><td>Change in microammeter reading small, change in milliammeter reading is bigger
I_b Increase, I_c increase // I_c depends on I_b
A small change in I_b caused a big change in I_c</td><td>1
1
1</td></tr>
<tr><td>b</td><td>At night resistance LDR increases
V_{BE} increases
I_b increases and switch on transistor
I_c increases and lights up bulb</td><td>1
1
1
1</td></tr>
<tr><td>c</td><td><table><tr><th>Modification</th><th>Explaination</th></tr><tr><td>Replace LDR withthermistor</td><td>To detectheatwhentemperatureis high</td></tr><tr><td>Replace bulb withsiren / bell</td><td>To producesound</td></tr><tr><td>Connectrelay switch to output transistor</td><td>To switch on the siren</td></tr><tr><td>Interchange the position of resistor R and termistor</td><td>To increase base voltage / / voltage across R // base current</td></tr><tr><td>Use 240 V power supply</td><td>Sirenisfunctionat high voltage</td></tr></table></td><td>2
2
2
2
2</td></tr>
<tr><td colspan="3">TOTAL</td><td>20</td></tr>
</table>

<table>
<tr><th colspan="2">QUESTION</th><th>ANSWER</th><th>MARK</th></tr>
<tr><td rowspan="8">12</td><td>a</td><td>(a) Semiconductor is a material with electrical conductivity better than an insulator but weaker than a conductor.</td><td>1</td></tr>
<tr><td>b(i)</td><td>  </td><td>1</td></tr>
<tr><td>(ii)</td><td>connect a capacitor in parallel to the output</td><td>1</td></tr>
<tr><td>(iii)</td><td> 
</td><td>1</td></tr>
<tr><td>(iv)</td><td>  </td><td>1</td></tr>
<tr><td>c</td><td>
<table>
<tr><th></th><th>suggestion</th><th>explanation</th></tr>
<tr><td>1</td><td>LDR must connect to the base circuit</td><td>If there is light, no current flow on base circuit, no current flow on collector, motor donot switch on</td></tr>
<tr><td>2</td><td>Relay switch must be connected</td><td>If there is a small change in the base current, transistor ON the relay switch</td></tr>
<tr><td>3</td><td>Emitter must be forward biased</td><td>Current can flow from collector to emitter of transistor</td></tr>
<tr><td>4</td><td>Resistance 1k must be in series with LDR</td><td>To function as a potential divider</td></tr>
</table>
Choose P because LDR connected to base, Relay switch, emitter forward biased and Resistance 1K with series with LDR</td><td>10</td></tr>
<tr><td>d(i)</td><td>current a.c</td><td>1</td></tr>
<tr><td>(ii)</td><td>4V</td><td>1</td></tr>
<tr><td>(iii)</td><td>T = 4 x 0.1 =0.4s
Frequency, f = 1/T= 1/0.4
= <u>2.5 Hz</u></td><td>2</td></tr>
<tr><td>(iv)</td><td>  </td><td>1</td></tr>
<tr><td colspan="3">TOTAL</td><td>20</td></tr>
</table>

SECTION C

SET 1 http://cikguadura.wordpress.com/

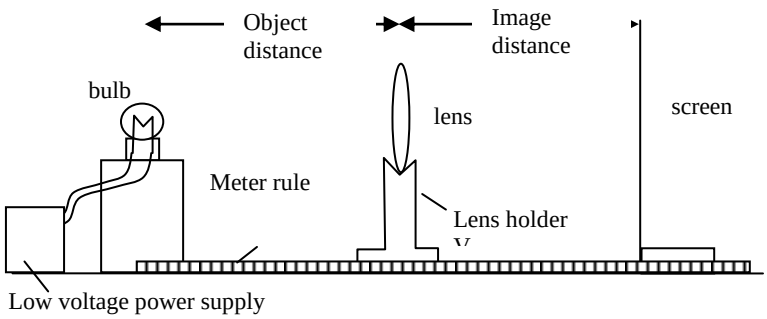
No2	Answer	Mark
2(a)	Show on the graph State the value of P_{atm} correctly 1.0×10^5 Nm^{-2}	1 1
2(b) (i)	Draw the triangle on the graph (minimum 8cm x 8cm) Show the substitution correctly Correct answer [8.4×10^3 - 8.7×10^3] Correct unit. Nm^{-3}	1 1 1 1
2(b)(ii)	Correct answer [1000- 1050]	1
2(c)	Show on the graph State the value with the correct unit 1.043×10^5 Nm^{-2}	1 1
2(d)(i)	State the changes correctly *k* will increase	1
2(d)(ii)	Give the correct explanation The pressure exerted by the liquid increases	1
2(e)	State the precaution correctly The eye position must be perpendicular to the scale of the Bourdon gauge/metre rule to avoid parallax error	1
TOTAL		**12**

No3	Answer	Mark
(a)	*Making the right inference* The mass of boiling water affects the heat (energy) given to the hand	*1*
(b)	*Building an appropriate hypothesis* The bigger the mass , the greater the heat (energy) released	*1*
(c)(i)	*Stating the aim of the experiment* To study the relationship between the mass and heat (energy) released	*1*
(ii)	*Stating the correct variables* Manipulated variable : mass of water Responding variable : time taken// amount of heat Fixed variable : power of heater// increase in temperature	*1* *1*
(iii)	*List of appropriate apparatus and material* Beaker, immersion heater, thermometer, water, stop watch (OR experiment involving the heating of slotted weights(mass-MV) in boiling water and then measuring the increase in temp(RV) infixed time of fixed amount of water)	*1*
(iv)	*Describing set up of the apparatus*	*1*
(v)	*Stating the procedure of the experiment* 1.Set up the apparatus as shown 2. Use m = 50 g of water 3. Switch on the power supply.The time taken, t is measured by using stop watch for the water to change in temperature by 50°C 4. Repeat step 2 and 3 for m = 100g, 150g, 200g and 250g	*1* *1* *1*
vi)	*Tabulating data* Show table with time,t and mass,m as headings	*1*
viii)	*Analysing data*  Or : The data is analysed by plotting a graph of t against m	1
TOTAL		**12**

<table>
<tr><th>No4</th><th>Answer</th><th>Mark</th></tr>
<tr><td>3a</td><td>The image distance /size of image / height of image / magnification depends on the object distance</td><td>1</td></tr>
<tr><td>b</td><td>The greater the object distance, the smaller the image distance / size of image / height of image / magnification</td><td>1</td></tr>
<tr><td>c(i)</td><td>Aim of the experiment
To investigate the relationship between object distance and image distance / size of image / height of image / magnification for a convex lens.</td><td>1</td></tr>
<tr><td>(ii)</td><td>Variables in the experiment

Manipulated variable: object distance
Responding variable : image distance/ size of image / height of image / magnification
Fixed variable : Focal length of lens / thickness of lens / power of lens</td><td>

1
1

1</td></tr>
<tr><td>(iii)</td><td>List of apparatus and material
light bulb, convex lens of focal length 10 cm , white screen, metre rule, low voltage power supply and lens holder</td><td>1</td></tr>
<tr><td>(iv)</td><td>Arrangement of apparatus
 
</td><td>1</td></tr>
<tr><td>(v)</td><td>The apparatus set up as in figure shown.
Adjust the bulb so that the object distance (filament), u is 35 cm from the lens.

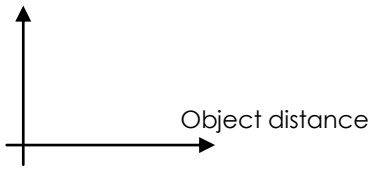
Light up the electric bulb, adjust the screen position until a sharp image of the filament is formed on the screen. The image distance, / height of image is measured by using metre rule // calculate magnification, m = $^{v}/_{u}$

Repeat steps 2 and 3 for objects distances of, u = 30cm, 25 cm, 20 cm, and 15 cm.</td><td>1

1

1</td></tr>
<tr><td>(vi)</td><td>How you tabulate the data.

<table>
<tr><th>objectdistance, u / cm</th><th>Imagedistance, v / cm / height of image , cm / Magnification</th></tr>
<tr><td>35
30
25
20
15</td><td></td></tr>
</table></td><td>1</td></tr>
</table>

No4	Answer	Mark
(vii)	How you analyse the data. Image distance / height of image , cm / Magnification  	1
	TOTAL	**12**

<table>
<tr><th>No1</th><th>Answer</th><th>Mark</th></tr>
<tr><td>a(i)</td><td>State the correct manipulated variable
Height // h</td><td>1</td></tr>
<tr><td>(ii)</td><td>State the correct responding variable

Frequency // Period // wave length</td><td>1</td></tr>
<tr><td>(iii)</td><td>State one fixed variable correctly

Speed of sound</td><td>1</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>b</td><td>Tabulate h, d, T and f

Give a tick (✓) based on the following:

A •Columns of h,d,T and f ✓
B •Correct units for h,d,T and f ✓
C •All values of d correct ✓
D •All values of T consistent to 2 d.p. ✓
E •All values of f correct to 2 d.p. ✓
F •All values of h,T and f consistent to 1 or 2 d.p. ✓

<table><tr><td>h/cm</td><td>d/cm</td><td>T/s</td><td>f/Hz</td></tr><tr><td>30.0</td><td>3.6</td><td>0.18</td><td>5.56</td></tr><tr><td>25.0</td><td>3.2</td><td>0.16</td><td>6.25</td></tr><tr><td>20.0</td><td>2.8</td><td>0.14</td><td>7.14</td></tr><tr><td>15.0</td><td>2.6</td><td>0.13</td><td>7.69</td></tr><tr><td>10.0</td><td>2.4</td><td>0.12</td><td>8.33</td></tr></table>
Note for F : Accept e.c.f. from D and E

Total marks : 6</td><td>6</td></tr>
<tr><td>d</td><td>Draw correctly a graph of f against h

Give a tick (✓) based on the following:

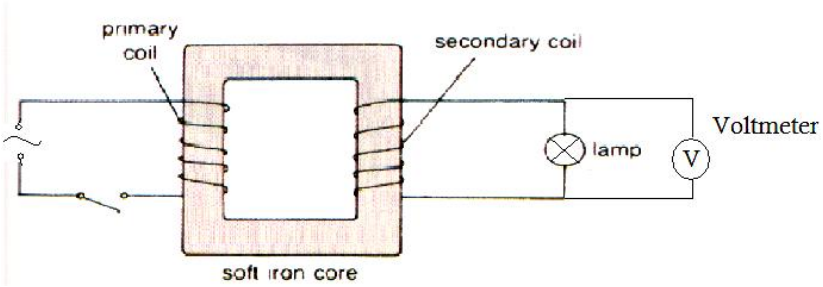
A • f at the y-axis, h at the x-axis ✓
B • Correct units at both axes ✓
C • Uniform scale at both axes ✓
D • 5 points plotted correctly ✓✓
[Note : 3 or 4 points plotted correctly : ✓]
E • Best straight line ✓
F • Minimum size of graph 5 x 4 big squares ✓
(Big square : 2 cm x 2 cm)
(From the origin to the last point)</td><td>5</td></tr>
</table>

No1	Answer	Mark
	Marks awarded : Number of ✓ / Marks 7 ✓ — 5 5-6 ✓ — 4 3-4 ✓ — 3 2 ✓ — 2 1 ✓ — 1 **Total marks** : 5	
e	**State the correct relationship based on the straight line drawn** **For a straight line with negative gradient passing with y-axis interception,** Frequency is decrease linearly to height / *f* is decrease linearly to h	**1**
f	**State one suitable precaution** Correct the zero error by calibrating the zero adjustment of CRO // Position of the pump must be perpendicular to the tiub and near to the top **//** Repeat experiment and calculate the average // Position of microphone must be at the same distance //All connection of the circuit must be tight	**1**
	TOTAL	**16**

No2	Answer	Mark
2(a)	**State the relationship between R and I** R is directly proportional to I	1
(b) (i)	**Calculate the gradient of the graph and state the value within the acceptable range** Show the triangle with an acceptable size (4 x 4 squares of 2 cm). **Substitute correctly (according to the candidate's graph)** $m = \frac{6.3 - 0}{100.0 - 0}$ **State the correct value of the gradient with unit** = 0.063 Ωcm^{-1}	3
(b) (ii)	ρ = mA = 0.063 x 1.5 x 10^{-5} = 9.375 x $10^{-7}\Omega$ cm	2
(c) (i)	R = 1.0 Ω	2
(c) (ii)	$\frac{1}{R'} = \frac{1}{1.0} + \frac{1}{1.0}$ $\frac{1}{R'} = \frac{2}{1.0}$ *∴ R' = 0.5 Ω*	*3*
(d)	**State ONE correct precaution so as to produce an accurate result of the experiment** The position of the eye perpendicular to the scale when takes the reading to avoid errors due to parallax/systematic error.	**1**

<table>
<tr><th>No3</th><th>Answer</th><th>Mark</th></tr>
<tr><td>(a)</td><td>State a suitable inference
The number of turns of wire in the secondary coil affects the output voltage</td><td>1</td></tr>
<tr><td>(b)</td><td>State a relevant hypothesis
The greater the number of turns of wire in the secondary coil, the greater the output voltage</td><td>1</td></tr>
<tr><td>(c)</td><td>State the aim of experiment
To investigate the relationship between number of turns of wire in the secondary coil and the output voltage</td><td>1</td></tr>
<tr><td></td><td>State the manipulated variable and the responding variable

Manipulated : number of turns of wire in secondary coil, N
Responding : output voltage, V</td><td>1</td></tr>
<tr><td></td><td>State ONE variable that kept constant
The number of turns of wire in the primary coil</td><td>1</td></tr>
<tr><td></td><td>Complete list of apparatus and materials
Thermometer, capillary tube, concentrated sulphuric acid, half metre rule, beaker, water, stirrer, Bunsen burner, tripod stand</td><td>1</td></tr>
<tr><td></td><td>Arrangement of apparatus :

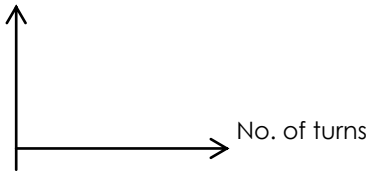
 
</td><td>1</td></tr>
<tr><td></td><td>State the method of controlling the manipulated variable
1. The set up of the apparatus is as shown in figure above.
2. 100 turns of wire is wound on the secondary coil of a transformer.

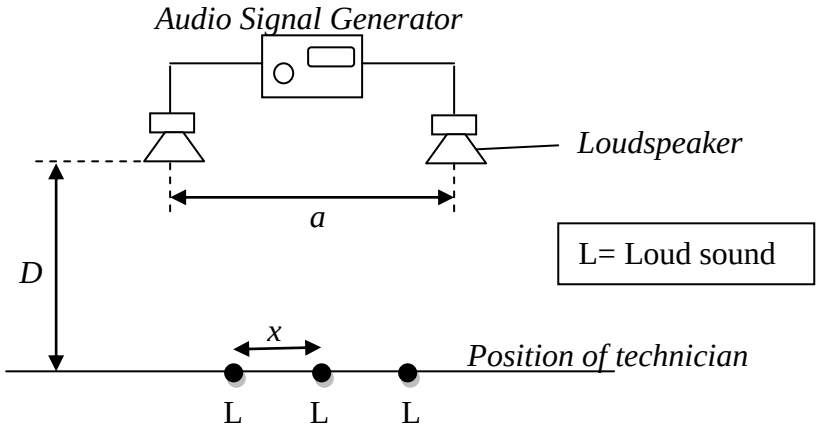
State the method of measuring the responding variable
3. The switch is on and the output voltage is measured by using a voltmeter.

Repeat the experiment at least 4 times
The experiment is repeated by winding the wire on secondary coil with 200 turns, 300 turns, 400 turns and 500 turns.</td><td>1

1

1</td></tr>
<tr><td></td><td>Tabulation of data:
<table>
<tr><td>Number of turns of wire in secondary coil, N</td><td>Output voltage, V / V</td></tr>
<tr><td>100</td><td></td></tr>
<tr><td>200</td><td></td></tr>
<tr><td>300</td><td></td></tr>
<tr><td>400</td><td></td></tr>
<tr><td>500</td><td></td></tr>
</table></td><td>1</td></tr>
</table>

	Analyse the data . Voltage  	**1**
	TOTAL	**12**

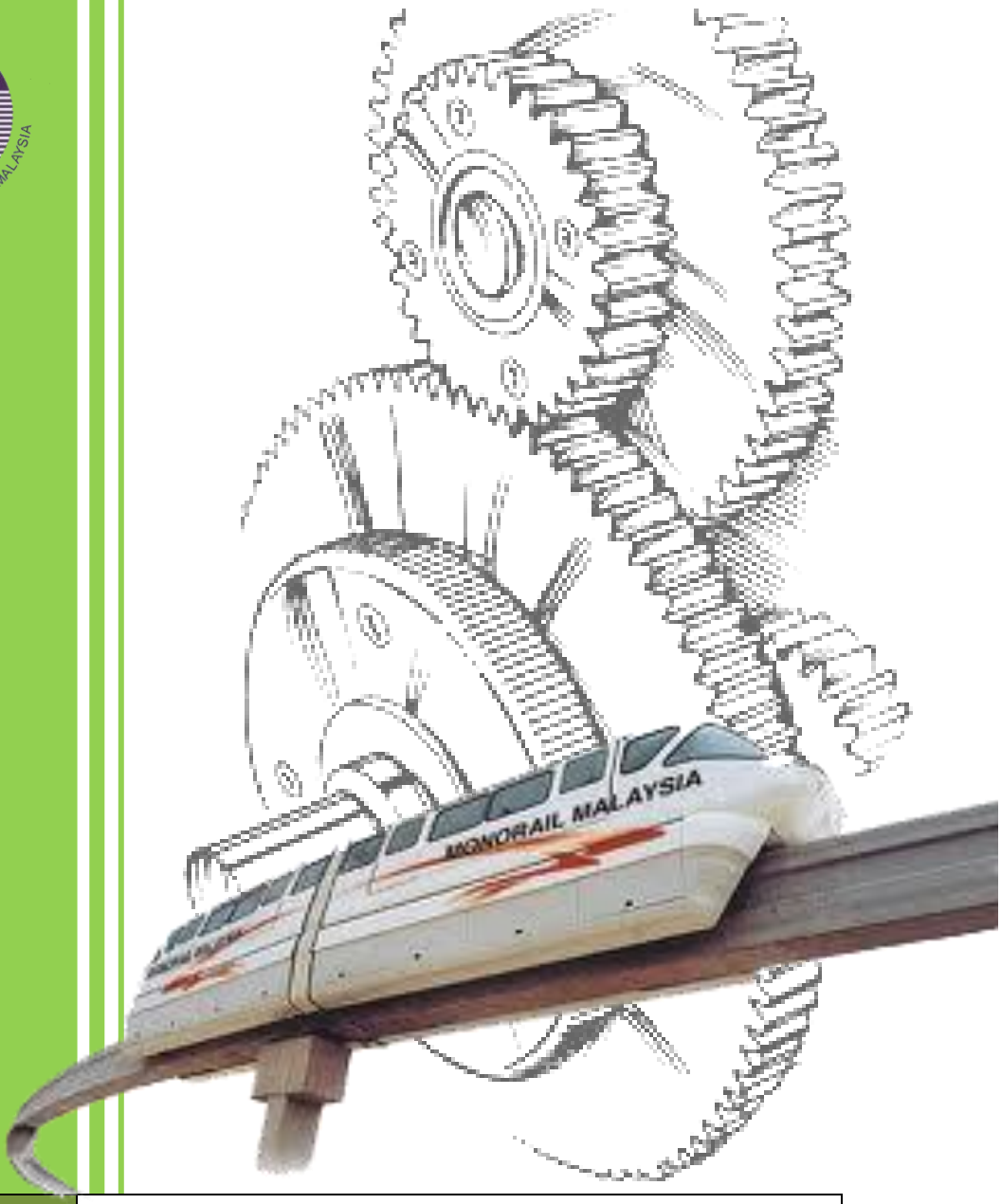
No4	**Answer**	**Mark**
4(a)	The distance between two successive positions of clear and loud sound depends on the distance of the loudspeakers and the position of technician.	1
(b)	The distance between two successive loud sounds, x, increases when the distance between the loudspeakers and position of the technician, D, increases.	1
	Jumlah	
(c)(i)	Aim: To investigate the relationship between distance, x, and D.	1
(ii)	Manipulated variable: Distance between loudspeakers and position of technician, D Responding variable: Distance between two successive positions of loud sound, x Constant/fixed variable: Distance between the two loudspeakers / frequency of sound wave.	1 1
(iii)	List of apparatus: Audio signal generator, two (identical) loudspeakers, connecting wires, metre rule or measuring tape.	1
(iv)	Arrangement of apparatus:  	1
(v)	1. The apparatus is set up with the two loudspeakers placed apart at a distance , a = 1.0 m as shown in the diagram. 2. The observer will stand at a distance, D = 5 m, from the speakers. 3. The audio generator is switched on and set at a frequency, f = 600 Hz. 4. The observer will move along a parallel straight line at a distance D = 5.0 m from the loudspeakers. 5. The positions of loud sound that can be heard are marked as L.	1

<table>
<tr><th>No4</th><th>Answer</th><th>Mark</th></tr>
<tr><td></td><td>6. Distance between 2 successive loud sound, x is measured using a metre rule and recorded.
7. The experiment is repeated with different values of D which is 10 m, 15 m, 20 m and 25m.
8. All the readings are tabulated.</td><td>1

1</td></tr>
<tr><td>(vi)</td><td>Tabulate the data
<table><tr><td>D (m)</td><td>x (m)</td></tr><tr><td>5.0
10.0
15.0
20.0
25.0</td><td></td></tr></table></td><td>1</td></tr>
<tr><td>(vii)</td><td>Analysis of data
x (m)
 

A graph of x against D is drawn to analyse the data.</td><td>1</td></tr>
<tr><td colspan="2">TOTAL</td><td>12</td></tr>
</table>

END OF TEACHER'S GUIDE



Sekolah Berasrama Penuh

2013

X A-PLUS

MODULE

PHYSICS

http://cikguadura.wordpress.com/

NAME : .....

CLASS : .....

PHYSICS X A-PLUS 2012 PANELS

JENNYTA BT NOORBI ***(Head Of Panels)*** *SMS Tuanku Munawir*
KAMARIAH BT MOHD ARSHAD *The Malay College Kuala Kangsar*
NIK SRI RAHAYU BT NIK ARIFFIN *SMS Hulu Selangor*
SURIYATI BT YUSOFF *SMS Muzaffar Shah*
JAMALUDIN B ABD GHANI *SBPI Batu Rakit*
NORLAH BT ZAIN *SMS Kuching*

PHYSICS TOPICS (X A-Plus 2013 MODULE)

No	Skill / Group					
	Conceptual	Understanding	Qualitative	Qualitative	Decision making	Experiment
1.	Force Motion	Force Motion	Intro Physics	Force Motion	Intro Physics	Force Motion
2.	Force Motion	Force Motion	Force Motion	Force Motion	Force Motion	Force Motion
3.	Force Motion	Force Motion	Force Motion	Force Motion	Force Motion	Force Motion
4.	Force Pressure	Force Motion	Force Motion	Force Motion	Force Pressure	Force Pressure
5.	Force Pressure	Force Motion	Force Pressure	Force Pressure	Force Pressure	Force Pressure
6.	Force Pressure	Force Pressure	Heat	Force Pressure	Force Pressure	Force Pressure
7.	Force Pressure	Force Pressure	Heat	Force Pressure	Force Pressure	Heat
8.	Force Pressure	Force Pressure	Heat	Force Pressure	Force Pressure	Heat
9.	Heat	Force Pressure	Light	Heat	Force Pressure	Heat
10.	Heat	Heat	Wave	Heat	Heat	Heat
11.	Light	Heat	Electricity	Light	Heat	Heat
12.	Light	Heat	Electromagnet	Light	Heat	Light
13.	Light	Light	Electronic	Light	Heat	Light
14.	Wave	Light	Electronic	Light	Light	Wave
15.	Wave	Wave	Radioactivity	Wave	Light	Wave
16.	Wave	Wave		Electricity	Wave	Electricity
17.	Electricity	Wave		Electricity	Wave	Electricity
18.	Electricity	Electricity		Electromagnet	Electricity	Electromagnet
19.	Electromagnet	Electricity		Electromagnet	Electromagnet	Electromagnet
20.	Electromagnet	Electromagnet		Electromagnet	Electronic	Electronic
21.	Electronic	Electromagnet		Electromagnet	Electronic	
22.	Electronic	Electromagnet		Electronic	Radioactivity	
23.	Electronic	Electromagnet		Electronic	Radioactivity	
24.	Electronic	Electromagnet		Electronic		
25.	Radioactivity	Electronic		Electronic		
26.		Electronic		Radioactivity		
27.		Electronic		Radioactivity		
28.		Electronic				
29.		Radioactivity				
30.		Radioactivity				
31.		Radioactivity				

SECTION I -PHYSICS CONCEPT AND DEFINITION

Chapter 1: Introduction to Physics

Bil	What is..	Definition
1	Base quantities	Base Quantities are quantities that cannot be defined in terms
2	Derived Quantities	Derived quantities are quantities that are obtained by other base quantities
3	Scalar Quantities	Scalar quantities are quantities that have only magnitude
4	Vector Quantities	Vector quantities are quantities that have both magnitude and direction
5	Consistency	The consistency of of a measuring instrument is its ability register the same reading when a measurement is made repeatedly
6	Accuracy	Accuracy is the degree of how close a measurement is to the actual vaue
7	Sensitivity	Sensitivity of an instrument is its ability to detect a small change in the quantity to be measured

Chapter 2: Force And Motion

	What is..	Definition
1	Speed	Speed is the rate of change of distance
2	Velocity	Velocity is the rate of change of displacement
3.	Acceleration	Acceleration is the rate of change of change/increase in velocity
4.	Deceleration	Deceleration is the rate of decrease in velocity
5.	Inertia	The inertia of an object is the tendency of the object to remain its state of rest or uniform motion in a straight line
6.	Newton's First Law of Motion / Law of Inertia	Newton's First Law of Motion states that every object continues in its state of rest or uniform speed in a straight line unless acted upon by an external force
7	. Linear momentum	Linear momentum is the product of mass and velocity
8.	Principle of Conservation of Momentum	Principle of Conservation of Momentum states that the total momentum of a system remains unchanged if no external force acts on the system.
9.	Force	Force is defined as anything that changes the state of rest or motion of an object moving in a straight line
10.	Newton's Second Law	The acceleration of a body ,a, is directly proportional to the net force acting on it, F , and inversely proportional to its mass, m
11.	Impulse	Impulse is defined as the change in momentum
12.	Impulsive Force	Impulsive force is defined as the rate of change of momentum

	What is..	Definition
13.	Weight / Force of Gravity / Gravitational Force	Pulled force towards the centre of the earth
14.	Free-Fall	A free-falling object is an object falling under the force of gravity only
15.	Gravitational Acceleration	The acceleration of objects due to gravity // falling free
16.	Gravitational Field	The gravitational field is the region around the earth in which an object experience a force due to gravitational attraction
17.	Resultant Force / Net Force	Resultant force is a single force that represents the combined effect of two or more forces in magnitude and direction
18.	Unbalanced Forces /	When the forces acting on an object is not balanced, there must be a net force/unbalanced/resultant force acting on it Unbalanced forces produce an acceleration to the object
19.	Forces in Equilibrium / Balanced Forces	The object is said to be in a state of equilibrium when the resulting force acting on the object is zero (no net force acting upon it) When the equilibrium is reached, then the object is in two states, that is (i) remains stationary (if the object is stationary) (ii) moves at a constant velocity (if the object is moving) / zero acceleration
20.	Newton's Third Law of Motion	Newton's third law of motion states that, To every action there is an equal but opposite direction
21.	Work	Work is defined as the product of the applied force ,F on the object and its displacement, s in the direction of the applied force
22.	Energy	Energy is the ability to do work (Work done is equal to the amount of energy transferred
23.	Gravitational Potential Energy	The Gravitational potential energy of an object is the energy stored in the object due to its position in a force field
24.	Kinetic Energy	Kinetic energy is the energy possessed by an object due to its motion
25.	Principle of Conservation of Energy	Principle of Conservation of Energy states that
26.	Power	Power is the amount of work done per second
27.	Efficiency	Efficiency of a device is the percentage of the energy input that is transferred into useful energy
28.	Elasticity	Elasticity is the property of a substance which enables it to return to original shape after an applied external force is removed

	What is..	Definition
29.	Elastic Limit	Elastic limit of a spring is defined as the maximum force that can be applied to a spring such that the spring will be able to restored to its original length when the force is removed
30.	Hooke's Law	Hooke's Law states that the extension of a spring is directly proportional to the applied force provided that the elastic limit is not exceeded
31.	Spring Constant / Force Constant	A spring constant of a spring is the force that is required to produce one unit of extension of the spring (measure of the stiffness of the spring)
32.	Elastic Potential Energy	Elastic Potential Energy is the energy stored in a spring when it is extended or compressed

Chapter 3: Force and Pressure

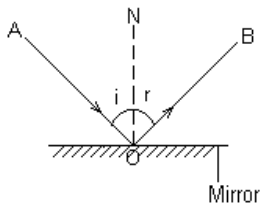
	What is..	Definition
1.	Pressure	Pressure is defined as the force acting normally on a unit of surface area
2.	Atmospheric Pressure	The Atmospheric pressure is caused by the the weight of the air on the Earth's surface
3.	Gas Pressure	Gas pressure is the force per unit area exerted by the gas molecules as they collide with the walls of their container
4.	Pascal's Principle	Pascal's principle states that when pressure is applied to an enclosed fluid, the pressure will be transmitted equally throughout the whole enclosed fluid
5.	Bouyant Force	Bouyant Force is an upward force resulting from an object being wholly or partially immersed in a fluid
6.	Archimedes' Principle	Archimedes' Principle states that, " When an object is immersed in a fluid, the buoyant force on the object is equal in size to the weight of fluid displaced by the object
7.	Bernoulli's Principle	Bernoulli's principlestatesthat the pressure of a moving liquid decreases as the speed of the fluid increases and vice versa

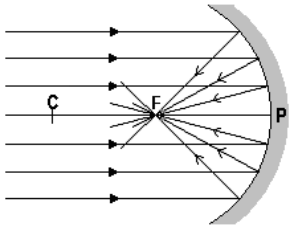
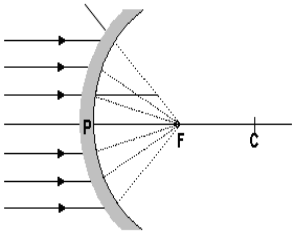
Chapter 4: Heat

	What is..	Definition
1.	Temperature	Temperature is the degree of hotness of an object / Amount of kinetic energy in an object
2.	Heat	Heat is the energy tranferred from hot to cold object
3.	Thermal Equilibrium	Two objects are said to be in thermal equilibrium when; i) The rates of heat tansfer between the objects are equal (net flow of heat between the two objects is zero) ii) The objects have the same temperature

4.	Thermometric Property	Thermometric Property is the physical property of a substance which is sensitive and varies linearly with changes in temperature of the material
5.	Ice Point (Lower fixed pont)	Ice point is the temperature of pure melting ice
6.	Steam Point (Upper fixed point)	Steam point is the temperature of steam from water that is boiling under standard atmospheric pressure
7.	Heat Capacity	Heat capacity of a body is the amount of heat that must be supplied to increase its temperature by 1 °C
8.	Specific Heat Capacity	Specific Heat Capacity of a substance is the amount of heat that must be supplied to increase the temperature by 1 °C for a mass of 1 kg of the substance
9.	Latent Heat	Latent heat is the heat absorbed or heat released at a constant temperature during a change of phase
10.	Specific Latent Heat	Specific Latent Heat of a substance is the amount of heat required to change the phase of 1 kg of the substance at a constant temperature
11.	Spesific Latent Heat of Fusion	Spesific Latent Heat of Fusion is the amount of heat required to change the phase of 1 kg of the substance from solid to liquid phase at a constant temperature
12.	Spesific Latent Heat of Vaporisation	Spesific Latent Heat of Fusion is the amount of heat required to change the phase of 1 kg of the substance from liquid to gaseous phase at a constant temperature
13.	Boyle's Law	Boyle's Law states that for a fixed mass of gas, the pressure of the gas is inversely proportional to its volume when the temperature is kept constant
14.	Charles' Law	Charles' Law states that for a fixed mass of gas, the volume of the gas is directly proportional to its absolute temperature when its pressure is kept constant
15.	Pressure Law	Pressure Law states that for a fixed mass of gas, the pressure of the gas is directly proportional to its absolutev temperature when the volume is kept constant

Chapter 5: Light

	What is..	Definition
1.	Law of Reflection  AO :Incident ray ON :Normal OB :Reflected ray i :Angle of incidence r :Angle of reflection	i. The incident ray, the reflected ray and the normal all lie in the same plane ii. The anle of incidence i, is equal to the angle of reflection, r

2.	Reflection by a concave mirror 	Parallel rays that strike the surface of a concave mirror will be reflected and converge at the focal point, F outside the mirror
3.		Centre of curvature, C of a curved mirror is the centre of the sphere of the mirror
4.		Radius of curvature. R is the distance between the the centre of curvature, C and the pole of the mirror
5.		Focal point is the point where parallel rays that strike the surface of a concave mirror will be reflected and converge at the focal point
6.	Refraction of light	Refraction of light is a light phenomenon which occurs when light passes through two materials of different optical densities, will change direction at the boundary between them.
7.	Refractive Index	Refractive Index, n of the medium is defined as the ratio of the speed of light in vacuum to the speed if light in the medium
8.	Law of Refraction and Snell's Law	i. The incident ray, the refracted ray and the normal all lie in the same plane ii. The value of $\frac{\sin i}{\sin r}$ is a constant (Snell's Law)
9.	Critical Angle	Critical angle is the angle of incidence in an optically more dense medium which results in angle of refraction of 90° in an optically less dense.
10.	Total Internal Reflection	The Internal Reflection of light is the phenomenon when the angle of incidence is greater than the critical angle and the light not refracted anymore but internally reflected The conditions for the occurrence of total internal reflection. (1) The light ray must be travel from an optically denser medium to less dense medium. (2) The angle of incidence must be greater than the critical angle.

Chapter 6: Waves

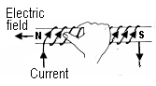
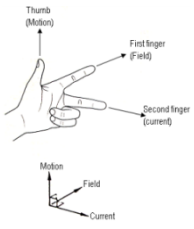
	What is..	Definition
1.	Waves	Waves are carriers of energy. They transfer energy from one location to another
2.	Longitudinal Wave	Longitudinal Wave is a wave in which the vibration of particles in the medium is parallel to the direction of the propagation of the wave
3.	Transverse Wave	Transverse Wave is a wave in which the vibration of particles in the medium is perpendicular to the direction of propagation of the wave
4.	Wavefront	In waves, lines joining all the points of the same phase

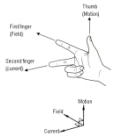
	What is..	Definition
5.	Wavelength	Wavelength of a wave is the distance between two adjacent points of the same phase on a wave
6.	Amplitude	Amplitude is the maximum displacement from its equilibrium position
7.	Frequency	Frequency of a wave is the number of waves produced by a source in one second
8.	Wave speed	The speed of the wave is the measurement of how fast a crest is moving from its fixed point
9.	Period	The period of a wave is the time taken for an oscillation to complete one cycle
10.	Forced Oscillation	Forced Oscillation is the external force supplies energy to the system
11.	Natural Frequency	Natural Frequency is the frequency of a system which oscillate freely without the action of an external force
12.	Resonance	Resonance occurs when a system is made to oscillate at a frequency equivalent to its natural frequency by an external force
13.	Diffraction	Diffraction of waves is the spreading of waves around corners and edges as waves pass through an opening or around an obstacle along their paths
14.	Coherent Waves	Coherent Waves are waves that have same frequency and wavelength and in phase
15.	Monochromatic Light	Monochromatic Light is light with one colour/wavelength
16.	Principle of Superposition of Waves	Principle of Superposition states that when two waves interfered, the resulting displacement of the medium at any point is the algebraic sum of the displacements of the individual waves
17.	Constructive interference	Constructive interference occurs when a crest meets acrest and when a trough meets a trough
18.	Destructive interference	Destructive interference occurs when crests suoerposed with troughs
19.	Antinodal lines	Antinodal lines are lines joining places of constructive interference
20.	Nodal lines	Nodal lines are line joining the places of destructive interference

Chapter 7: Electricity

	What is..	Definition
1.	Electric Field	Electric field is a region around a charged object which any other charged body experience a force
2.	Potential Difference	Potential Difference, V between two points in a circuit is defined as the amount of work done when a coulomb of charge passes from one point to the other point
3.	Ohm's Law	Ohm's Law states that the current that passes through an ohmic conductor is directly proportional to the potential difference applied accross it if the temperature and other physical conditions are constant
4.	Resistance	Resistance, R of a conductor is the ratio of the potential difference, V to the current, I
5.	Electromotive Force (e.m.f)	Electromotive Force (e.m.f) is defined as the work done by the source to move a coulomb of charge around a complete circuit
6.	Internal Resistance	The internal resistance ,r is the resistance within a cell due to its electrolyte and electrodes or source of electricity.

Chapter 8: Electromagnetism

	What is..	Definition
1.	Ferromagnetic materials	Ferromagnetic materials are the materials attracted to the magnet. The examples of the ferromagnetic materials such as iron, nickel and cobalt
2.	Electromagnet	An electromagnet is a device in which magnetism is produced by an electric current. An electromagnet acts as a temporary magnet
3.	Magnetic field	A magnetic field is a region in which a magnetic material experiences a force as the result of the present of a magnet or a electromagnet
4.	The right -hand grip rule.	 If a solenoid carrying a current is gripped with the right hand and with the thumb pointing along the solenoid so that the fingers curling round the solenoid in the direction of the current and the thumb then points towards the north pole.
5.	Fleming's Left-hand Rule.	Fleming's Left-hand Rule.  Fleming's Left-hand Rule states" If the thumb, first finger (forefinger)and second finger of the left hand are held

	What is..	Definition
		at right angles to each other, then if the first finger (forefinger)represents the direction of the magnetic field and the second represents the direction of the current, then the thumb will represents the direction of the motion"
6.	Catapult Field (Resultant field)	Catapult field are the combinations field between (a) the magnetic field produced by the current and magnetic field of the permanent magnet occurred. Or (b) the magnetic field produced by two current – carrying conductors are placed close to each other
7.	Electromagnetic induction	Electromagnetic induction is the production of induced current or induced e.m.f. without using the power supplies but using the relative motion between a conductor or a magnet
8.	Faraday's law	Faraday's law state that " The magnitude of the induced current or induced e.m.f. is directly proportional to the rate of change of magnetic flux linkage with the solenoid or the rate at which a conductor cuts through the magnetic flux."
9.	Lenz's law	Lenz's law state that" The direction of an induced current always flows in such as a direction so to oppose the change which is causing it."
10.	Fleming's Right-hand rule	To determine the direction of the induced current in the dynamo – Fleming's Right-hand rule  Fleming's Right-hand Rule states" If the thumb, first finger (forefinger)and second finger of the right hand are held at right angles to each other, then if the first finger (forefinger)represents the direction of the magnetic field and the thumb represents the direction of the motion of the conductor , then the second finger will represents the direction of the induced current "

Chapter 9: Electronics

	What is..	Definition
1.	Thermionic Emission	The emission of electrons from the surface of a heated metal or heated metal cathode. The thermionic emission is a bit like electrons being evaporated off from the hot wire
2.	Cathode Ray	Cathode ray is a narrow beam of a fast electrons moving in a vacuum
3.	Semiconductor Materials	Semiconductors are materials which conduct electricity better than insulator, but no so well as ordinary conductors
4.	Doping	Doping is a process of adding a small amount of impurities into the pure crystal of semiconductor (intrinsic semiconductor)
5.	Rectifier	A rectifier converts alternating current(a.c.) into direct current(d.c). The process of converting a.c. to d.c. is called rectification
6.	Transistor	A transistor is a semiconductor device capable of amplification in addition to rectification.
7.	Logic Gate	An electronic circuit with a single output and one or more inputs

Chapter 10: Radioactivity

	What is..	Definition
1.	Radioisotope	Radioisotopes are unstable isotopes which decay and give out radioactive emissions
2.	Radioactivity	Radioactivity is the spontaneous disintegration of an unstable nucleus into a more stable nucleus accompanied by the emission of energetic particles (radioactive rays) or photons
3.	α- particles :	Helium nucleus or $^{4}_{2}He$
4.	β- particles :	Fast moving electrons or $^{0}_{-1}e$
5.	γ-rays	Electromagnetic waves
6.	The half-life	The half-life of a radioactive material is the time taken for the activity of radioactive fall to half its original activity
7.	Nuclear fission	Nuclear fission is the splitting of a heavy nucleus into two lighter nuclei, which subsequently emit either two or three neutrons and release of large amounts of energy
8.	Nuclear fusion	Nuclear fusion is the combining of two lighter nuclei to form a heavier nucleus with the release of large amount of energy.

SECTION II - COMMON MISTAKES AND MISCONCEPTIONS

A. Common and Frequent Mistakes

1. Problem Solving (Quantitative) –the answer given:
   i. *FRACTION FORM*
   ii. *without UNIT*

2. Careless mistakes:
Example: Convert minute into hour - 30 minutes = 30 x 60 = 1800 hours

3. Conceptual question:
   i. Giving the reason:
   E.g. : The horizontal distance of the water spurting out in Diagram (b) is greater because.....
   ii. Giving the *value* when comparing two situations:
   E.g. The boiling points of water is 100°C whereas the boiling point of methylated spirit is 80°C

4. Understanding Question - *Not systematic* in explanation

5. Explanation *without diagram / symbol / formula / graph*.

6. Use the reason *given in the question*

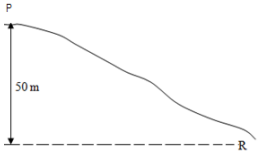
7. Light topic; Draw the ray diagram without "*arrow*"

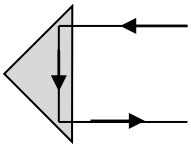
8. Cannot distinguish between Physical Quantity, Physics Instrument and Physics Unit
Examples:

Physical Quantity	Physical quantity measured	Physics Unit and symbol
Stop watch		
voltmeter		
thermometer		
Bourdon gauge		
Ammeter		
Centimeter		

9. Wrong Physics Term / Definition / Concept (Base on SBP Physics Trial Exams)

Examples:

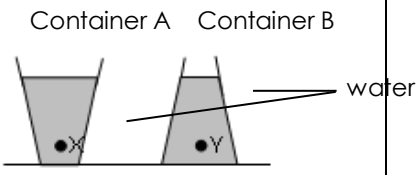
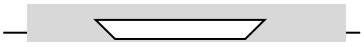
	Terms	Common Mistake	Correct Answer
a	[The type of energy when the object is at P] 	Potential energy	..... Potential Energy
b	Pressure	Force acting on surface area Force/area A product of depth, density and gravitational acceleration	..... forceacting on..... ofsurface area
c	Pascal's principle	In a close container, force is transmitted equally	In a close container..... .....

	Terms	Common Mistake	Correct Answer
d	Latent heat of vaporization	Heat absorbed to change by 1°C	Heat absorbed to change ..... of liquid to gas without ....
e	Temperature	Transfer from hot body to cold body	
f	[Physics phenomena in a prism] 	Reflection	..... .
g	Critical angle	Critical angle is when the refracted angle is 90° Critical angle is the incident angle when the reflected angle is 90°	Critical angle is the .... in .....r medium which produces when the ..... angle in ..... medium is .....
h	Virtual image	The image that formed behind the lens	The image that ....
i	Monochromatic light	A colour of one light	The light that ....
j	Amplitude	Maximum point of the highest displacement	……. ..... of any particle/oscillating system from its ……..
k	Period	One complete oscillation	The ……. for any particle to make …… ……oscillation
l	Specification: 240 V, 1000 W	1000 W of energy is supplied when the power supplied is 240 V.	.... when connected to a .... of ....
j	electromagnet	When the current flow through magnet Is a combination of electric and magnetic field	A ..... which can produce ..... when ....

	Terms	Common Mistake	Correct Answer
k	Beta particles	Negative charge	..... electron

B. Misconceptians

Examples:

Num	Misconceptions	Correction
1	Oil is used in hydraulic jack because it has higher boiling point	
2	Snell's law state that: $\frac{\text{The sine of incident angle}}{\text{The sine of refracted angle}} = \text{Refractive index}$	
3	 The force exerted at X > the force exerted at Y because smaller surface area (P = F /A)	
4	To increase the efficiency of ac/dc GENERATOR: - Use more number of turns to produce stronger magnetic field	
5	 The ship can float in sea water because *the buoyant force is bigger than the weight of the ship*	

C. Paper 3

1. Data Tabulation

Title - no unit
Content- not consistent
Example:

Common Mistake		Correct Answer	
Electric Current	*Voltage*		
0.1	*0.5*		
0.12	*1*		
0.14	*1.5*		

2. Graph:

Label - x-axis & y-axis : no unit
Scale - Not uniform, odd
Plotting (x @ ●) - too small or too big
Line - not smooth, not balance
Size - small [< (8 cm x 8 cm)]

3. Gradient of the graph

Triangle - small [< (8 cm x 8 cm)]
Final answer - no unit,
Written in fraction

4. Calculation

Final answer - no unit
written in fraction

5. Procedure

Repeat the experiment three times
Should state:
What:……..……..
How : ……..……

6. Precaution

"*Avoid parallax error*"

Should state:

What: ……

How : ……

SECTION II : CONCEPTUALIZATION [Paper 2 Section B]

Question 1 [Forces and Motion]

Diagram 1.1 shows a stationary cannon on a smooth surface.
Diagram 1.2 shows the cannon and the cannonball after the cannon has been fired by remote control.

Diagram 1.1

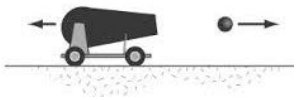
Cannon recoils at lower speed  Cannonball moves at high speed

Diagram 1.2

State the total momentum of the cannon and the cannonball in Diagram 1.1.
Using Diagram 1.1 and Diagram 1.2, compare the total momentum before and after the cannon is fired. Using Diagram 1.2, compare the magnitude and direction of the momentum of the cannon and cannonball. Name the physics principle that can be applied to the motion of the cannon and cannonball.

[*5 marks*]

Question 2 [Forces and Motion]

Diagram 2.1 shows the effect of a man falls from a high position to the ground without opening the parachute.
Diagram 2.2 shows a man with the same mass falls from the same height when the parachute is open.

Diagram 2.1

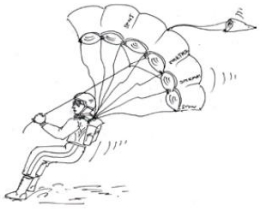


Diagram 2.2

Based on Diagram 2.1 and Diagram 2.2, compare the acceleration, the air resistance and the time to fall.
Relate the acceleration with the
(i) Air resistance
(ii) Falling time

[*5 marks*]

Question 3 [Forces and Motion]

Diagram 3.1 and Diagram 3.2 show the rubber of Catapult A and Catapult B is pulled by extension x_1 and x_2 to slingshot a stone.

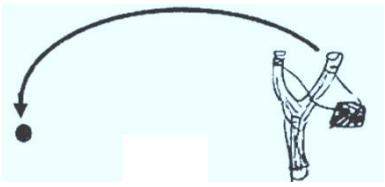
Before	After
	

Diagram 3.1

Before	After
	

Diagram 3.2

(a) Based on Diagram 3.1 and Diagram 3.2, compare the thickness of the rubber used, the distance travelled by stone and the energy of catapults.
Relate the thickness of the rubber and the energy of catapults.
Relate the thickness of rubber and distance of the stone travelled.
[5 marks]

(b) Based on Diagram 3.3 and Diagram 3.4, compare the distance travelled by the stone and the extension of the rubber,
(Assume the mass of the stone is the same)
[2 marks]

(c) State the energy change and deduce a relevant physics concept.
[2 marks]

Question 4 [Forces and Pressure]

Diagram 4.1 and Diagram 4.2 show two identical thistle funnels are covered with rubber sheets, immersed in measuring cylinders filled with liquid P which density is 0.8 g cm^{-3}.
A manometer is connected to the thistle funnel using rubber tube.
The depth, h_1 and h_2 are measured from the surface of the liquid P to the rubber sheet.
.

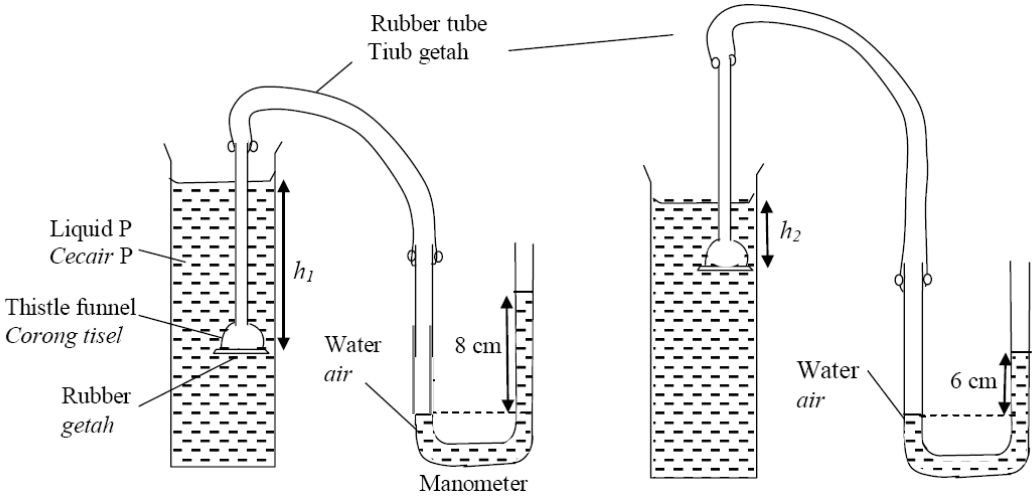


Diagram 4.1 Diagram 4.2

(a) Based on Diagram 4.1 and Diagram 4.2, compare h_1 and h_2, and the different in height of the water level in the manometer.
(b) Name the physical quantity that represents the difference in height of the water in manometer.
(c) Relate the depth of thistle funnel and the difference in height of the water in manometer.
(d) Relate the depth of the liquid and the physical quantity in 4(b)
[5 marks]

Question 5 [Forces and Pressure]

Diagram 5 shows the Foothill and Mountain peak of Mount Kinabalu, Sabah.

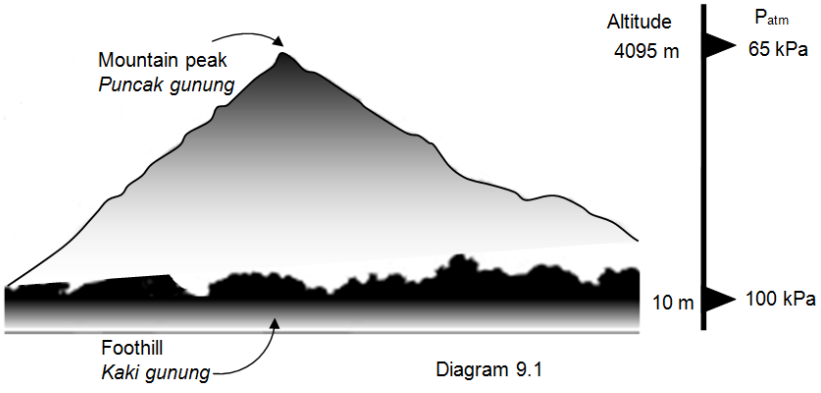


Diagram 5

Based on Diagram 5, compare the altitude between mountain peak and foothill, the atmospheric pressure at mountain peak and foothill and density of air between the two altitudes.
State the relationship between the altitude and the atmospheric pressure.
Hence, deduce a relationship between the atmospheric pressure and density of air. [5 marks]

Question 6 [Forces and Pressure]

Diagram 6.1 and Diagram 6.2 show two identical glass tube filled with different number of lead shots floats in the water. The glass tube floats because the net force acting on the glass tube is zero.

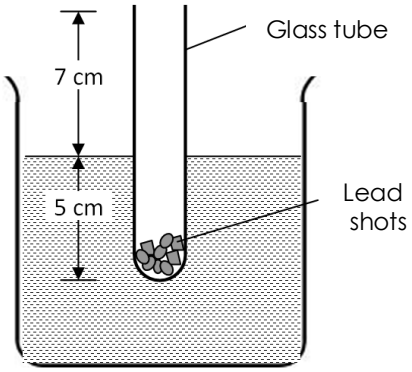


Diagram 6.1

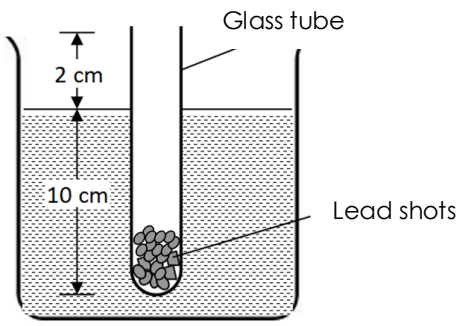


Diagram 6.2

Based on Diagram 6.1 and Diagram 6.2, compare the volume of water displaced by the glass tube, the weight of the glass tube filled with lead shots and the buoyant force acted on the glass tube filled with lead shots.
Relate the volume of water displaced and the buoyant force to deduce a relevant physics concept.

[5 *marks*]

Question 7 [Forces and Pressure]

Diagram 7.1 and Diagram 7.2 show two identical ball is dipped into oil and water separately.
The ball immersed at different levels in the two liquids.
The density of the oil is 900 kg m^{-3} and the density of water is 1000 kg m^{-3} .

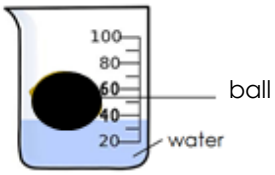


Diagram 7.1

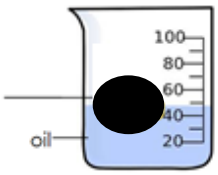


Diagram 7.2

Based on Diagram 7.1 and Diagram 7.2, compare the level of the ball in the oil and in the water, the volume of liquid displaced by the ball in the oil and in the water, and the density of oil and water.
Relate the volume of liquid displaced to the density of the liquid.
Relate the weight of the ball to the weight of the liquid displaced.
Name the physics principle that explains the situation above.

[6 marks]

Question 8 [Forces and Pressure]

Diagram 8.1 and Diagram 8.2 show the distances between two streams of water, x_1 and x_2 when air are blown in the middle with two tubes which nozzles have different cross sectional areas.
The air pressure supplied at both tubes is the same.

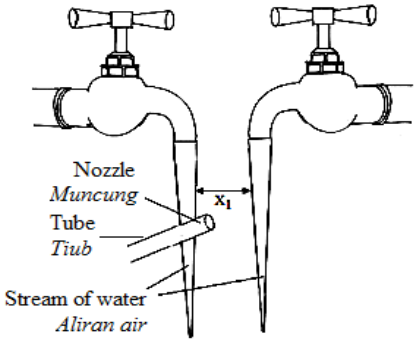


Diagram 8.1

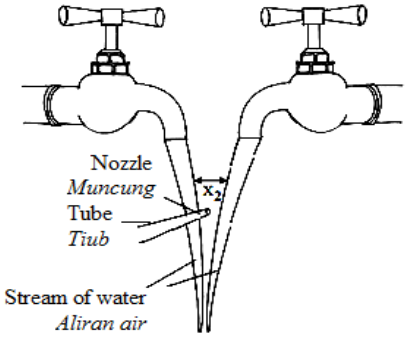


Diagram 8.2

Using Diagram 8.1 and Diagram 8.2,compare the cross sectional area of the nozzles, and the distance between the two streams of water, x_1 and x_2 .
Relate the cross sectional area of the nozzle with the speed of the air at the nozzle.
Relate the air pressure with the distance, x in between two streams of water.
Deduce the relationship between the speed of air with the air pressure [5 marks]

Question 9 [Heat]

Diagram 9.1 and Diagram 9.2 show two identical polystyrene glasses are filled with hot water at The same temperature.
Diagram 9.3 and Diagram 9.4 shows the changes in temperature of the water after 5 minutes the water are cooled.

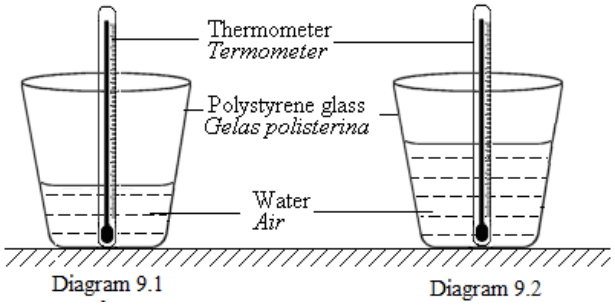


Diagram 9.1 Diagram 9.2

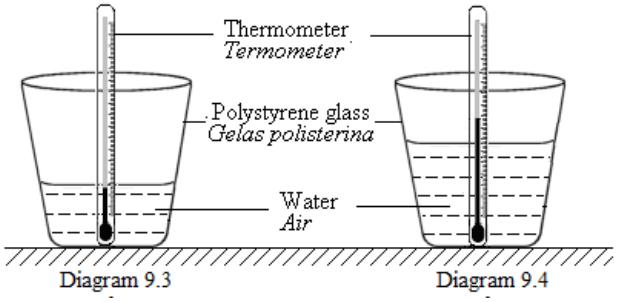


Diagram 9.3 Diagram 9.4

Using Diagram 9.1 and Diagram 9.2 , compare the mass of water in both glasses.
Using Diagram 9.3 and Diagram 9.4 , compare the reading of the thermometer and the rate of heat loss from the water in the glasses after 5 minutes.
Relate the mass of water and the rate of loss of heat from water to make a deduction regarding the relationship between the mass of water and the quantity of heat in water.

[5 *marks*]

Question 10 [Heat]

Diagram 10.1 and Diagram 10.2 shows positions of the sulphuric acid that trapped air before and after it is heated.

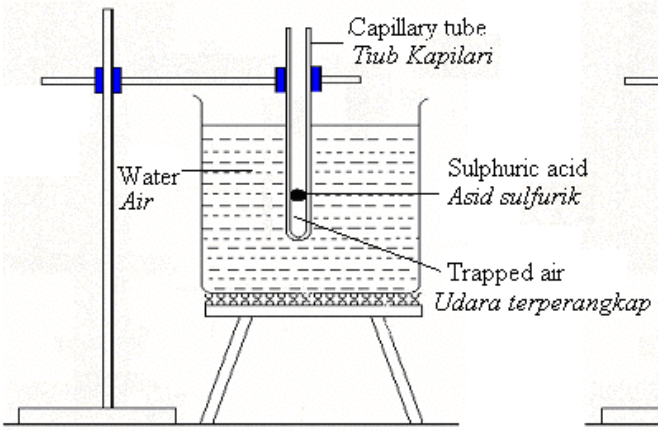


Diagram 10.1

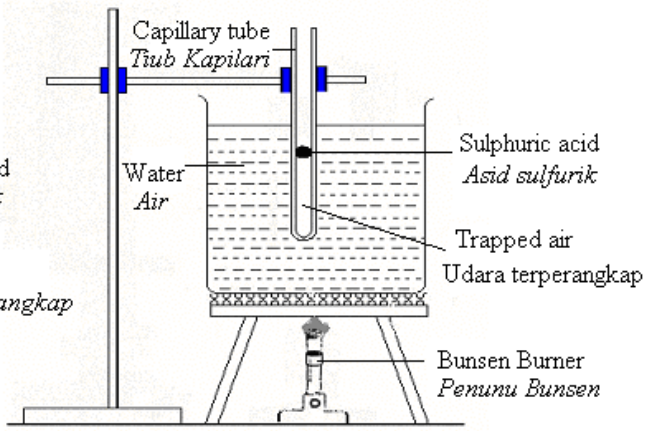


Diagram 10.2

(a) Based on Diagram 10.1 and Diagram 10.2, compare
- (i) the mass of air before and after it is heated
- (ii) the volume of the air before and after it is heated
- (iii) the temperature of the air before and after it is heated.
- (iv) the pressure of the air before and after it is heated

[4 marks]

(b) Based on the answer in 10(a)(ii) and 10(a)(iii), state the relationship between the temperature and volume of the air before and after it is heated.

[2 marks]

(c) Name the gas law involved in (a)(iii).

[1 *mark*]

Question 11 [Light]

Diagram 11.1 and Diagram 11.2 show the identical objects located at different positions in front of identical concave mirror. Real images with different sizes are produced.

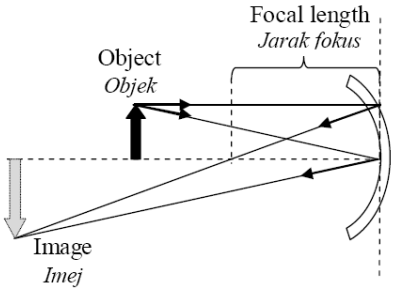


Diagram 11.1

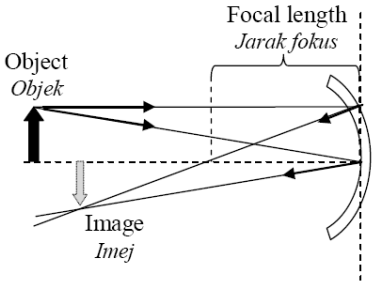


Diagram 11.2

Using Diagram 11.1 and Diagram 11.2, compare the object distance, the size of image formed and the image distance.
Relate the object distance and the size of the image formed to make a deduction on the relationship between the object distance and the magnification scale.

[5 marks]

Question 12 [Light]

Diagram 12.1 shows a phenomenon of light on mirror P.Diagram 12.2 shows the same phenomenon of light on mirror Q.CX is the radius of curvature and F is the focal point.

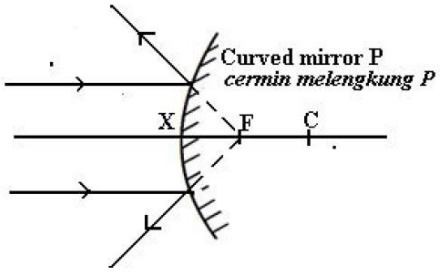


Diagram 12.1

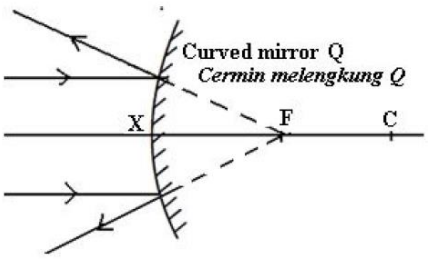


Diagram 12.2

Based on Diagrams 12.1 and Diagram 12.2, compare the curvature of mirrors, the focal length and the angle of reflection.
Relate the curvature of the mirrors to its focal lengths.
Relate the focal length to the angle of reflection.

[*5 marks*]

Question 13 [Light]

Diagram 13.1 and Diagram 13.2 show light rays from two identical objects passing through the convex lenses, M and N.
Both of the lenses produce virtual images. F is the focal point of each lens.

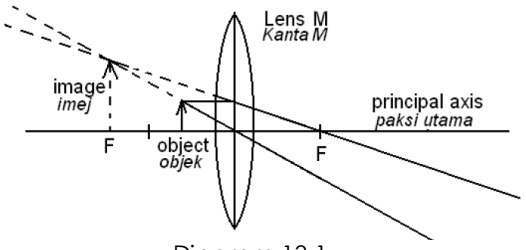


Diagram 13.1

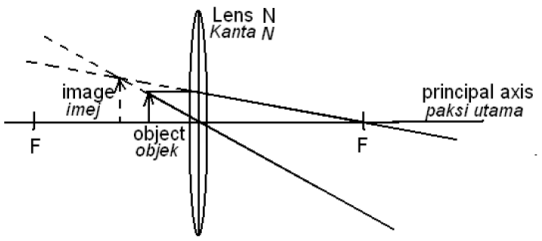


Diagram 13.2

Based on Diagram 13.1 and Diagram 13.2, compare the size of image produced by the lenses, the object distance, u, and the image distance , v.
State the relationship between the size of image and the image distance of the lens.
Hence, write an equation to show the relationship between the magnification of the image, m , object distance, u and the image distance, v.

[5 *marks*]

Question 14 [Waves]

Diagram 14.1 shows a Barton's pendulum consists of metal bob acting as the driver pendulum and a number of paper cones.
Diagram 14.2 shows the paper cone pendulum begins to oscillate when the driver pendulum start to swing.

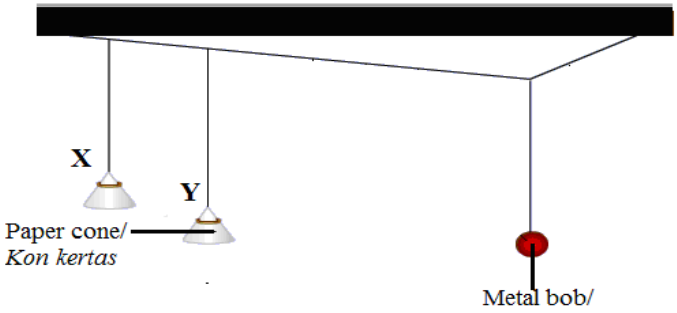


Diagram 14.1

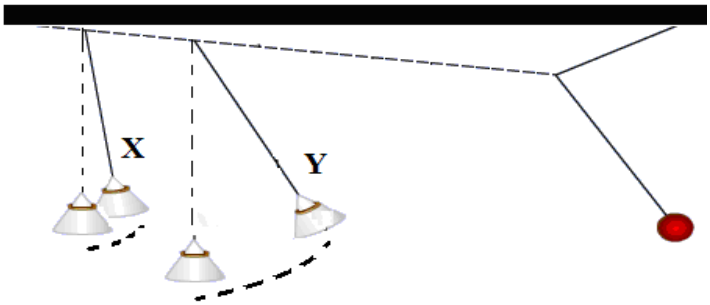


Diagram 14.2

Using Diagram 14.1 and Diagram 14.2, compare the length and frequency of pendulum X and pendulum Y to the length and frequency of the metal bob pendulum.
Compare the amplitude of oscillations between pendulum X and the pendulum Y.
Deduce the physics concept that involved in the situation.

[5 marks]

Question 15 [Waves]

Diagram 15.1 shows the side view of two water tanks.

When the motors on the dippers are switched on, the dippers oscillate on the surface of the water and produce water waves.

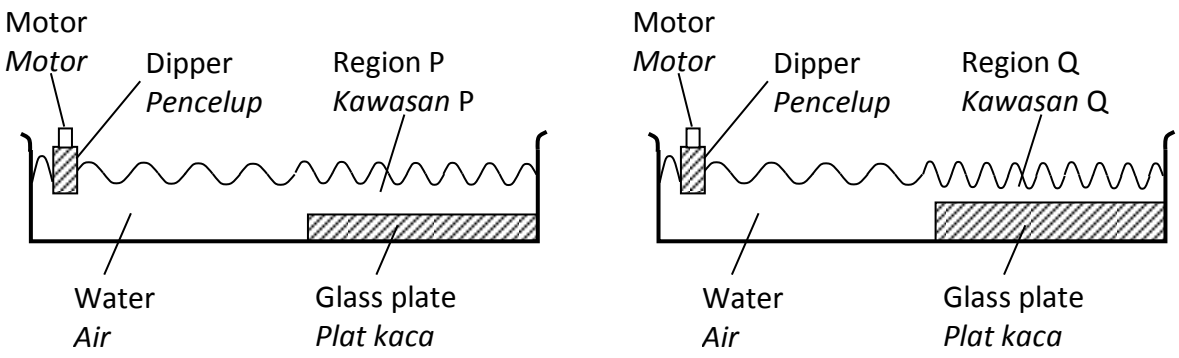


Diagram 15.1 / *Rajah* 15.1

Diagram 15.2 shows the top view of the propagation of the waves into region P and Q.

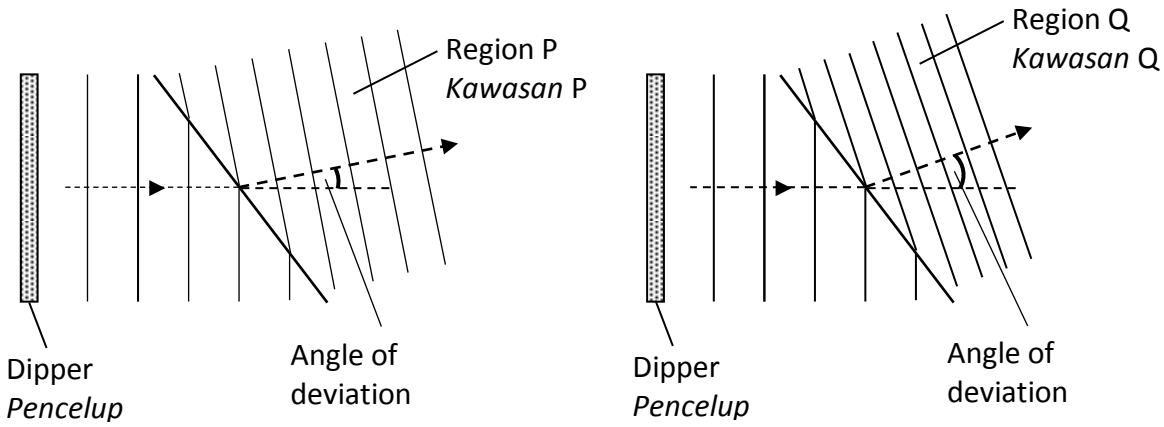


Diagram 15.2 / *Rajah* 15.2

Based on Diagram 15.1 and Diagram 15.2, compare the depth of water in region P and region Q, the angle of deviation when the waves move into region P and into region Q, the wavelength of the waves, and the change of speed of the waves.
Relate the change of speed of wave to the angle of deviation.

[5 *marks*]

Question 16 [Waves]

Diagram 16.1 and Diagram 16.2 show the pattern of interference using coherent sources of water waves.

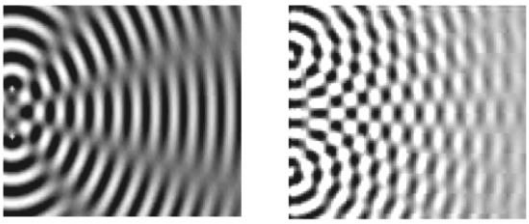


Diagram 16.1 Diagram 16.2

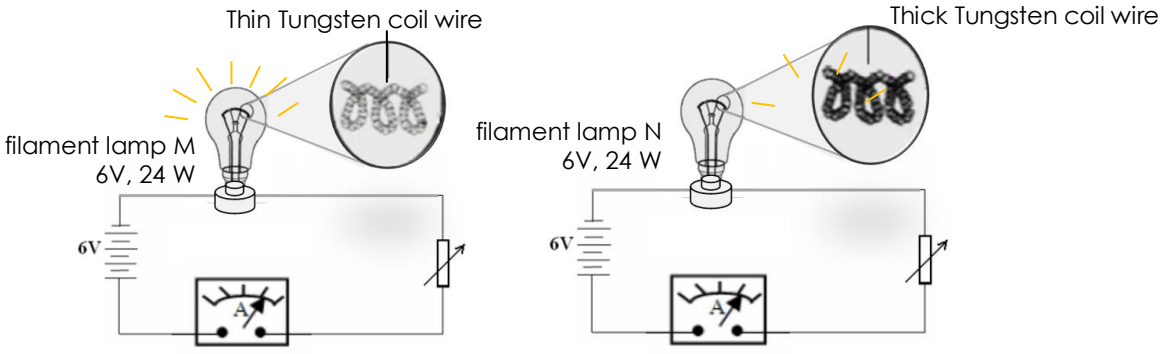
(a) Using Diagram 16.1 and Diagram 16.2, compare the distance between the two coherent sources, wavelength of the propagation of water waves and distance between two consecutive antinodal line.

(b) Relate the distance between the two coherent sources with the distance between two consecutive antinodal line.

[4 marks]

Question 17 [Electricity]

Diagram 17.1 and Diagram 17.2 show the thickness of coiled wire of the filament lamp M and N, respectively, in two electrical circuits.



. Diagram 17.1 Diagram 17.2

Based on Diagram 17.1and Diagram 17.2, compare the reading of the ammeter, the brightness of the filament lamp M and N, and the thickness of coiled wire of the filament lamps.
Relate the brightness of the filament lamp with the thickness of coiled wire to make a deduction on the relationship between thickness of coil wire and the heat produced by the filament lamp

[5 marks]

Question 18 [Electricity]

Diagram 18.1 and Diagram 18.2 show electric circuits contains two identical bulbs which has resistance R, are connected to a new dry cell 1.5 V. Current flows through the circuits to light up the bulbs.

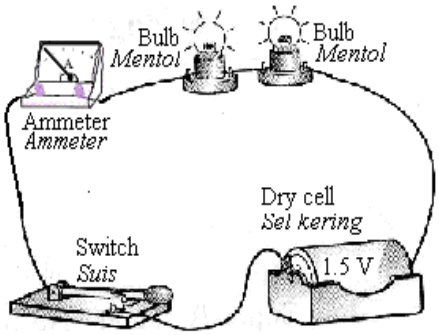


Diagram 18.1

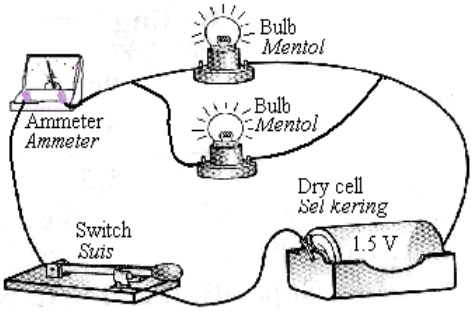


Diagram 18.2

Using Diagram 18.1 and Diagram 18.2, compare the brightness of the bulbs light up, the effective resistance of the type of circuit connections and the reading of ammeter of the both electric circuits.
Relate the brightness of the bulbs light up to the reading of the ammeter.
Deduce the relationship between the effective resistance and the magnitude of current flows.

[5 *marks*]

Question 19 [Electromagnetism]

Diagram 19.1 and Diagram 19.2 show a magnet bar is dropped from a certain height through a coil. The relative motion between the magnet and the coil produced an induced current due to change in magnetic field occurred.

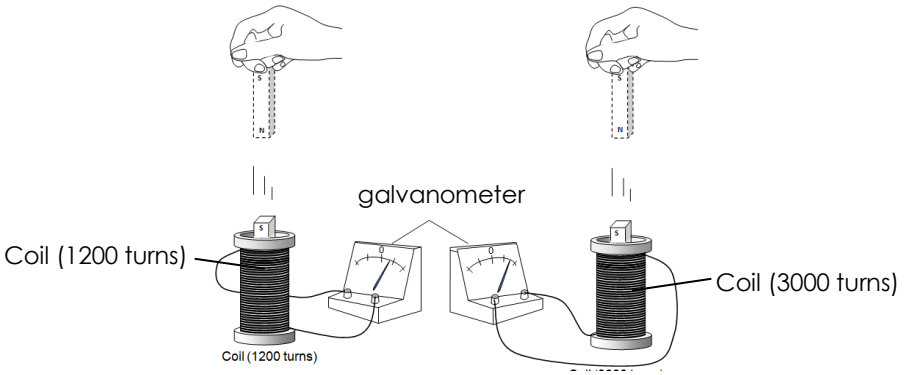


Diagram 19.1 Diagram 19.2

(a) Based on Diagram 19.1 and Diagram 19.2, compare the relative motions between the magnet to the coil, the number of turns of the coils, the induced current is produced.

(b) State the relationship between the number of turns of the coils and
   (i) the change in magnetic field
   (ii) The magnitude of induced current.

[5 marks]

Question 20 [Electromagnetism]

Diagram 20.1 and Diagram 20.2 show two coils of identical wire wound around an iron core. The primary coil is connected to 12V a.c. power supply, while the secondary coil is connected to a bulb labelled 24V, 36W.

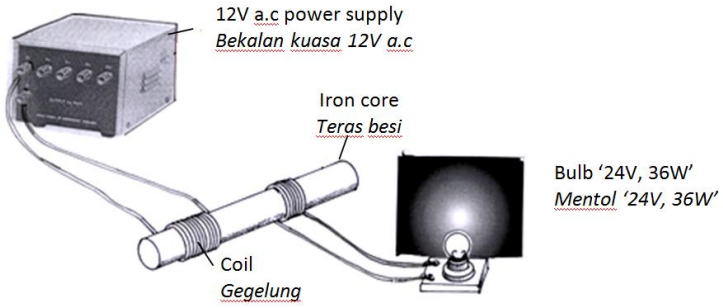


Diagram 20.1

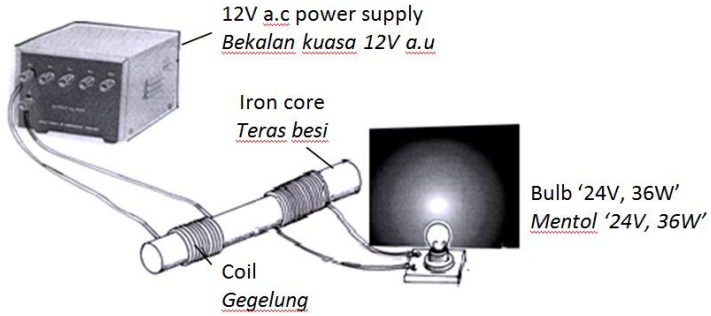


Diagram 20.2

(a) Based on Diagram 20.1 and Diagram 20.2, compare;
(i) The brightness of bulb
(ii) The number of turns in the primary coil and secondary coil [3 marks]

(b) Relate the brightness of bulb with:
(i) The number of turns in secondary coil
(ii) The induced current produced in the secondary coil. [2 marks]

Question 21 [Electronic]

Diagram 21.1 and Diagram 21.2 show the deflection of a cathode ray in a deflection tube.

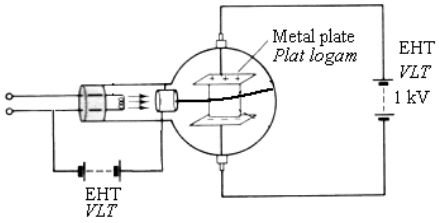


Diagram 21.1

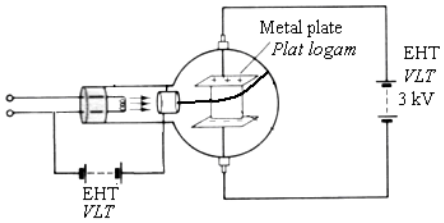


Diagram 21.2

(a) Using Diagram 21.1 and Diagram 21.2,
(i) state the charge of the cathode ray, [1 *mark*]
(ii) compare the voltage of EHT connected to the metal plate and the deflection of the cathode ray [2 *marks*]

(b) State the relationship between
(i) the voltage of EHT and the strength of the electric field between the metal plates, [1 *mark*]
(ii) the strength of the electric field between the metal plates and the deflection of the cathode ray. [1 *mark*]

Question 22 [Electronic]

Diagram 22.1 and Diagram 22.2 show traces on the screen of a Cathode Ray Oscilloscope (C.R.O) when it is connected to the output a.c. generators of different frequency.

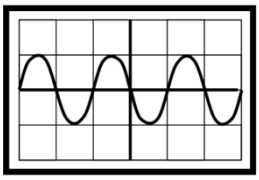


Diagram 22.1

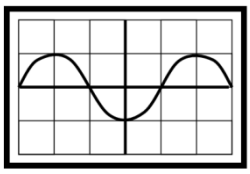


Diagram 22.2

Using Diagram 22.1 and Diagram 22.2, compare the amplitude, number of complete oscillations and period of oscillation of the traces.
Relate the number of complete oscillations with the period of oscillation to make a deduction regarding the relationship between period of oscillation and frequency.

[5 marks]

Question 23 [Electronic]

A semiconductor diode is an electronic device made by joining pieces of p-type and n-type semiconductors. n-type and p- type semiconductors are produced through the doping process.

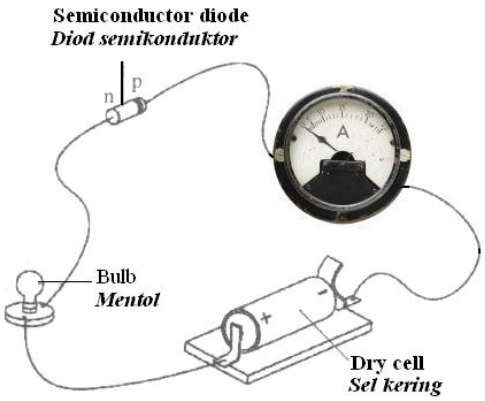


Diagram 23.1

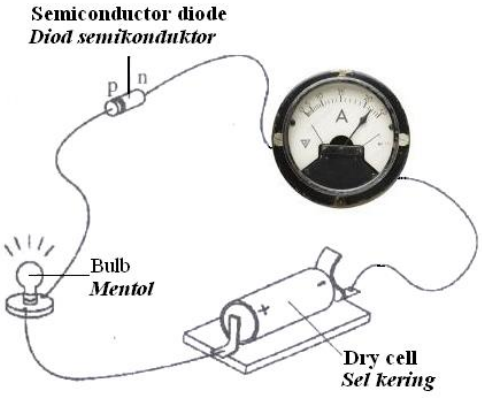


Diagram 23.2

Using Diagram 23.1 and Diagram 23.2 , compare the connection of diode to the dry cell, the lighting of bulbs and the reading of ammeter.
Relate the lighting of bulbs with the connection of diode to the dry cell to make a deduction regarding the relationship between the current flowing in the circuits and the connection of diode to the dry cell.

[6 *marks*]

Question 24 [Electronic]

Diagram 24.1 shows a transisitor circuit when switch A is off.
Diagram 24.2 and Diagram 24.3 show the transistor circuit with different mirometer reading and miliammeter reading.

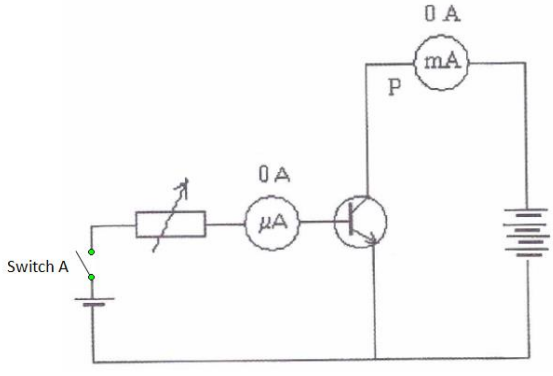


Diagram 24.1

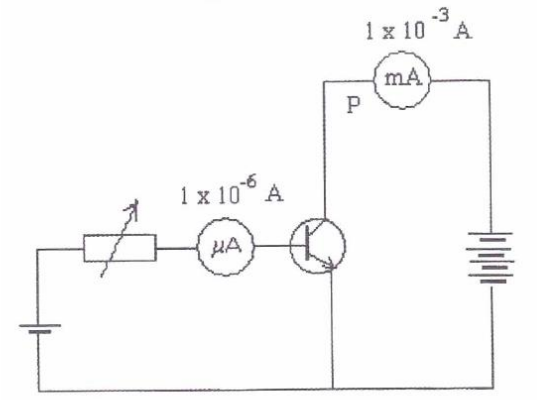


Diagram 24.2

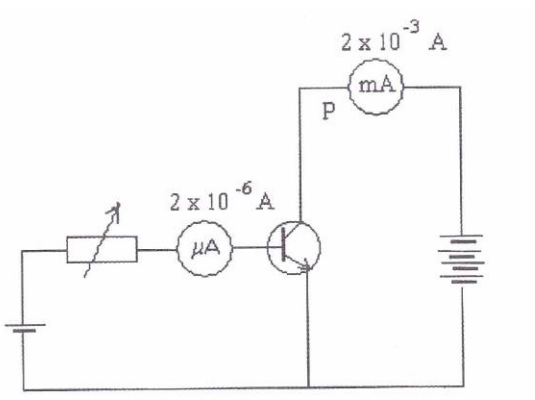


Diagram 24.3

(a) (i) Based on Diagram 24.1, compare the microammeter reading and the miliammeter reading

(ii) Based on Diagram 24.2, compare the microammeter reading and the miliammeter reading

(iii) Based on Diagram 24.2 and Diagram 24.3, compare the change in microammeter reading and change in miliammeter reading

(b) Relate the microammeter reading, miliammeter reading and deduce a physics concept for base current, I_b and collecter current I_c in a transistor circuit.

[5 marks]

Question 25 [Radioactivity]

Diagram 25 shows the decay curves obtained for radioactive substance X and radioactive substance Y.

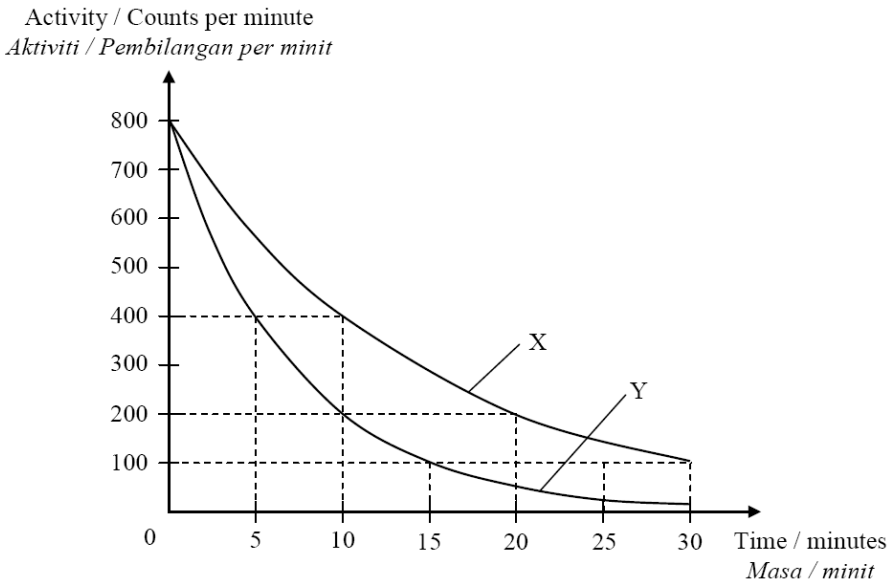


Diagram 25

(a) For radioactive substance X and radioactive substance Y, determine the time taken for the activity to become half of its initial value.

[2 *marks*]

(b) Compare the times taken in (a) for the activities of radioactive substance X and radioactive substance Y to become half of its initial value.

[1 *mark*]

(c) State one common characteristic of the times taken in 25(a) for the activities of radioactive substance X and radioactive substance Y to become half of its initial value.

[1 *mark*]

(d) Give a name for the time taken for the activity of a radioactive source to become half of its initial value.

[1 *mark*]

SECTION III : UNDESTANDING [Paper 2 (Section B and C)] http://cikguadura.wordpress.com/

Question 1 [Introduction to Physics]

Explain the meaning of consistency and accuracy of a measuring instrument by using suitable examples

[4 marks]

Question 2 [Forces and Motion]

Diagram 1 below shows a vibrating pile driver used to drive a steel pile to the ground.

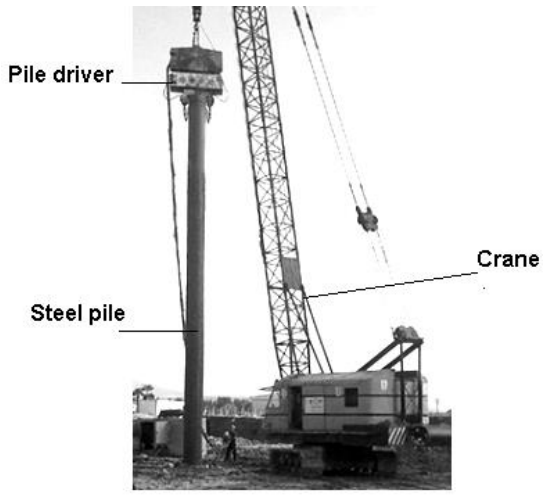


Diagram 1

Explain how the steel pile is driven to the ground. [4 *marks*]

Question 3 [Forces and Motion

Based on the relevant physics concept,

(i) explain why a driver lurch forwards when a car he is driving comes to a sudden stop,

(ii) describe and explain a method which can overcome the situation in (c)(i).

[4 marks]

Question 4 [Forces and Motion]

Diagram 4 shows 'Newton's cradle' which consists of five identical balls suspended in a row from a wooden frame by wires. When the ball on left end is pulled aside and allowed to fall, the ball on the far end is knocked away from the others with the same speed as the first ball .

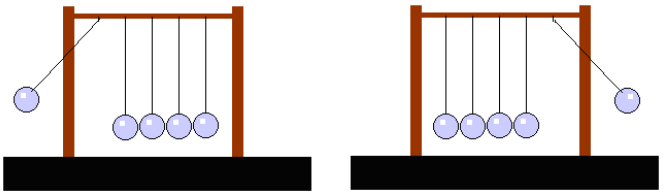


Diagram 4

Explain, in term of momentum and energy transfers, why the ball on the opposite end is knocked away from the others.

[4 marks]

Question 5 [Forces and Motion]

Diagram 5.1 shows a boy of mass 40 kg sliding in two identical flumes, one after another.

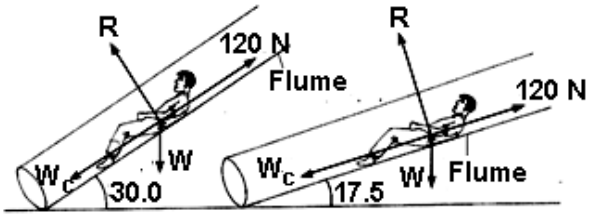


Diagram 5.1 Diagram 5.2

Diagram 5.1 shows the boy sliding down the flume, which is inclined at 30.0° to the horizontal. Diagram5.2 shows the boy stationary in the flume when the flume is inclined at 17.5° to the horizontal. The frictional force acting on the boy in both flumes is 120 N. Using the concept of force, explain why the boy slides down the flume when the angle of inclination is 30.0° and remains stationary when the angle of inclination is 17.5°.

[4 marks]

Question 6 [Forces and Pressure]

Diagram 6 shows a siphon. It is very useful for removing liquids from a tank or a fixed container.

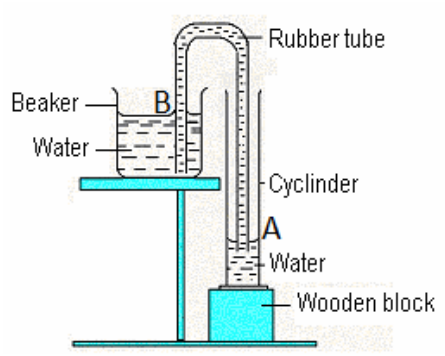


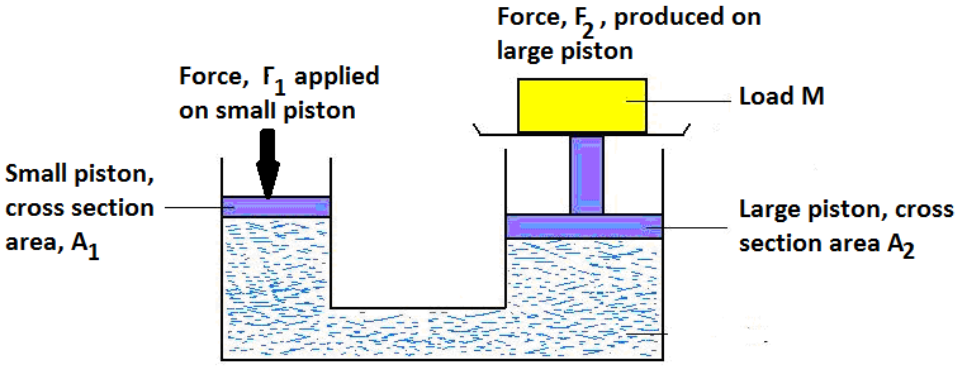
Diagram 6

Explain how siphon is used to remove liquid from a tank.

[4 *marks*]

Question 7 [Forces and Pressure]

Diagram 7 shows a simple hydraulic jack which is used to lift up load M. The working principl of the hydraulic jack is based on the Pascal's principle.

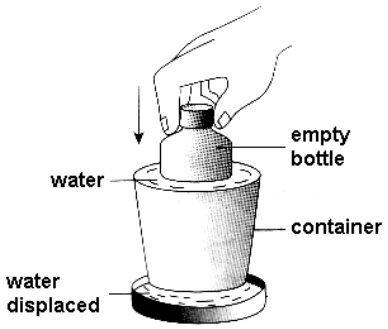


Explain how the hydraulic jack can be used to lift load M when force is applied on the small piston with cross-section area A_1 . In your explanation, state the reason why force F_2 is greater than force F_1 .

[4 *marks*]

Question 8 [Forces and Pressure]

Diagram 8 shows an empty bottle is pushed completely into the water and then releases it. Using the concept of buoyant force, explain what happen to the empty bottle after it is released.



[4 marks]

Question 9 [Forces and Pressure

Diagram 9 shows a remote control airplane.

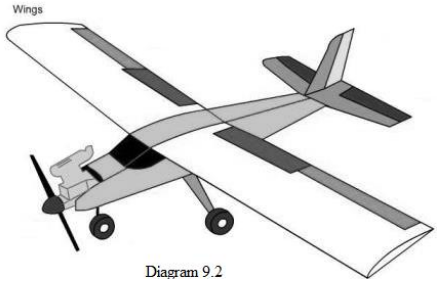
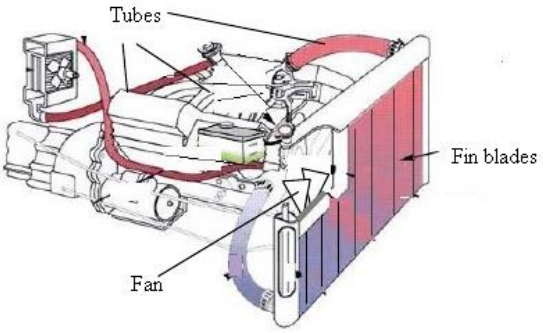


Diagram 9.2

Explain how the remote control airplane able to fly . [4 marks]

Question 10 [Heat]

Diagram 10 shows a radiator of a car



Water is used as a cooling agent in a radiator. Explain how water is used. [4marks]

Question 11 [Heat]

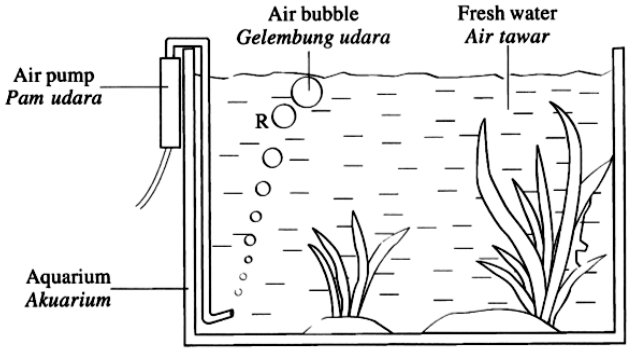
Diagram 11 shows the air pressure in the tire of a car being measured by a pressure gauge.

Based on kinetic theory of gasses, explain why the air pressure in the tire increases after the car has completed a long journey.

[4 *marks*]

Question 12 [Heat]

Diagram 12 shows air bubbles produced by an air pump in an aquarium filled with fresh water.



Explain why the volume of an air bubble increases as it moves towards the surface.

[4 marks]

Question 13 [Light]

By using suitable apparatus, explain how the focal length of both lenses can be estimated.

[*4 marks*]

Question 14 [Light]

Diagram 14.1 and Diagram 14.2 show a ray of light passing into crystal and diamond respectively.

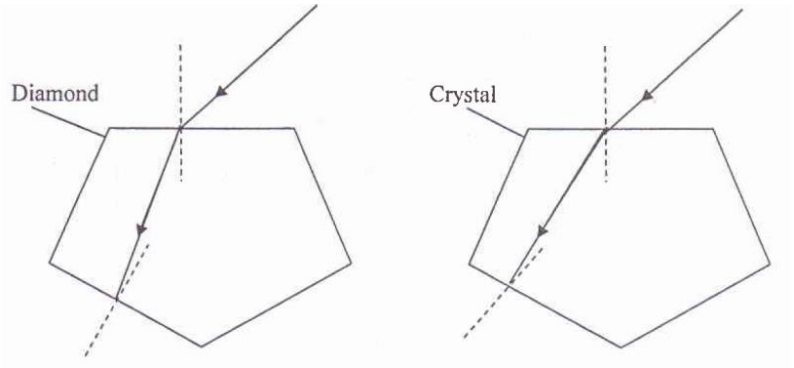


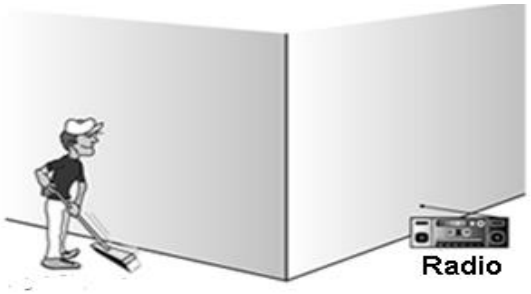
Diagram 14.1 Diagram 14.2

Explain why the diamond is sparkling when the ray of light pass through.
[Refractive index of glass = 1.5, refractive index of diamond = 2.4]

[4 *marks*]

Question 15 [Waves]

Diagram 15 shows a radio is placed near the corner of a wall. A boy is standing around the next corner.



When the radio is switched on, the boy can hear the sound from the radio but he cannot see the radio. Explain this situation.

[4 marks]

Question 16 [Waves]

Diagram 16 shows that the glass breaks when the singer sings.

Diagram 16

Using the physics concept in (b), explain why it happens.

[4 *marks*]

Question 17 [Waves]

Diagram 17 shows another modification to the harbour to overcome the heavy sea traffic problem. The wave pattern produced at the entrances is shown.

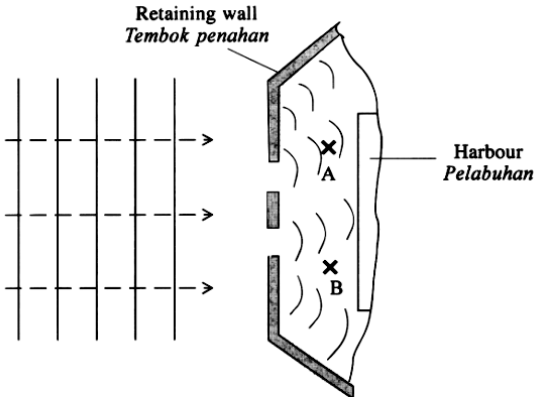


Diagram 17

Describe the movement of two similar ships that are located at A and B. Explain your answer.

[4 *marks*]

Question 18 [Electricity]

Diagram 18 shows a typical circuit on a household electrical appliance that using a fuse.

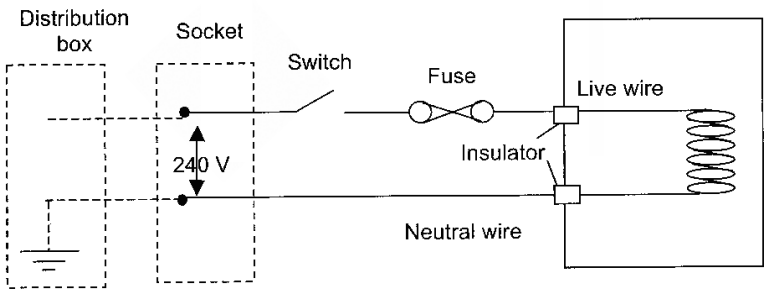


Diagram 18

Explain the advantages of parallel circuit in a house wiring system

[4 *marks*]

Question 19 [Electricity]

Diagram 19.1 and 19.2 shows two identical bulbs connected to one cell and two dry cell respectively. The bulb connected to two dry cells lights up brighter

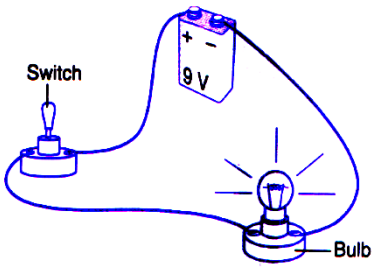


Diagram 19.2

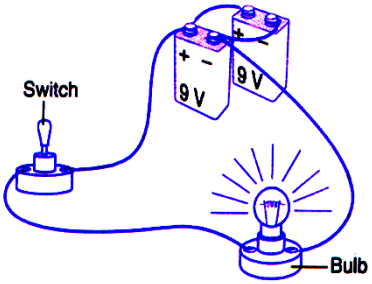


Diagram 19.1

(i) What is meant by the value " 9 V " labelled on the dry cell?

[1 *mark*]

(ii) Explain why the bulb connected to two dry cells is brighter.

[3 *marks*]

Question 20 [Electromagnetism]

Diagram 20 shows an electromagnet crane.

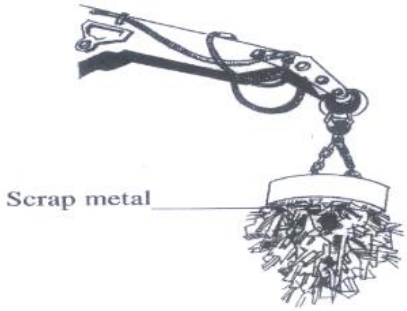


Diagram 20

Explain how the electromagnet crane can be used to lift scrap metal. [4 *marks*]

Question 21 [Electromagnetism]

Diagram 21 shows a simple direct current electric motor.

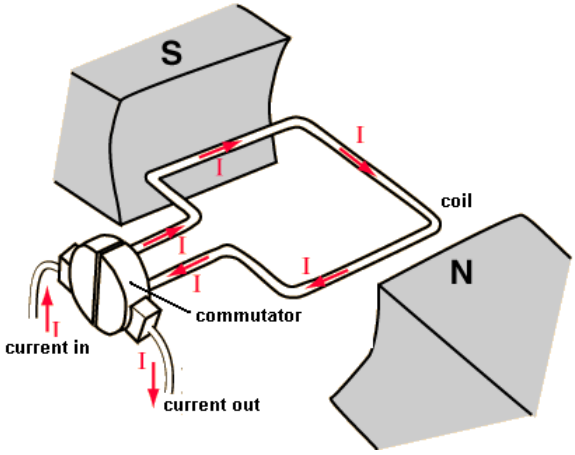


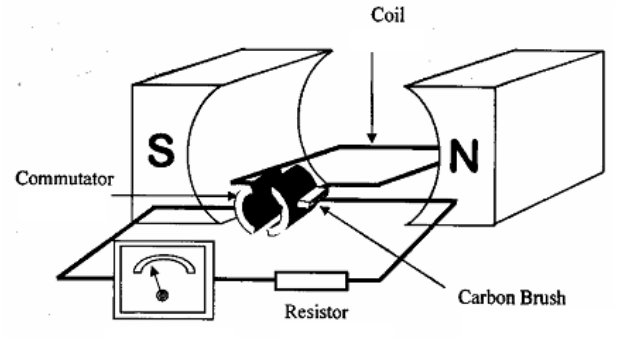
Diagram 21

Using the concept of the magnetic effect of an electric current, explain with the aid of diagrams how forces are produced on a wire in the coil, as shown in the diagram above.

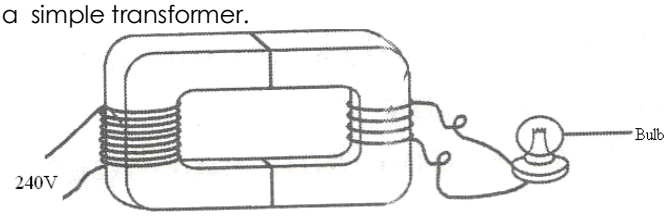
[4 marks]

Question 22 [Electromagnetism]
Diagram 22 shows the structure of a generator. Explain how the generator can be used to produce electricity.

[4 marks]



Question 23 [Electromagnetism]
Diagram 23 shows a simple transformer.



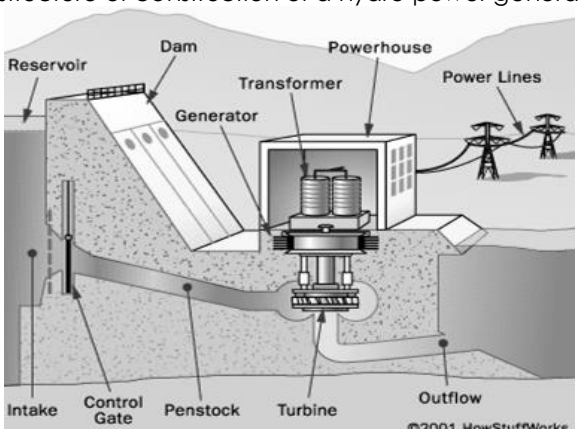
(i) What is meant by ideal transformer?

[1 mark]

(ii) Explain the working principle of a transformer.

[4 marks]

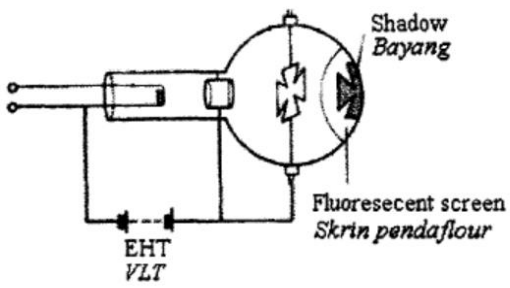
Question 24 [Electromagnetism]
Diagram 24 shows the structure of construction of a hydro power generating plant.



Base on the diagram, explain how the efficiency can be increased in the long distance transmission of electricity by using the alternate-current.

[4 marks]

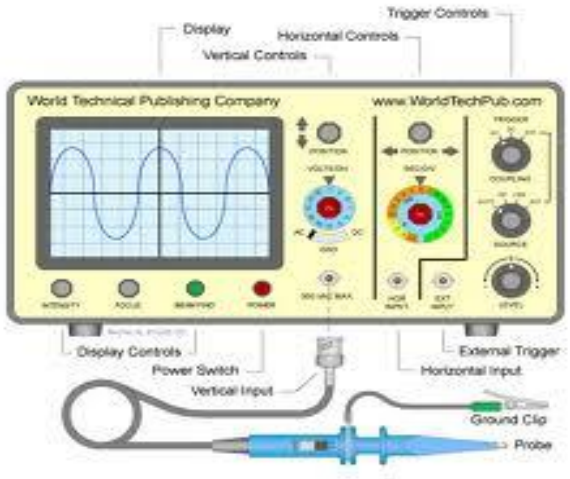
Question 25 [Electronic]
Diagram 25 shows a shadow is formed on fluorescent screen of the Maltese cross tube.



Explain how the shadow is formed on the fluorescent screen? [4 marks]

Question 26 [Electronic]

Diagram 26 shows a Cathode-Ray Oscilloscope.

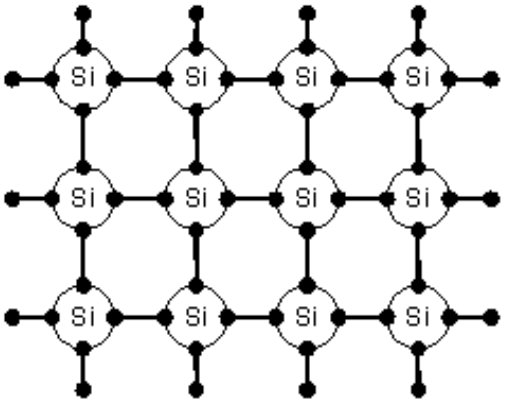


Explain how the Cathode-Ray Oscilloscope can be used to measure the potential difference of a dry cell.

[4 *marks*]

Question 27 [Electronic]

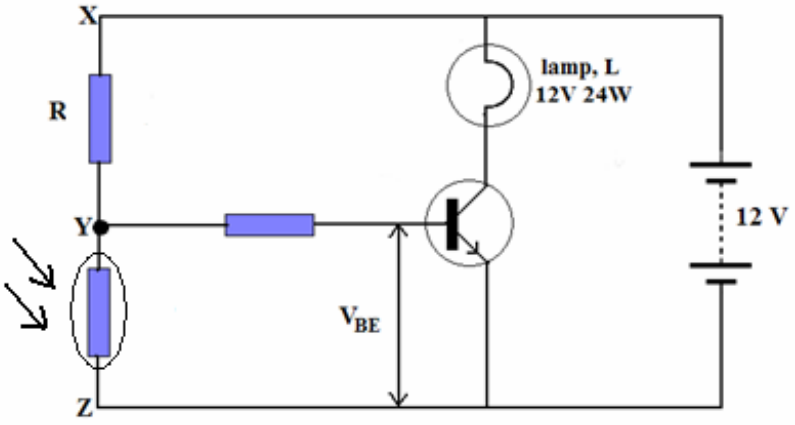
Diagram 27 shows the bonding of silicon atoms, each with four valence electrons in its outermost shell.



By using the diagram, explain how n–type semiconductor is produced. [4 *marks*]

Question 28 [Electronic]

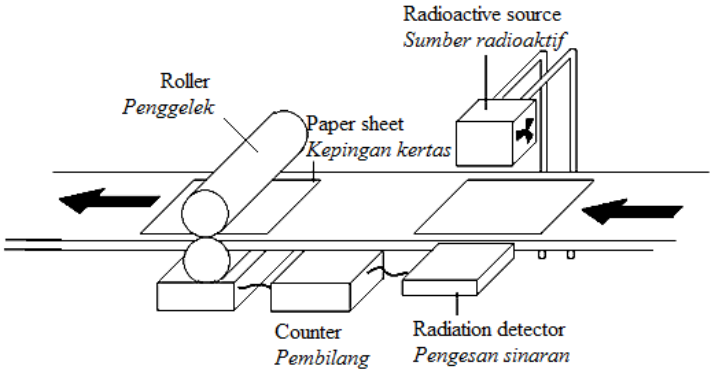
Diagram 28 shows a transistor circuit is used to light up a bulb at night.



Explain why the bulb light up at night. [4 marks]

Question 29 [Radioactivity]

Diagram 29 shows how a system is used in a factory to ensure the thickness of paper sheets are uniform. The system uses radioisotope Strontium – 90 as the radioactive source.

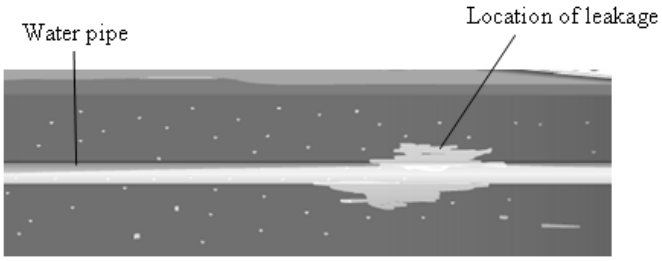


Explain how Strontium-90 is used to measure the thickness piece of paper?

[4 *marks*]

Question 30 [Radioactivity]

Radioisotopes can be used as tracers to detect leaks from pipes underground. Diagram 30 shows a leak that occurred in an underground water pipe.



(a) What is meant by radioisotopes? [1 mark]

(b) With the aid of diagram, explain how radioisotopes can be used to detect the location of the leakage as shown in Diagram.

[3 marks]

Question 31 [Radioactivity]

The following equation shows a fission reaction of Uranium-235.

$$ {}^{1}_{0}n + {}^{235}_{92}\mathrm{U} \longrightarrow {}^{91}_{36}\mathrm{Kr} + {}^{142}_{56}\mathrm{Ba} + 3\,{}^{1}_{0}n + \text{Energy} $$

Nuclear fission produces a chain reaction.

Describe how the chain reaction occurs in a nuclear fission of an atom of Uranium- 235.

[4 *marks*]

SECTION IV : PROBLEM SOLVING (QUALITATIVE) [Paper 2 Section B (no.9/10)]

Question 1 [Introduction In Physics]

Diagram1 below shows a thermometer.

Diagram 1

You are required to give some suggestions to design an efficient alcohol thermometer to be used in physics research expedition at North Pole. Using your knowledge about heat and properties of materials, explain how to build a thermometer which can function effectively based on the following aspects:

(i) Strength of thermometer
(ii) Sensitivity of thermometer
(iii) Design of the thermometer so that the scale can easily be read
(iv) Freezing point of the liquid
(v) Thickness of the glass bulb's wall

[10 marks]

Question 2 [Forces and Motion]

Diagram 2 below shows a rocket.

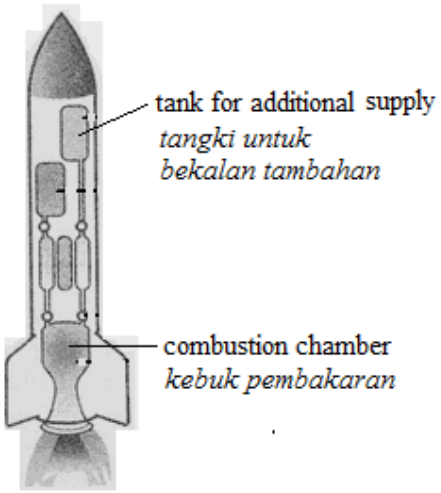


Diagram 2

You are required to give some suggestions to design a rocket which can travel in the outer space with higher acceleration. Using the knowledge on forces and motion and the properties of materials, explain the suggestions based on the following aspects:
(i) the shape of the rocket
(ii) the material used to build the rocket
(iii) additional supply needed that enable the rocket to move in outer space
(iv) the structure of the rocket to accelerate.
(v) size of the combustion chamber

[10 marks]

Question 3 [Forces and Motion]

Diagram 3 shows an athlete throwing a javelin.

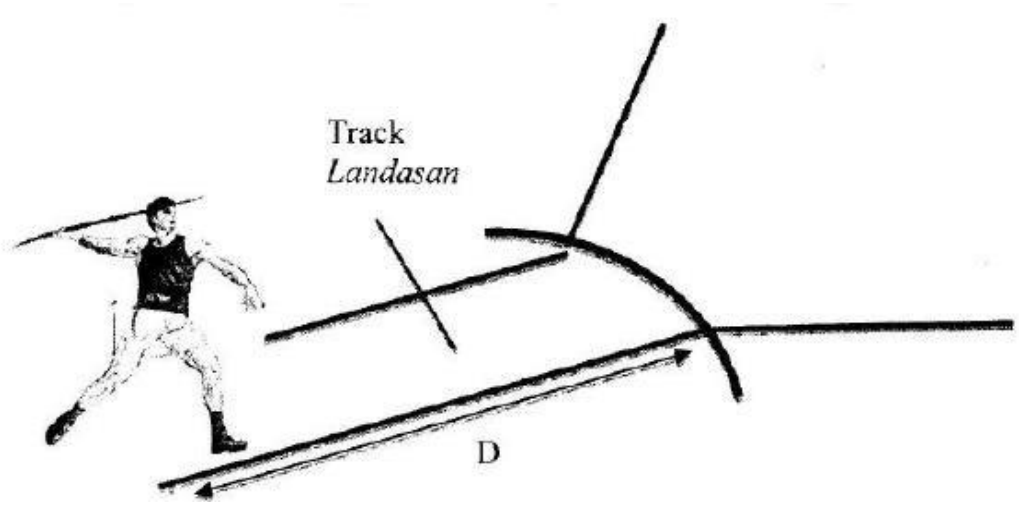


Diagram 3

Using appropriate physics concepts, explain the use of suitable equipment and techniques to improve his performance. Your answer should include following aspects:
(i) Characteristics of material used for javelin
(ii) Shape of javelin
(iii) Motion of the athlete
(iv) How the javelin should be thrown

[10 marks]

Question 4 [Forces and Motion]

Diagram 4 shows a badminton player in a competition.

Diagram 4

You are required to give some suggestions to design the shuttle and racquet used in the competition. Using your knowledge of motion, forces and properties of material, state and explain the suggestions based on the following aspects:
(i) Shape of the shuttle.
(ii) Characteristic of the material used for shuttle.
(iii) Material used for the base of the shuttle. (iv) Material used for the string of the racquet.
(v) Tension of the string of the racquet.

[10 marks]

Question 5 [Forces and Pressure]

The manager of a carnival near your home seeks your advice on handling a hot air balloon. The balloon should be able to rise to about the height of a five-storey building, carry up to three people and can be brought down to the same spot after a certain time.

Diagram 5

Explain your suggestion taking into account:
(i) Size of the envelope
(ii) Characteristic of the materials used for the envelope
(iii) Equipment required to rise up the balloon.
(iv) Characteristics of the material used for the basket,
(v) the best times in a day to launch the balloon

[10 marks]

Question 6 [Heat]

Diagram 6 below shows food being fried in a wok of cooking oil

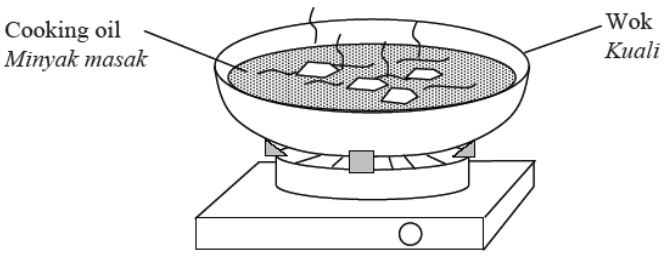


Diagram 6

Suggest and explain how the food to be fried can be cooked in a short time based on the following aspects of material of the wok and the cooking oil.

a. Material of the wok
   (i) Specific heat capacity
   (ii) Thermal conductivity
   (iii) Melting point

b. Cooking oil
   (i) Specific heat capacity
   (ii) Boiling point

[10 marks]

Question 7 [Heat]

A family is having a picnic at Port Dickson beach. A container is used to stor the packet drinks as shown in diagram below.
Use appropriate concepts in physics, explain the modifications required to the above container so as to effectively cool packet drinks in a shorter time and keep the packet drinks remain cold for a longer period. State and explain the suggestion based on the following aspects:

Diagram 7

(i) Materials added in the container
(ii) Specific heat capacity of the container
(iii) Colour of the container
(iv) Characteristics of the material used for the container.

[10 marks]

Question 8 [Heat/Light]
Diagram below shows a simple solar tank as a water heater

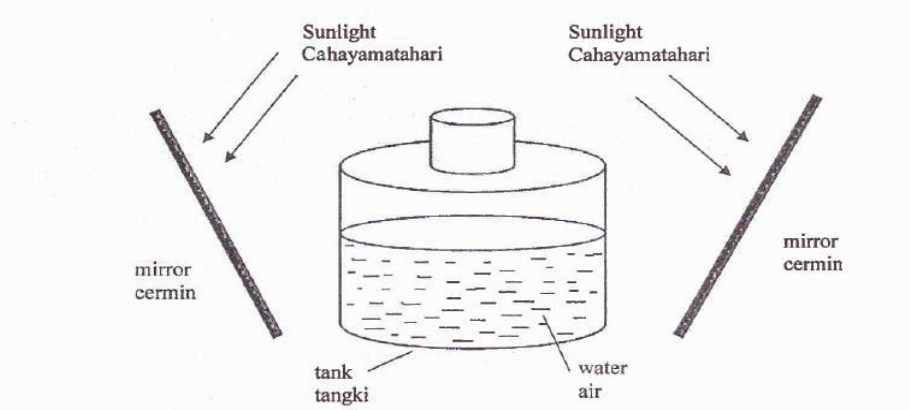


Diagram 8

Using appropriate physics concept, explain the modifications that can be used to make a solar more efficient.Your answer should include the following aspects:
(i) Type of mirror
(ii) Radius of curvature
(iii) Color of the tank wall
(iv) Specific heat capacity and other suitable aspect
(v) Size of the mirror

[10 marks]

Question 9 [Light]
Diagram 9 shows two cars, R and S , travelling in the opposite directions, passing through a sharp band. A mirror is placed at X .

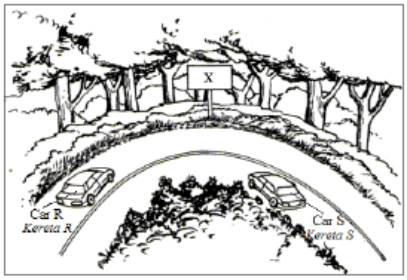


Diagram 9

Using the knowledge on reflection of light, explain your choice of mirror to help the driver to see an approaching car based on the following aspect:
(i) the type of mirror
(ii) the diameter of the mirror
(iii) the characteristics of material used for the mirror
(iv) the thickness of the mirror
(v) The position of the mirror [10 marks]

Question 10[Light]

Diagram 10 shows an endoscopes that can be used in medical.

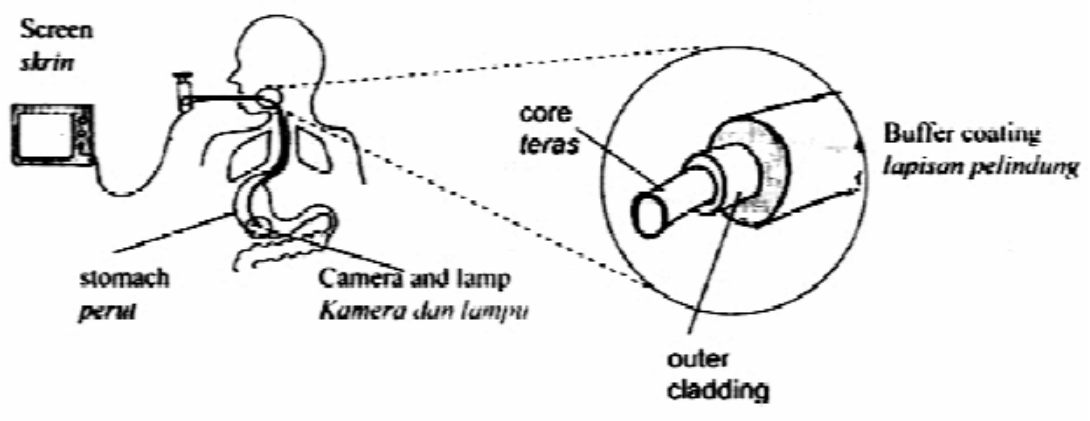


Diagram 10

Using appropriate physical concepts, suggest and explain suitable modifications that needs to be done to the endoscope. You can base your modification or suggestion on the following aspects.

(i) Characteristic of core and outer cladding.
(ii) Material of buffer coating.
(iii) The size of fibre.
(iv) The density of the fibre.
(v) The strength and flexibility.

[10 marks]

Question 11 [Electricity]

Diagram 11 shows the lamps in a domestic lightning circuit are connected in parallel.

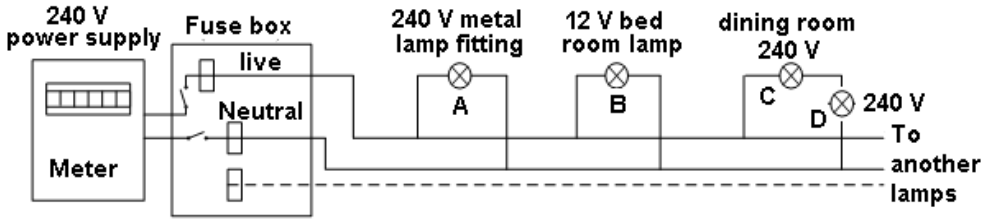


Diagram 11

The circuit is not complete and not efficient for electrical energy consuming and less safety. Suggest modifications that need to be done to the circuit to improve safety, produce the lamps lights up with normal brightness and to increases the efficiency of electrical energy consuming. State and explain the modification based on the following aspects:

(i) switch
(ii) connection between bulb C and D
(iii) suitable voltage for the bulb
(iv) safety aspect
(v) suitable device to be connected to bulb B.

[10 marks]

Question 12 [Electromagnets]

Diagram 12 shows a cross section of a simple seismometer which is used to detect the earth motionand then convert it into the electrical signals.

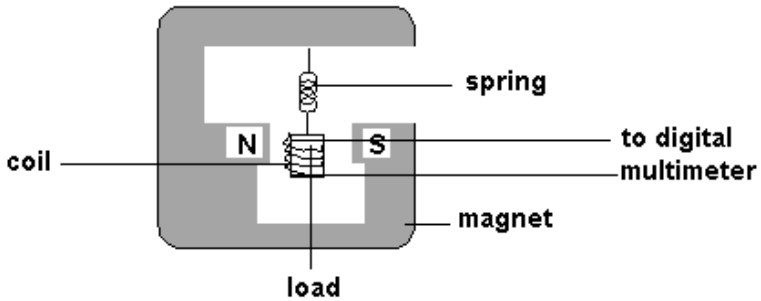


Diagram 12

You are required to give suggestions to design the seismometer which can work efficiently. Using

your knowledge, explain the suggestion based on the following aspects;
(i) the stiffness of the spring
(ii) density of the load
(iii) theshapeofthemagnet
(iv) the type of the electrical coil
(v) how it is used to detect small motion

[10 marks]

Question 13 [Electromagnetism]
Diagram 13 shows a simple anemometer(wind meter) for measuring the velocity of the wind.

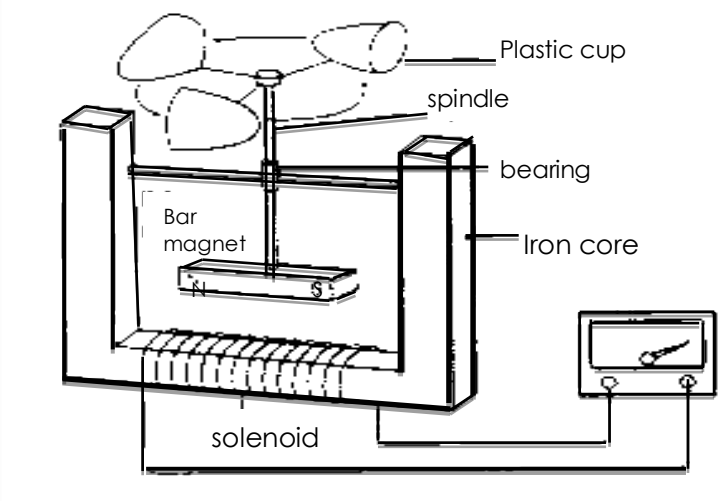


Diagram 13

Using appropriate physical concepts, suggest and explain suitable modifications to the anemometer to improve its sensitivity. You can base your modification or suggestion on the following aspects.
(i) The material of the plastic cup.
(ii) The bar magnet.
(iii) The solenoid.
(iv) The number of turns of wire used fun the solenoid.
(v) The thickness of the wire

[10 marks]

Question 14[Electromagnetism]
Diagram 14 shows an ac generator.

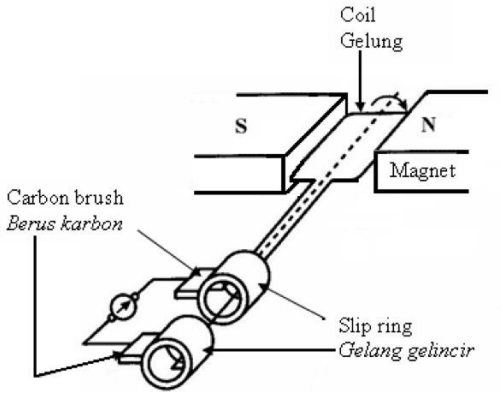


Diagram 14

Suggest modifications that can be made to increase the output current to the generator in Diagram 14. State and explain the modifications based on the following aspects:
(i) Strength of the magnet
(ii) Shape of the magnet
(iii) Number of turns of the coil
(iv) Diameter of the wire of the coil
(v) The speed of rotation [10 marks]

Question 15[Electronics]

Diagram 15 shows a control circuit for a simple fire alarm system.

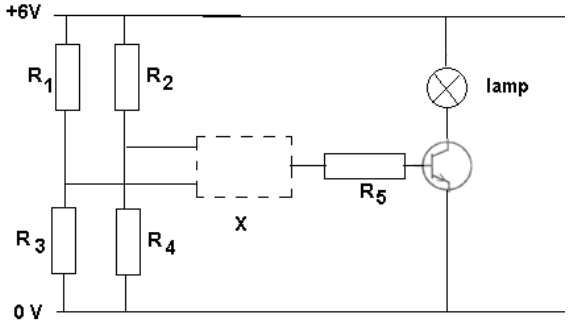


Diagram 15

You are required to give suggestions to design the circuit so that it can switch on the transistor and sound an alarm when either one of the sensors gets hot. State and explain the suggestions based on the following aspects:

(i) The type of gate X
(ii) Component used to detect heat and it position
(iii) The position of the alarm.
(iv) The use of extra components in the circuit and its positions to switch on the 240 V, 12 W alarm.

[10 marks]

Question 16 [Electronics]

Diagram 16 shows a shadow is formed on fluorescent screen of the Maltase cross tube.

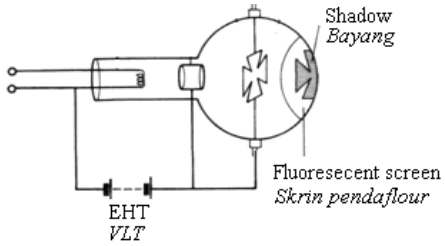


Diagram 16

Maltase cross tube in Diagram 16 is not suitable for measuring the frequency of the sound waves. Suggest modifications that can be made to the Maltase cross tube in Diagram 16 to transform it into Cathode Ray Oscilloscope that can measure the frequency of the sound waves.In your suggestions, state the components that are used and their functions based on the following aspects:

(i) the electron gun
(ii) the deflection system

[10 marks]

Question 17 [Radioactive]

Diagram 17 shows a radioactive source is handled by a scientist. The method shown is not safe.

Diagram 17

Suggest and explain;

(i) The equipment to be used in handling a radioactive source.
(ii) Modifications to the storing method to ensure safe keeping of the radioactive source.
(iii) Other precautions that need to be taken when handling a radioactive source. [10 marks]

SECTION V : PROBLEM SOLVING (QUANTITATIVE) [Paper 2 Section C (no.11 & 12)]

Question 1 [Forces and Motion]

1. (i) A toy car of mass 1.5 kg is moving at a constant velocity of 40 ms^{-1} collides with a wall and bounce back at a velocity of 35 ms^{-1}. What is the impulse applied on the car?

(ii) If the time of collision between the toy car and the wall takes 0.8 s, what is the Impulsive force applied on the toy car?

Question 2 [Forces and Motion]

2. Diagram shows a car is moving with a constant velocity when the engine provides a thrust of 900 N. The car is then accelerates at 2 m s^{-2}. The total mass of the car is 1 000 kg.

(i) What is the frictional force between the tyre & the road?

(ii) What is the force exerted by the engine when the car accelerates at 2 m s^{-2} ?

Question 3 [Forces and Motion]

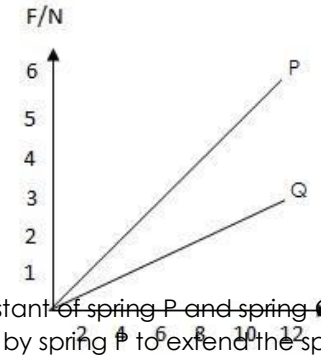
3. A racing bike of mass 202 kg accelerates from rest to its velocity of18 kmh^{-1} in 10 s.

(i) Calculate the acceleration of the racing bike.

(ii) Calculate the force acting on the racing bike.

Question 4 [Forces and Motion]

4. Justin conducted an experiment to prove Hooke"s Law. The observation is plotted as the graph shown below.

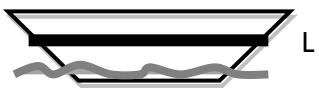


(i) Calculate the spring constant of spring P and spring Q.

(ii) Calculate the work done by spring P to extend the spring to 10 cm.

Question 5 [Forces and Pressure]

5. Diagram shows a boat which has a safety limit line, L. The volume of the boat under the line L is 4 m^3. The mass of the boat is 250 kg. (Density of water = 1 000kgm^{-3})



(i) Calculate the volume of water displaced by the boat.

(ii) What is the mass of the maximum load that can be carried safely by the boat?

Question 6 [Forces and Pressure]

6. An aircraft has a mass of 800 kg and the surface area of its wing is 40 m^2.

(i) If the air pressure below the wing is greater than the air pressure above the wing by 500 Nm^{-2} , calculate the force exerted on the wing.

(ii) Determine the resultant force exerted on the wing of the aircraft. State the direction of the resultant force.

(iii) Calculate the vertical acceleration of the aircraft.

Question 7 [Forces and Pressure]

7. Diagram shows a hydraulic jack with a cross sectional area of the smaller piston is 0.2 m^2 and the larger piston is 1.2 m^2.

(i) If a force of 6N is exerted on the smaller piston, what is the output force acted onthe larger piston?

(ii) If the smaller piston moves downward by 1.2 cm, what is the distance moved by the larger piston?

Question 8 [Forces and Pressure]

8. The weight of the boat is 15 000 N. The maximum volume of water that can be displaced bythe boat Is 2.0 m^3.

(i) Calculate the buoyant force exerted on the boat.
[Density of the sea water is 1020 kgm^{-3}]

(ii) A heavy box is put on the boat. Calculate the maximum weight of the box so that theboat will not sink.

Question 9 [Heat]

9. 0.004 m^3 of cooking oil was heated by using electric deep fryer of power rating 240V , 2500W. The temperature of the oil rises from 30°C to 160 °C. Assuming all the electrical energy was used to increase the temperature of oil only and no heat loss to thesurrounding. Calculate:

(i) mass of the cooking oil

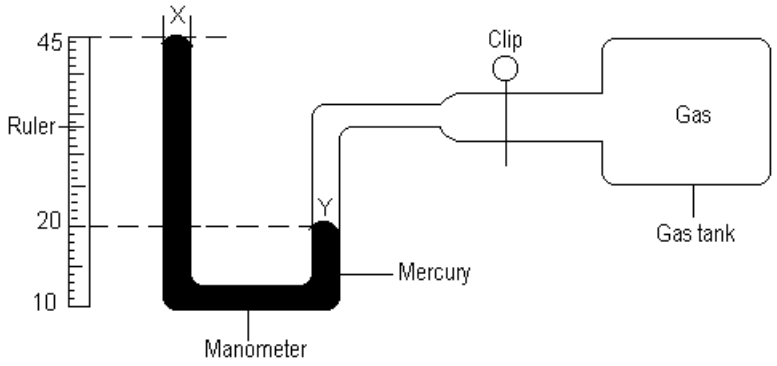
(ii) the time taken to heat the cooking oil.

[Specific heat capacity of oil is 2000J kg^{-1} $°C^{-1}$. Density of oil is 800 kg m^{-3}]

Question 10 [Heat]

10 The diagram shows a manometer is connected to a gas tank. When the clip is opened the positions of mercury level at point X and Y are 45 cm and 25 cm respectively. The temperature of the gas is 127°C.

[Atmospheric pressure = 75 cm of Hg]



(a) Determine the pressure

(i) at point X

(ii) of the gas in the gas tank

(b) When the gas is cooled down to T°C,the mercury level , Y increasing and X decreasing until X and Y at same level.

(i) Based on the kinetic theory of gases explain why the mercury level X decreased,

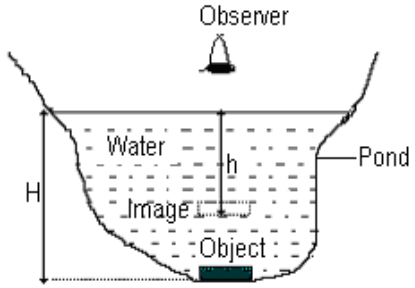
(ii) What is the pressure of the gas at T°C?

(iii) Calculate the value of T.

(iv) Name the law involved in b(iii).

Question 11 [Light]

11 Figure(a) shows an object in a small pond. The depth of the water in the pond is H. The image of the objet appears to be h from water surface.



Figure(a)

(a) State the relationship between H and h
(b) When H = 4.5 m and the refractive index of water is 1.33, determine the value of h .
(c) What happen to value of h when the pond is poured with water of refractive index 1.40 ?
(d) A glass tube is immersed vertically in the surface of the water pond at a depth 0.5 m as shown in Figure (b)

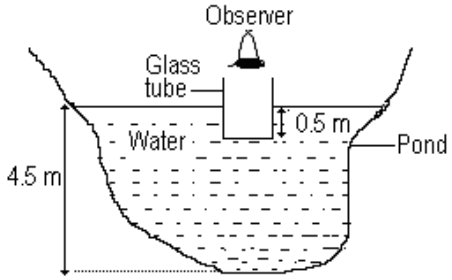
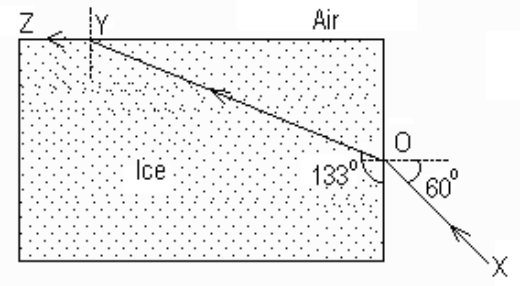


Figure (b)

When H = 4.5 m and the refractive index of water = 1.33 , how far the base of pond appear closer to the surface of the water?

Question 12 [Light]

12 The diagram show a ray of light XOYZ is incident at angle of 60^0 to an ice block.



(a) Mark the critical angle of ice with "c" in the figure above.
(b) Determine the value of the critical angle , c.
(c) Calculate the refractive index of ice.
(d) What happen to the critical angle when the ice block is replaced by a substance which has the refractive index 1.8 ?

Question 13 [Light]

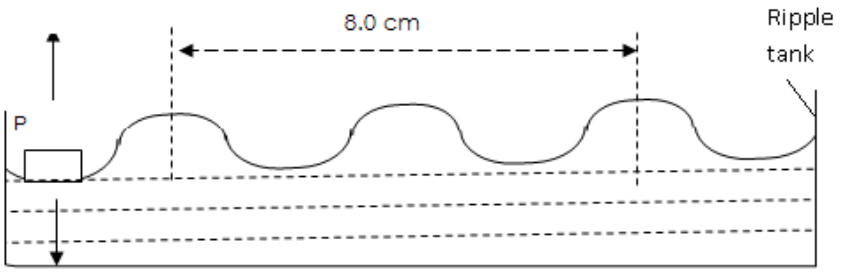
13. An object is placed at a distance of 20 cm from a concave lens of focal length 15 cm.
(i) Calculate the image distance
(ii) Calculate the magnification of the image
(iii) State the characteristics of the image formed.

Question 14 [Light]

14. A student is using a magnifying glass with focal length of 5 cm to observe a small ant at a distance of 2 cm.
    (i) Calculate the image distance.
    (ii) Determine the linear magnification of the image of the ant.

Question 15 [Waves]

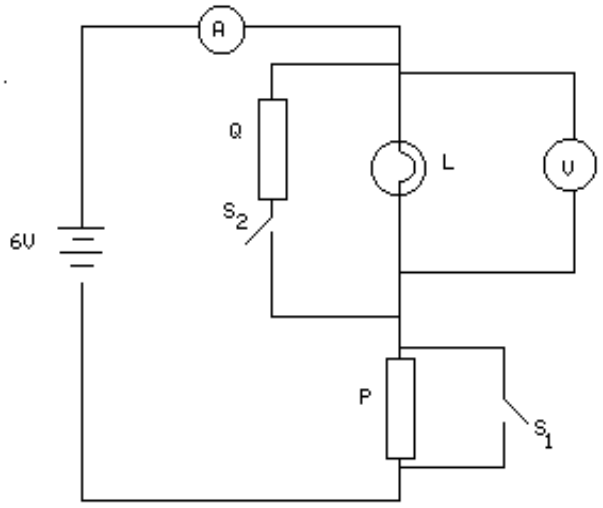
15 A wooden bar P vibrates on a water surface of a ripple tank at a frequency of 5 Hz. The water wave produced is shown in the diagram below.



(i) The distance between three consecutive crests is 8.0 cm. What is the wavelength, λ, of the water wave?
(ii) What is the frequency of the water wave?
(iii) Calculate the speed of the water wave in the ripple tank.

Question 16 [Electricity]

16 The figure show a circuit containing two resistors P and Q , a bulb L, two switches S_1 and S_2, ammeter, voltmeter and a battery.



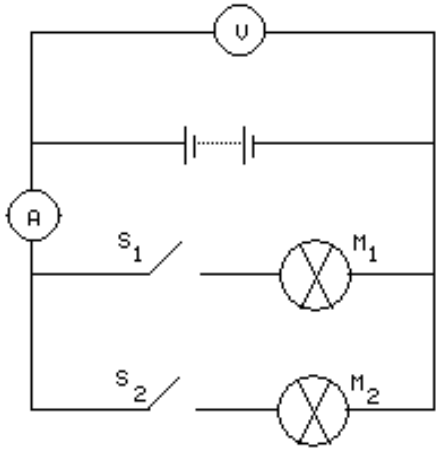
(a) When the switches S_1 and S_2 is opened , the reading of ammeter and voltmeter are 0.3 A and 2.4 V respectively.
Calculate,
(i) the resistance of the bulb
(ii) the resistance of the resistor
(iii) The power dissipated in P

(b) Compare the brightness of the bulb in the situation (a) when
(i) only the switch S_1 is closed
(ii) both the switches S_1 and S_2 is closed.

(c) The resistance of the resistor Q is 8Ω. When the switch S_2 is closed and the switch S_1 is opened, what is the reading of
(i) the voltmeter
(ii) the ammeter

Question 17 [Electricity]

17 The figure shows a circuit containing voltmeter, ammeter, two switches S_1 and S_2 , two bulbs M_1 and M_2 and a battery with internal resistance of 1Ω.



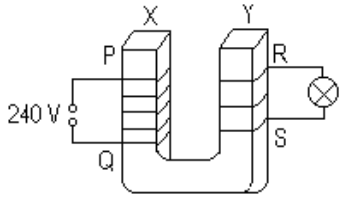
(a) When the switches S_1 and S_2 is opened , the reading of the voltmeter is 12 V.
What is the e.m.f. of the cell?

(b) When the switch S_1 is closed and the switch S_2 is opened , the reading of the ammeter is 3.0 A.
Calculate
(i) the reading of the voltmeter?
(ii) the resistance of bulb M_1 ?

(c) When the switches S_1 and S_2 is closed , the reading of the ammeter is 6.0 A .
Calculate
(i) the resistance of bulb M_2 ?
(ii) the reading of the voltmeter?

Question 18 [Electromagnetism]

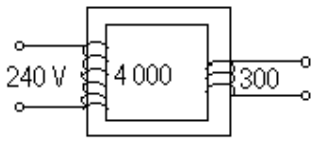
18 Diagram shows a U-shaped soft iron core is wound with insulated copper wire PQ and RS. An a.c. supply of 240 V is connected at the ends of PQ and a bulb of 12V, 60W is connected at the ends of RS.



(i) If the bulb lights up with normal brightness, determine the ratio of the number of turns in the coilPQ to the number of turns in the coil RS.
(ii) Calculate the output current.
(iii) If the efficiency of the transformer is 80%, calculate the current in the primary coil.

Question 19 [Electromagnetism]

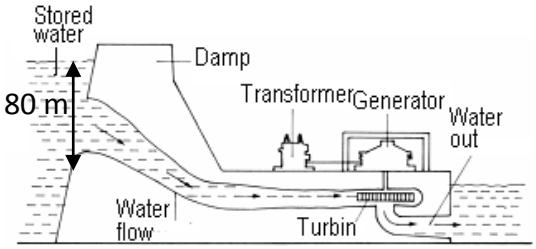
19 The diagram shows a transformer has the number of turns of the primary coil and the secondary coil 4000 turns and 300 turns respectively.
The input voltage of the transformer is 240 V.



(a) Calculate the output voltage of the transformer.
(b) A lamp 36W 18V is connected across the secondary coil. The lamp light up with normal brightness. Calculate
(i) the current in the secondary coil?
(ii) the resistance of the filament bulb?
(iii) the efficiency of the transformer when the current in the primary coil is 0.2 A.

Question 20 [Electromagnetism]

20 The diagram shows part of a hydroelectric power station.

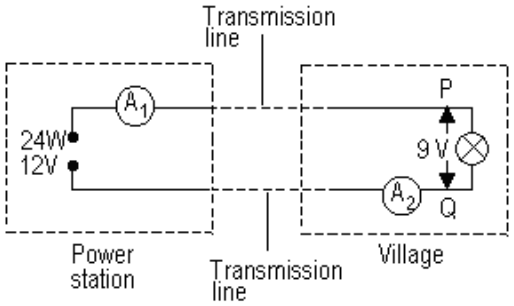


(a) State the changes in energy that occur during the generation of electricity power in the hydroelectric power station.

(b) Given that 0.5 m^3 s^{-1} of water flows down the pipe.
[Density of water = 1 000 kgm^{-3}]
Determine the power delivered to the water-turbine, assuming that no energy is lost in the pipe.

Question 21 [Electromagnetism]

21 The diagram shows the Model of an Electricity Transmission System. The electrical power of 24 W is transmitted at a voltage 12 V. The voltage reaches at a village across a bulb is 9V.



(a) Why is the voltage decreases when reaches at the village?

(b) Two identical ammeters A_1 and A_2 are connected as shown in the diagram above.
(i) What is the reading of ammeter A_1.
(ii) Compare the reading of ammeter A_2 and ammeter A_1?

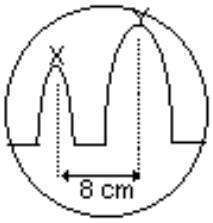
(c) Calculate
(i) the power loss in the transmission line
(ii) the total resistance of the transmission lines.

Question 22 [Electromagnetism]

22. A potential difference of 3 kV is applied across the cathode and anode of an electron gun. Calculate the maximum velocity of the electron produced.
Given the charge of an electron, e = 1.6 x 10-19 C,
mass of an electron, m = 9.0 x 10-31 kg.

Question 23 [Electromagnetism]

23 The figure shows a waveform obtained on the screen of CRO at an airport radar station. The point X and Y indicate the time transmission to an aero plane and time of receiving the reflected signals by the radar station .
[Time-base control setting of the CRO = 50 ms cm^{-1}]



Determine

(a) The time travels of the radar from X to Y.

(b) The distance between the radar station and the aero plane.
[Speed of light = 3 x 10^8 ms^{-1}]

Question 24 [Electromagnetism]

24. Figure (b)shows a circuit consisting of a transformer, an ammeter and two light bulbs. The ammeter reading is 0.5 A and both bulbs light up with normal brightness.

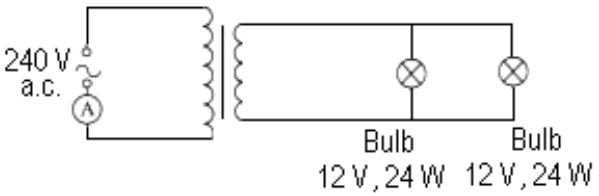
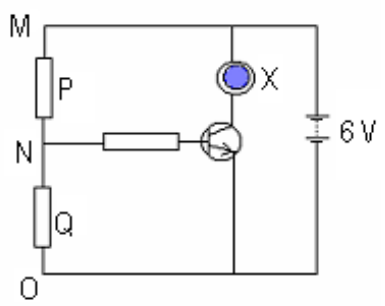


Figure (b)

(a) What is the output voltage of the transformer?
(b) Calculate the efficiency of the transformer.

Question 25 [Electronic]

25 The diagram shows a transistor circuit.
In order to trigger alarm X , the potential difference across NO must be at least 1V.



(a) What is the potential difference across MO ?
(b) When the resistance of resistors P and Q are 500 Ω respectively,
(i) what is the potential diference across MN?
(ii) what happens to alarm X?

(c) When the resistance of resistor Q is 500 Ω and the resistance of resistor P is 4000Ω , determine the potential difference across the resistor Q to show that alarm X is not triggered.

(d) The table shows the variations of the resistance of a thermostat , T with temperature.

Temperature / ° C	Thermostat resistance / Ω
200	1750
100	3500
55	5000
30	6000

When resistor P is replaced by thermostat T , what is
(i) the resistance of resistor Q if alarm X is triggered at 200° C.
(ii) the temperature required to trigger alarm X ,when the resistance of resistor is 1000Ω.

Question 26 [Radioactivity]

26. A cup of milk is contaminated with iodine-131. The half-life of iodine-131 is 8 days.
(i) Iodine-131 is no longer a threat once its activity decay to one-eighth of its original activity. After how many days will the milk be safe to drink?
(ii) The initial mass of a sample of iodine-131 is 20 mg. How much of iodine-131 will remain after 32 days?

Question 27 [Radioactivity]

27 Polonium-210 undergoes alpha decay to become plumbum-206 . The equation for the decay is:

$$^{210}_{82}Po \rightarrow {}^{206}_{84}Pb + {}^{4}_{2}He + \text{energy}$$

Additional information:

Mass Po = 209.982 u
Mass Pb = 205.969 u
Mass He = 4.004 u
1 u = 1.66×10^{-27} kg
c = 3×10^{8} ms^{-1}

Using the equation and the information above , calculate
(a) The mass defect
(b) The energy released
(c) The power generated in 2 ms

SECTION VI : DECISION MAKING [Paper 2 Section C (no.11 / 12)]

Question 1 [Introduction to Physics]

As an engineer, you are assigned to investigate the characteristics of several instruments that could be used to measure the length and width of 25 cm X 40 cm metal block.

Table 1 shows the characteristics of five types of measuring instruments P, Q, R, S and T. Study the characteristics of all five instruments and decide which is the most suitable instrument to be used to measure the length of the metal block

Justify your choice.

Measuring instrument	Smallest scale / cm	Range of measurement / cm	Zero error / cm	Shape of the instrument
P	0.5	0 – 100	0.2	Flat and thin
Q	0.1	0 – 50	0.1	Roll and thin
R	0.1	0 – 50	0.0	Flat and thin
S	0.1	0 – 50	0.1	Flat and thin
T	1.0	0 – 100	0.0	Roll and thin

Table 1

[10 marks]

Question 2 [Forces and Motion / Forces and Motion]

Diagram 2 shows a playground swing which will be used for 7 to 15 years old children. The vertical height of the swing is 2.5 m. Table 2 shows the characteristics of the swing.

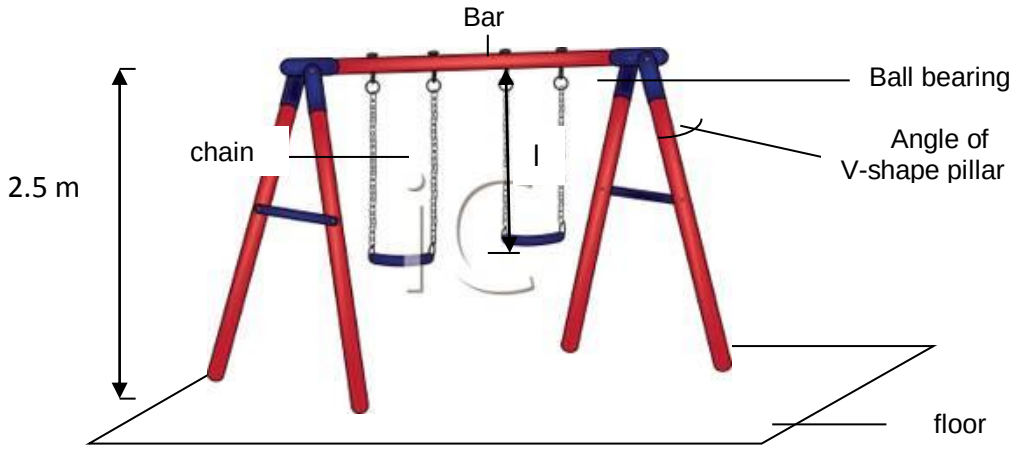


Diagram 2

Swing	Length of the chain from the bar,l / cm	Joint of chain to the bar	Angle of V-shape pillar	Type of floor
K	210	With ball bearing	10°	Soft padded floor
L	150	Without ball bearing	10°	Soft padded floor
M	210	With ball bearing	40°	Soft padded floor
N	150	With ball bearing	40°	Concrete floor

Table 2

You are asked to investigate the characteristics of the swings. Explain the suitability of each characteristic and determine the most suitable safety swing to be built.
Justify your choice.

[10 marks]

Question 3 [Forces and Motion / Forces and Pressure]

Table 3 shows four bicycles, W, X,Y and Z, with different specifications.

Bicycle	Diagram	Specification
W		Distance between seat and handle : 75 cm Density of bicycle's frame : 700 kg m^{-3} Width of tyre : 6 cm With gear
X		Distance between seat and handle : 75 cm Density of bicycle's frame : 700 kg m^{-3} Width of tyre : 4 cm With gear
Y		Distance between seat and handle : 45 cm Density of bicycle's frame : 900 kg m^{-3} Width of tyre : 6 cm Without gear
Z		Distance between seat and handle : 75 cm Density of bicycle's frame : 500 kg m^{-3} Width of tyre : 4 cm With gear

Table 3

You are required to determine the most suitable bicycle that can be used as a racing bicycle to move with high speed.
Study the specifications of all the four bicycle from the following aspects:

- The distance between the seat and the handle.
- The density of bicycle's frame.
- The Width of tyre.
- The presence of gear

Explain the suitability of the above aspects and hence, determine the most suitable racing bicycle to move with high speed.

[10 marks]

Question 4 [Force And Pressure]

Diagram 4 shows a pair of outdoor shoes suitable for mountain trekking.

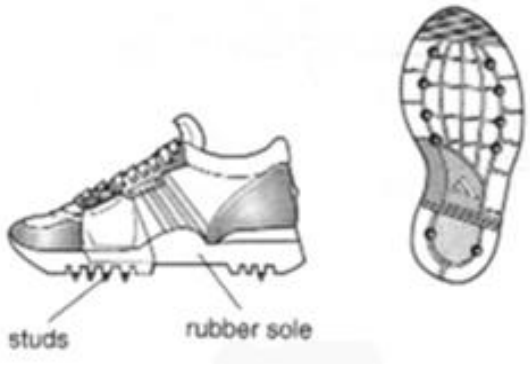


Diagram 4

Table shows the characteristics of five types of materials that can be used for making the soles of the trekking shoes.

Type of material	Density (Kg/m $^{-3}$)	Number of studs x Area of 1 stud	Expansion effect	Ability to stretch
P	820	6 x 30 cm^2	Low	Good
Q	700	8 x 30 cm^2	Low	Good
R	720	5 x 30 cm^2	Medium	Average
S	750	4 x 30 cm^2	High	Poor
T	880	3 x 30 cm^2	High	Poor

Table 4

You are asked to study the characteristics of the materials shown in Table 15.2. Explain the suitability of each characteristics in Table 11.1 and then determine the most suitable material to be used. Give a reason for your choice.

[*10 marks*]

Question 5 [Force And Pressure]

Table 5 shows the specifications of four water storage tanks, P, Q, R and S, that can be used to store water.

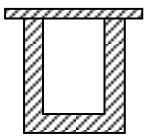
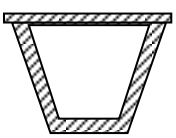
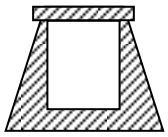
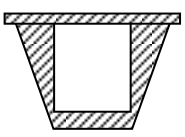
Water storage tank	P	Q	R	S
Material used	metal	concrete	concrete	metal
Density	low	high	low	low
Shape *Bentuk*				
Height from the ground	low	high	high	low

Table 5

You are required to determine the most suitable water storage tank. Study the specifications of all the four water storage tanks based on the following aspects :

- The material used
- The density of the tank
- The shape of the tank
- The height of the tank from the ground

[10*marks*]

Question 6 [Force and Pressure]

Diagram 6 shows the parts of brake systems car.

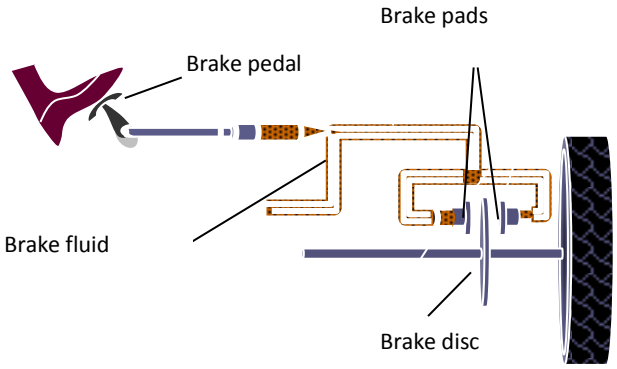


Diagram 6

Table 6 shows the specifications of components that can be used in brake systems , P,Q,R, S and T.

Brake system	Specifications of components in a car brake system			
	Specific heat capacity of brake disc / J kg^{-1} $^0C^{-1}$	Melting point of brake disc /^{0}C	Compression of brake fluid	The material use of brake pads
P	360	930	Difficult	ceramics
Q	2400	1220	Difficult	steel
R	890	580	Easy	ceramics
S	2210	1940	Difficult	ceramics
T	1460	2070	Easy	steel

Table 6

Based on Table 4;You are required to determine the most suitable brake system and explain the suitability of the aspects in Table 4

[10 *marks*]

Question 7 [Force and Pressure]

Table 7 shows four hydraulic jacks J, K, L and M with different specifications.

You are required to determine the most suitable hidraulic jack that can lift heavy load to a high level.
Study the specifications of all the four hidraulic jack based on the following aspects:

(i) Size of the fluid container.
(ii) Surface area of the input piston
(iii) Type of the hydraulic fluid.
(iv) Surface area of the output piston.

Explain the suitability of each aspects and then determine the most suitable hydraulic jack.
Give a reason of your choice.

[10 *marks*]

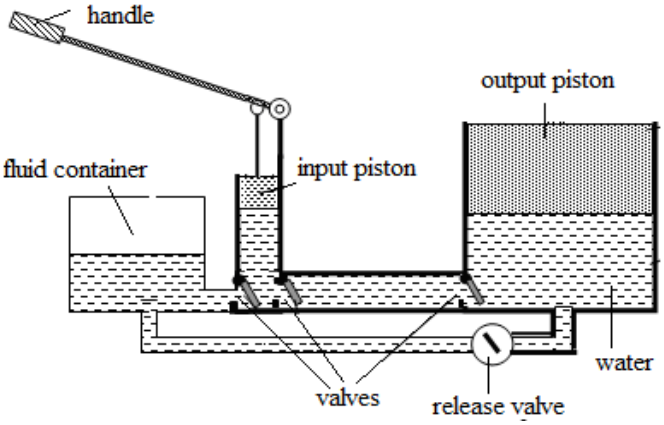
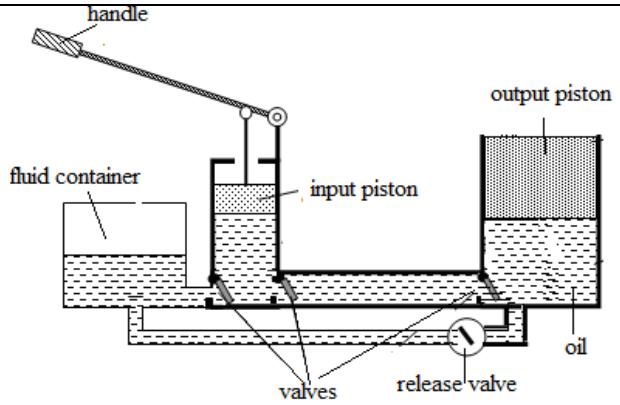
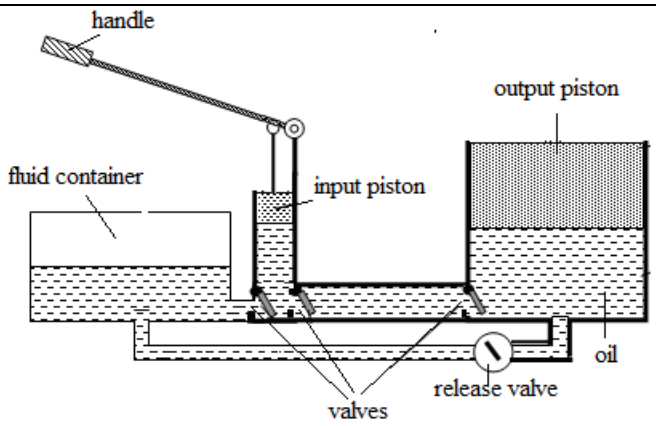
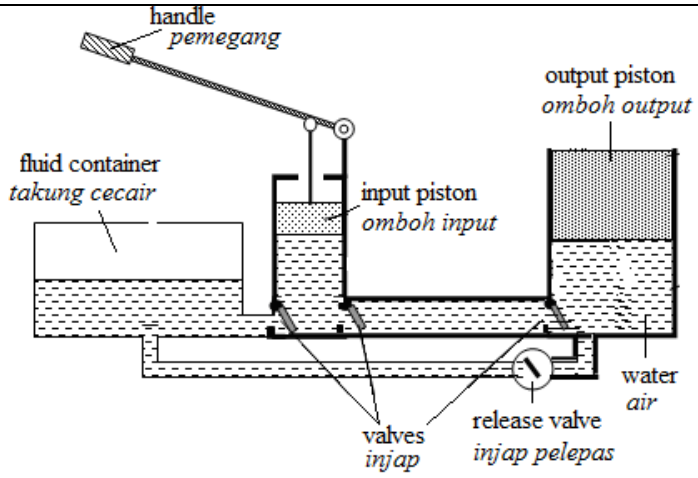
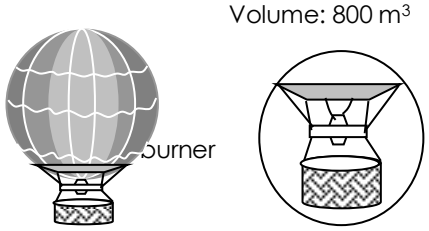
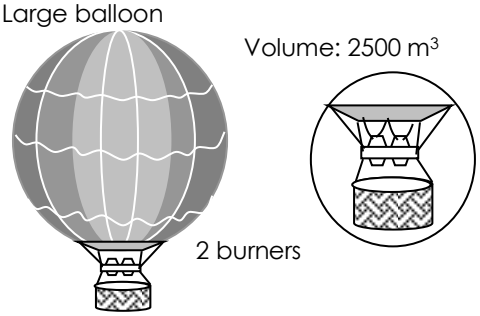
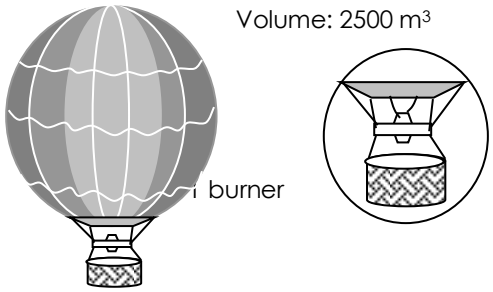
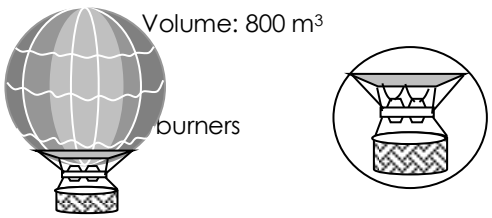
Hydraulic jack	Structure and specifications
J	
K	
L	
M	

Table 7

QUESTION 8[force and pressure]

Diagram shows four hot air balloons, P, Q, R and S with different features.

Hot air balloon P	Small balloon Volume: 800 m^3  burner	Features ➢ Type of balloon fabric: Synthetic nylon ➢ Temperature of flame: 100 °C
Hot air balloon Q	Large balloon Volume: 2500 m^3  2 burners	Features ➢ Type of balloon fabric: Synthetic nylon ➢ Temperature of flame: 120 °C
Hot air balloon R	Large balloon Volume: 2500 m^3  burner	Features ➢ Type of balloon fabric: Canvas ➢ Temperature of flame: 60 °C
Hot air balloon S	Small balloon Volume: 800 m^3  burners	Features ➢ Type of balloon fabric: Canvas ➢ Temperature of flame: 80 °C

You are required to determine the most suitable hot air balloon which is able to carry three or four people to a higher altitude in a shorter time.

Study the features of all the four hot air balloons from the following aspects:

- The size of the balloon
- The number of the burners
- The type of the fabric of the balloon
- The temperature of the air in the balloon

Explain the suitability of the aspects.
Justify your choice.

[10 marks]

Question 9 [Force and Pressure]

Diagram 9 shows four racing motorcycles, P, Q, R and S, with different specifications.

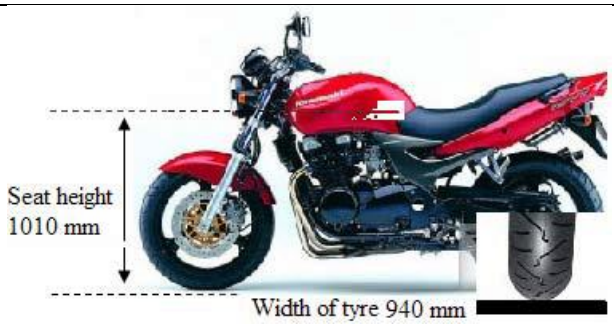
Racing bike A Type of brake : without ABS Mass : 205.0 kg	
Racing bike B Type of brake : without ABS Mass : 220.0 kg	
Racing bike C Type of brake : ABS (Antilock Brake System) Mass : 208.0 kg	
Racing bike D Type of brake : ABS (Antilock Brake System) Mass : 242.0 kg	

Diagram 9

You are required to determine the most suitable motorcycle to move fast and safe when racing.
Study the specifications of all the four motorcycles from the following aspects:

(i) Type of brake
(ii) the mass of the motorcycle
(iii) the seat height
(iv) the width of the tyre

Explain the suitability of the aspects.
Justify your choice.

[10 *marks*]

Question 10 [Heat]

You are asked to investigate the features of heating material and the design of a pressure cooker as in Table 10.

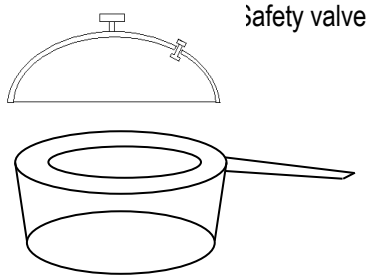
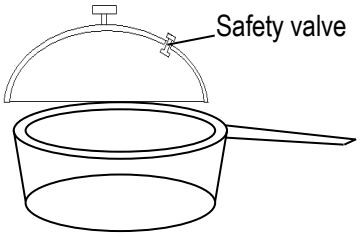
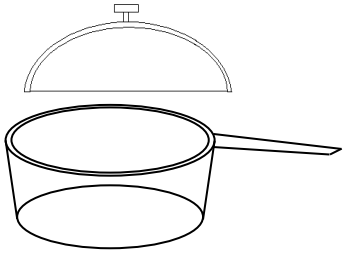
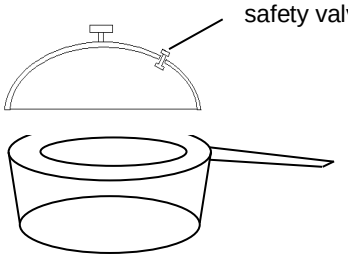
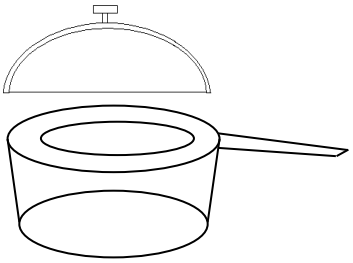
P		<u>The features of pressure cooker :</u> • Specific heat capacity of the body of the pot : 1400 $Jkg^{-1}{}^{o}C^{-1}$ • Specific heat capacity of the handle of pot : 890 $Jkg^{-1}{}^{o}C^{-1}$ • Thickness of the pot : 5.0 mm • Has safety valve
Q		<u>The features of pressure cooker :</u> • Specific heat capacity of the body of the pot : 385 $Jkg^{-1}{}^{o}C^{-1}$ • Specific heat capacity of the handle: 890 $Jkg^{-1}{}^{o}C^{-1}$ • Thickness of the pot : 3.0 mm • Has safety valve
R		<u>The features of pressure cooker :</u> • Specific heat capacity of the body of the pot : 449 $Jkg^{-1}{}^{o}C^{-1}$ • Specific heat capacity of the handle of pot : 385 $Jkg^{-1}{}^{o}C^{-1}$ • Thickness of the pot : 1.0 mm
S		<u>The features of pressure cooker :</u> • Specific heat capacity of the body of the pot : 502 $Jkg^{-1}{}^{o}C^{-1}$ • Specific heat capacity of the handle of pot : 2300 $Jkg^{-1}{}^{o}C^{-1}$ • Thickness of the pot : 5.0 mm • Has safety valve
T		<u>The features of pressure cooker :</u> • Specific heat capacity of the body of the pot : 1400 $Jkg^{-1}{}^{o}C^{-1}$ • Specific heat capacity of the handle of pot : 890 $Jkg^{-1}{}^{o}C^{-1}$ • Thickness of the pot : 5.0 mm

Table 10

Explain the suitability of each features described in Table 10 and then determine the most suitable pressure cooker to be used. Give a reason for your choice.

[10 marks]

QUESTION 11[heat]

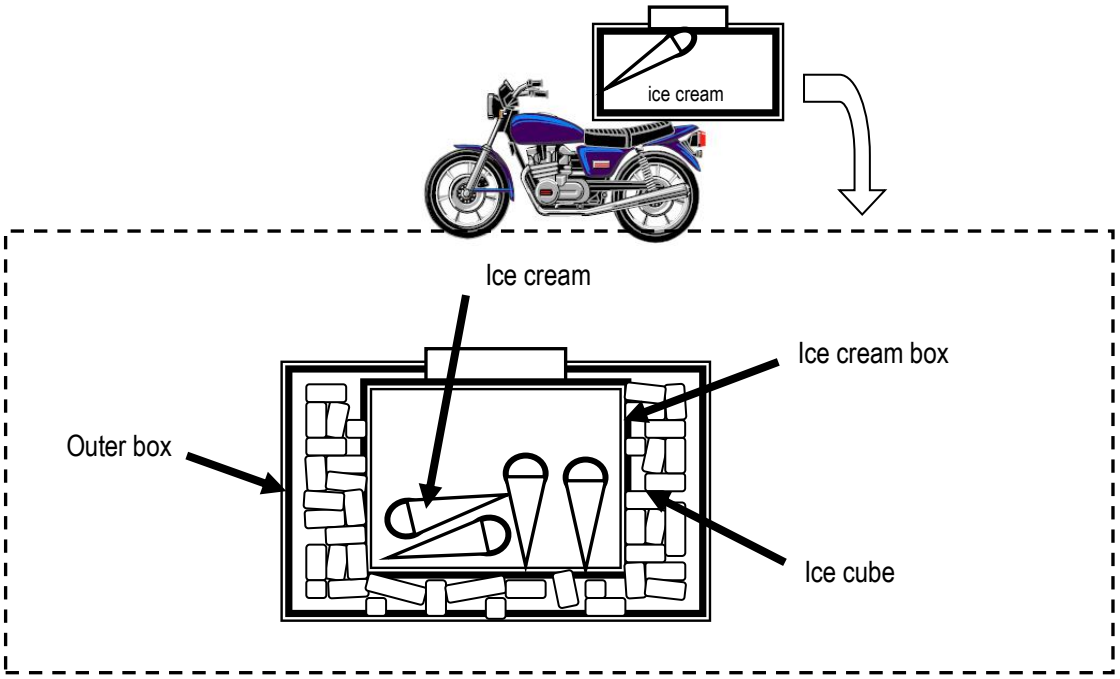


Diagram 5.1

Table 11 shows the specification of four types of ice cream containers P, Q, R and S, that can be used by an ice cream seller to carry ice cream.

Box	P	Q	R	S
Specific heat capacity of ice cream box	High	High	Low	Low
Size of ice cream box	Large	Small	Small	Large
Material of outer box	Copper	PVC plastic	PVC plastic	Aluminium
Colour of outer box	Dark	Bright	Bright	Dark

Table 11

You are required to determine the most suitable ice cream container to carry ice cream. Study the specification of the four types of ice cream container based on the following aspects:

- Specific heat capacity of ice cream box
- Size of ice cream box
- Material of outer box
- Colour of outer box

Explain the suitability of the aspects

[10 marks]

QUESTION 12[heat]

Heat generated in the car engine has to be removed effectively to avoid overheating.
Diagram 12 shows the cooling system of a car engine

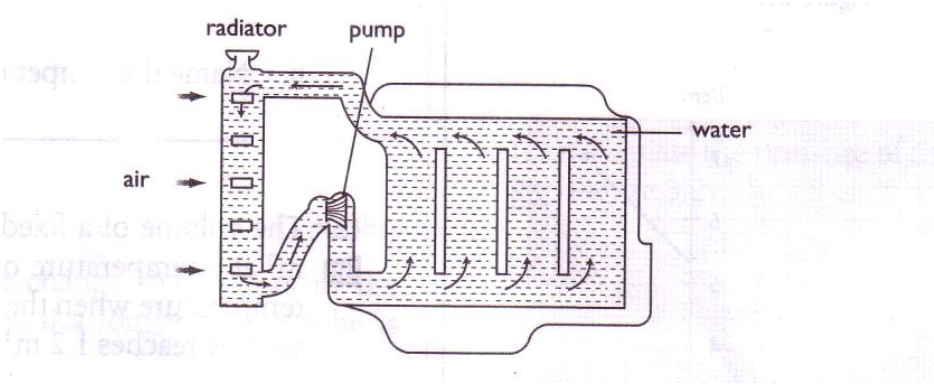


Diagram 12

Table 12 shows the characteristics of liquid that can be used in the cooling system of a car.

Liquid	Characteristics			
	Specific heat capacity (J kg^{-1} $°C^{-1}$)	Freezing point (°C)	Boiling point (°C)	Rusting rate of metal
J	5000	20	110	High
K	4600	-15	120	Low
L	3800	15	95	Medium
M	3000	5	95	Medium
N	200	-20	320	Low

You are asked to investigate the characteristic of the liquid in Table 12.
Explain the suitability of eachcharacteristic in Table 12 and hence, determine which liquid is most suitableto be used in the cooling system of a car. Justify your choice.

[10 *marks*]

QUESTION 13[heat]

Diagram 13 shows cross sectional shape and the characteristic of the four thermoses R, S, T and U which are used to maintain the temperature of the hot drink.

You are required to determine the most suitable thermos which is able to maintain the temperature of the hot drink for a long time and can be easily moved from one place to another.

Study the characteristics of the four thermoses from the following aspects:
- stopper
- material to make the double layer wall
- density
- material in between the double wall

Explain the suitability of the aspects.
Justify your choice.

[10 *marks*]

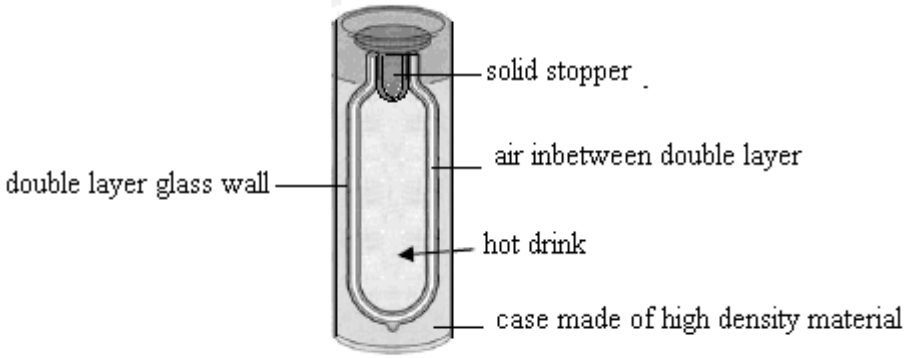
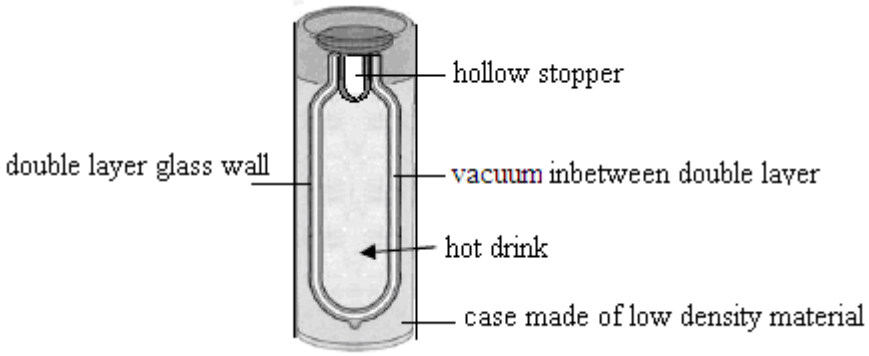
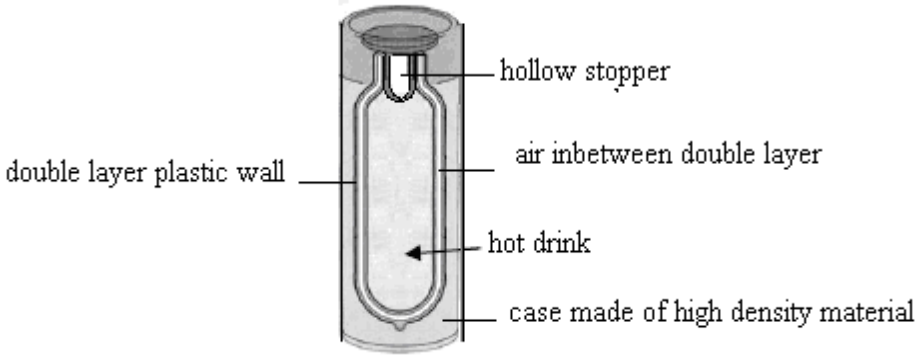
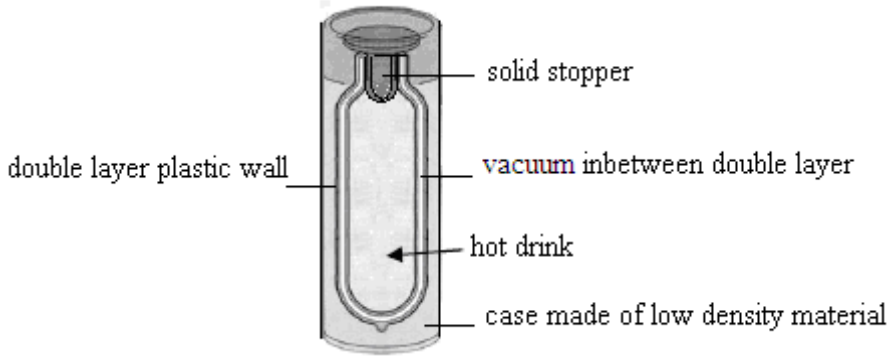
R	
S	
T	
U	

Diagram 13

QUESTION 14[Light]

Table 14 shows the design of five torchlights P, Q, R, S and T.

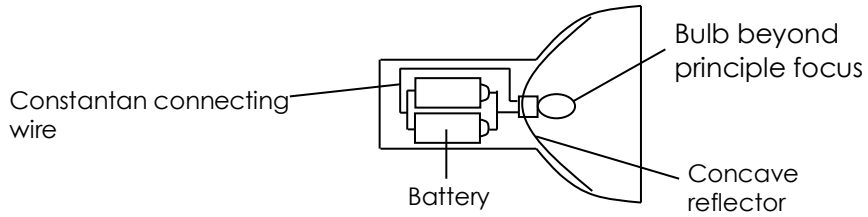
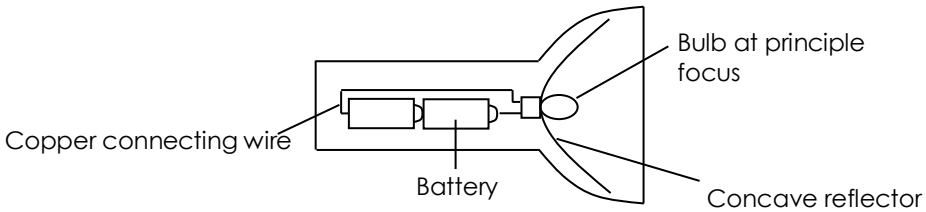
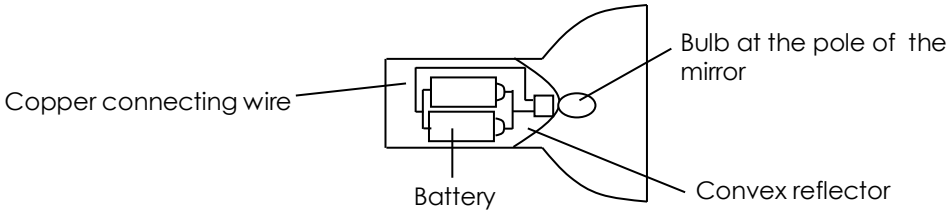
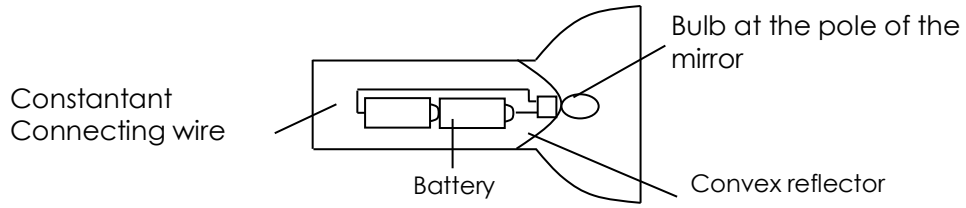
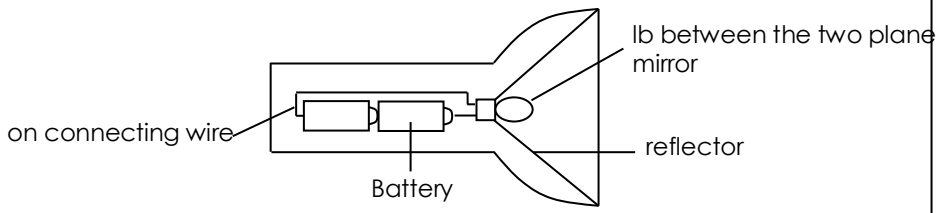
P	
Q	
R	
S	
T	

Table 14

You are asked to investigate the characteristics of the five torchlights shown in Table 14.
Explain the suitability of each characteristics of the torchlight and determine the torchlight which can produce a strong parallel beam of light.
Give reasons for your choice.

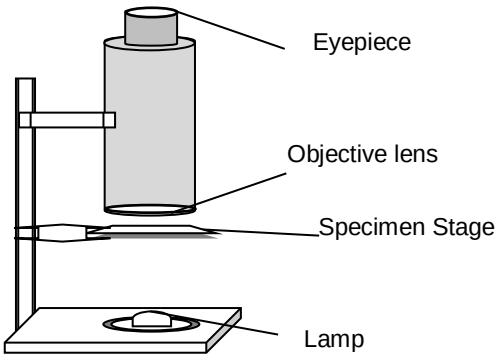
[10 marks]

QUESTION 15[Light]

Diagram 15 shows four simple compound microscopes, J, K, L and M with different pecifications. You are required to determine the most suitable simple compound microscopes to examine a small specimen.

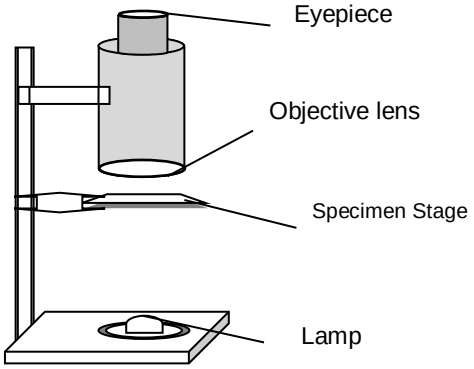
Microscope J

Eyepiece	+ 20D
Objective lens	+ 14D
Distance between two lenses	$>(f_o + f_e)$
Position of the specimen	$u < f_o$



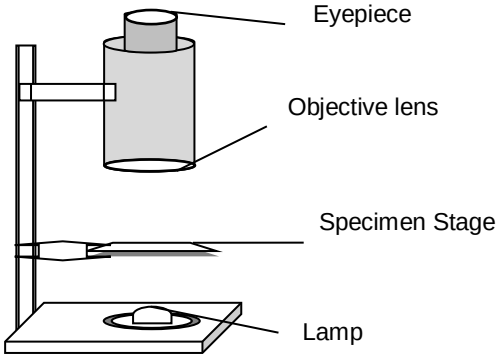
Microscope K

Eyepiece	+ 14D
Objective lens	+ 20D
Distance between two lenses	$(f_o + f_e)$
Position of the specimen	$u < f_o$



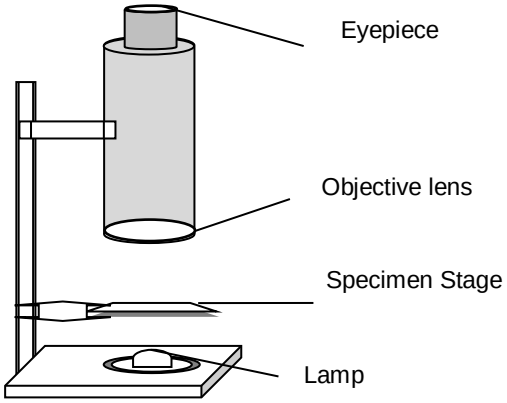
Microscope L

Eyepiece	+ 20D
Objective lens	+ 14D
Distance between two lenses	$(f_o + f_e)$
Position of the specimen	$f_o < u < 2f_o$



Microscope M

Eyepiece	+ 14D
Objective lens	+ 20D
Distance between two lenses	$>(f_o + f_e)$
Position of the specimen	$f_o < u < 2f_o$



Study the specification of the four simple compound microscopes based on the following aspects:

(i) Power of eyepiece
(ii) Power of objective lens
(iii) Distance between eyepiece and objective lens
(iv) Position of the specimen

Explain the suitability of each aspect and then determine the most suitable microscope.
Give a reason for your choice

[10 marks]

Question 16[Waves]

Diagram 16 shows a guitar with 6 strings.

The sound of a music note from a guitar depends on the strings of the guitar. Each string has its own natural frequency.

String	Density	Tension	Length of string (cm)	String material
P	Low	low	90.0	nylon
Q	Low	High	70.0	steel
R	Medium	Medium	70.0	nylon
S	High	medium	90.0	steel

Table 16

Table 16 shows the characteristic of strings P, Q, R and S. Explain the suitability of the characteristics of strings to be used in a guitar that can produce high pitch sound and will not break easily when it is strummed.
Determine the most suitable string to be used and justify your choice.

[10 *marks*]

Question 17 [Waves]

Strong retaining walls are usually built in the sea near a harbuor jetty to protect the boats from damage caused by strong waves.

You have been assigned as an engineer to assemble a retaining wall to be build in front of a new harbour. Four models for the structure of wall with their suggested locations and characteristics are shown in table 17.

You are asked to build a strong and safe harbour. Study the characteristics in table 6.Explain the suitability of the characteristics and determine the most suitable design, characteristics and location for the harbour.

[10 marks]

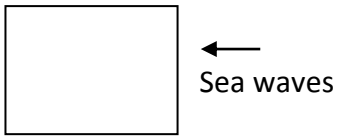
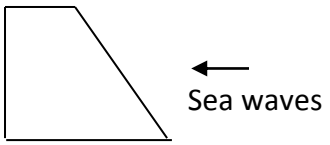
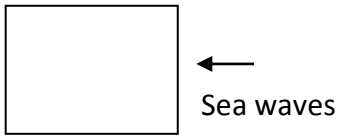
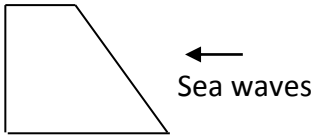
Models	Shape of walls	Material of walls	Location of harbour	Has several openings at the wall
P		concrete	Bay	No
Q		Cement and bricks	cape	Yes
R		Cement and bricks	Bay	No
S		concrete	Bay	Yes

Table 17

Question 18 [Electrycity]

Diagram 18 below shows a boiler that using to boil water at home.

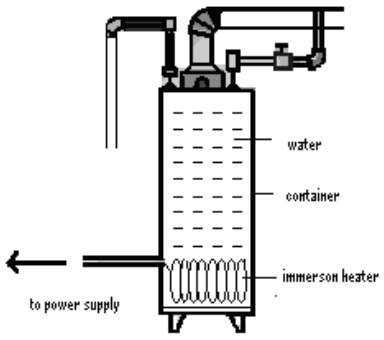


DIAGRAM 18

Table 18 below shows characteristics of material that can be used to make immerson heater .

Characteristic / Matertial	Density/ (kgm^{-3})	Boiling point / ^0C	Resistivity/ Ωm	Rate of corrosion
P	7900	5500	2.0×10^{-7}	Average
Q	5000	6550	4.0×10^{-7}	Low
R	2500	7500	3.0×10^{-7}	Low
S	7000	9000	7.0×10^{-7}	Average
T	3500	8050	8.0×10^{-7}	Low

Table 18

You are asked to investigate the characteristics of the materials above. Explain the suitability of each characteristic in table 18 and then determine the most suitable material to make immersion heater.

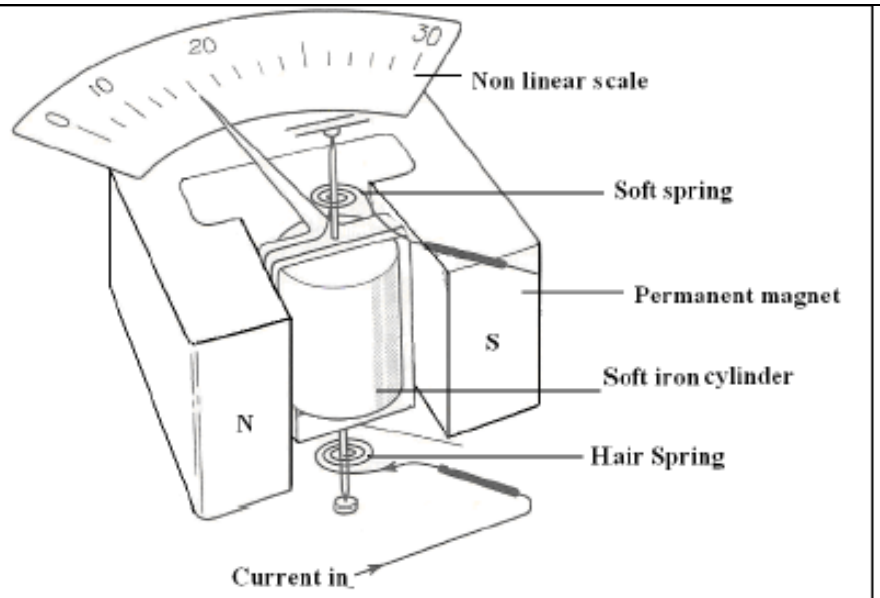
[10 *marks*]

Question 19 [Electromagnetism]

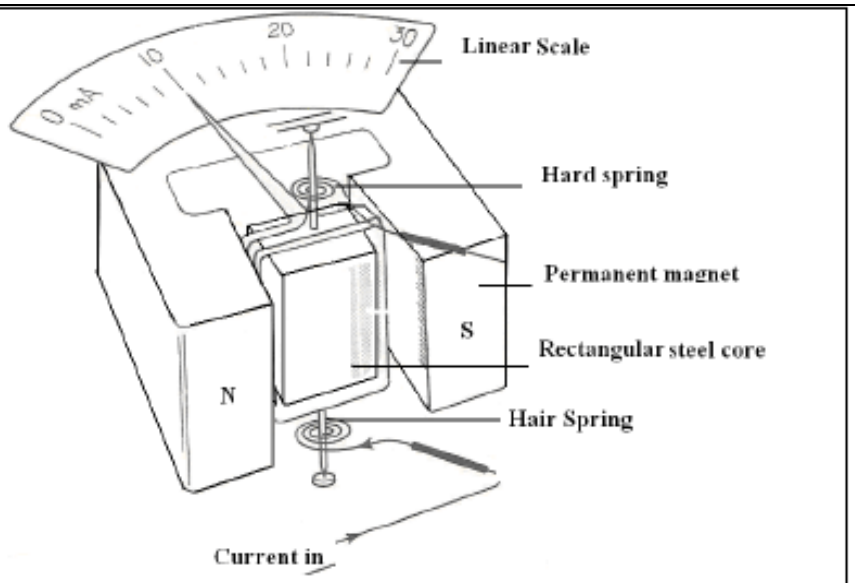
Diagram 19 shows four types of moving coil ammeter, R, S, T and U to measure small direct current.

You are required to determine the most suitable moving coil ammeter to measure the small direct current effectively.

Moving coil ammeter R



Moving coil ammeter S



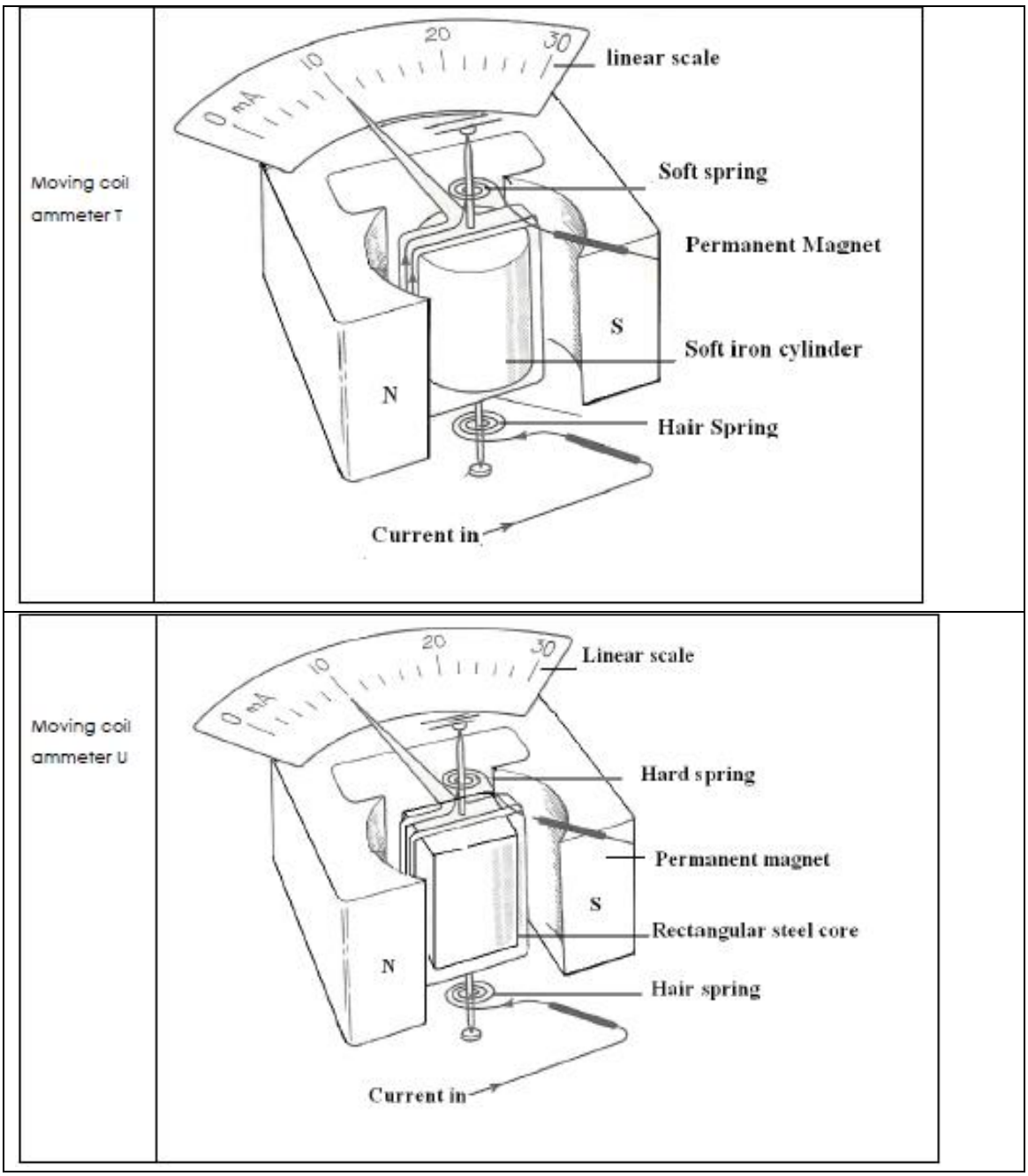


Diagram 19

You are required to determine the most suitable moving coil ammeter to measure small direct current effectively.

Study the specification of all the four moving coil ammeters based on the following aspects:
(i). The shape of the permanent magnet and core
(ii). The material of the core
(iii) The stiffness of the hair spring
(iv) The type of scale of the ammeter

Explain the suitability of each aspect and then determine the most suitable moving coil ammeter. Give a reason for your choice.

[10marks]

QUESTION 20[electromagnet&electronic]

Diagram 20 shows circuits P, Q, R, S and T each containing an *ideal transformer*. Diodes in the circuits are used for the purpose of rectification.

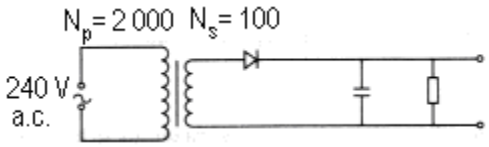
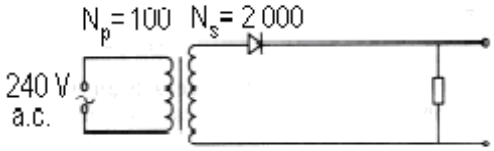
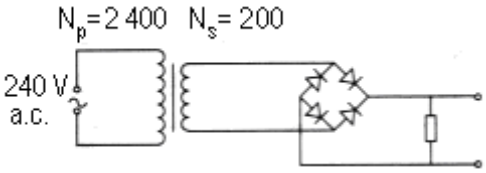
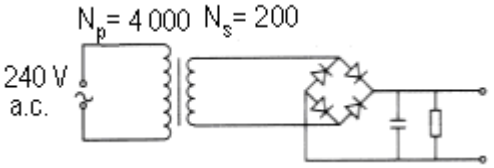
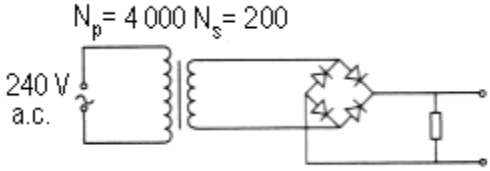
Circuit	Specification of circuit
P	
Q	
R	
S	
T	

Diagram 20

You are asked to make a circuit that can be used to switch on 12 V d.c. radio. Study the circuits P, Q, R, S and T in Diagram 20 and consider the following aspects:

- type of transformer
- ratio of the number of turns in primary coil to secondary coil
- type of rectification
- characteristic of output current

Explain the suitability of the above aspects and hence, determine the most suitable circuit to switch on 12 V d.c. radio.Justify your choice.

[*10 marks*]

QUESTION 21[electronic]

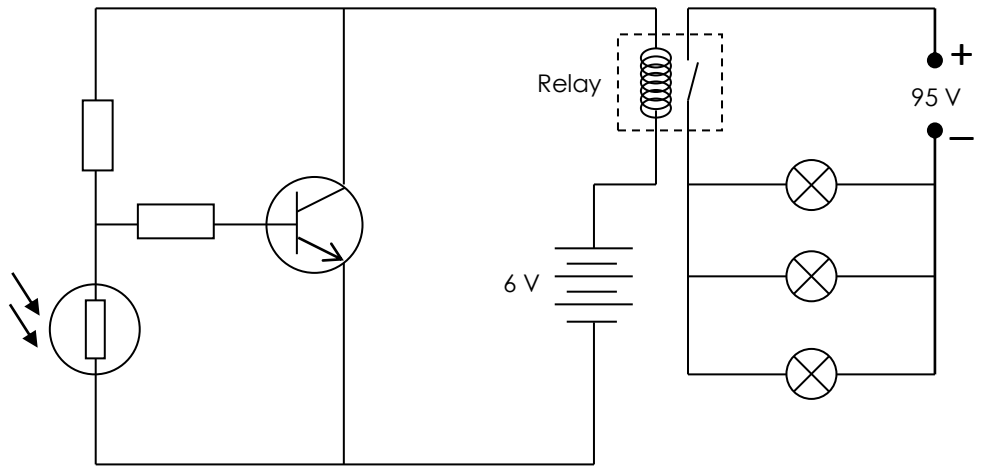
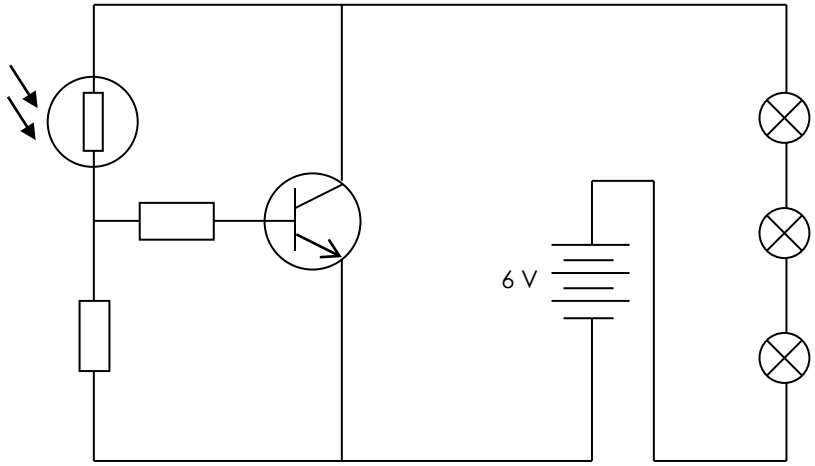
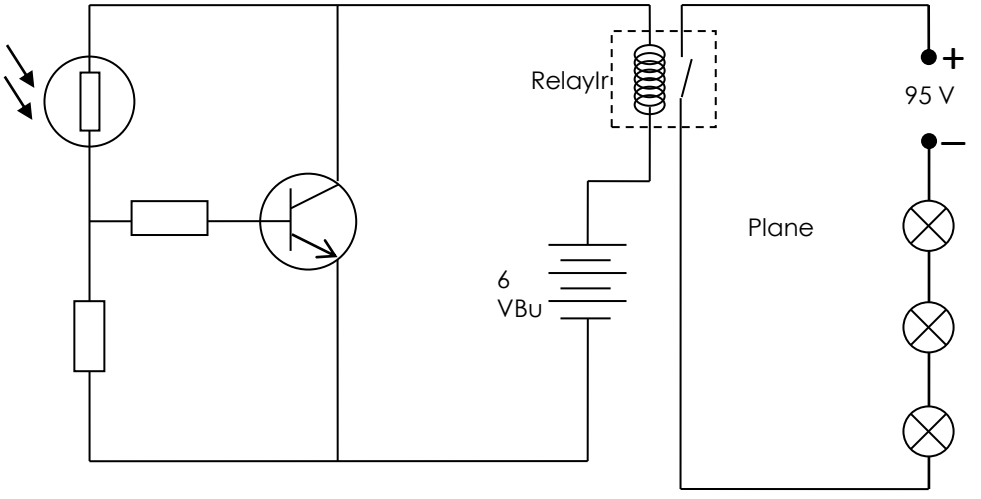
Diagram 21 shows four electronic circuits A, B, C and D with different specifications. You are required to determine the most suitable electronic circuit to light up three street lights 95V, 65 W automatically with normal brightness when it is dark.

Study the specifications of all of the four circuits based on the following aspects:

- The position of the light dependent resistor (LDR).
- The connection of the batteries.
- The arrangement of the street lights circuit.
- The use of a relay switch in the circuit.

Determine the most suitable circuit diagram to be chosen and give one reason for your choice.

[10 *marks*]

Circuit	Circuit diagrams
A	
B	
C	

D

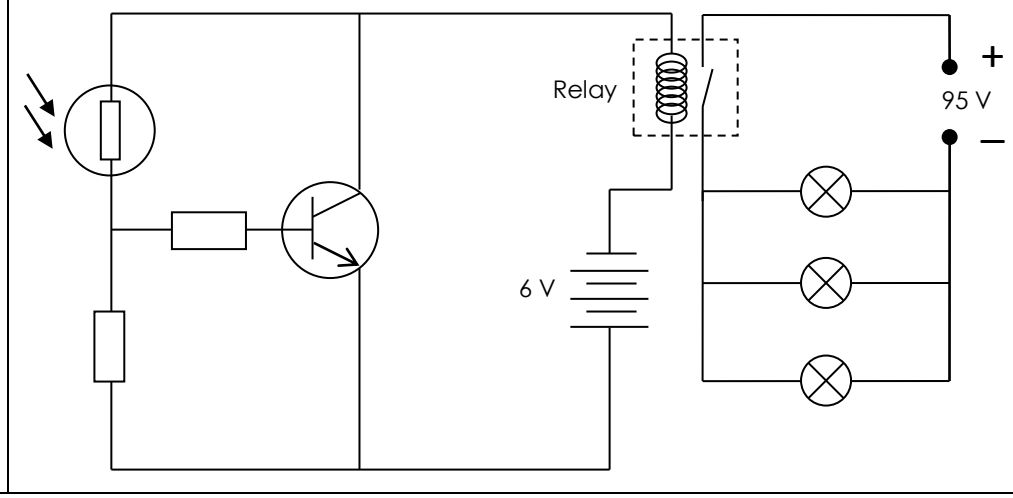


Diagram 21

Question 22 [Radioactivity]

Diagram 22 shows a technician is tracing water pipe line laid underground to detect leakage point.

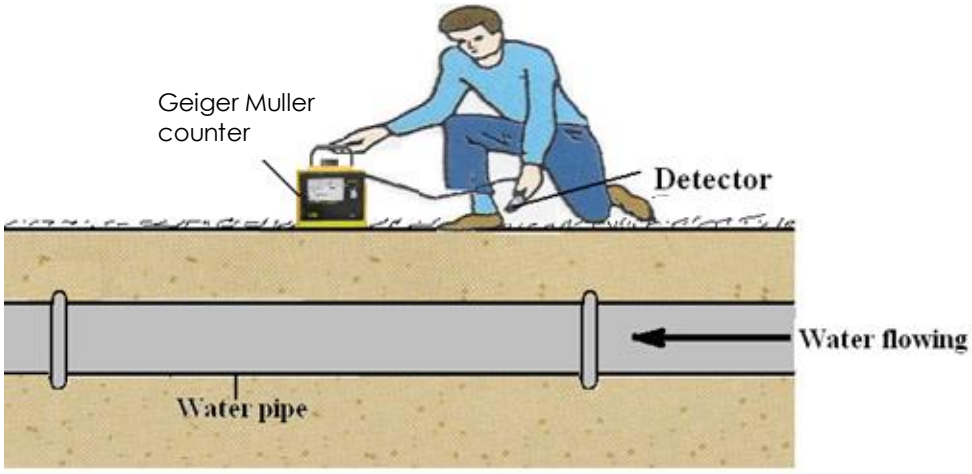


Diagram 22

Small amount of radioisotope is put in the water reservoir Table 10 shows the properties of four radioisotopes.

Radioisotope	Solubility in water	Half life	Types of radiation	Physical state
W	High	15 hours	beta	Liquid
X	High	8 days	gamma	Liquid
Y	Low	28 years	beta	Solid
Z	Low	38 minutes	alpha	gas

Table 22

A Geiger-Muller counter is moved over the pipe according to layout plan. At a point, the Geiger-Muller counter detected high radiation level indicating the point of leakage.

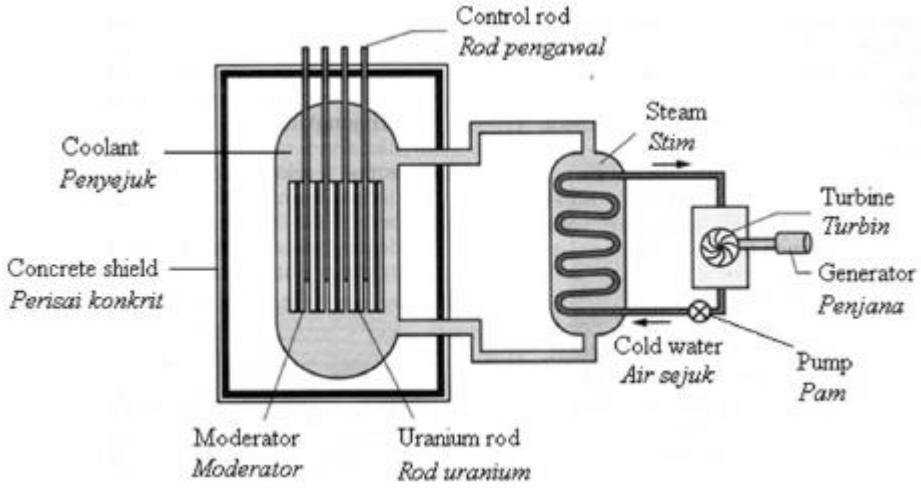
Based on table 22, explain the suitability of the properties of the radioisotopes to be used for detecting the leakage then state the most suitable radioisotope to be chosen.

Justify your choice.

[10 marks]

Question 23 [Radioactivity]

Diagram 23 shows a nuclear reactor which is used to generate nuclear energy.



You are required to investigate the characteristics of the features in the nuclear reactor as shown in Table 23.

Nuclear Reactor	Material for the moderator	Material for the control rod	Material for the coolant	Thickness of concrete shield
P	Graphite	Krypton	Oil	Thin
Q	Iron	Boron	Oil	Thin
R	Graphite	Boron	Heavy water	Thick
S	Iron	Krypton	Heavy water	Thick

Table 23

Explain the suitability of each characteristic of the features in the nuclear reactor which can generate a controlled nuclear reaction safely. Determine the most suitable reactor to be used. Give reasons for your choice.

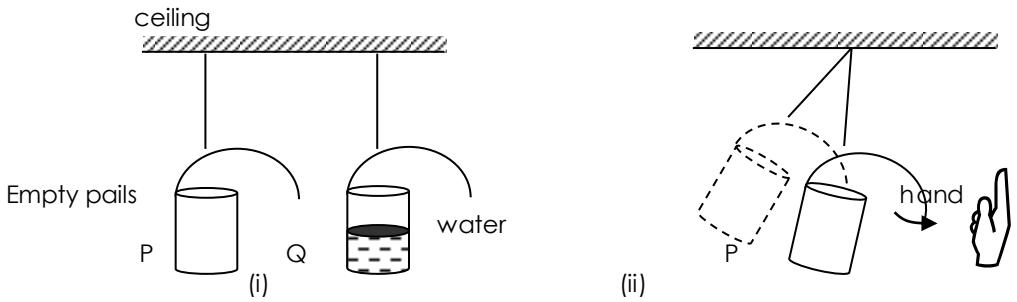
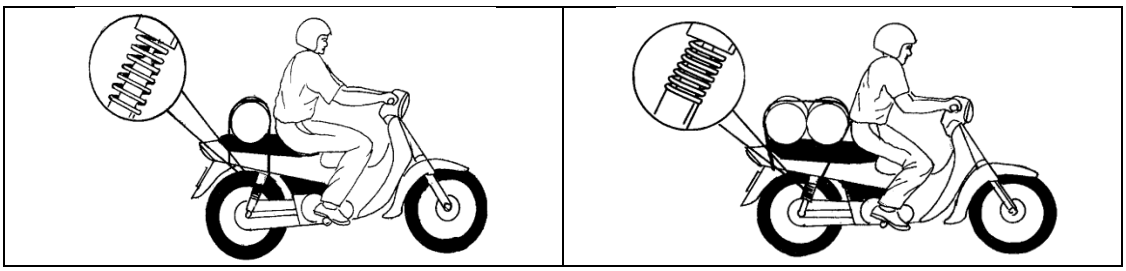
[10 marks]

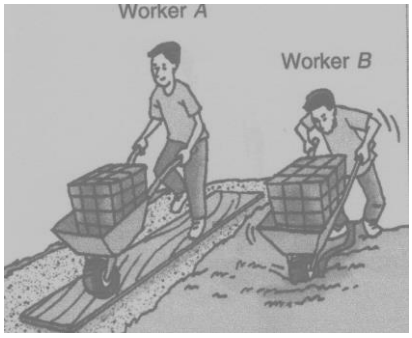
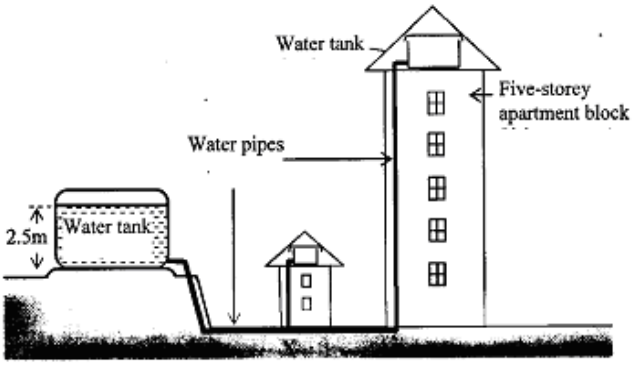
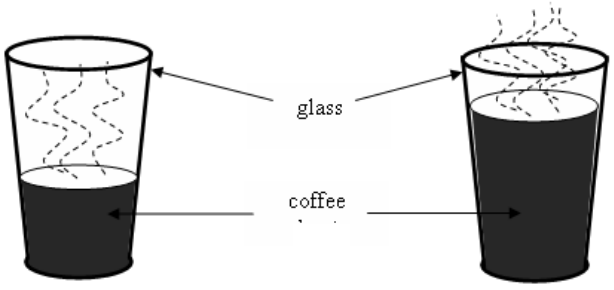
SECTION VII : EXPERIMENT [Paper 3 Section B (No. 3 / 4)]

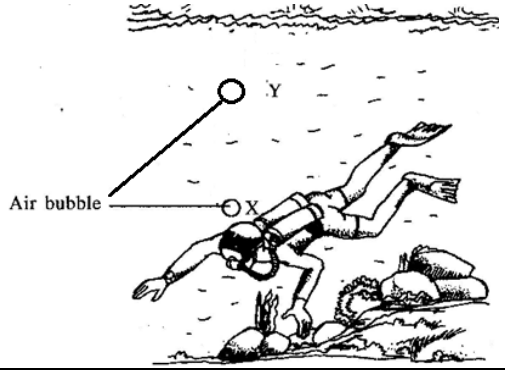
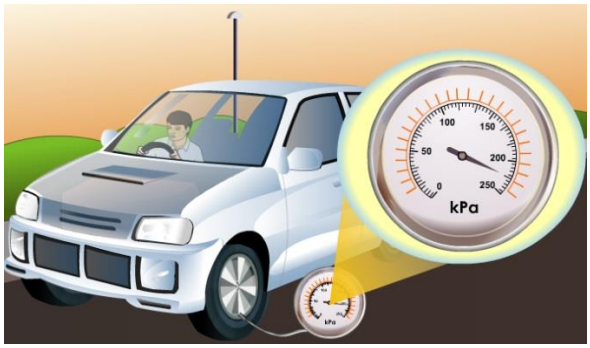
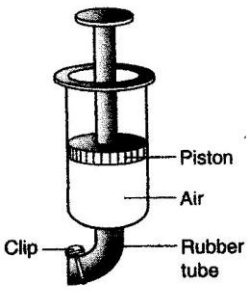
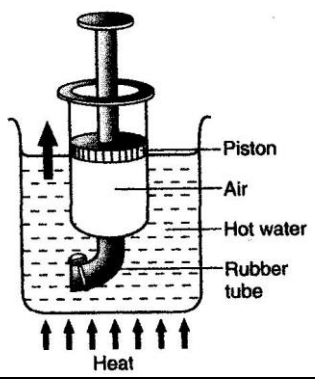
Based on the diagrams in Questions 1- 19,

(a) make one suitable inference .
(b) state one appropriate hypothesis that could be investigated.
(c) describe how you would design an experiment to test your hypothesis

In your explanation, state clearly the following :
(i) The aim of the experiment
(ii) The variables in the experiment
(iii) The list of apparatus and materials
(iv) The arrangement of the apparatus
(v) the procedures of the experiment, which includes the method of controlling the manipulated variable and the method of measuring the responding variable
(vi) the way you would tabulate the data
(vii) the way you would analyse the data

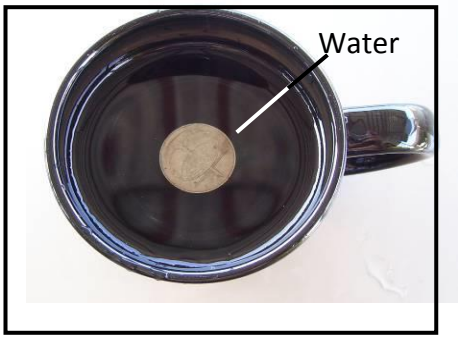
No	Situation
1	A boy pushes the boxes along a level walkway as shown in Diagram (a). The boy experiences that the boxes on trolley move slowly. When the boy removes two of the boxes as shown in Diagram (b), he experiences that the trolley move faster than before although the same force was applied, 8 N.  (a) (b)
2	 Two identical pails, P and Q are set up as shown in diagram. P is empty and Q is filled with water. They are then swing together. After a while, the pails are then stopped. P need a longer time to completely stopped.
3	Diagram (a) shows a worker carrying a gas tank. Diagram (b) shows the same worker carrying two gas tanks. Length of the spring in the suspension system of the motorcycle decreasing.  Diagram (a) Diagram (b)

4	Diagrams show two workers each pushing a wheelbarrow loaded with bricks of the same weight. Worker A pushs the wheelbarrow easier compared to worker B. 
5	Diagram 5 shows a public water tank which supplies water for domestic use to a residential area. Tenants on the fifth floor of the apartment block are unable to obtain tap water compared to the tenants on the first floor. 
6	Diagram (a) , Diagram (b) and Diagram (c) show a fisherman pulling the fishing net out of the river. In Diagram (a), the fisherman finds it easy to pull up the fishing net while most of the fish is in the water. However as more and more of the net is out of the water it gets harder to pull up the net as shown in Diagrams (b) and (b) .  (a) (b) (c)
7	Diagram (a) shows a half glass of hot coffee that is left for tenminutes. Diagram (b) shows a full glass of similar hot coffee that is left for the same time. It is notice that the hot coffee in Diagram (a) cools down faster than Diagram (b).  Diagram (a) Diagram (b)

8	Diagram (a) shows a boy accidentally spilt a few drops of hot noodle soup onto his hand and felt slight pain. Later on, he accidentally spilt the whole bowl of hot noodle soup onto himself and felt extreme pain as shown in Diagram (b).  Diagram (a)  Diagram (b)
9	Diagram shows an air bubble released by a diver at position X which then rises up to positionY. 
10	En Ahmad is travelling from Kota Bahru to Seremban. Before going on a long journey. En Ahmad measured the air pressure in the tyre of his car. He found that the air pressure in the tyre was 190kPa. After the journey, he noticed that the tyre become 'stiff' and the air pressure in the tyre as shown on the meter in Diagram . He also found that the tyre became hot. However the size of the tyre remained the same. 
11	Diagram shows a syringe with its end sealed. When the syringe is immersed in hot water, the piston move up.  

12 Diagram (a) shows a coin at the bottom of a tall empty cup looking from the top.
Diagram (b) shows the coin at the bottom of the cup when the cup is filled with water looking from the top.

(a)



(b)

13 A student used a slide projector to produce an image on the screen. Diagram (a) and Diagram (b) show the relative positions of the slide, projector lens and the screen.
It is observed that when the projector lens is moved nearer to the slide as shown in Diagram (b) the screen has to be moved further away from the slide to obtain a sharp image.

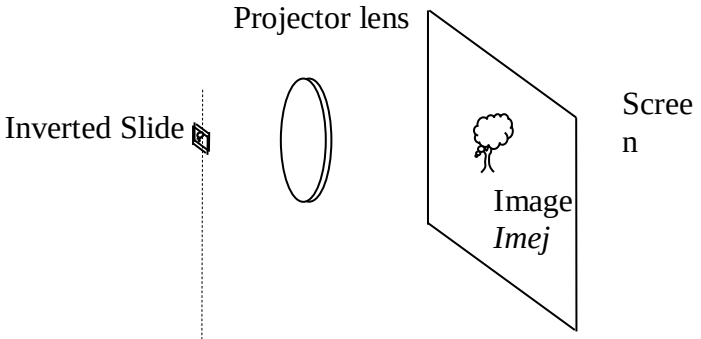


Diagram (a)

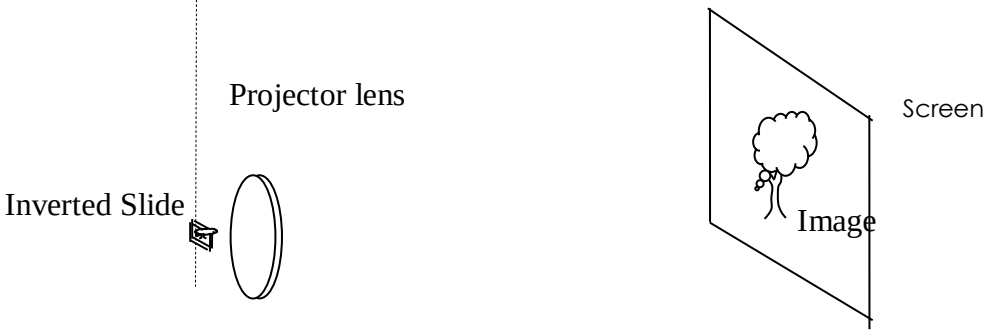
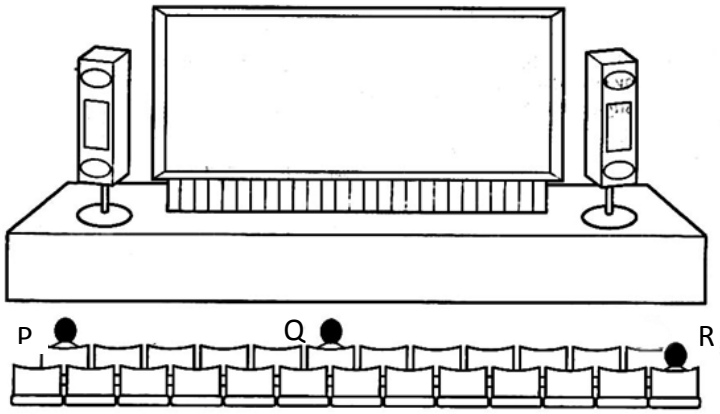
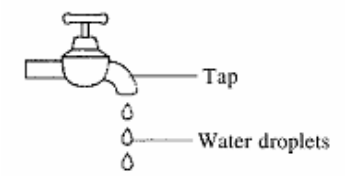


Diagram (b)

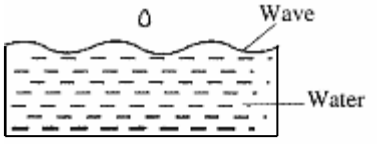
14 Diagram 14 shows an audio technician checking and testing the audio system in a mini theatre by changing his seating positions. Clear and loud sound can only be obtained at seating positions P and Q which is equals to 4 seatings away from each other with a certain distance from the loudspeakers. When he moves further away from the loudspeakers, the clear and loud sound can only be heard between Q and R which is equals to 6 seatings away from each other.



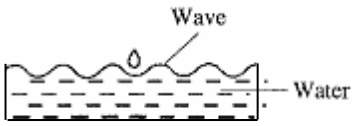
15 Diagram (a) shows tap releasing droplets of water into large containers.
The number of droplets which fall per second into the container are same. Diagram (b) and (c) show the cross sections of the water waves formed from the droplets in the containers.



(a)

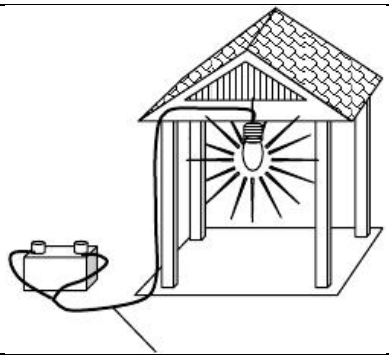


(b)

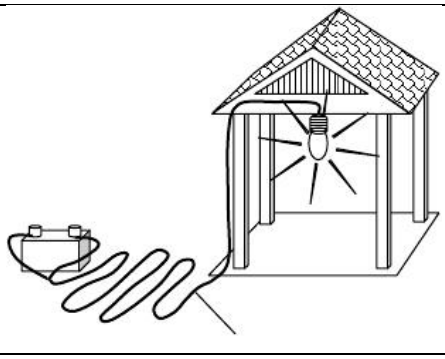


(c)

16 Diagram (a) shows shed A lighted up by a lamp connected to a battery using a short connecting wire. Diagram (b) shows shed B lighted up by a lamp connected to a battery using a long connecting wire.

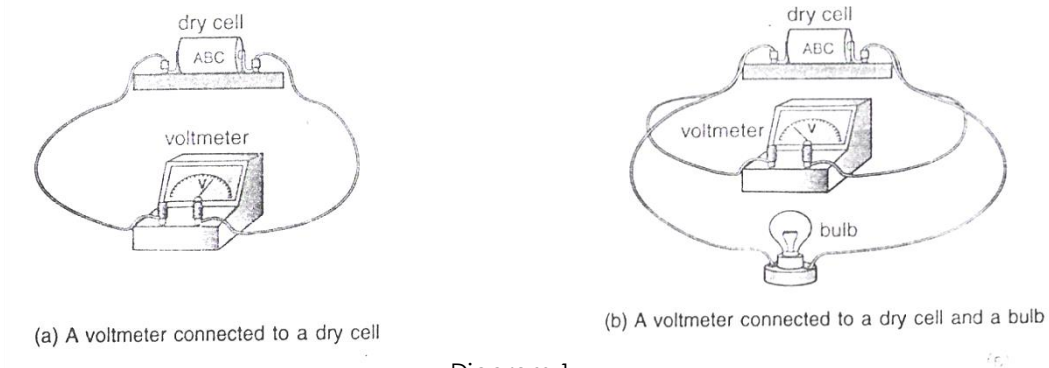


Connecting wire
(a)



connecting wire
(b)

17 Diagram 17(a), a voltmeter shows a certain reading when it is connected across the terminals of a dry cell. It was found that the voltmeter reading decreases when a bulb is connected across the terminals of the dry cell as shown in Diagram 17(b).

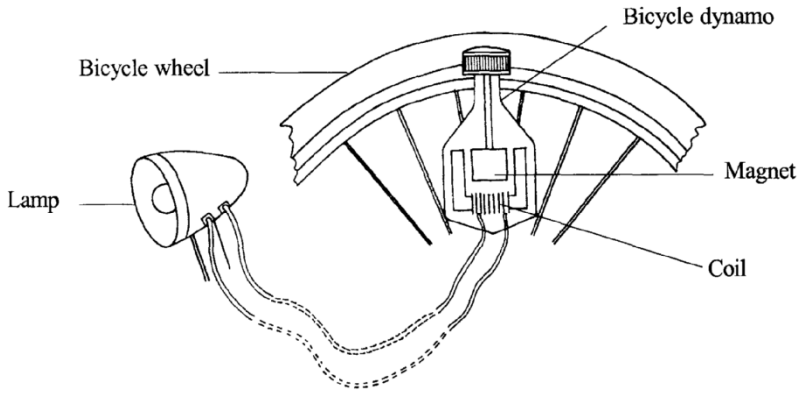


(a) A voltmeter connected to a dry cell

(b) A voltmeter connected to a dry cell and a bulb

Diagram 1.

18 Diagram 18 shows a cross-section of a bicycle dynamo which has a magnet and a coil of insulated copper wire. The output of the dynamo is connected to a bicycle lamp. The lamp will light up when the magnet is rotated by turning the wheel. The light gets brighter when the wheel turns faster.



19 Diagram 19(a) shows a step down transformer. A primary coil is connected to the input supply 240V a.c. Diagram 19(b) and Diagram 19(c) shows a bulb that is connected to a secondary coil. It is observed that the brightness of the bulb in diagram (b) is brighter than in diagram (a).

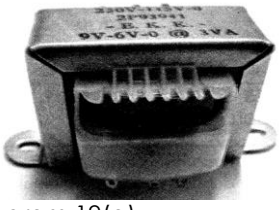


Diagram 19(a)

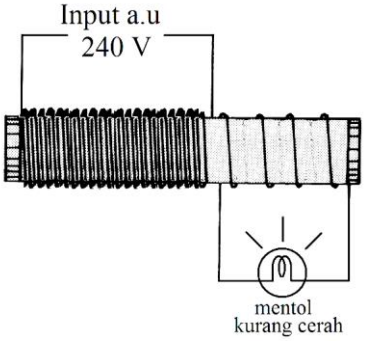


Diagram 19(b)

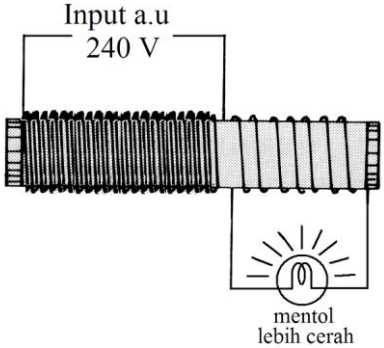
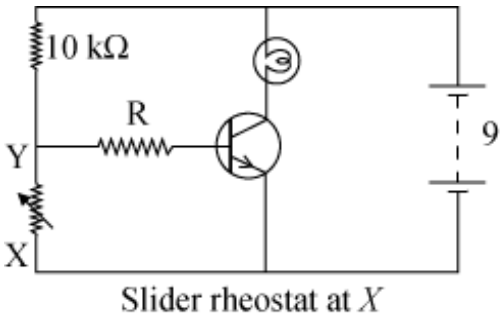
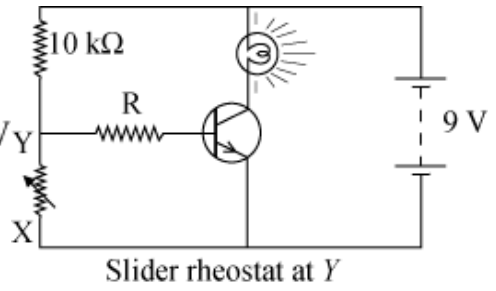


Diagram 19(c)

20	Diagram 20(a) and Diagram 20(b) show transistor circuits. When the variable resistor is adjusted from*X* to *Y*, the bulb becomes brighter.   Diagram 20(a) Diagram 20(b)

SPM FORMAT : Paper 2 Section A [No. 5, 6, 7, 8]

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Question 5 [Pressure In Liquid]

Diagram 5.1 and Diagram 5.2 show how water spurts out from its container when the valve is opened.

Diagram 5.1

Diagram 5.2

When a liquid is held in a container, it exerts pressure on the container.

(a) What is meant by pressure?

……

[1 mark]

(b) Based on to Diagram 5.1 and Diagram 5.2, compare :

(i) the depth of the water in both containers,

……

[1 mark]

(ii) the rate at which water spurts out

……

[1 mark]

(iii) the distance travelled by the water that spurts out.

……

[1 mark]

(c) Relate the distance travelled by the water that spurts out to the depth of the water.

……

[1 mark]

(d) State the relationship between the pressure and the depth of the water.

……

[1 mark]

(e) Why diver experiences more pain on their ear as they go deeper in to the sea?

……

……

[2 marks]

Question 6 [Radioactivity]

Diagram 6.1 and 6.2 represent the radioactive decay of radium-226 and carbon-14 respectively.

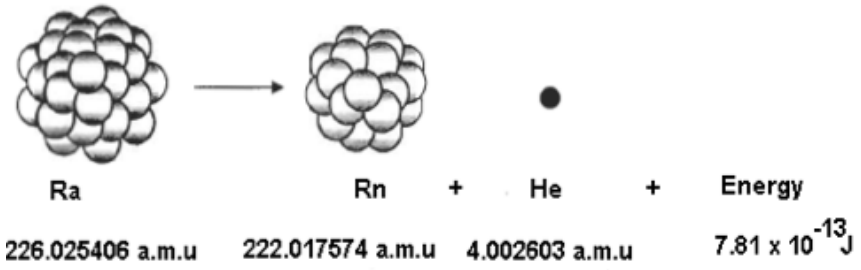


Diagram 6.1

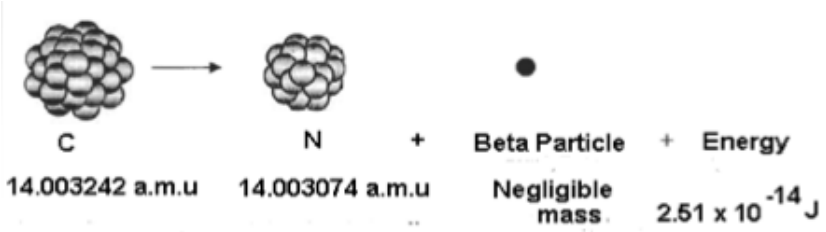


Diagram 6.2

(a) (i) Why does the parent nuclide decay?

……

[1 mark]

(ii) Compare the total mass in a.m.u. before and after the decay process.

……

[1 mark]

(iii) Explain the reason for the observation 6(a)(ii).

……

[1 mark]

(iv) Write an equation to show relationship between mass defect, m, speed of light, c and energy, E.

……

[1 mark]

(v) State the relationship between the mass defect and the energy released.

……

[1 mark]

(b) The half-lifes of radium-226 and carbon-14 are 1 600 years and 5 600 years respectively.

(i) What is meant by half-life?

……

[1 mark]

(ii) Which radioactive material will decay at a faster rate? Explain your answer.

……

……

[2 marks]

. **Question 7 [Electromagnetism]**

7 (a) Diagram 7.1 shows a d.c generator

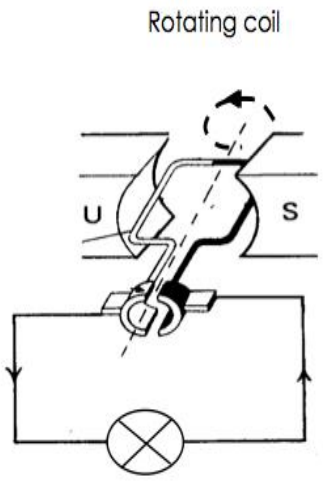


Diagram 7.1

(i) State the change in energy in the generator.

……

[1 mark]

(iii) Explain how the generator works to produce a direct current.

……

……

[3 marks]

(b) Diagram 7.2 shows a model of a step down transformer connected to a 240 V a.c supply.

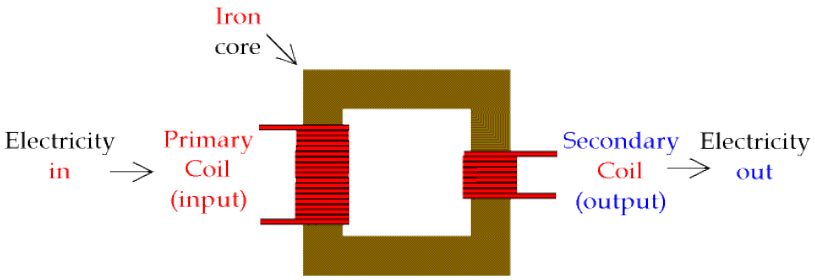


Diagram 7.2

Modification has to be done on the transformer so that it can be used as an efficient 6 V d.c handphone charger.

Suggest the modifications that can be made so that the transformer:

(i) can produce 6V voltage output.

Suggestion:

……

[1 mark]

Reason:

……

[1 mark]

(ii) can produce a steady direct current.

Suggestion:

……

[1 mark]

Reason:

……

[1 mark]

(iii) High efficiency

Suggestion:

……

[1 mark]

Reason:

……

[1 mark]

Question 8 [Gas and Atmospheric Pressure]

Diagram 8.1 shows a mercury manometer being connected to a gas X supply. Given that the atmospheric pressure is 76 cm Hg.

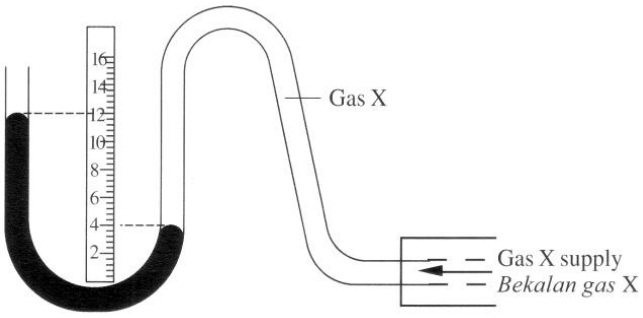


Diagram 8.1

(a) What does it mean by atmospheric pressure?

……

[1 mark]

(b) (i) Why there is the difference in the level of mercury?

……

[1 mark]

(ii) Mark on Diagram 8.1 to show the direction of P_{gas} and $P_{atmospheric}$

[2 marks]

(c) Given that density of mercury is 1.36×10^4 kg m^{-3}, and atmospheric pressure = 76 cm Hg. Calculate the pressure of gas X in :

(i) cm Hg

[1 marks]

(ii) Pascal

[2 marks]

(d) Diagram 8.2 shows a vacuum cleaner.

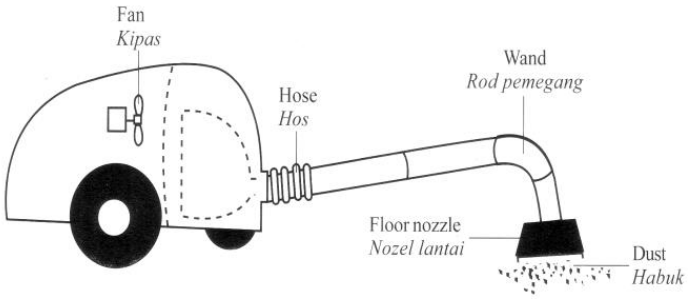


Diagram 8.2

Table 1 shows the characteristics of four different types of a vacuum cleaner.

Vacuum Cleaner	Size of the fan	The diameter of wand
K	Small	16.0 cm
L	Big	4.0 cm

(d) Based on the information in Table 1, state the suitable characteristics of the vacuum cleaner which can clean the dust faster and effectively.
Give reason for the suitability of the characteristics.

(i) Size of the fan

.....
Reason

.....
[2 marks]

(ii) The diameter of wand

.....
Reason

.....
[2 marks]

(e) Based on the answer in 8(d), determine which vacuum cleaner in Table 1 will clean the dust faster and effectively.

.....
[1 mark]

Question 5 [Forces & Motion]

A diagram 5.1 show a worker is applying a force to knock the ceramic floor of a house using a rubber hammer.

Diagram 5.2 shows another worker is applying an identical force to knock the ceramic floor of a house using an iron hammer.

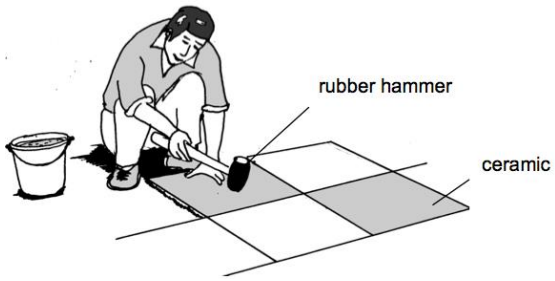


Diagram 5.1

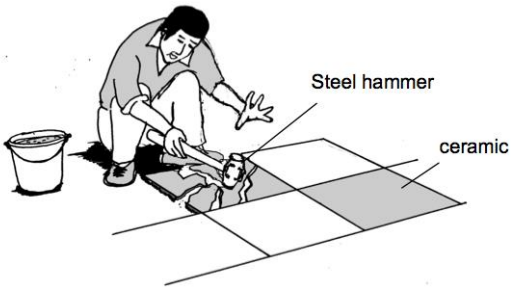


Diagram 5.2

(a) What is the meaning of impulsive force?

……

[1 mark]

(b) Observe Diagram 5.1 and Diagram 5.2.

(i) Compare the characteristic of the hammers.

……

[1 mark]

(ii) Compare the condition of the ceramic after being knocked with the hammer.

……

[1 mark]

(iii) Compare the time of impact between the hammer and the ceramic.

……

[1 mark]

(c) Relate the answers in 5(b)(ii) and 5(b)(iii).

……

[1 mark]

(d) Based on your answer in 5(b),

(i) state the relationship between the characteristic of the hammers with the time of impact.

……

[1 mark]

(ii) relate the time of impact with the impulsive force.

……

[1 mark]

(e) Give one suggestion how you would reduce the impulsive force acting towards the ceramic.

……

[1 mark]

Question 6 [Pressure in liquid]

Diagram 6.1 shows water flowing out of a hole at the side of a container.

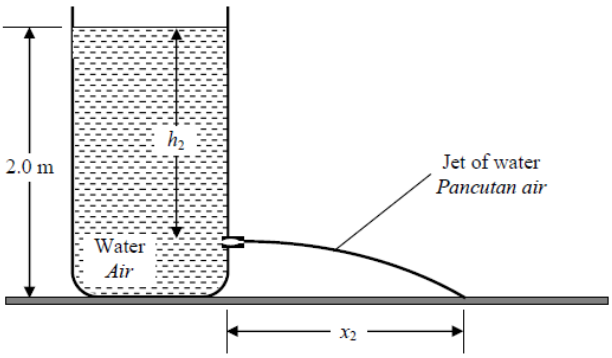


Diagram 6.1

Diagram 6.2 shows water flowing out of a hole at the side of another container.

(a) Whatisthemeaningofpressure?

.....

[1 mark]

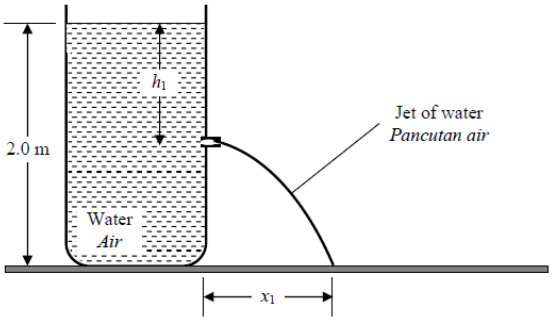


Diagram 6.2

(b) Observe Diagram 6.1 and Diagram 6.2,

(i) Compare the depth of the holes from the surface of the water.

.....

[1 mark]

(ii) Compare the horizontal distance travelled by the jet of water.

.....

[1 mark]

(iii) Relate the horizontal distance in (b)(ii) to the pressure of water at the hole.

.....

[1 mark]

(iv) Relate the pressure in the water to the depth of the water.

.....

[1 mark]

(c) State two other factors that affect the pressure in a liquid.

.....

.....

[2 marks]

(d) Explain why diver finds it difficult to breath normally when he is in the deep sea?

.....

[1 mark]

Question 7 [Electromagnetism : motor]

7 Diagram 7.1 shows a simple electric motor.

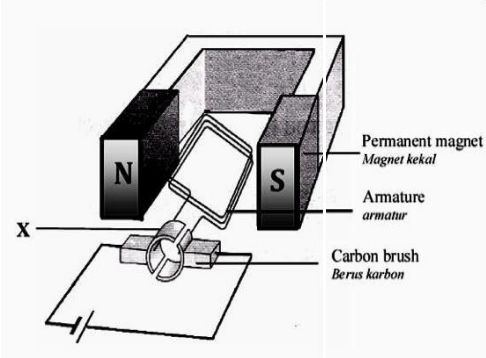


Diagram 7.1

(a) (i) Name the type of motor shown in the diagram above.

.....

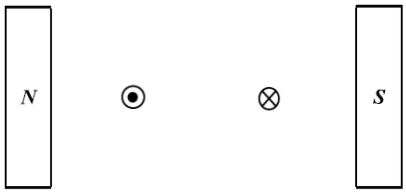
[1 mark]

(ii) what is the function of the part labeled X?

.....

[2 marks]

(b) (i) By referring to Diagram 7.1, draw the related catapult field in the diagram below and label the direction of forces produced.



[2 mark]

(ii) State one factor that affects the speed of rotation of the armature.

.....

[1 mark]

(c) Diagram 7.2 shows the same type of electric motor used in a blender to grind food where a blade is attached to the electric motor.

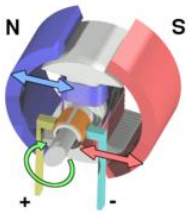


Diagram 7.2

Suggest and explain the modifications which need to be done for each of the following:

(i) To enable the motor to be used with alternating current.

.....

Reason:

.....

[2 marks]

(ii) To increase the strength of the magnetic field.

.....

Reason:

.....

[2 marks]

Question 8 [Force and Motion]

A coach has to train and select participants for a competition. During the training session, trainees were asked to run up an inclined surface from point X to point Y as shown in Diagram 8.

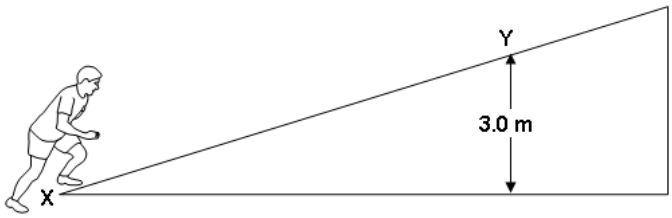


Diagram 8

Three trainees A, B and C run up the inclined surface 6 times and the times recorded are shown in Table 1.

Trainee	Mass / kg	Time / s						
		1	2	3	4	5	6	Average
A	48	5.4	5.5	5.6	6.1	6.3	6.5	
B	52	5.8	6.0	6.5	6.9	7.7	8.5	
C	48	6.1	6.2	6.0	6.1	6.1	6.1	

Table 8

(a) What is the meaning of energy?

……

[1 mark]

(b) Calculate the average time of each trainee and write the answers in Table 8.

[2 marks]

(c) For trainee A, calculate:

(i) The potential energy gained when he runs from X to Y.

[2 marks]

(ii) The average power generated. Ignore the work done against friction.

[2 marks]

(d) Based on the results of the training, which trainee should the coach choose to compete in:

(i) a 100 m race?

……

Reason:

……

[2 marks]

(ii) a 1500 m race

……

Reason:

……

[2 marks]

(e) For the trainee who is not selected in either d(i) or d(ii), give a reason why the coach did not select him or her.

……

[1 mark]

SET 3

Question 5 [Forces and Motion]

5 Diagram 5.1 and diagram 5.2 shows a 2kg load being pulled by a slotted weight using a pulley. T is the tension of the string . The slotted weight is hung at the same height,h from the floor.

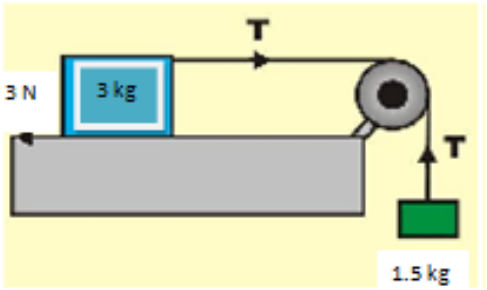


Diagram 5.1

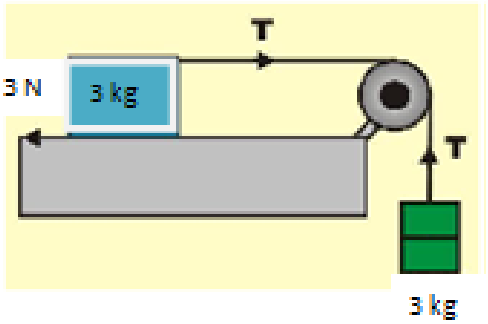


Diagram 5.2

(a) What is meant by weight?

.....

[1 mark]

(b) Based on diagram 5.1 and diagram 5.2,

(i) Compare the mass of the slotted weight.

.....

[1 mark]

(ii) Compare the net forces acting on the systems on the table.

.....

[1 mark]

(iii) Compare the acceleration of the 3 kg load move on the table.

.....

[1 mark]

(c) Based on the answer in b (ii) and b(iii) , relate the net forces and the acceleration of the load.

.....

[1 mark]

(d) The two load now are hang as shown in the Diagram 5.3.

(i) Compare the net force for the systems in Diagram 5.1 and Diagram 5.3

.....

[1 mark]

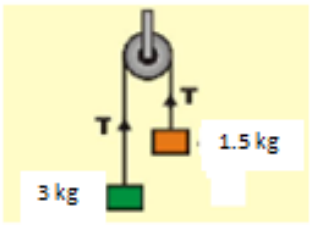


Diagram 5.3

(ii) Compare the acceleration of the load between Diagram 5.1 and Diagram 5.3 .

.....

[1 mark]

(iii) What cause the difference in the net force between Diagram 5.1 and Diagram 5.3?

.....

[1 mark]

Question 6 [Forces and Pressure]

6 Two apples with same size and mass, each of these apples are dipped into oil and water separately. The apples immersed at different levels in the two liquids. The density of the oil is 800 kgm^{-3} and the density of water is 1000 kg m^{-3}.

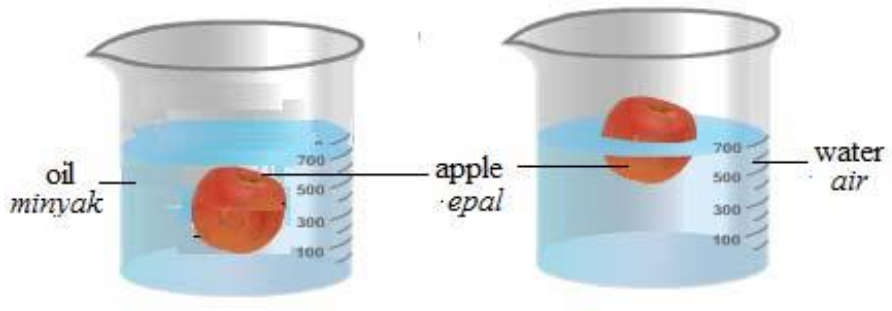


Diagram 6.1 Diagram 6.2

Diagram 6.1 and Diagram 6.2 illustrate the situation of the apples in the oil and in the water.

(a) What is meant by pressure?

.....

[1 mark]

(b) Based on Diagram 6.1 and Diagram 6.2:

(i) Compare the level of the apple in the oil and in the water.

.....

[1 mark]

(ii) Compare the volume of liquid displaced by the apple in the oil and in the water

.....

[1 mark]

(iii) Compare the density of oil and water.

.....

[1 mark]

(c) (i)Relate the volume of liquid displaced to the density of the liquid.

.....

[1 mark]

(ii) State the relationship between weight of the apple and the weight of the liquid displaced.

.....

[1 mark]

(d) Name the physics principle that explains the situation above.

.....

[1 mark]

(e) A submarine can sail on the sea surface and under the sea by using the principle stated in (d). How a submarine at the seabed can float to the surface of the sea?

.....

[1 mark]

Question 7 [Waves]

7 Diagram 7.1 shows water waves passing through the entrance of a model harbour.

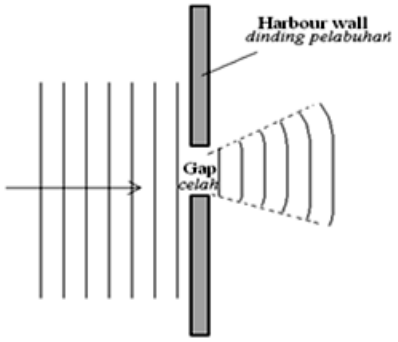


Diagram 7.1

(a) (i) Name the type of wave is the water wave.

.....

[1 *mark*]

(ii) State why the wave shape is only slightly change after passing the gap

.....

[1 *mark*]

(b) Diagram 7.2 shows the cross sectional of the harbour wall that facing the waves.
In Diagram 7.2 draw the waves after passing trough the gap.

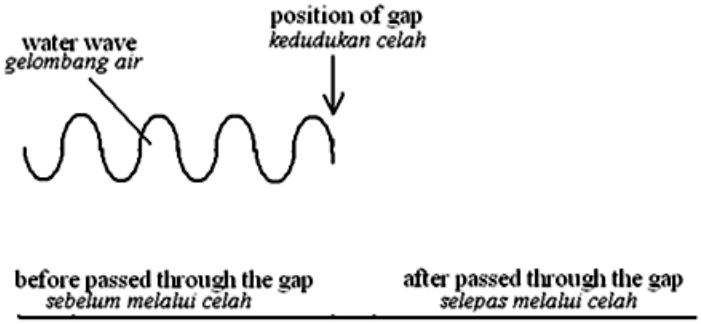


Diagram 7.2 [2 marks]

(c) The model harbour in diagram 7.1 is to be use for commercial purposes.
Suggest modifications to the harbour wall that enables ;

(i) to sustain the impact of the water wave

.....
Reason:

.....

[2 marks]

(ii) to reduce the impact of the water wave to the shore

.....
Reason:

.....

[2 *marks*]

(c) During dry season large ship is advice not to shelter at the harbour. Explain this situation and suggest a method to load and unload the ship.

.....

.....

[2 *marks*]

Question 8 [Electronic]

Diagram 8.1 shows an adapter which can be used to charge a cell phone battery. The adapter change the direction of current through the rectification process before charging the battery.

Diagram 8.1

(a) What is the meaning of rectification process?

.....

[1 *mark*]

(b) Table 8.2 shows four rectification circuits. The rectifications circuits consists of diode, resistor and capasitor.

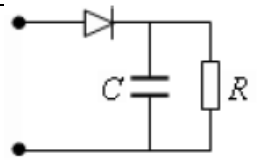
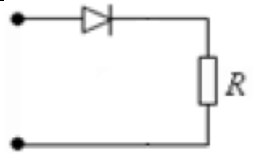
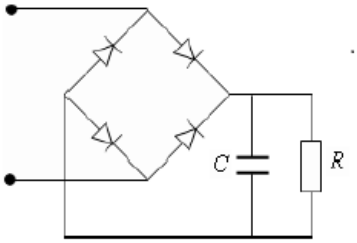
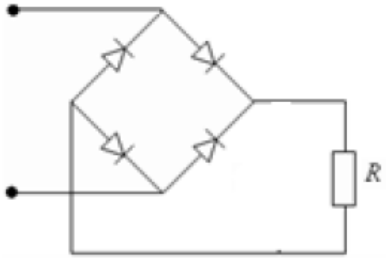
Rectification circuit	
P	
Q	
R	
S	

Table 1

Using Table 1, state the suitable characteristics of the rectification circuits based on aspects;

(i) Diode arrangement

.....

Reason

.....

[2 *marks*]

(ii) With or without capacitor

.....

Reason

.....

[2 *marks*]

(c) Based on the answer in (b)(i) and (b)(ii), state the most suitable rectification circuit can be used.

.....[

1 *mark*]

(d) State another function of the diode.

.....

[1 *mark*]

(e) Diagram 8.2 shows the trace produced by an alternating current signal on the screen of a cathode ray oscilloscope. The time base of the oscilloscope is set at 0.02 s per division.

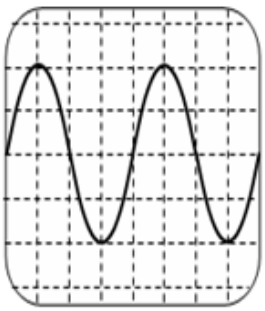


Diagram 8.2

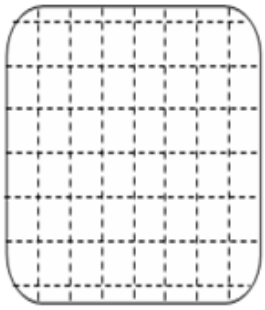


Diagram 8.3

(i) What is the period of the alternating current signal?

.....

[1 *mark*]

(ii) Calculate the frequency of the alternating current signal.

[2 *marks*]

(iii) On the Diagram 8.3 draw the trace produced when the frequency of the alternating current signal is doubled

[2 *marks*]

SPM FORMAT : Paper 2 Section B [No. 9 / 10] http://cikguadura.wordpress.com/

Question 1 [Gas laws : Pressure Law]

(a) Diagram 9.1 and 9.2 show the set of apparatus to study the pressure of gas.

θ = 50°C

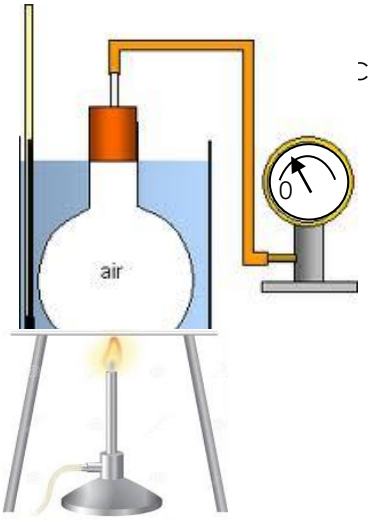


Diagram 9.1

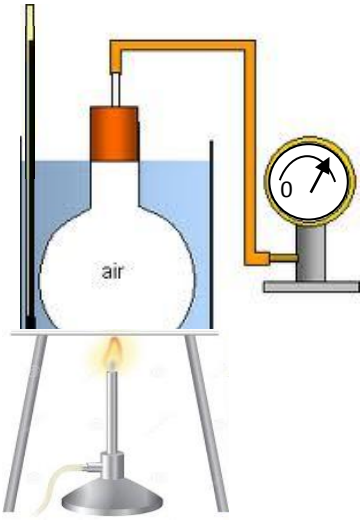


Diagram 9.2

(i) What is the meaning of temperature? [1 mark]

(ii) Based on Diagram 9.1 and 9.2, compare the temperature of gas , the volume of gas and the reading of the Pressure Gauge.
Relate the temperature and the reading of pressure gauge and state the physics law involved. [5 marks]

(b) Diagram 9.3 shows a dented ping-pong ball is placed in hot water.
Diagram 9.4 shows the ping-pong ball reverted to its original spherical shape after a few minutes.

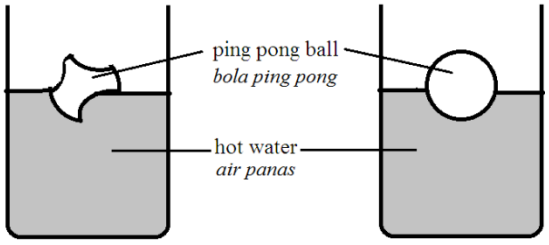


Diagram 9.3 Diagram 9.4

Using the concept of physics, explain how the ping-pong ball reverted to its original spherical shape. [4 marks]

(c) Diagram 9.3 shows a pot used to cook a beef stew.
It takes a long time to cook the beef tenderly.

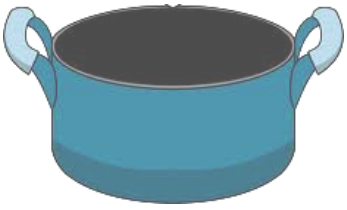


Diagram 9.3

Using appropriate physics concepts, suggest modification that can be made to the pot so that the beef stew can be cooked tenderly in shorter time.
Your answer should include the following aspects :
(i) the material and characteristics of the pot
(ii) additional item for safety [10 marks]

Question 2 [Archimedes' Principle]

9. Diagram 9.1 and Diagram 9.2 shows different number of boys sitting on two identical banana boat, A and B respectively.

Diagram 9.1

Diagram 9.2

Their weights are balanced by the buoyant force.

(a) What is the meaning of weight

[1 mark]

(b) (i) Using Diagram 1.1 and Diagram 1.2, compare the total weight of the boys, the volume of the water displaced and the buoyant force acted on them.

[3 marks]

(ii) State the relationship between the buoyant force and :
(a) the volume of water displaced
(b) the weight of water displaced

[2 marks]

(iii) Name the physics principle involved

[1 mark]

(c) Diagram 9.2 shows what happens when an apple is held above the water surface and then released into the water.

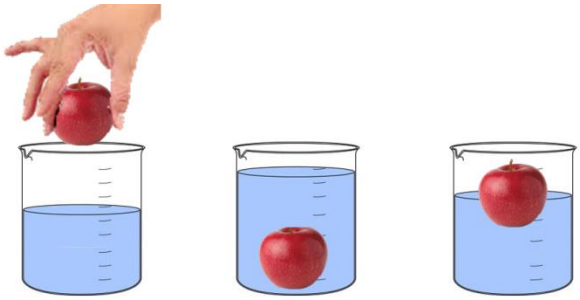


Diagram 9.2

When the apple is released, it falls into the water and goes completely under the water surface. Then it moves upwards and floats on the water surface.
Using the concept of buoyant force, explain why the apple moves upwards and then floats on the water surface.

[3 marks]

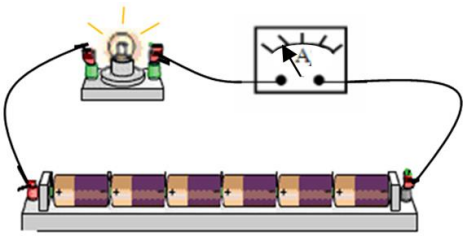
(d) Diagram 9.3 shows a barge used to transport goods from fresh water port to the ship anchored away from the seaside.

Diagram 9.3

Using suitable physics concepts, explain the required modification needed in designing a barge that can carry more and heavier goods, move faster and safe in fresh and salt water.
Using your knowledge of motion, forces and properties of materials, state and explain the suggestions, based on the following aspects:
(i) the material used for the raft
(ii) plimsoll line
(iii) shape and size of the barge [10 marks]

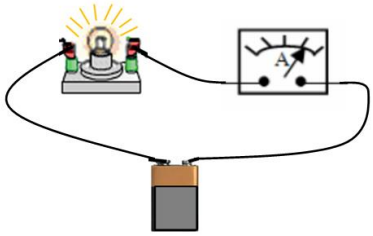
Question 3 [Electricity]

10. Diagram 10.1 shows a photograph of a circuit with six identical dry cells with 1.5 V.
Diagram 10.2 shows a photograph of a circuit consists of a new dry cell with 9 V.
Each circuit is connected to a bulb labelled 9 V 24 W.



six 1.5 V of dry cell

Diagram 10.1



a 9 V of dry cell

Diagram 10.2

(a) What is the meant by label 9 V 24 W on the bulb?

[1 mark]

(b) (i) State the energy transformation that take place in the bulb.

[1 mark]

(ii) Based on Diagram 10.1 and Diagram 10.2, compare the brightness of the bulb, the amount of current flow and the internal resistance.
Relate the brightness of the bulb with the amount of current flow to make a deduction regarding the relationship between the brightness of the bulb and the internal resistance.

[5 marks]

(c) Diagram 10.3 shows a 12 V accumulator used to start a car engine.
The accumulator is then being replaced with eight 1.5 V dry cells.

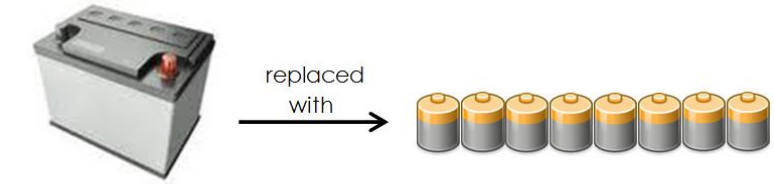


Diagram 10.3

Can the car be started ? Explain your answer.

[3 marks]

(d) Diagram 10.4 shows the condition in a closed room with unsuitable installation of lamp.

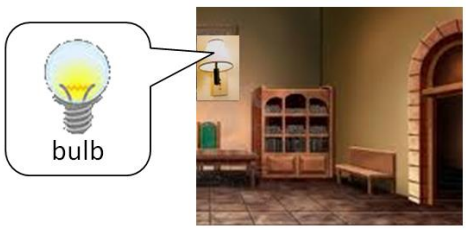


Diagram 10.4

Using appropriate physics concepts, explain suitable modification to the room and the lamp so that the room condition becomes brighter and more comfortable.
Your answer should include the following aspects :
(i) type of the lamp
(ii) the energy efficiency of the lamp
(iii) safety feature of the lamp
(iv) wiring system for the lamp [10 marks]

SPM FORMAT : Paper 2 Section C [No. 11 / 12] http://cikguadura.wordpress.com/

Question 1 [Light]

1. Diagram 1.1 shows a lens used as a magnifying glass to view the magnified image.

Diagram 1.1

(a) (i) What is meant by the focal point of a lens?

[1 mark]

(ii) With the aids of a ray diagram, explain how the image is formed by the magnifying glass.

[4 marks]

(b) A Liquid Crystal Display (LCD) Projector is a device that can be used to display information or video onto a surface (screen) with magnified image.

Diagram 1.2 and Diagram 1.3 show the LCD and the inner parts of the LCD Projector consist of few major sections respectively.

Diagram 1.2

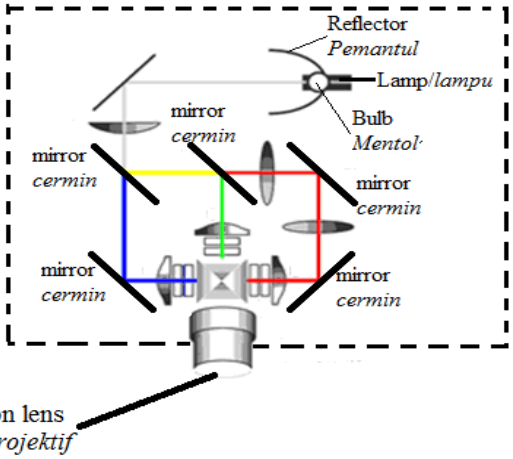


Diagram 1.3

Table 1.1 shows the characteristics of four different LCDs and their position from the screen.

LCD Projector	Type of the projection lens	Surface of the reflector	Power of the bulb	Distance between LCD to the screen
P	Concave	Black	240 W	1 m
Q	Concave	Shiny	750 W	2 m
R	Convex	Black	3000 W	5 m
S	Convex	Shiny	5000 W	10 m

Table 1.1

You are asked to study the characteristics of a few LCD Projectors for the purpose of delivering a lecture by a lecturer in the hall at your school.
Explain the suitability of each characteristic of the LCD Projectors in Table 1.1 and determine the most suitable projector to be used by a lecturer in a hall.

[10 marks]

(c) When an object of height 3 cm is placed in front of a convex lens with a focal length of 10 cm, a virtual image is formed 15 cm from the lens. Calculate

(i) the distance between the object and the lens
(ii) size of the image.

[5 marks]

Question 2 [Waves]

2 An echo – sounderon aship produces apulseofsound. A fishingboat uses thesound echo to determinethedepth ofseabed.You areassigned to investigatethesuitable characteristics ofthewaves that could beused to determinethedepth theseabed.

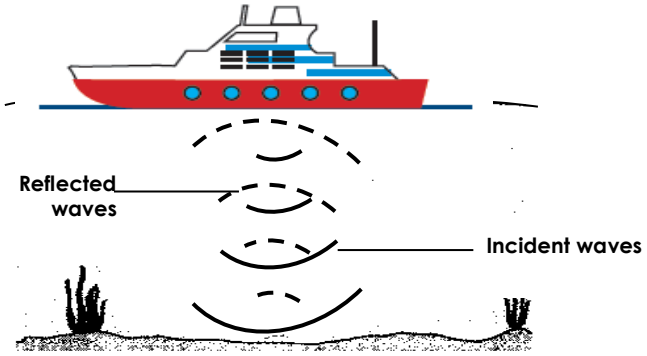


Diagram 2

(a) Stateonephenomenon ofwaves that produces ' echo'

[1 *mark*]

(b) Microwaves is usedto detect theposition of an aeroplane and sonar techniqueis used todetect theshoal offish below theboat.

(i) Statethedifferencebetween radio waves and sound waves.
(ii) Explain whythespeed ofsound isgreaterin waterthan that in air?

[4 *marks*]

(c) Table 2 shows thespecification of fivewaves P,Q,R,Sand T that can beused to determinetheposition ofashoal of fish.

Nameof waves	Typeof waves	Frequency/Hz	Speeds/m s^{-1}	PenetratingPower
P	Transverse	High	$3x10^8$	Low
Q	Longitudinal	Low	330	Moderate
R	Transverse	High	330	Low
S	Longitudinal	High	1500	High
T	Transverse	Low	$3x10^8$	High

Table 2

You arerequired to determinethemostsuitablewaves. Studythewaves based on the followingaspects:

- Thetypeofthewavestransmitted
- Frequency of waves
- Thespeed ofthewaves
- Penetratingpowerofwaves

[10 *marks*]

(d) Thetimetakenforthewave to transmitted and reflected backis 0.07 s. The speed of sound in water is 1500 m s^{-1}
Calculate the depth of the shoal of fish below the boat.

[3 *marks*]

(e) Statetwo otherusesof an echo sounder

[2 *marks*]

Question 3 [Electricity]

3. Diagram 3.1 shows an electrical circuit.

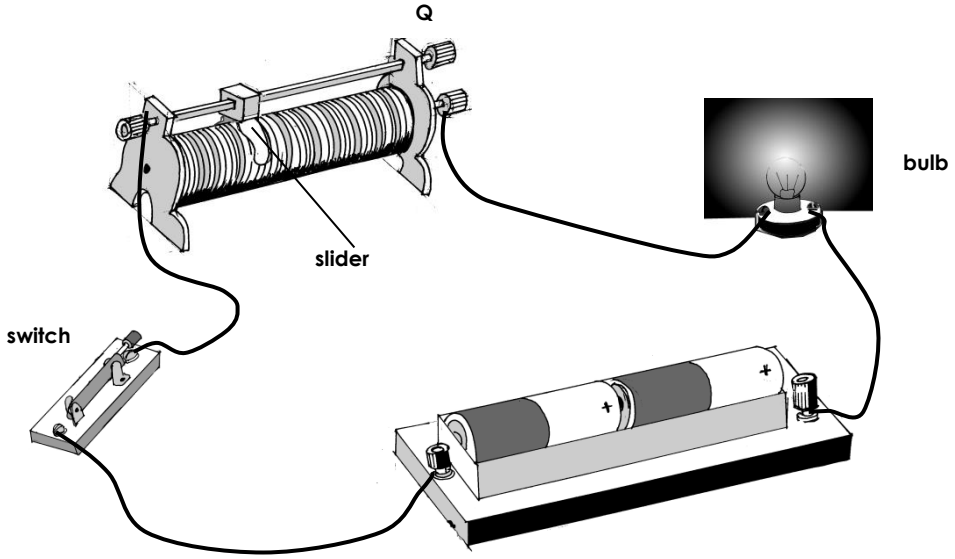


Diagram 3.1

(a) (i) What is the function of rheostat in the circuit ?

[1 mark]

(ii) State the energy transformation occurs at the bulb in the circuit .

[1 mark]

(iii) Draw the diagram of circuit in Diagram 3.1 using symbols.

[1 mark]

(b) Explain why the brightness of the bulb increases when the slider is adjusted close to Q.

[2 mark]

(c) Diagram 3.2 shows an electric circuit consist of two bulbs R and S labeled 6V 3W and 6V 12W respectively connected to a 6V battery.

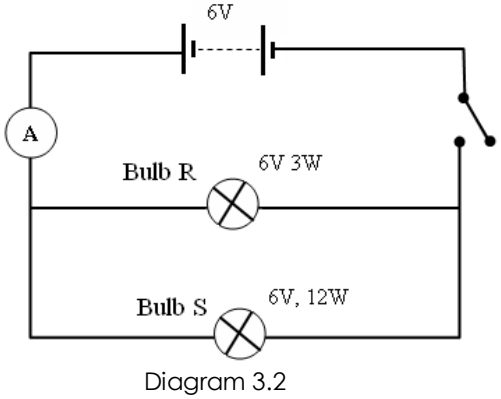


Diagram 3.2

When the switch is turn on, calculate:

(i) the total current in the circuit .

[3 marks]

(ii) the energy used by a bulb , R in one minute.

[2 marks]

(d) National Grid Network is a system of electric transmission from power station to the consumer in our country. Diagram 3.3 shows a block diagram of the system.

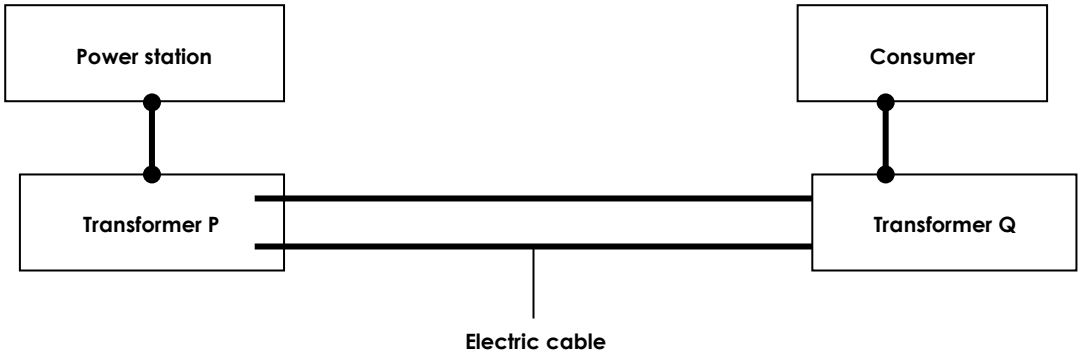


Diagram 3.3

Using your knowledge about electrical and Diagram 3.3 , you are asked to determine the most suitable item used in the system J, K, L, M and N for a National Grid Network system in Diagram 3.4.

System	Type of Transformer	Diameter of conductor cable	Transmission voltage	Cable Position
J	P is step up Q is step down	Big diameter conductor	Current with Low voltage	On the Pylon
K	Q is step up P is step down	Small diameter Conductor	Current with higher voltage	On concrete piller
L	P is step up Q is step down	Big diameter conductor	Current with higher voltage	On the Pylon
M	Q is step up P is step down	Small diameter Conductor	Curent with Low voltage	On concrete pylon
N	P is step up Q is step up	Small diameter Conductor	Current with higher vltage	On concrete piller

Diagram 3.4

Study the specification of the five system and explain the suitability of each based on following aspects;

(i) type of transformer P and Q

(ii) characteristic of cable used

(iii) potential difference transmission of electric

(iv) The position of cable

Explain the suitability of each aspects and determine the most suitable system. Give your reason for your choice.

[10 marks]

Question 4 [Radioactivity]

4 Diagram 4.1 shows a water detection system designed by a student to detect the level of water in a storage tank so that an outlet valve can be opened automatically when the water level is too high.

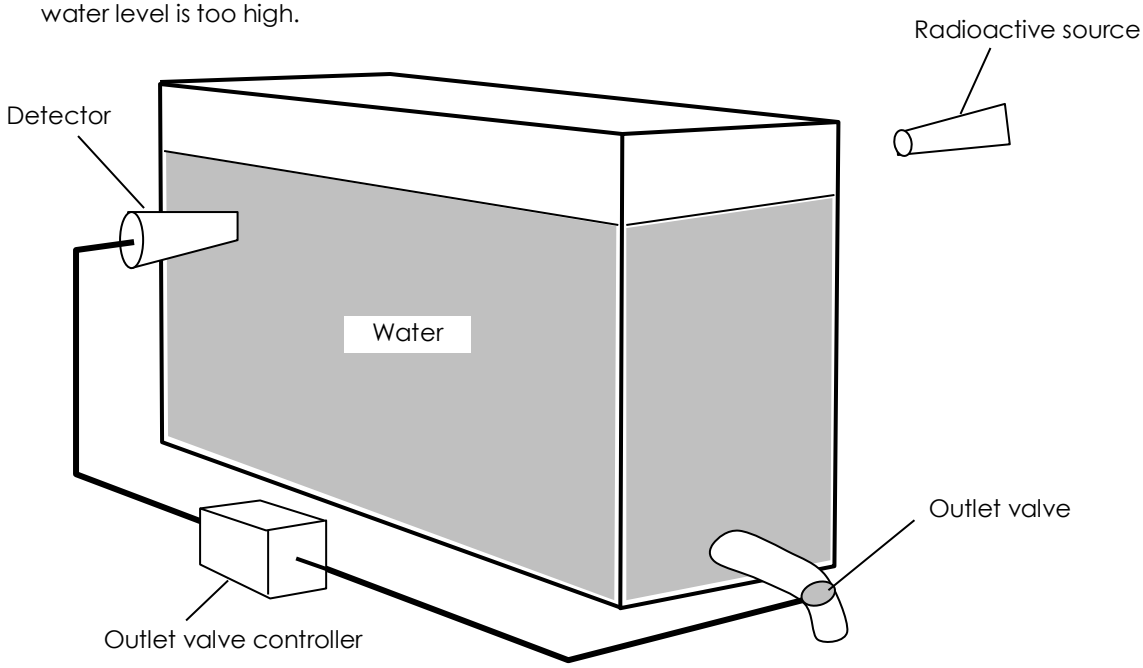


Diagram 4.1

The radioactive source and detector are used to detect the level of water in the tank. The radioactive source contains a radioisotope.

(a) What is the meaning of radioisotope?

(b) Explain how the outlet valve opens when the water level is too high.

[4 marks]

(c) Diagram 4.2 shows the properties of five radioisotopes.

You are required to determine the most suitable radioisotope that can be used as the radioactive source in the water detection system.

Study the properties of all the five radioisotopes based on the following aspects:

(i) Initial activity.

[2 marks]

(ii) Type of radioactive emission.

[2 marks]

(iii) Half life of the radioisotope.

[2 marks]

(iv) The physical state of the radioisotope.

[2 marks]

Explain the suitability of each property and then determine the most suitable radioisotope.
Give the reasons for your choice.

[2 marks]

P

Iodine-133, $^{133}_{53}\mathrm{I}$

Initial activity : 40 counts per minute
Radioactive emission : β

Half-life : 20.8 hours

Changes from solid to liquid at 114 °C

Q

Radon-222, $^{222}_{86}\mathrm{Rn}$

Initial activity : 560 counts per minute
Radioactive emission : α

Half-life : 3.8 days

Changes from liquid to gas at –62 °C

R

Iron-60, $^{60}_{26}\mathrm{Fe}$

Initial activity : 542 counts per minute

Radioactive emission : β

Half-life : 1.5×10^6 years

Changes from solid to liquid at 1538 °C

S

Cobalt-60, $^{60}_{27}\mathrm{Co}$

Initial activity : 300 counts per minute

Radioactive emission : γ

Half-life : 5.3 years

Changes from solid to liquid at 1495 °C

T

Bromine-83, $^{83}_{35}\mathrm{Br}$

Initial activity : 384 counts per minute

Radioactive emission : β

Half-life : 2.4 hours

Changes from liquid to gas at 59 °C

Diagram 4.2

(d) (i) State the number of neutrons in an atom of radioisotope T.

[1 mark]

(ii) The proton numbers of selenium and krypton are 34 and 36 respectively. Which element is produced by the decay of radioisotope T?

[1 mark]

(iii) Write the decay equation for radioisotope T.

[1 mark]

(iv) What is the activity of radioisotope T after 9.6 hours?

[2 marks]

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SET 1

Question 1 [Forces & Motion]

1 A student carries out an experiment to find out the relationship between mass, m, and the oscillation period, T, of an inertia balance. A piece of jigsaw blade is clamped at one end and a plasticine ball with mass 10.0g is fixed at the other end. The distance from the plasticine ball to the clamp is 20.0 cm. The arrangement of the apparatus for the experiment is shown in Diagram 1.1.

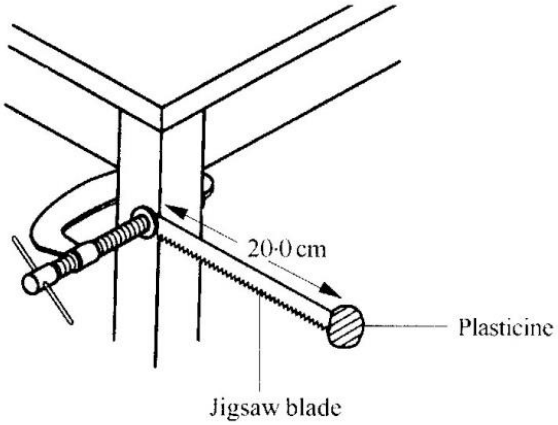
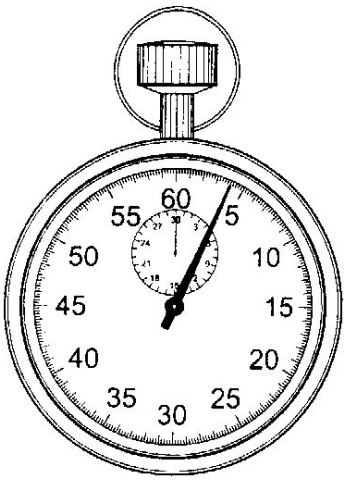


Diagram 1.1

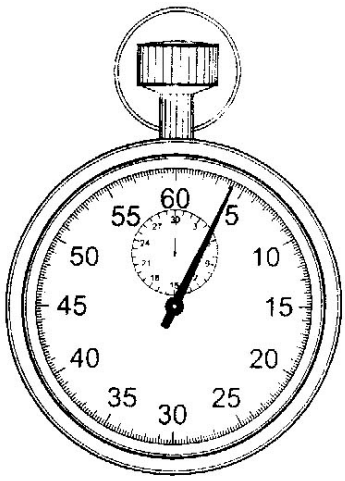
The jigsaw blade is displaced horizontally to one side and then released so that it oscillates. The time for 10 oscillations, t_1, is taken using a stop watch. The jigsaw blade is oscillated again to obtain the time for 10 oscillations, t_2, for the second time. The actual readings of t_1 and t_2 are shown in Diagram 1.2.
The experiment is repeated by using plasticine balls with masses 20.0g , 30.0 g, 40.0 g and 50.0 g. The readings of the stop watch are shown in Diagram 1.3, 1.4, 1.5 and 1.6.

The period of oscillation, T, of the jigsaw blade is given by the following equation:

$T = \frac{t_{mean}}{10}$ where $t_{mean} = \frac{t_1 + t_2}{2}$

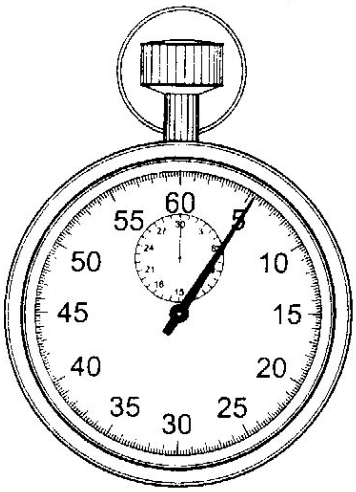


First reading

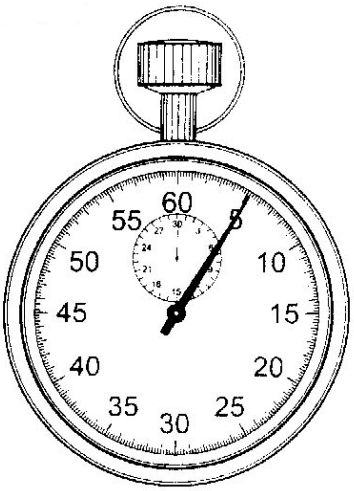


Second reading

Mass of plasticine 10.0 g
Diagram 1.2



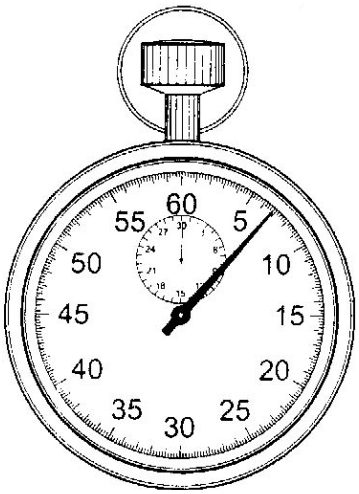
First reading



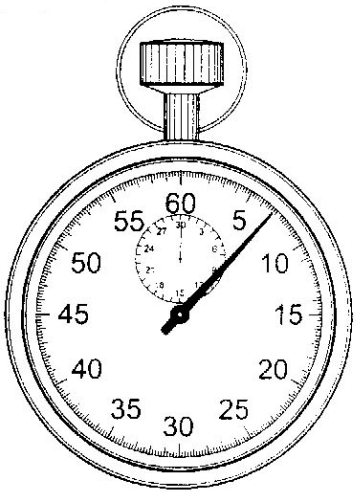
Second reading

Mass of plasticine 20.0 g

Diagram 1.3

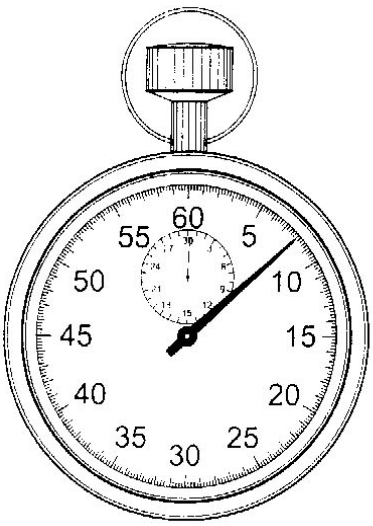


First reading

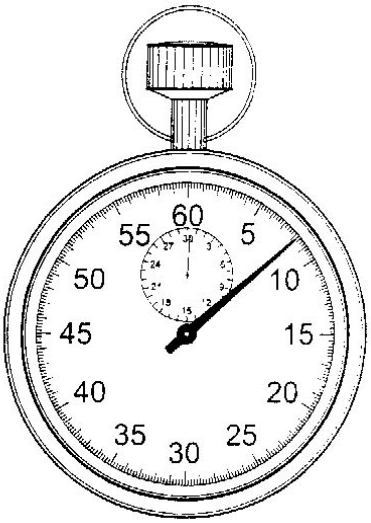


Second reading

Mass of plasticine 30.0 g **Diagram1.4**

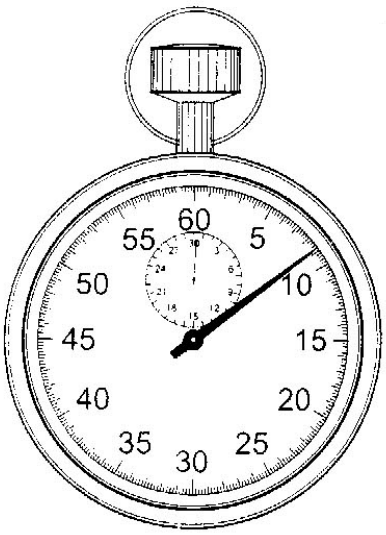


First reading

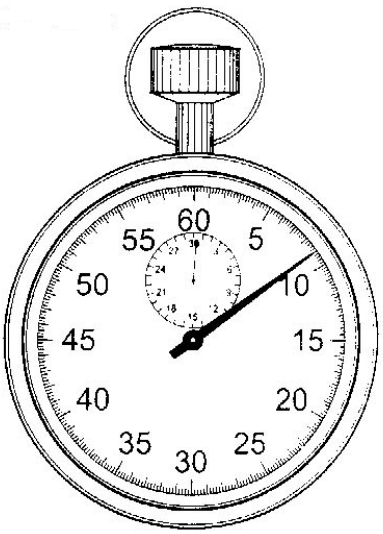


Second reading

Mass of plasticine 40.0 g
Diagram 10.5



First reading



Second reading

Mass of plasticine 50.0 g
Diagram 10.6

(a) For the experiment described above, identify:

(i) the manipulated variable,

……..

[1 mark]

(ii) the responding variable

……..

[1 mark]

(iii) a constant variable

……

[1 mark]

(b) Based on Diagram 1.2, 1.3, 1.4, 1.5 and 1.6, tabulate t_1, t_2, t_{mean}, T and T^2 for each value of m in the space below.

[7marks]

(c) On a piece of graph paper, plot a graph T^2 against m.

[5 marks]

(d) Use your graph to state the relationship between T and m.

[1 mark]

Question 2 [Electricity]

2. A student carried out an experiment to investigate the relationship between the resistance, *R*, and diameter, *d*, of a nichrome wire and to determine the resistivity, ρ, of the nichrome wire. The student used six nichrome wires with different diameters and the length, *l*, of each wire is 100 cm.

The result of the experiment is shown in the graph *R* against $\frac{1}{d^2}$ in Diagram 2 below.

(a) Based on the graph in Diagram 2,

(i) State the relationship between *R* and d^2.

.....

[1 mark]

(ii) Determine resistance of 100 cm nichrome wire, *X*, with diameter of 0.20 mm.

[2 marks]

(b) The resistivity , ρ , of nichrome is given by the formula $\rho = \frac{\pi R d^2}{4l}$

(i) Calculate the gradient, *m*, of the graph.
Show on the graph how you determine *m*.

m = ...

[3 marks]

(ii) Express gradient, *m*, in terms of *R* and d^2.

[1 mark]

(iii) Using the formula $\rho = \frac{\pi R d^2}{4l}$ and the value of m in(b)(i), calculate the resistivity , ρ , of nichrome. Use *l* = 100 cm.

[2 marks]

(c) Another nichrome wire, *Y*, has a diameter of 0.25 mm and a length of 200 cm.

Using the formula $\rho = \frac{\pi R d^2}{4l}$ and the value of ρ in (b)(iii), calculate the resistance of nichrome wire, *Y*.

2 marks]

(d) State **one** precaution that should be taken during this experiment.

[1 mark]

Graph of *R* against $\frac{1}{d^2}$

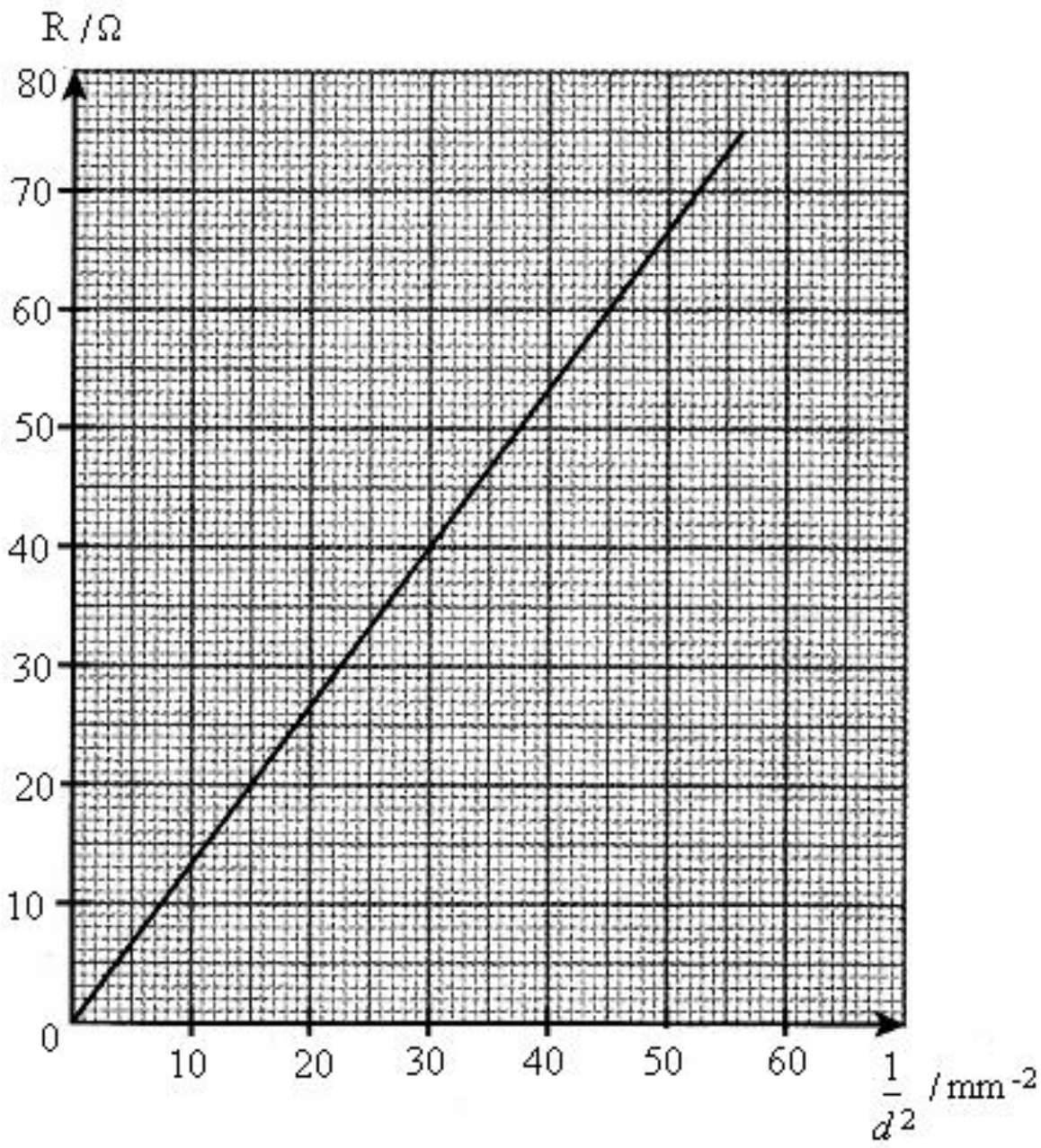


Diagram 2

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SET 2

Question 1 [Heat]

1. A student carries out an experiment to investigate the relationship between the length of air column , ℓ , and the temperature , θ , for a fixed mass of air. The air is trapped by concentrated sulphuric acid in a capillary tube.
Diagram 1.1 shows the thermometer and capillary tube tied on a metre rule. The sealed end of the capillary tube is placed at the zero mark on the scale of the ruler.

The thermometer and capillary tube are placed into a beaker filled with water.
The arrangement of the apparatus is shown in Diagram 1.2

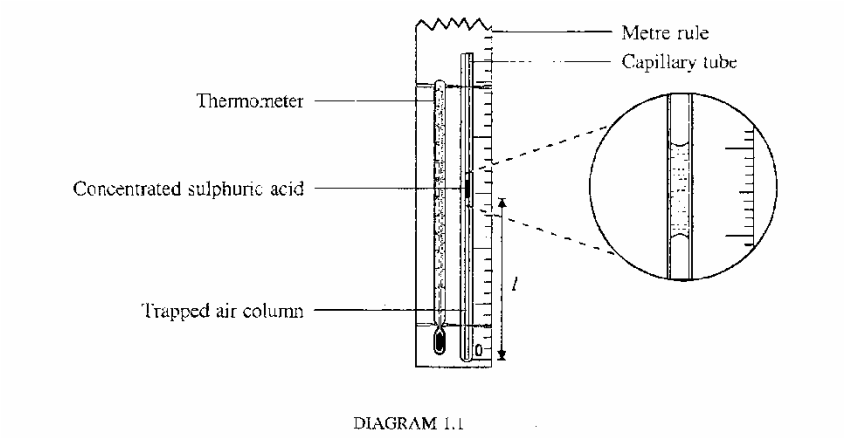

DIAGRAM 1.1

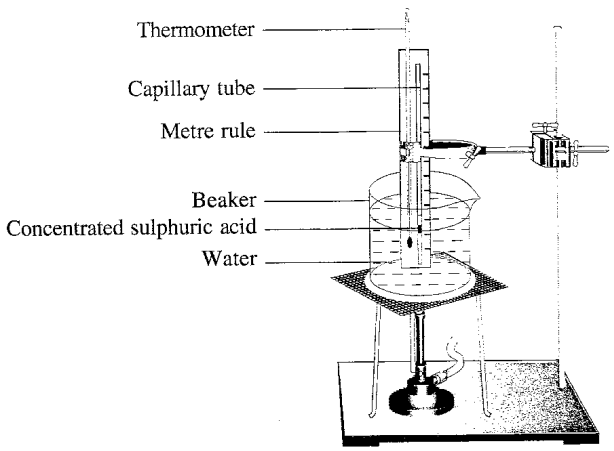

DIAGRAM 1.2

Ice cubes are put into the beaker until the temperature , θ , reaches 0° C. The actual reading of the length of the air column , ℓ, is shown in Diagram 1.4.

Then the beaker is heated until the temperature, θ , reaches 20 °C.
The actual corresponding reading of the length of the air column , ℓ is shown in Diagram 1.5.
The procedure of the heating process is repeated with temperatures , θ = 30 °C , 40 °C, 50 °C , 60° C and 70 °C.

The actual corresponding readings of the lengths of the air column, are shown in Diagrams 1.6 ,1.7 ,1.8 , 1.9 and 1.10.

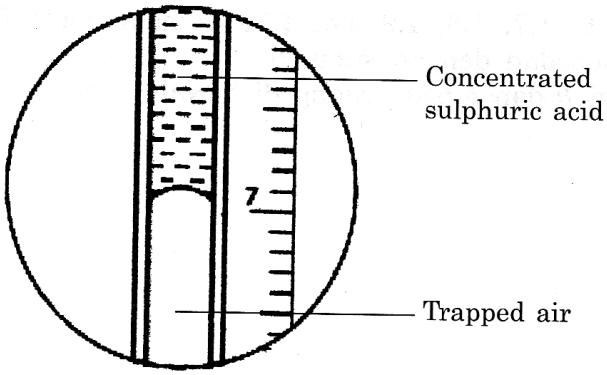

Diagram 1.4
Air column length reading at 0 °C

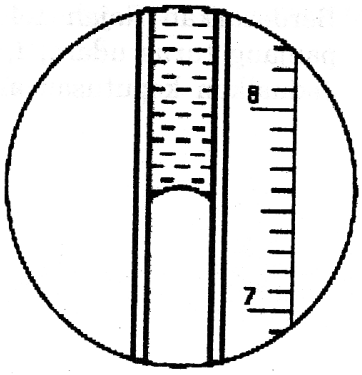

Diagram 1.5
Air column length reading at 20 °C

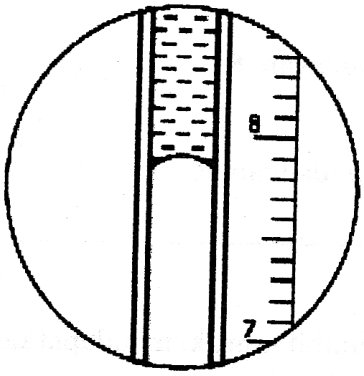

Diagram 1.6
Air column length reading at 30 °C

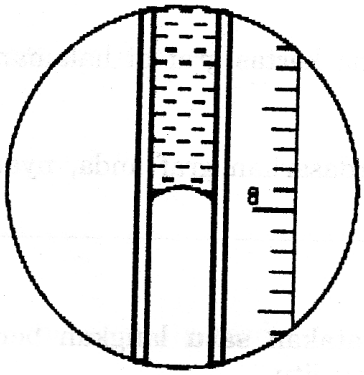

Diagram 1.7
Air column length reading at 40 °C

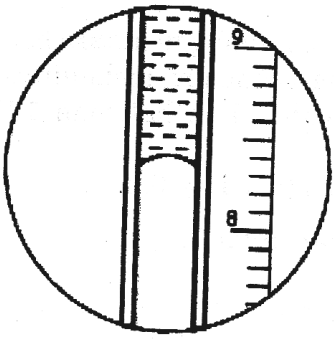

Diagram 1.8
Air column length reading at 50 °C

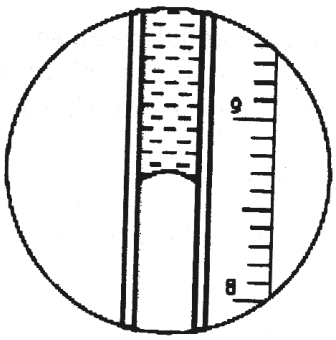

Diagram 1.9
Air column length reading at 60 °C

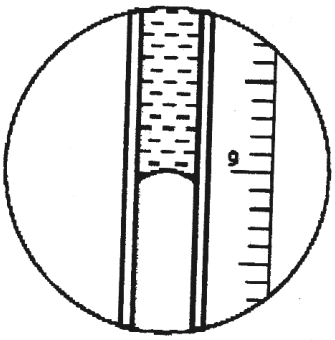

Diagram 1.10
Air column length reading at 70 °C

(a) For the experiment described on page 55, identify :

(i) The manipulated variable

……

[1 mark]

(ii) The responding variable

……

[1 mark]

(iii) The constant variable

……

[1 mark]

(b) (i) Diagram 1.3 shows the meniscus of the concentrated sulphuric acid inside the capillary tube.

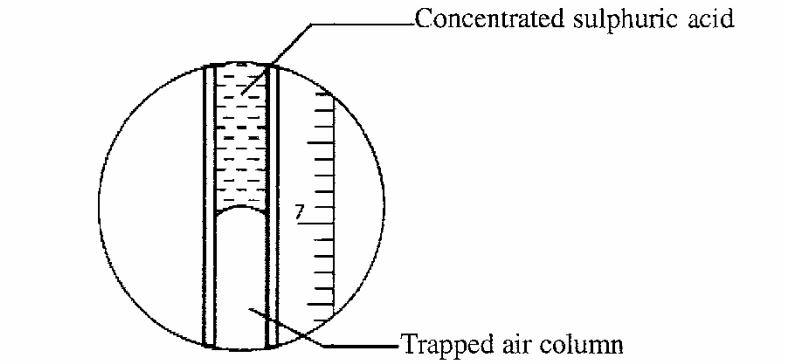

DIAGRAM 1.3

State the correct position of the eye while taking the reading of the length of the air column.

……

[1 mark]

(ii) Based on Diagrams 1.4 , 1.5 , 1.6 , 1.7 , 1.8 , 1.9 and 1.10, determine the lengths of air column , ℓ , and their corresponding temperature , θ . Tabulate your results for θ and ℓ in the space below

(c) On a piece of graph paper , plot a graph of ℓ against θ . [5 *marks*]

(d) Based on your graph , state the relationship between ℓ and θ .

……

[1 *mark*]

(e) State one precaution that should be taken to obtain the accurate readings of ℓ

……

[1 *mark*]

Question 2 [Light]

2 A student carries out an experiment to investigate the relationship between object distance, *u*, and the magnification, *m*, of a convex lens.
The student used different object distance and the corresponding magnification is determined. A graph of $\frac{1}{m}$ against *u* is plotted as shown in Diagram 2.1.

(a) Based on the graph in Diagram 2.1,

(i) state the relationship between $\frac{1}{m}$ and *u*.

.....

[1 *mark*]

(ii) Calculate the image magnification, *m*, if the object distance, *u*, is 25 cm.

[*3 marks*]

(iii) Calculate the gradient of the graph.

[*3 marks*]

(b) (i) Given that $1+\frac{1}{m}=\frac{u}{f}$, where *f* = focal length of the lens
By using the the above equation and the equation of linear motion, y =mx + c, show the relationship between focal length, *f*, and the gradient of graph $\frac{1}{m}$ against *u*.

[*2 marks*]

(ii) Calculate the focal length of the lens used.

[*2 marks*]

(c) State **one** precaution that should be taken in this experiment.

.....

[1 *mark*]

Graph of $\frac{1}{m}$ against u

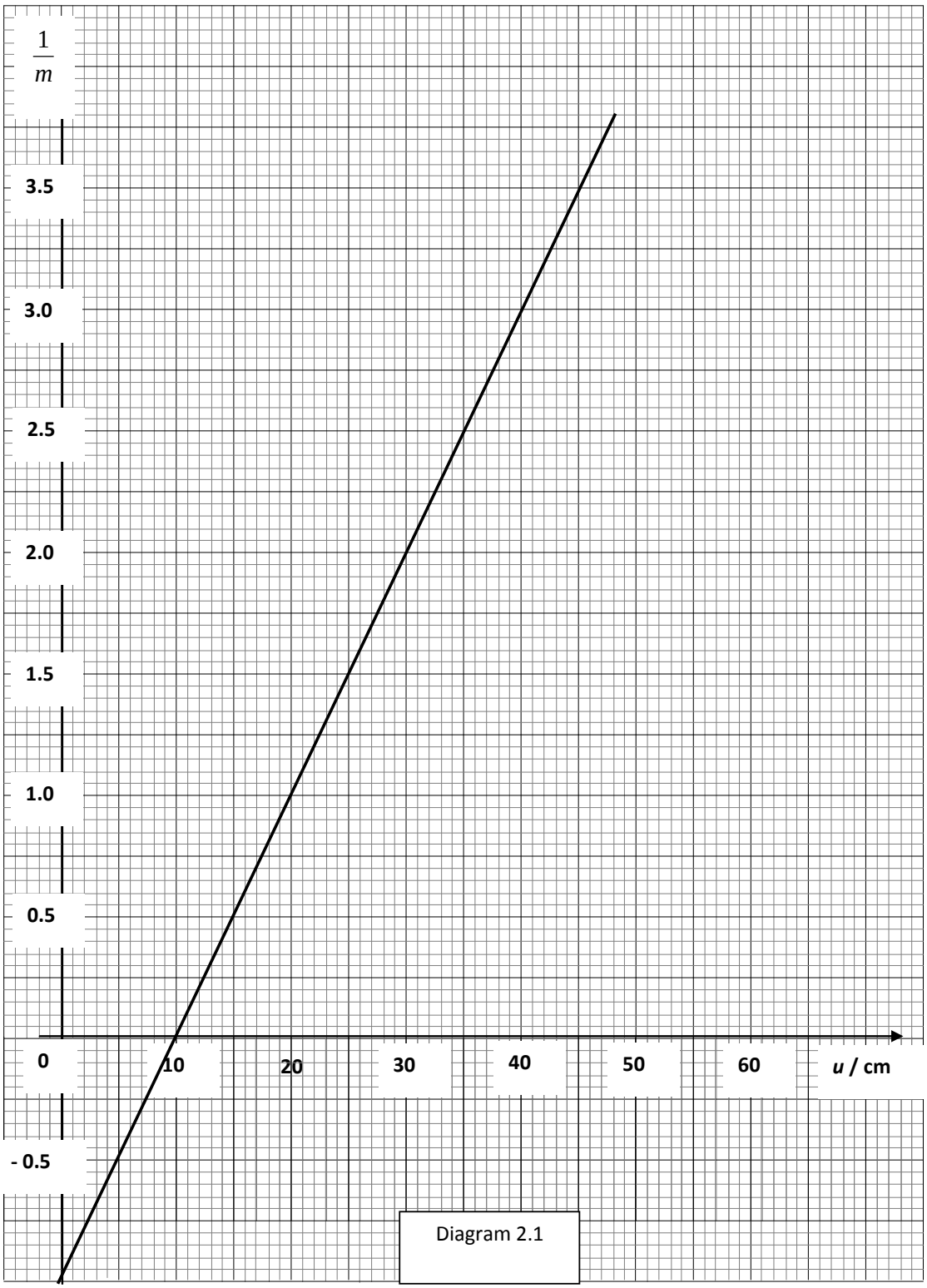

Diagram 2.1

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SET 3

Question 1 [Electronic]

1. A student carries out an experiment to determine the relationship between the collector current I_C to the base current I_B of a transistor.

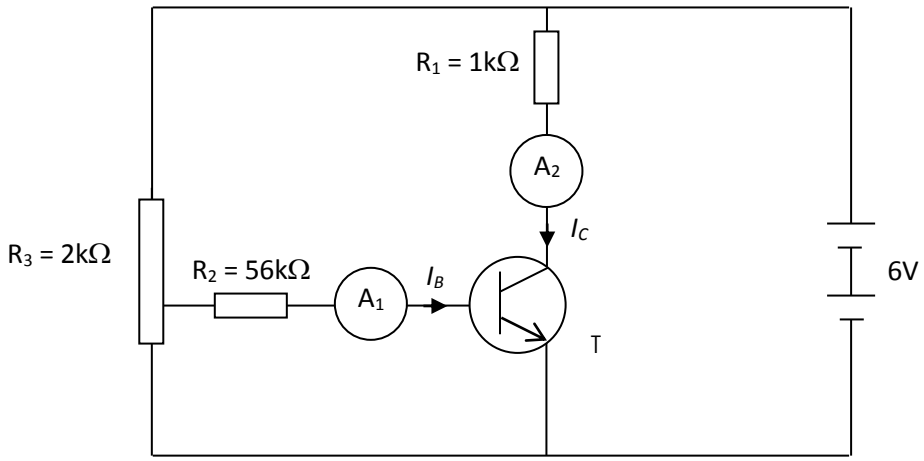
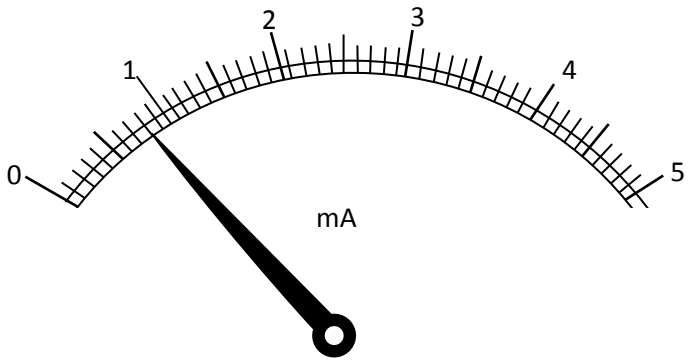


Diagram 1

Transistor T is connected to fixed resistor R_1 =1kΩ and R_2 = 56 kΩ and a rheostat R_3 as shown in diagram 1. The battery supplies a voltage of 6 V to the transistor circuit.

Rheostat R_3 is adjusted until the current I_B detected by microammeter A_1 is 10 μA. The collector current, I_C recorded by miliammeter A_2 is shown in Diagram (a).



(a) I_B = 10μA

Rheostat R_3 is then adjusted to lower value so that microammeter A_1 gives I_B = 20 μA, 30 μA, 40 μA, 50 μA and 60 μA. The corresponding readings of I_C on miliammeter, A_2 are shown in diagram (b), (c), (d), (e) and (f).

(a) For the experiment described identify

(i) the manipulated variable : .....

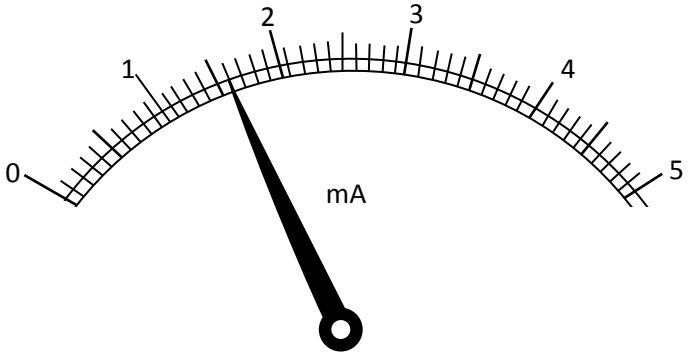
[1mark]

(ii) the responding variable : .....

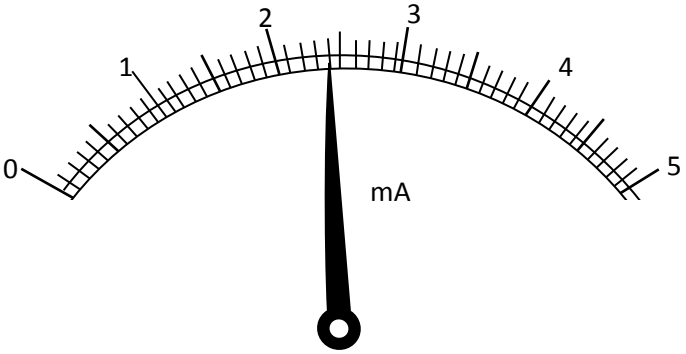
[1mark]

(iii) the fixed variable : .....

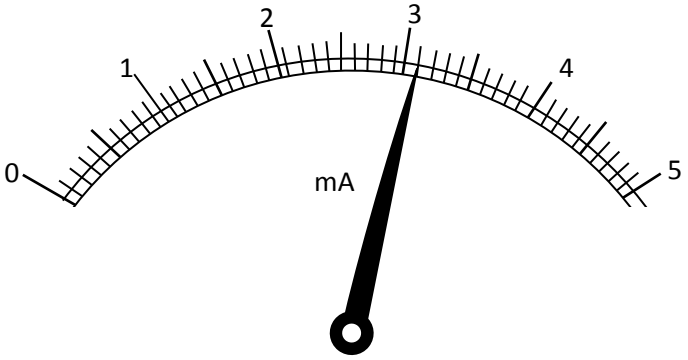
[1mark]



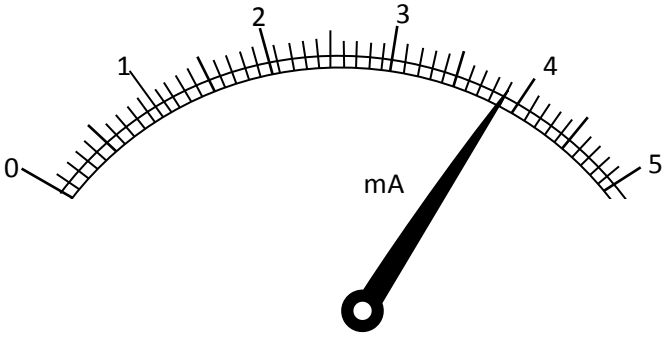
(b) I_B = 20μA



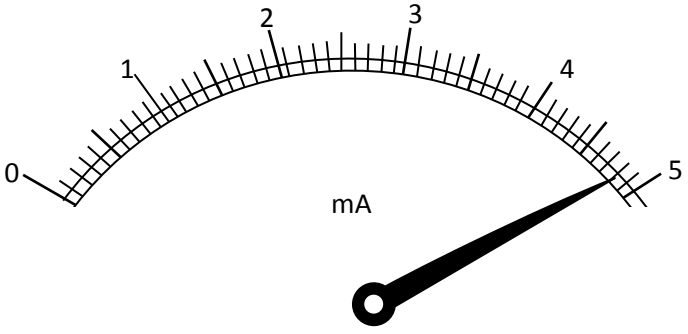
(b) I_B = 30μA



(c) I_B = 40μA



(d) I_B = 50μA



(e) I_B = 60μA

(b) From the diagram, record the collector current, I_C when I_B = 10, 20, 30, 40, 50 and 60μA. Tabulate your results for I_B and I_C in the space given below.

[7 marks]

(c) On a graph paper, draw a graph of I_C against I_B.

[5 marks]

(d) Based on your graph, determine the relationship between I_C and I_B.

[1 mark]

Question 2 [Forces & Motion / Waves]

2. A student carries out an experiment to investigate the relationship between elasticity of a spring, *k* and the period of oscillation, *T* of a steel spring. The student uses springs of different elasticity and record the corresponding period, *T*, and fixes the mass, *m* of the weight used.

The student then plots a graph of T^2 against $\frac{1}{k}$ as in Diagram 2.

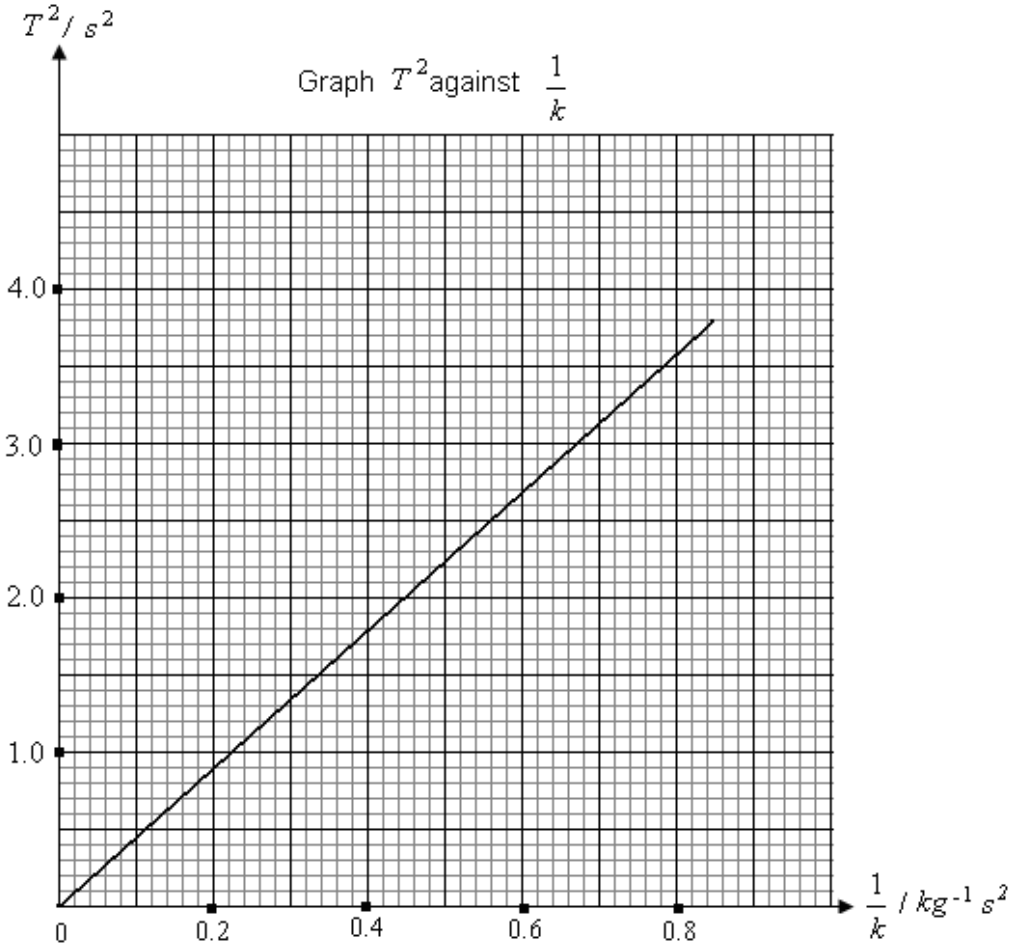


Diagram 2

(a) Based on the graph in Diagram 2,

(i) what happen to *T* when *k* increased?

……

[1 *mark*]

(ii) find the period, *T*, if $\frac{1}{k}$ is 0.9. Show on the graph how you find T.

[3 *marks*]

(iii) calculate the gradient of the graph. Show on the graph how you determine the gradient.

[3 *marks*]

(b) Using the value obtained in (a)(iii) and equation $T^2 = 4\pi^2 \frac{m}{k}$, calculate the weight mass, m, used.

[4 *marks*]

(c) What happen to *T* if the experiment is conducted in the region has a small acceleration due to gravity?

……

[1 *mark*]

Sekolah Berasrama Penuh

2013

X A-PLUS

MODULE

PHYSICS

http://cikguadura.wordpress.com/

TEACHER'S GUIDE

NAME : .....

SECTION II : CONCEPTUALIZATION [Paper 2 Section B] http://cikguadura.wordpress.com/

Question 1 [Forces and Motion]

M1 the total momentum in Diagram 1.1 is zero
M2 Total momentum before the cannon is fired = total momentum after the cannon is fired.
M3 the magnitude of the momentum of the cannon and cannonball is equal
M4 the direction of the momentum of the cannon and cannonball is opposite
M5 the physics principle : Principle of Conservation of Momentum

Question 2 [Forces and Motion]

M1 The acceleration Diagram 2.1 larger than Diagram 2.2
M2 The rate of change momentum Diagram 2.1 more than Diagram 2.2
M3 The time impact in Diagram 2.1 more than Diagram 2.2
M4 When the time of impact is smaller, the rate of change of momentum is large
M5 When the acceleration is larger, the rate of change of momentum is large

Question 3 [Forces and Motion]

(a) the thickness of rubber in Diagram 3.1 is thinner than rubber in Diagram 3.2
(b) M1 Distance travelled by the stone in Diagram 3.4 is longer than in Diagram 3.3
M2 extension is same
(c) M1 Elastic Potential energy → kinetic energy
M2 Principle of conservation of energy

Question 4 [Forces and Pressure]

(a) M1 h_1 is higher than h_2
M2 difference in height of the water in the manometer in Diagram 4.1 is
(b) Pressure
(c) The greater the depth of thistle funnel, the greater the difference in height of the water in manometer / when h increases, the difference in height of the water in manometer also increase.
(d) As depth of liquid increases, the pressure also increases.

Question 5 [Forces and Pressure]

M1 The altitude of mountain peak > the altitude of foothill
M2 The P_{atm} at mountain peak < The P_{atm} at foothill
M3 The density of air at mountain peak < the density of air at foothill
M4 When the altitude increases, the atmospheric pressure decreases
M5 When the density of air decreases, the atmospheric pressure decreases

Question 6 [Forces and Pressure]

M1 the volume of water displaced by the glass tube in Diagram 6.1 is smaller
M2 the weight of the glass tube filled with lead shots in Diagram 6.1 is smaller
M3 the buoyant force acted on the glass tube filled with lead shots in Diagram 6.1 is smaller
M4 When the volume of water displaced increases, the buoyant force increases
M5 Physics concept : Archimedes' principle.

Question 7 [Forces and Pressure]

M1 The level of the ball in the oil immerses more than in the water
M2 Volume of oil displaced by the ball is larger than the water
M3 Density of water is larger/ greater than oil

M4 when the density of the liquid increases, the volume of liquid displaced decreases.
M5 the weight of the ball = the weight of the liquid displaced
M6 Archimedes' principle

Question 8 [Forces and Pressure]

M1 The cross sectional area of nozzle in Diagram 8.1 > 8.2
M2 The distance between two streams of water in 8.1 > 8.2 // $x_1 > x_2$
M3 The bigger the cross sectional area the lower the speed of air // vice-versa
M4 The higher the air pressure between the two streams the longer the distance between two streams of water. // vice-versa
M5 The higher the speed of air had blown, the lower the air pressure between the two streams of water.

Question 9 [Heat]

M1 Mass of the water in diagram 9.1 < 9.2
M2 The reading in of thermometer in 9.3 < 9.4
M3 The rate of heat loss from water in Diagram 9.3 >9.4
M4 Mass decreases, the rate of heat loss is increases
M5 When the mass increases quantity of heat increases

Question 10 [Heat]

(a) (i) the mass of air before and after its being heated is same
(ii) the volume of the air in Diagram 10.1 is smaller
(iii) the temperature of the air in Diagram 10.1 is smaller
(iv) the pressure of the air is same
(b) when the temperature increases, the volume of the air increases
(c) gas law : Charles' Law

Question 11 [Light]

M1 Object distance in Diagram 11.1 is shorter than Diagram 11.2
M2 Size of image formed in Diagram 11.1 is bigger than in Diagram 11.2
M3 Image distance in Diagram 11.1 is bigger
M4 The shorter the object distance, the bigger the size of the image formed
M5 When the object distance is shorter, the magnification scale is bigger

Question 12 [Light]

M1 The radius of curvature in Diagram 12.1 is greater than in Diagram 12.2 .
M2 The focal length for mirror P /Diagram 12.1 is smaller than for mirror Q/Diagram 12.1.
M3 The angle of reflection in Diagram 12.1 is greater than in Diagram 12.2.
M4 When the curvature of the mirror increases, the focal length decreases // the curvature of a mirror is inversely proportional to the focal length.
M5 when the focal length increases, the angle of reflection decreases

Question 13 [Light]

M1 the size of image in Diagram 13.1 is bigger
M2 the object distance, u, in Diagram 13.1 is smaller
M3 the image distance , v in Diagram 13.1 is bigger
M4 when the image distance increases, the size of image increases
M5 $m = \frac{v}{u}$

Question 14 [Waves]

M1 Length of pendulum X is shorter than the length pendulum metal bob
M2 Frequency of pendulum X is higher than the frequency of metal bob pendulum.
M3 Length and frequency of pendulum Y as same as that of metal bob pendulum.
M4 Amplitude of oscillation of pendulum Y is higher/bigger than amplitude of oscillation of pendulum X.
M5 Resonance

Question 15 [Waves]

M1 the depth of water in region P is bigger
M2 the angle of deviation when the waves move into region P is smaller
M3 the wavelength of the waves in Region P is longer
M4 the change of speed of the waves in Region P is smaller
M5 The smaller the change in speed, the smaller the angle of deviation//vice versa

Question 16 [Waves]

(a) M1 Distance between two coherent sources in Diagram 16.2 is bigger than diagram 16.1
M2 The wavelength are the same
M3 The distance between two consecutive antinodal lines in diagram 16.2 is smaller than diagram 16.1
(b) As the distance between two coherent sources increases, the distance between two consecutive antinodal lines decreases.

Question 17 [Electricity]

M1 Reading of ammeter is the same
M2 The brightness of filament lamp in Diagram 17.1 is brighter than Diagram 17.2 // vice versa // Filament M is brighter
M3 The thickness of wire in Diagram 17.1 is bigger // vice versa // Filament M is thinner
M4 The thinner the thickness of wire the brighter the lamp // vice versa
M5 The thinner the thickness of wire the more the heat produced by the lamp.

Question 18 [Electricity]

M1 Bulbs in Diagram 18.2 brighter than bulbs in Diagram 18.1
M2 Effective resistance in Diagram 18.1 > in Diagram 18.2.
M3 The ammeter reading in Diagram 18.2 > in Diagram 18.1.
M4 The greater the reading of the ammeter /magnitude of current, the brighter the bulbs light up.
M5 The lower the effective resistance, the higher the magnitude of current flows.

Question 19 [Electromagnetism]

M1 the relative motion is same
M2 The number of turns of the coils in Diagram 19.2 > the number of turns of the coils in Diagram 19.1
M3 The induced current in Diagram 19.2 > the induced current in Diagram 19.1
M4 When the number of turns of coils increases, the change in magnetic field increases
M5 When the number of turns of coils increases, the magnitude of induced current increases

Question 20 [Electromagnetism]

(a) (i) The brightness of bulb in Diagram 20.2 is brighter than Diagram 20.1

(ii) M1 The number of turns of the primary coil is equal

M2 The number of turns of the secondary coil in Diagram 20.2 is bigger

(b) (i) When the number of turns in secondary coil is bigger (than primary coil), the brightness of bulb is greater

(ii) When the induced current (produced) is increases, the brightness of bulb increases

Question 21 [Electronic]

(a) (i) the charge of the cathode ray = Negative/ (-)

(ii) M1 Voltage of EHT in Diagram 21.2 is bigger

M2 The deflection in Diagram 21.2 is bigger

(b) (i) Voltage of EHT increases, the strength of electric field increases // directly proportional

(ii) The strength of electric field increases , the deflection of the cathode ray increases// directly proportional

Question 22 [Electronic]

M1 Amplitude of traces in Diagram 22.1 = Diagram 22.2

M2 Number of complete oscillation in Diagram 22.1 > Diagram 22.2

M3 Period of oscillation in Diagram 22.1 < Diagram 22.2

M4 The higher the number of complete oscillations the shorter the period of oscillation.

M5 The shorter the period of oscillation, the higher the frequency // $T = \frac{1}{f}$

Question 23 [Electronic]

M1 Diagram 23.1, the p end of diode is connected to negative terminal of dry cell

M2 Diagram 23.2, the p end of diode is connected to positive terminal of dry cell

M3 Bulb in Diagram 10.1 does not lights up

M4 No current flow in Diagram 10.1 // Current flow in Diagram 10.2

M5 The bulb will lights up when the p end of diode is connected to the positive terminal of dry cell // vice versa

M6 Current only flow in the circuit when p end of diode is connected to positive terminal of dry cell or in forward bias

Question 24 [Electronic]

(a) (i) the microammeter and the miliammeter has no reading

(ii) Microammeter and miliammeter has reading

(iii) Small change in microammeter reading, change in miliammeter reading is bigger

(b) M1 Ib increase, Ic increase

M2 small change in Ib caused a big change in Ic

Question 25 [Radioactivity]

(a) X : 10 minutes

Y : 5 minutes

(b) time taken for the activity to become half of its initial value for radioactive substance X is bigger // vice versa

(c) The time taken for the activity to become half its initial value is constant

(d) half life

SECTION III : UNDESTANDING [Paper 2 (Section B and C)] http://cikguadura.wordpress.com/

Question 1 (Introduction to Physics)

1. Consistency is the ability of the instrument to give the same readings close to each other when repeated measurement are done
2. each measurement with little deviation among readings/ draw diagram bulls eye target.
3. Accuracy is the ability of an instrument to give a measured reading to the actual reading.
4. The value determined is accurate if it is near to the actual value/ draw diagram bulls eye target.

Question 2 (Force and Motion)

1. Place the pile driver at a certain height
2. Release the steel pile onto the pile driver
3. Causes an impact on the pile driver in a short time
4. Produces high impulsive force on the pile driver

Question 3 (Force and Motion)

(i) 1st: The driver and the car move together with same velocity.
2nd : When the car stops suddenly, the inertia of the driver maintains the forward motion

(ii) 3rd : Wearing a seat belt:
4th : Restrains the body of the driver from being thrown forward//inside or outside the car.
// It slows down the forward movement of the driver when the car stops suddenly

Question 4 (Force and Motion)

1. When the ball on one end is pulled up and let to fall, it strikes the second ball which is at rest and comes to a dead stop.
2. The momentum of the ball becomes zero as its velocity is zero.
3. The Principle of Conservation of Momentum states that in a collision between two objects the total momentum of the objects in the system remains unchanged.
4. The energy and momentum from the first ball is transferred to the second ball and then transmitted through the balls at rest to the ball on the other end.
5. Because the momentum and energy is maintained in this system, the ball on the opposite side will move at the same velocity as the ball that were in initial motion

(any four)

Question 5 (Force and Motion)

1. Wc > frictional force
2. unbalanced force or Resultant force acting
3. Wc = frictional force
4. Resultant force is zero / force in equilibrium

Question 6 (Force and Pressure)

1. The pressure at lowest point in cylinder (point A) is greater than the atmospheric pressure,
2. the liquid flows out at lowest point in cylinder/at the end of rubber tube in cylinder.
3. The pressure in the rubber tube decreases as the water flows out and a partial vacuum is created.
4. The higher atmospheric pressure at point B pushes the water into the tube.The water flows until the liquid surface in cylinder reaches the same level as in beaker.

Question 7 (Force and Pressure)

1. Force, F_1 produce pressure , P_1/ P=F/A
2. pressure transmitted equally/equal / $P_1=P_2$
3. pressure act on A_2 / pressure produce bigger force / $F_2 = PA_2$
4. $A_2 > A_1$ so the output force F_2 is larger

Question 8 (Force and Pressure)

1. The empty bottle moving upwards and float on the surface of water.
2. Buoyant increases when the volume of the immersed empty bottle increases.
3. buoyant force is larger than the weight of the empty bottle when it moves upward
4. Buoyant force equals to weight of the empty bottle when it is floating on the surface of water.

Quesstion 9 (Force and Pressure)

1. The aerofoil shape of the wing causes the speed of airflow above the wings to be higher than the speed of airflow below.
2. According to Bernoulli's principle, when the speed of moving air is higher the pressure is lower.
3. Hence air pressure below the wings is higher compare to above the wings.
4. The difference in pressure produce a resultant / lift force

Question 10 (Heat)

1. Water has high specific heat capacity
2. When water in tube pass through the engine it can absorb large amount of heat.
3. Once water reach the radiator, the heat of the water absorbed by the fin blade of the radiator .
4. The fan in the radiator pushes/blows the heat out of the car.

Question 11 (Heat)

1. When temperature increases, the average kinetic energy increases
2. Rate of collision between the air molecules and wall of the tire also increases.
3. Rate of change of momentum increases
4. Force exerted per unit area increase, so the air pressure increases.

Question 12 (Heat)

1. pressure of air is inversely proportional to the volume of air (Boyle's Law)
2. the pressure inside the air bubbles is equal to the water pressure
3. The pressure at the bottom is high so the volume of air bubbles is small.
4. as air bubble goes up to the surface, the pressure decreases, so the volume of air bubbles increases.

Question 13 (Light)

1. The convex lens is aimed/focused to a distant object (infinity)
2. The screen is adjusted until a sharp image is formed on the screen
3. The distance between the screen and the lens is measured
4. Focal length = distance between the screen and the lens

Question 14 (Light)

1. equation regarding critical angle is $n = 1/\sin c$
2. refractive index for diamond is larger than glass
3. so critical angle for diamond (24.6°) is smaller than glass (48°)
4. The smaller the critical angle, the easier total internal reflection can occur
5. So diamond is more sparkling than glass.

Question 15 (Wave)

1. The sound wave can be heard because it can bend / diffracted around the corner.
2. Sound wave has longer wavelength than light waves.
3. The diffraction of sound wave is more obvious / easier than light waves.
4. The effect of diffraction is more obvious if the wavelength is large enough.

Question 16 (Wave)

1. When the singer sings, she produces a high frequency sound
2. the frequency of the glass equal with the frequecy of the singer's sound
3. both systems are in resonance

4. so the glass will oscillates at its maximum aplitude and it breaks.

Question 17 (Wave)

1. The ship moves up and down with higher amplitude at A.
2. Constructive interference occurs at A.
3. The ship remains calm at B.
4. Destructive interference occurs at B.

Question 18 (Electricity)

1. A parallel circuit can run several devices using the full voltage of the supply.
2. If one device fails, the others will continue running normally
3. If the device shorts, the other devices will receive no voltage, preventing overload damage.
4. A failure of one component does not lead to the failure of the other components.
5. More components may be added in parallel without the need for more voltage.
6. Each electrical appliance in the circuit has its own switch.

Question 19 (Electricity)

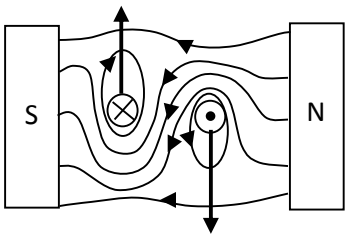
1. '9 V' means 9 J of energy is needed to move 1 C of charge around a complete circuit.
2. The two dry cells are connected in parallel.
3. The effective internal resistance of the two batteries is smaller.
4. So more current can flow.

Question 20 (Electromagnetism)

1. When current flow through the solenoid, a magnetic field is produced
2. The (soft) iron core will be magnetized
3. The scrap metal attracted to the iron core
4. When the current is switched off, the soft iron core will be demagnetised and the scrap metal falls down

Question 21(Electromagnetism)

1. The (magnadur) magnets produce a magnetic field / diagram
2. The current in the wire produces a magnetic field / diagram
3. The two magnetic fields interact/combine to form a resultant / catapult field / diagram
4. Same direction of magnetic field produces stronger resultant magnetic field. Opposite direction cancel each other and produce weaker magnetic field.



Question 22 (Electromagnetism)

1. Coil is rotated, cutting of magnetic flux occurs / change in magnetic flux
2. The unbalanced of magnetic fields induced current in the coil
3. The split ring causes the current in externa circuit to be in the same direction
4. Inertia of coil causes coil to rotate continuosly

Question 23 (Electromagnetism)

(i) Ideal transformer is when the efficiency is 100% / power output equal to power input

(ii) 1. When a.c. voltage is supplied to primary coil, (alternating current will flow) and the soft iron core is magnetized.

2. The magnet produced varies in magnitude and direction.

3. This causes a changing magnetic flux pass through the secondary coil.

4. An induced e.m.f. across the secondary coil is produced

Question 24 (Electromagnetism)

1. The power loss,P, due to the resistance, R, in power line can be reduced, $P = I^2R$
2. So the power loss in the transmissions cable can be reduced by reducing the current, I, in the cables.
3. The power to be transmitted by the cables is P = VI where V = voltage of the cables and I = current in the cables.
4. The current is inversely proportional to the voltage.
5. So increase the voltage in the cable transmission in order to reduce the current in power line
6. Use alternate current because its voltage can be step-up by using a transformer

Question 25 (Electronic)

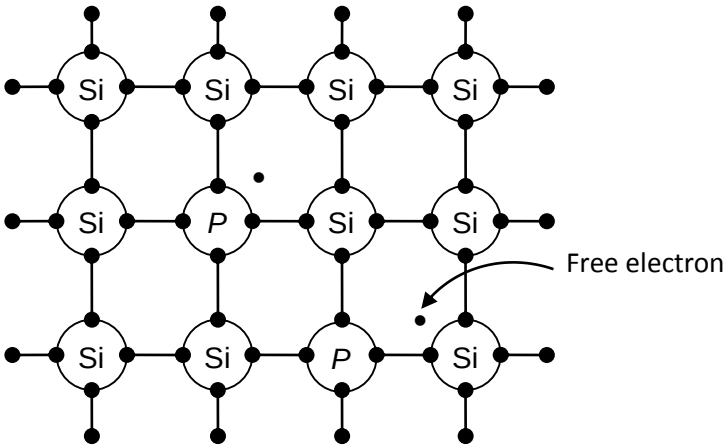
1. The cathode is heated emits electrons
2. The electron / cathode ray is accelerated
3. Cathode rays travel in a straight line
4. Cathode rays is blocked by the maltese cross and formed shadow on the screen
5. Cathode rays carry kinetic energy and converts to light energy when they hit the screen.

Question 26 (Electronic)

1. Connect the dry cell terminal to the Y-input of CRO.
2. The Y-gain setting is recorded
3. The vertical displacement is measured = h.
4. Potential difference = (Y-gain scale) x (Vertical displacement of direct current wave)

Question 27 (Electronic)

1. A pure silicon atom has four valence electrons.
2. Doping process/Silicon is doped with pentavalent atoms/Phosphorus/Antimony
3. To produce 4 covalent bonds with one extra electron
4. The free electrons are the majority carriers and the holes are minority carries.



Question 28 (Electronic)

1. At night resistance LDR increases
2. V_{BE} increases
3. I_b increases and switch on transistor
4. I_c increases and lights up bulb

Question 29 [Radioactivity]

1. Put the radioactive source opposite the detector
2. Detector is connected to the thickness indicator
3. Detector detect the reading of the changes in counts

4. Thickness is measured with the thickness indicator. If the reading of the detector is less than the specified value, the thickness of the paper is too tick/ vice versa

Question 30 [Radioactivity]

(a) Unstable isotopes which decay and emit radioactive particles / ray

(b)1. Radioisotope is injected into the pipe

2. G-M tube as detector is used to find the leakage

3. Reading on detector increases when near a leakage

Question 31 [Radioactivity]

1. Neutron bombarded a uranium nucleus and produced three neutral
2 The new neutron bombarded a new uranium nucleus
3. For every reaction, the neutrons produced will generate a chain reaction
4. Diagram of chain reaction

SECTION IV : PROBLEM SOLVING (QUALITATIVE) [Paper 2 Section A (no.7) & Section B (no.9/10)]

Question 1 [Introduction to Physics]

Suggestion	Explanations
Thermometer is made from transparent glass that is strong	It is not easily broken
The capillary tube is made narrow and thin	It is more sensitive
The shape of the thermometer is round/streamline	It has a magnifying effect
The liquid has low freezing point	It can measure very low temperature/ not freeze at low temperature
Thin glass bulb's wall	Absorb / transfer heat faster

Question 2 [Forces & Motion]

Suggestion	Reason
Aerodynamic shape / stream line/ torpedo	Reduce air resistance
Low density material // Strong material// high boiling point	Lighter // Does not break easily// does not melt easily
Has liquid oxygen	Boosting combustion // supply oxygen for combustion
Retro rocket /Has several stages that can slip/strip off	To decrease mass
Increase the size of combustion chamber	More space for the fuel to be burnt

Question 3 [Forces & Motion]

Suggestion	Reason
Strong material	Do not break easily
Low density	Small mass / lighter //o increase the acceleration
Streamline javelin	To reduce air resistance
The athlete runs with high speed /has to increase his speed/acceleration	To increase kinetic energy/energy/force/ momentum
Throw at an angle of 45^{o} / Throw with a great force	To get maximum horizontal distance of throwing

Question 4 [Forces & Motion]

Suggestion	Explanation
Shape of the shuttle – conical shape /oval /diagram / aerodynamic	Allow for better / fast air flow//produce more lift force // reduce air resistance
Material used for shuttle – feather / small mass/ low density	Light// high velocity/ acceleration //further distance travelled//reduce inertia // smaller mass
Material used for base of the shuttle – cork/ small mass/ low density	Light// high velocity/ acceleration //further distance travelled//reduce inertia // smaller mass
Material used for the string of the racquet – strong/ low elasticity	Not easily broken //withstand high force
High tension	Short time impact// high impulsive force

Question 5 [Forces & Pressure]

Suggestion		Reason
1	Balloon should be large size	To create sufficient buoyant force due to greater weight of surrounding air displaced.
2	Balloon material is made of light weight material like nylon	The total weight of the balloon is less than the buoyant force//reduce weight
3	Balloon material should also have a high melting point.	It will not disintegrate when exposed to hot air
4	The part of the balloon (the skirt) near the burner must be fire resistant /coated with fire resistant material	So that it doesn't catch fire easily
5	The burner burns (liquefied) propane/gas	Warms up the air in the balloon
6	A large fan is needed initially	To blow enough air into the balloon
7	The basket must be made off light and flexible/safe material (e.g. rattan or cane woven)	Prolong the collision time between basket and ground// reduce impulsive force when basket hits the ground
9	Best times to launch the balloon are early morning and late afternoon when the air is cooler	Cool air is denser, providing more buoyant force

Question 6 [Heat]

Suggestion	Reason
Specific heat capacity of the wok is low	Heat up faster / temperature increase faster
Thermal conductivity of the wok is high	Can conduct heat faster
Melting point of wok is high	Can withstand high temperature
Specific heat capacity of the oil is low	Heat up faster
Boiling point of oil is high	Will not change to vapour easily // cooking at higher temperature

Question 7 [Heat]

Suggestion	Reason
Put ice in the cointainer	Ice absorbs heat out from the packet drinks.
Add a little water to the ice	Heat transfer is faster through the heat conduction.
Container has high specific heat capacity	Heat up slower.
White container	Does not absorb heat
Insulator // low density	Avoid absorb heat from outside into the container // lighter

Question 8 [Heat]

Suggestion	Reason
Concave mirror	Sunlight ray will converge / focus to the tank // absorb more heat
Radius of curvature is smaller	Reflect more light /focus light at shorter distance// reduce energy lost
Black	Absorb more heat
Low specific heat capacity	The temperature rise up faster
Bigger size	Receive/collect more light

Question 9 [Light]

Suggestion	Reason
Convex mirror	The image formed is virtual, upright an diminished
Large diameter	Wider field view
strong	Withstand change in weather / does not break easily

Less thickness	Avoid multiple image formed / clearer image
At the sharp corner	Can reflect the light from opposite direction

Question 10 [Light]

Suggestion	Explanations
The refraction index of inner core must be bigger than refraction index of outer cladding	produce total internal reflection when light travels inside the optical fibre
Buffer coating is proof from water and chemical liquid	Hence the fibre is not damage by water and liquid
A small diameter of optical fibre	hence easy to push the body and not injured the organ
The density of the fibre must low	so that easy to handle
Fibre must be made up by a strong and high flexibility material	so that the endoscope can be used in any situation, small places or not straight line

Question 11 [Electricity]

Suggestion	Reason
Attach switch for each lamp	To allows each lamp to be switched on and off independently
Connect the metal fitting lamp to the earth wire/cable	To flows electron (extra) to earth to avoid lethal shock
Parallel	Voltage across both bulbs is 240 V / if one bulb blows another bulb can still function.
Using only 240 V light bulb	To ensure the bulbs light up with normal brightness
Step down transformer / adapter	Reduce the voltage from 240 V to 12 V.

Question 12 [Electromagnetism]

Suggestion	Reason
Soft spring	Give a greater sensitivity/ can detect small changes
Small density	Small mass / light
Curve in shape of the magnet	Radial magnetic field, create uniform strength of magnetic field around the coil
copper coil	To reduce energy loss / Low resistance material of the coil
Place the seismometer in direct contact with the earth	to convert very small motions of the earth into electrical signals

Question 13 [Electromagnetism]

Suggestion	Explanations
Material for plastic cup with low density	to reduce the mass of the cup.
Speed of rotation of the cup is higher with small change in wind speed	to produce higher induced current.
The surface area and size of the plastic cups are larger	Can capture more wind so that it can be rotated even by slower wind
Use magnet of stronger magnetic field	Rate of magnetic flux change is higher to produced larger induced current. Hence can detect small change in wind speed.
Mass of magnet must be small	Speed of rotation of the magnet becomes higher to produced larger induced current
The number of turns of the solenoid wire is increased	The rate of magnetic flux change is higher even with small rotation speed of anemometer. Hence, can produced larger induced current to cause larger deflection in the pointer
The wire used for the solenoid must have low	Induced current of large magnitude can be

resistance	produced

Question 14 [Electromagnetism]

Suggestion	Explanations
Use strong magnet.	Strong magnet produced strong magnetic field, when a conductor cutting through a strong magnetic field, high emf/current will be induced.
Concave poles of magnet.	Concave poles provide a radial field which ensures the cutting of the magnetic field is always maximum.
Coil with more turns.	More turns mean more conductor cutting through magnetic field, therefore more emf/current is induced.
Diameter of wire	Bigger diameter decreases resistance
Speed of rotation	High speed to increase the rate of change of magnetic induction.

Question 15 [Electronic]

Suggestion	Reason
OR gate	The gate's output is ON if either one sensor is ON
Thermistor	Resistance decrease when temperature increase
At R1 and R2	Base voltage increase, when the temperature increase. Base current flows, collector current flows. Alarm will triggered.
Replace the lamp or at the collector circuit	It converts the electrical signal into sound energy/ Alarm triggered when collector current flow.
Relay switch	To switch on the alarm which is use a greater voltage

Question 16 [Electronic]

Suggestion	Reason
Filament	To heat up the cathode
Cathode	Emits electrons
Control Grid	Controls the number of electrons// control the brightness of the image on the screen
Focusing anode	Focuses the electrons into a beam
Accelerating anode	To accelerate electrons to towards the screen
Y-plates	To deflect the electron beam vertically
X-plates	To deflect the electron beam Horizontally

Question 17 [Radioactivity]

Suggestion	Reason
Use forceps/robot	The distance between the source and the body is far
Wear a mask/goggle	The radiation does not penetrate our eyes
Use a lead box/container with thick concrete	To prevent radiation leakage to surroundings
Keep the exposure time as short as possible	The body is not exposed to the radiation for a long time
Wear a film bandage	To detect the amount of radiation exposed
Put radiation symbol on the storage box	To inform the users of dangerous contents of the box

Wear coat lined with lead	To protect the body from the radiation

SECTION V : PROBLEM SOLVING (QUANTITATIVE) [Paper 2 Section C (no.11 & 12)]

1	(i) impulse = mv – mu = 1.5 (-35-40) = 112.5 kg ms-1 (ii) Impulsive force = $\frac{mv-mu}{t} = \frac{112.5}{0.8}$ = 140.625 N

2	(i) 900 N (ii) F – 900 N = 1000 (2) F = 2 900 N

3	(i) $v = \frac{18 \times 1000}{60 \times 60} = 5$ ms-1 $a = \frac{v-u}{t}$ $= \frac{5-0}{10}$ = 0.5 ms-2 (ii) F = ma = (202) (0.5) = 101 N

4	(i) Spring constant P , $k = \frac{F}{x} = \frac{6N}{12\ cm}$ $= 0.5\ Ncm^{-1}$ Spring constant Q, $k = \frac{F}{x} = \frac{3N}{12\ cm}$ $= 0.75\ N\ cm^{-1}$ (ii) $W_P = \frac{1}{2} kx^2 = \frac{1}{2}(0.5)(0.1)^2 = 0.0025$ J

5	(i) Buoyant force = weight of the boat $\rho V g = 250\ (10)$ $V = \frac{2500}{1000 \times 10}$ $V = 0.25\ m^{-3}$ (ii) Weight of the boat + weight of the load = buoyant force $2500 + W_{Load} = 1000\ (4)\ (10)$ $W_{Load} = 40\ 000 – 2500$ = 3 7500 N Mass of load = 3 750 kg

6	(i) F = 500 x 40 = 20 000 N (ii) Resultant force = 20 000 – 800 (10) = 12000 N (ii) F = ma $a = \frac{12\ 000}{}$

	800 =15 m s^{-2}

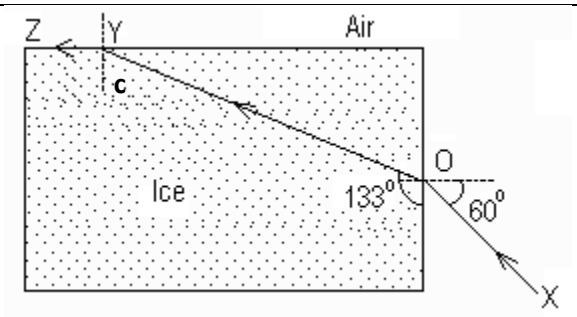
7	(i) $\frac{F1}{A1} = \frac{F2}{A2}$ $F2 = \frac{6 \times 1.2}{0.2}$ = 36 N (ii) $V_1 = V_2$ $A_1h_1 = A_2h_2$ $h_2 = \frac{1.2\ (0.2)}{1.2}$ = 0.2 cm

8	(i) F = ρVg = 1020 (2)(10) = 20 400 N (ii) Buoyant Force = weight of the boat + weight of the box 20 400 N = 15 000 + W W = 5 400N

9	(i) Mass,m = ρV = 800 x 0.004 = 3.2 kg (iii) Pt = mcθ 2 500 (t) = 3.2 (2 000) (130) t = 332.8 s

10	(a) (i) P = atmospheric pressure = 75 cm Hg (ii) P_{gas} = 75 + 25 = 100 cm Hg (b) (i) When the gas is cooled down, the kinetic energy of the gas decreases, reducing the rate of collision between the gas molecules and the container, therefore pressure reduced. (ii) P = atmospheric pressure = 75 cm Hg (iii) T_1 = 127 + 273 = 300 K P_1 = 100 cm Hg P_2 = 75 cm Hg $T^O = \frac{300 \times 75}{100}$ = 75 K (iv) Pressure Law

11	(a) Directly proportional (b) $n = \frac{H}{h}$ $h = \frac{4.5}{1.33} = 3.38$ m (c) h become smaller (h inversely proportional to n) (d) H = 4.0 m, n = 1.33 $h = \frac{4.0}{1.33} = 3.0$ m Base appear from the surface = 3.0 + 0.5 = 3.5 m

12	(a)  (b) C = 180° - (133° = 47° (c) n = 1/sin 47° = 1.37 (d) 1.8 = 1/sin C C = 33.7° Refractive index will be smaller

13	(i) 1/f = 1/u + 1/v 1/-15 = 1/20 + 1/v v = - 8.6 cm (ii) Magnification = v/u = 8.6 / 20 = 0.43 (iii) virtual, upright and diminished

14	(i) 1/f = 1/v + 1/u 1/5 = ½ +1/v v = -3.33 cm (ii) m = v/u =3.33/2 = 1.67 times

15	(i) 4 cm (ii) 5 Hz (iii) 20 cm s^{-1}

16	(a) (i) $R_L = \frac{V}{} = \frac{2.4}{} = 8\ \Omega$

	I 0.3 (iii) $R_L + R_P = \frac{V}{I} = \frac{6}{0.3} = 20\,\Omega$ $R_P = 20 - 8 = 12\,\Omega$ @ $R = V/I = (6 - 2.4)/0.3$ (iv) $P = I^2R = (0.3)^2(12) = 1.08$ W (b) (i) brighter (ii) brighter (c) (i) effective resistance at the parallel circuit, $R_S = 4\,\Omega$, Total resistance = 12 + 4 = 16 Ω $V = \frac{4}{16} \times 6 = 1.5$ V (ii) $I = \frac{V}{R} = \frac{6}{16} = 0.375$ A

17	(a) E = 12 V (b) (i) E = V + Ir 12 = V + (3)1) V = 12 – 3 = 9 V (ii) $R = \frac{V}{I} = \frac{9}{3} = 3\,\Omega$ (c) (i) $E = IR_S + Ir$ $12 = 6(1/3 + 1/R)^{-1} + 6$ $= 6\left(\frac{R+3}{3R}\right)^{-1} + 6$ $1 = \frac{(3R)}{R+3}$ R + 3 = 3R R = 1.5 Ω (ii) $R_S = (1/3 + 1/1.5)^{-1}$ $R_S = 1\,\Omega$ $V = IR_S = (6)(1) = 6$ V

18	(i) $\frac{Np}{Ns} = \frac{Vp}{Vs}$ $= \frac{240}{12} = 20$ Ratio = 20 : 1 (ii) P = IV I = 60 /12

	= 5 A (iii) $80 = \frac{P_O}{P_i} \times 100$ $80 = \frac{60 \times 100}{I_P\ (240)}$ $I_P = 0.3125$ A

19	(a) $\frac{N_P}{N_S} = \frac{V_P}{V_S}$ $\frac{4000}{300} = \frac{240}{V_S}$ $V_S = \frac{(300)(240)}{400} = 18$ V (b) (i) $P = VI$ $I = P/I$ $= \frac{36}{18} = 2$ A (ii) $R = \frac{V}{I} = \frac{18}{2} = 9\ \Omega$ (iii) Efficiency $= \frac{P_O}{P_i} \times 100\ \%$ $= \frac{36 \times 100\%}{(0.2 \times 240)} = 75\ \%$

20	(a) Gravitational Potential Energy →Kinetik Energy → Electrical Energy (b) $\frac{V}{t} = 0.5$, $m = V\rho$ $P = \frac{E}{t} = \frac{mgh}{t} = \frac{V\rho gh}{t} = \frac{(1000)(0.5)(10)(80)}{1}$ $= 4 \times 10^5$ W

21	(a) Voltage drop along the transmission line due lost to heat (b) (i) $I = \frac{P}{V} = \frac{24}{12} = 2$ A (ii) same (c) (i) $P_O = VI = (9)(2) = 18$W $P_{loss} = 24 - 18 = 6$ W (ii) $P = I^2R$ $R = P/I^2 = 6/2^2 = 1.5\ \Omega$

22	$eV = \frac{1}{2} m_e v^2$ $1.6 \times 10^{-19} (3 \times 10^3) = \frac{1}{2} (9.0 \times 10^{-31}) v^2$

	$v = 3.27 \times 10^7 \text{ m s}^{-1}$

23	(a) $t = 8 \times 50 \times 10^{-3} \text{ s} = 0.4 \text{ s}$ (b) $S = \frac{vt}{2} = \frac{(3 \times 10^8)(0.4)}{2}$ $= 6 \times 10^7 \text{ m}$

24	(a) 12 V (b) $P_i = VI = (240)(0.5) = 120 \text{ W}$ $P_O = 24 + 24 = 48 \text{ W}$ Efficiency $= \frac{P_O}{P_i} = \frac{48}{120} \times 100\%$ $= 40\ \%$

25	(a) 6V (b) (i) 3 V (ii) alarm will function because NO > 1V (c) $\frac{500}{4500} = \frac{V_Q}{6}$ $V_Q = \frac{6(500)}{4500} = 0.667\text{V} < 1\text{V}$ (d) (i) When $\theta = 200^\circ\text{C}$, T = 1750 $\frac{R_Q}{1750} = \frac{1}{5}$ $R_Q = 350\ \Omega$ (ii) $\frac{1000}{R_T} = \frac{1}{5}$ $R_T = 5000\ \Omega,\ \theta = 55^\circ\text{C}$

26	(i) 1 → ½ → ¼ → 1/8 $3T_{½}$ = 3 X 8 days = 24 days (ii) 32 days = 32/8 = 4 $T_{½}$ 20 mg→ 10 mg→ 5 mg→ 2.5 mg→ 1.25 mg Or (½)4 X 20 = 5/4 = 1.25 mg

27	(a) Mass defect = 209.982 - (205.969 + 4.004) = 0.009 u $= 0.009 \times 1.66 \times 10^{-27} \text{ kg}$ $= 1.494 \times 10^{-29} \text{ kg}$ (b) $E = mc^2$ $= (1.494 \times 10^{-29})(3 \times 10^8)^2$ $= 1.345 \times 10^{-12} \text{ J}$ (c) $P = \frac{E}{1.345 \times 10^{-12}}$

	t 2×10^{-3} $= 6.73 \times 10^{-10}$ W

SECTION VI : DECISION MAKING [Paper 2 Section C (no.11 / 12)] http://cikguadura.wordpress.com/

Question 1 [Introduction to physics]

Characteristic	Explanation
Smallest 0.1 cm	More sensitive measuring
Range of measurement 0 – 50 cm	Suitable with the size of metal block
Zero error is 0	More accurate, no zero error
Shape of instrument flat and thin	Suitable with the shape of metal block
R	Smallest 0.1 cm, Range of measurement 0 – 50 cm, Zero error is 0 and Shape of instrument flat and thin

Question 2 [Forces & Motion]

Characteristic	Explanation
Length of the chain from the bar 210 cm	the frequency of swing oscillations will be higher
Joint of chain to the bar with ball bearing	Reduce the friction, it can rotate smoothly
Angle of V-shape pillar 40°	Increase the stability, low centre of gravity
Soft padded floor	Reduce the impulsive force if the children fall down
M	Length of the chain from the bar 210 cm, Joint of chain to the bar with ball bearing, Angle of V-shape pillar 40° and Soft padded floor.

Question 3 [Forces & Motion]

Characteristic	Explanation
Distance between seat and handle is far (75 cm)	The rider can bend his body to form an aerofoil shape to reduce the air resistance
Density of bicycle's frame is small	Mass of the bicycle will be smaller, lighter
Width of tyres are small (4 cm)	Less friction, increase the speed
With gear	Gear act as a simple machine, less energy used
	Distance between seat and handle is far

Z	(75 cm), Density of bicycle's frame is small, Width of tyres are small (4 cm) and has gear.

Question 4 [Forces & Motion]

Characteristic	Explanation
Low density	Small mass/light
Many/fewer/very few studs	Gives extra/higher grip
Expansion effect is low	Always fits/Does not loosen when hot.
Ability to stretch is good	Less stress on the feet/ Can be pushed in all directions/ Can walk on uneven surface.
Q	Because it has a low density,many studs,low expansion effect and good ability to stretch.

Question 5 [Forces & Pressure]

Characteristic	Explanation
Made of concrete	Stronger / Not easy to break // metal can rust easily
low density	lighter / the structure that hold the tank able to withstand the weight of tank
thicker wall at the bottom // Diagram	able to withstand the higher pressure at the bottom
height from ground is high	to produce a greater difference in pressure
R	Made of concrete, low density, thicker wall at the bottom, height from ground is high

Question 6 [Heat]

Characteristic	Explanation
High specific heat capacity	Can slow down the increase in temperature caused by friction
High melting point	Does not melt easily
Difficult to compress	Pressure will be transmitted uniformly in all directions / will not reduce pressure
High degree of	Can withstand great force / does not break easily
S	Because it has high specific heat capacity, high melting point, difficult to be compressed and has high degree of hardness of the brake pads

Question 7 [Forces & Pressure]

Characteristic	Explanation
Large fluid container	Enough supply of oil
Small surface area of input piston	Produce high pressure
Oil as fluid	Incompressible
Large surface area of output piston	Produce high force
L	Large fluid container, small surface area of input piston, oil as fluid and large surface area of output

	piston

Question 8 [Forces & Pressure]

Characteristic	Explanation
Large balloon	To produce bigger buoyant / upthrust // Increase the volume of the air displaced
Use 2 burners // Many burners	To produce bigger flame // heat up the gas in the balloon faster
Synthetic nylon	Light-weight, strong and air-proof material
High temperature of the air in the balloon	Reduce the density /weight of the air in the balloon
Q	Large balloon, use 2 burners / many burners, use synthetic nylon and has high temperature of the air in the balloon // or combination of the reasons

Question 9 [Forces & Motion]

Characteristic	Explanation
With ABS	Motorcycle does not stop immediately/ can be controlled if direction changes/ does not move side ways / more friction with ABS
Bigger with of tyre	Bigger surface area, better support / low pressure acts on the tyres/ more friction when breaks.
Smaller mass	Lighter, can move faster / low inertia.
Lower seat height	Lower centre of gravity/ more stable/ safer when turn
C	It has ABS, bigger width of tyre, smaller mass, lowest seat height.

Question 10 [Heat]

Characteristic	Explanation
Need safety valve	To release extra steam so that the pressure in the cooker does not reach a dangerous stage
High thickness of the pot	To withstand high pressure
Low specific heat capacity of the pot	Heats up quickly and food will be cooked faster
High specific heat capacity of the handle	Heats up slowly and can be held with bare hands
S	It has safety valve, high thickness, low specific heat capacity of the pot, high specific heat capacity of the handle.

Question 11 [Heat]

Characteristic	Explanation
Low specific heat capacity of ice cream box	Easy get cold // becomes cool quickly
Smaller size of ice cream box	Easier to carry // easy too become cool
Plastic PVC	Poor conductor of heat
Bright colour of outer box	Does not absorb heat from surrounding quickly

R	Low specific heat capacity of ice cream box, Smaller size of ice cream box, Plastic PVC, Bright colour of outer box

Question 12 [Heat]

Characteristic	Explanation
High specific heat capacity	Able to absorb more heat from the engine with only slight increase in temperature
Low freezing point	Does not freeze easily and stop the cooling system from functioning in cold weather
High boiling point	Does not boil easily when it get hot
Low rusting rate on metal	Does not cause the engine parts to rust and become corroded
K	has high specific capacity, relatively low freezing point, relatively high boiling point and low rusting rate on metal.

Question 13 [Heat]

Characteristic	Explanation
Hollow stopper	Prevent heat lost through conduction
Double layer made of glass	High specific heat capacity
Vacuum in between double layer	Prevent heat loss
Low density material for the casing	Light / reduce mass
s	Has hollow stopper, double layer made of glass, Vacuum in between double layer, Low density material for the casing

Question 14 [Light]

Characteristic	Explanation
Concave mirror	Reflected ray is converging
Bulb at principal focus	Reflected ray form a parallel beam
Batteries connected in series	Produces larger current
Copper connecting wire	Low resistance / large current
Q	it has concave mirror, bulb at principal focus, batteries connected in series and copper connecting wire

Question 15 [Light]

Characteristic	Explanation
Power of eyepiece : Low power	Focal length is longer // eyepiece must be more longer focal length than objective lens
Power of objective lens : High power	Focal length is shorter // Objective lens must be more powerful lens than eyepiece // Objective lens must be more shorter focal length than eyepiece
Distance between lenses : $> f_o + f_e$	To produce bigger image from the eyepiece // to increase the magnification
Position of the specimen : $f_o < u < 2f_o$	To produce real, inverted and magnified image
M	Focal length of eyepiece is longer than objective

	lens, distance between lenses is greater than ($f_o + f_e$), and the position of the specimen is between f_o and $2 f_o$

Question 16 [Forces & Motion]

Characteristic	Explanation
Low density	Lighter/less massive string, wave travel faster and frequency higher
High tension	High frequency hence high pitch
Smaller length of the string	Produce higher frequency - smaller length of string has low wave length
string material **: Steel**	Produce bright sound/ high corrosion resistance/Lasting and does not break easily/Prolong and retain their tone longer
Q	it has low density, high tension, smaller length of the string and its made of steel.

Question 17 [Forces & Pressure]

Characteristic	Explanation
The shape of the wall is thicker at the base	To withstand higher pressure at deeper position
Material of wall is concrete	Strong to withstand stronger wave
Location of harbour is at the bay	At the bay the sea is more calmer
The wall has opening	The diffraction of waves will be occur, the amplitude of waves become shorter
S	The shape of the wall is thicker at the base, material of wall is concrete, the location of harbour is at the bay and the wall has opening

Question 18 [Electricity]

Characteristic	Explanation
Low density	So that the loop will be light
High boiling point	So that it can't easily freeze
High resitivity	So that the current high// high heat energy produced
Low rate of corrosion	Can't easily rust
T	Low density, high boiling point, high resitivity, low rate of corrosion

Question 19 [Electromagnetism]

Characteristic	Explanation
Curved shape	Produce radial magnetic field
Soft iron	Concentrate magnetic field
Soft spring	Can detect small current // more sensitive // can measured small current
Linear scale	Uniform deflection // force produced directly proportional to current.
T	Curved shape, Soft iron , soft spring and linear scale

Question 20 [Electromagnetism]

Characteristic	Explanation
Step-down transformer	Capable of reducing potential difference / voltage
Ratio 20 : 1 // 240 : 12 // N_p = 4000 turns and N_s = 200 turns	Reduce potential difference 240 V to 12 V
Using four diodes	Full wave rectification.
Using a capacitor.	To smooth out output current // produce output of steady direct current.
S	Step-down transformer, Ratio is 20 : 1, Using four diodes and using a capacitor.

Question 21 [Electronic]

Characteristic	Explanation
- LDR is connected at base circuit	- When intensity of light is low / dark, resistance of LDR increases / so V_{base} is large / transistor switched on
- Terminal positive of batteries is connected to collector	- So that the transistor is forward biased
- Bulbs are arranged in parallel circuit	- All bulbs are connected to voltage supply of 95V
- Relay switch is used	- So that the secondary circuit will switch on // So that the electromagnet will switch on the secondary circuit
A	- Because LDR is connected at base circuit, terminal positive of batteries is connected to collector; bulbs are arranged in parallel circuit and relay switch is used.

Question 21 [Radioactivity]

Characteristic	Explanation
Solubility in water is high	Easy to dissolve in water
Half life is short	Half life of 8 15 hours is a sufficient time for the worker to detect the leakage.
Type of radiation is beta	Has medium penetration power
Physical state is liquid	It easy to flow in water
W	Solubility in water is high, half life is 8 days, type of radiation is beta and the physical state is liquid.

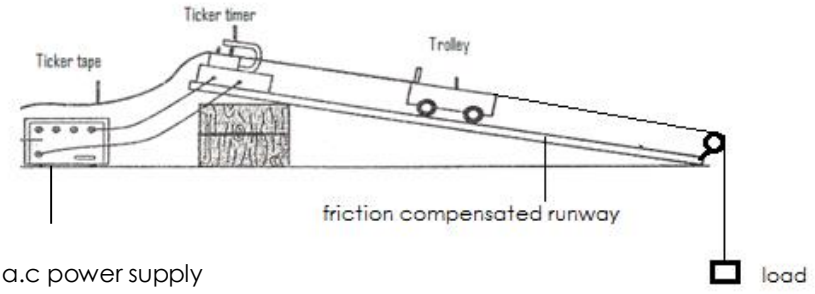
Question 22 [Radioactivity]

Characteristic	Explanation
Graphite	to slow down the fast neutrons produced by the fission.
Boron / Cadmium	to absorb some of the neutrons // reduce the rate of the fission reaction.
Heavy water	To absorb heat from the nuclear reaction. // have high specific heat capacity

Thick	To prevent leakage of radiation from the reactor core
R	Graphite,Boron, heavywater and thick wall

SECTION VII : EXPERIMENT [Paper 3 Section B (No. 3 / 4)] http://cikguadura.wordpress.com/

Question 1 [Force and motion]

(a)	Inference	The mass affects the acceleration
(b)	hypothesis	The greater the mass, the smaller the acceleration
(c)	i. Aim	To investigate the relationship between the mass and the acceleration
	ii. Variables	Manipulated variable : mass. m Responding variable : acceleration, a Fixed variable : Mass of the trolley, m
	iii. List of apparatus and materials	A trolley, runway, ticker- timer, ticker-tape, power supply, metre rule and wooden block
	iv. Arrangement of apparatus	**States the workable arrangement of the apparatus** 
	v. Procedure	Set up the apparatus as shown in the diagram. Use load of F = 0.5 N to pull the trolley down the runway.
	vi. tabulate data	**States the method of controlling the manipulated variable** Use trolley with the mass, m = 500 g
	vii.analyse data	**States the method of measuring the responding variable** Switch on the power supply and release the trolley. Cut the ticker tape into 5-tick strips and a tape chart for the motion of the trolley is made.

Calculate the acceleration of the using $a = \frac{v-u}{t}$ and record the data.

Repeat the experiment at least 4 times

Repeat the experiment by using m = 1000 g, 1500 g, 2000 g and 2500 g

Tabulating of data

Mass, m/ g	**acceleration , a /cms^{-2}**
500	
1000	
1500	
2000	
2500	
3000	

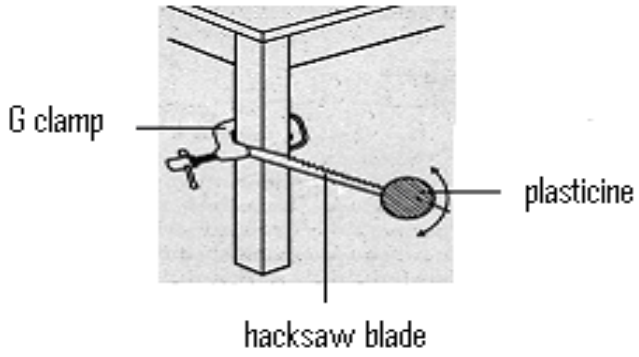
State how data will be analysed

Plot graph of acceleration against Mass

a/cms^{-2}

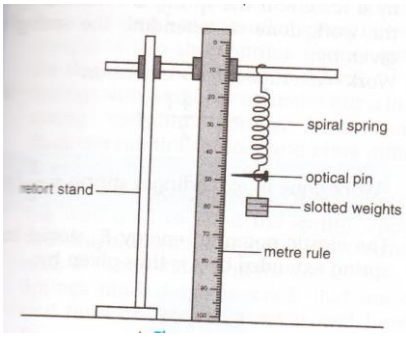
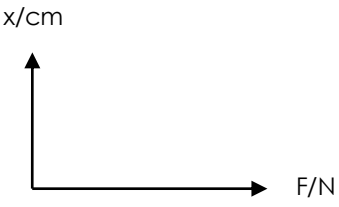
Question 2 [Force and motion]

(a)	Inference	Time for the object to stop oscillate is influenced by its mass
(b)	hypothesis	The bigger the mass the longer the object oscillate
(c)	(i) Aim	To investigate the relationship between mass and period.
	(ii) Variables	Manipulated: mass Responding : period Fixed: Length of hacksaw blade / number of oscillations
	(iii) List of apparatus and materials	Mass balance , stop watch , plasticine , G clamp
	(iv) Arrangement of apparatus	**States the workable arrangement of the apparatus**

	(v)Procedure	 **States the method of controlling the manipulated variable** Plasticine with the mass of 50.0 g is clamped to the end of the hacksaw blade
	(vi)tabulate data	**States the method of measuring the responding variable** The time for 10 complete oscillations is recorded. The period of oscillation is calculated **Repeat the experiment at least 4 times** Repeat the previous steps using plasticine of masses 100.0g , 150.0g, 200.0g and 250.0 g.
	(vii)analyse data	<table><tr><th>Mass/g</th><th>Period of oscillation/s</th></tr><tr><td>50.0</td><td></td></tr><tr><td>100.0</td><td></td></tr><tr><td>150.0</td><td></td></tr><tr><td>200.0</td><td></td></tr><tr><td>250.0</td><td></td></tr></table> **State how data will be analysed** Period of oscillation/s 

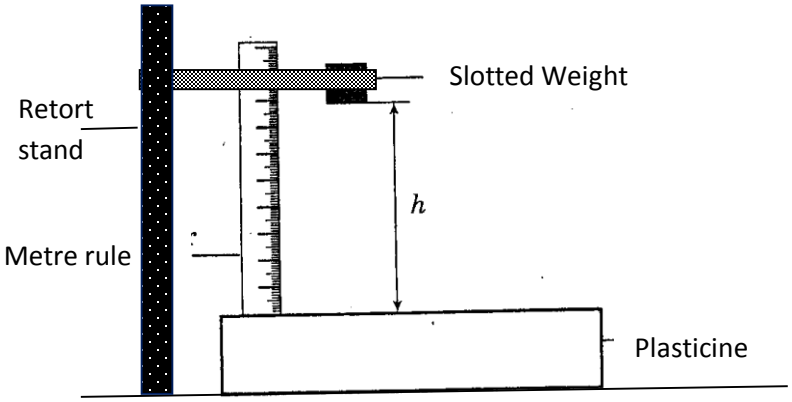
Question 3 [Force and Motion]

(a)	Inference	Extension / compression of the spring is affected by the force applied
(b)	hypothesis	The greater the force, the longer the Extension / compression

(c)	(i) Aim	To investigate the relationship between the Extension / compression of the spring and the force applied
	(ii) Variables	Manipulated: force / weight of slotted weight Responding : Extension / compression Fixed: diameter of the spring
	(iii) List of apparatus and materials	A spring, slotted weight with different mass, metre rule, needle, plasticine
	(iv)Arrangement of apparatus	**States the workable arrangement of the apparatus** 
	(v)Procedure	**States the method of controlling the manipulated variable** The initial reading of the pin l_o is noted. A **50 g** weight is attached. **States the method of measuring the responding variable** The reading of the pin l_1 is record. Calculate the extension of spring $x = l_1 - l_0$. **Repeat the experiment at least 4 times**
	(vi)tabulate data	Repeat the experiment weight **100 g** , **150 g**, **200 g** and **250 g**. Mass , m /g | Extension of the spring, x/cm
	(vii)analyse data	**State how data will be analysed** 

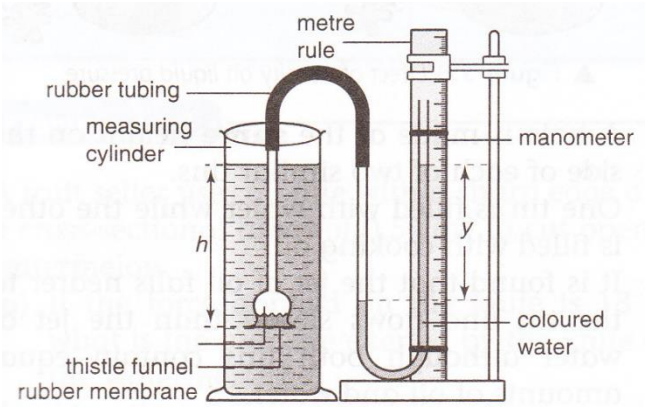
Question 4 [Force and Pressure]

(a)	Inference	The depth of the tyre sink into the ground depends on the mass of the load.

(b)	hypothesis	When the weight/force/mass of the object is greater, the pressure exerted by the object also greater.
(c)	(i) Aim	To investigate the relationship between weight/force and pressure.
	(ii) Variables	Manipulated : Weight / Force /mass Responding : Pressure / depth of the dent Fixed variable : Height of object released
	(iii) List of apparatus and materials	Plasticine, slotted weights and metre rule.
	(iv)Arrangement of apparatus	**States the workable arrangement of the apparatus** 
	(v)Procedure	**States the method of controlling the manipulated variable** Plasticine with constant thickness is placed on the table. Drop a slotted weight of 50 g on the surface of the plasticine. **States the method of measuring the responding variable** Remove the slotted weight and measure the depth,d of the dent on the plasticine using metre rule. **Repeat the experiment at least 4 times** Plasticine is flattened and the steps are repeated using slotted weights 100 g, 150 g, 200 g and 250 g.
	(vi)tabulate data	**Mass, m/ g** | **Depth of the dent, d / cm** | | | | | | | | | |
	(vii)analyse data	**State how data will be analysed** Depth of the dent, d / cm

		Mass,m / g →

Question 5 [Force and Pressure]

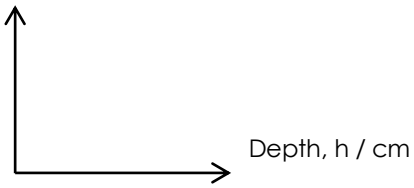
(a)	Inference	The pressure of liquid is depends on the depth
(b)	hypothesis	The pressure of liquid increases as its depth increases.
(c)	(i) Aim	**States the workable arrangement of the apparatus** To investigate the relationship between the pressure and depth.
	(ii) Variables	**State the manipulated variable and the responding variable** **Manipulated :** Depth, h **Responding :** The pressure of liquid, P (difference of length of the liquid in manometer, y) **State ONE variable that kept constant** **Constant** : The density of liquid
	(iii) List of apparatus and materials	**Complete list of apparatus and materials** Tall beaker, thistle funnel, manometer, metre rule
	(iv)Arrangement of apparatus	
	(v)Procedure	**States the method of controlling the manipulated variable** Set up the apparatus as shown in the diagram. Immerse the thistle funnel into the water until depth, h = 6.0 cm **States the method of measuring the responding variable**

<table>
<tr>
<td></td>
<td>(vi)tabulate data

(vii)analyse data</td>
<td>Measure the difference of length of the liquid in manometer, y by using ametre rule.

Repeat the experiment at least 4 times
Repeat the experiment using h = 8.0 cm, 10.0 cm, 12.0 cm and 14.0 cm.

<table>
<tr><th>h/ cm</th><th>difference of length of the liquid in manometer, y / cm</th></tr>
<tr><td>6.0</td><td></td></tr>
<tr><td>8.0</td><td></td></tr>
<tr><td>10.0</td><td></td></tr>
<tr><td>12.0</td><td></td></tr>
<tr><td>14.0</td><td></td></tr>
</table>
State how data will be analysed

Analyse the data .
y/ cm
 
Depth, h / cm</td>
</tr>
</table>

<u>Question 6 [Force and Pressure]</u>

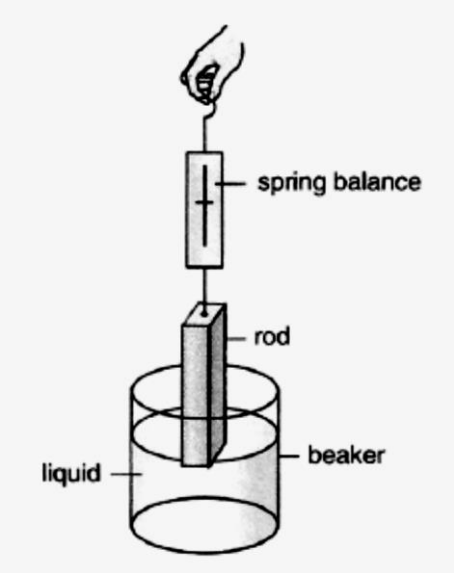
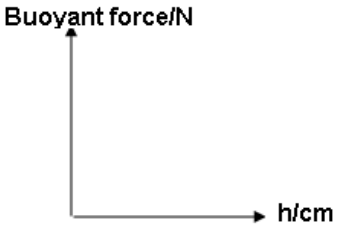
<table>
<tr><td>(a)</td><td>Inference</td><td>The volume of water displacement affects the buoyant force.</td></tr>
<tr><td>(b)</td><td>hypothesis</td><td>The greater the volume of water displacement//the more the rod is immersed the greater the buoyant force / the lower the reading on the spring balance.</td></tr>
<tr><td>(c)</td><td>Aim

(ii) Variables</td><td>Aim of the experiment:

To investigate the relationship between the volume of water displacement and the buoyant force.//
To investigate the relationship between weight of water displaced and thebuoyant force

Manipulated : the volume of water displacementV// length of rod below the water level

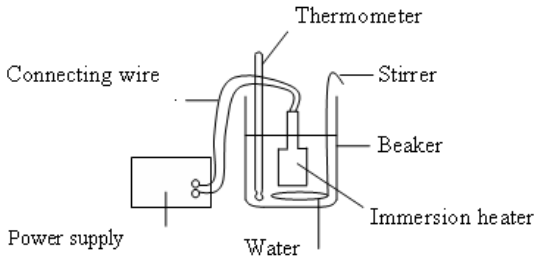
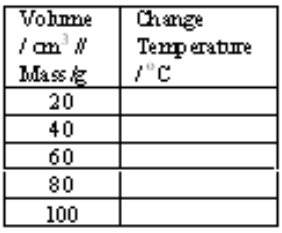
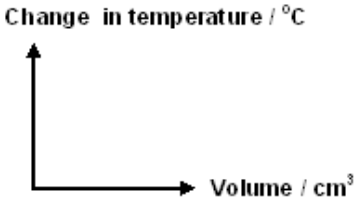
Responding : buoyant force / lost in weight
Constant : the density of water</td></tr>
</table>

	(iii) List of apparatus and materials	Beaker, rod, spring balance, meter ruler, measuring cylinder.
	(iv) Arrangement of apparatus	**States the workable arrangement of the apparatus** 
	(v) Procedure	**States the method of controlling the manipulated variable** Measure the weight of the rod in the air, W_{air} The rod is immersed into water at the depth of 5.0 cm. **States the method of measuring the responding variable** Take the reading of the spring balance, W_{water} Buoyant force = weight in air - weight in water **Repeat the experiment at least 4 times** Repeat the experiment with depth of 6.0 cm, 7.0 cm, 8.0 cm and 9.0 cm
	(vi) tabulate data	**State how data will be analysed**
	(vii) analyse data	

h/cm	Buoyant force/N
5.0	
6.0	
7.0	
8.0	
9.0	

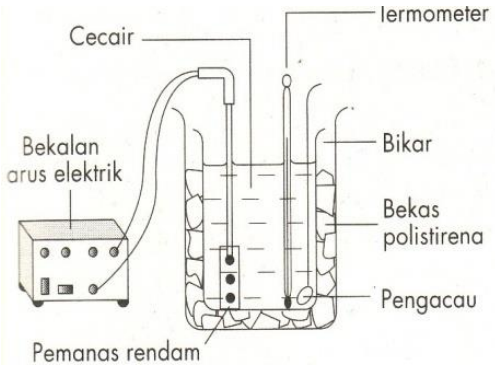
Question 7 [Heat]

No	7	Answer

(a)	Inference	The change in temperature of water depends on its volume / mass
(b)	hypothesis	When the volume / mass increases, change in temperature decreases
(c)	Aim	To investigate the relationship between the volume / mass and rise in temperature
	(ii) Variables	**Manipulated :** Mass/volume of water. **Responding :** Rise in temperature. **Constant :** Time/power supply.
	(iii) List of apparatus and materials	Power supply, immersion heater, connecting wires, beaker, stirrer, thermometer, water, measuring cylinder / balance , heater and stop watch
	(iv)Arrangement of apparatus	**States the workable arrangement of the apparatus** 
	(v)Procedure	**States the method of controlling the manipulated variable** 20 cm^3//g of water is heated by an immersion heater for 5 minutes. Initial temperature of water is recorded, T_1 **States the method of measuring the responding variable** Final temperature is recorded after 5 minutes, T_2 Change in temperature, $T_1 - T_2$ is determined **Repeat the experiment at least 4 times** Repeat step 1 and 2 using 40 cm^3, 60 cm^3, 80 cm^3 and 100 cm^3 of water.
	(vi)tabulate data	
	(vii)analyse data	**State how data will be analysed** 

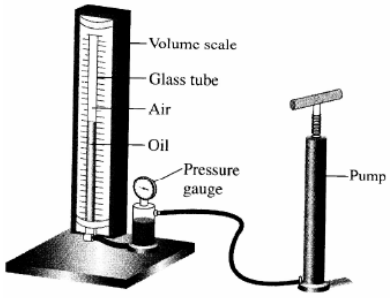
Volume / cm^3 // Mass/g	Change Temperature / °C
20	
40	
60	
80	
100	

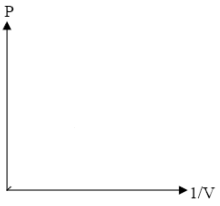
Question 8 [Heat]

(a)	Inference	time taken of the water to change the temperature depends on its mass/volume
(b)	hypothesis	The greater the mass/volume, the longer the time taken to change the temperature
(c)	Aim	To investigate the relationship between the time taken to increase the temperature and mass/volume
	(ii) Variables	Manipulated variable : mass/volume Responding variable : Time taken to increase the temperature by 5°C Constant variable : Initial temperature/specific heat capacity/ changes in temperature
	(iii) List of apparatus and materials	Power supply, thermometer, beaker, immersion heater, stirrer
	(iv)Arrangement of apparatus	**States the workable arrangement of the apparatus** 
	(v)Procedure	**States the method of controlling the manipulated variable** The 20 g of water is filled in the beaker. The initial temperature, θ_0, of water is recorded. **States the method of measuring the responding variable** The heater is switched on until the water boiled. The time taken for the water is observed and recorded/ The heat is calculated.

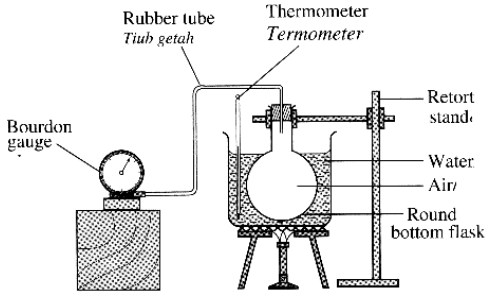
		Repeat the experiment at least 4 times Repeat with masses of boiling water 40 g, 60 g, 80 g and 100 g
	(vi)tabulate data	<table><tr><th>Mass, m / g</th><th>Time taken, t /s</th><th></th></tr><tr><td>20</td><td></td><td></td></tr><tr><td>40</td><td></td><td></td></tr><tr><td>60</td><td></td><td></td></tr><tr><td>80</td><td></td><td></td></tr><tr><td>100</td><td></td><td></td></tr></table>
	(vii)analyse data	**State how data will be analysed** **Time taken, t / s** **mass, m / g**

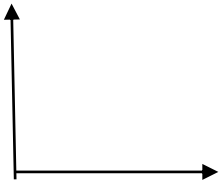
Question 9 [Heat]

(a)	Inference	Volume of the bubble depends on the pressure of the sea water
(b)	hypothesis	The bigger the pressure, the smaller the volume
(c)	Aim	**To investigate the relationship between pressure and volume**
	(ii) Variables	**Manipulated variable :** pressure, P **Responding variable :** volume, V **Fixed variable :** temperature, T
	(iii) List of apparatus and materials	Oil reservoir, glass tube with volume scale, pressure gauge, bicycle pump
	(iv)Arrangement of apparatus	**States the workable arrangement of the apparatus** 
	(v)Procedure	**States the method of controlling the manipulated variable** Push the piston into the pump until P = 100 KPa **States the method of measuring the responding variable** Record the volume of the air in the capillary tube. **Repeat the experiment at least 4 times**

	(vi)tabulate data	Repeat the experiments with P = 150 KPa, 200 KPa, 250 KPa and300 Kpa. Pressure, P / KPa | Volume, V / cm^3 | $\frac{1}{V}$ / cm^{-3} 100 150 200 250 300
	(vii)analyse data	**State how data will be analysed** 

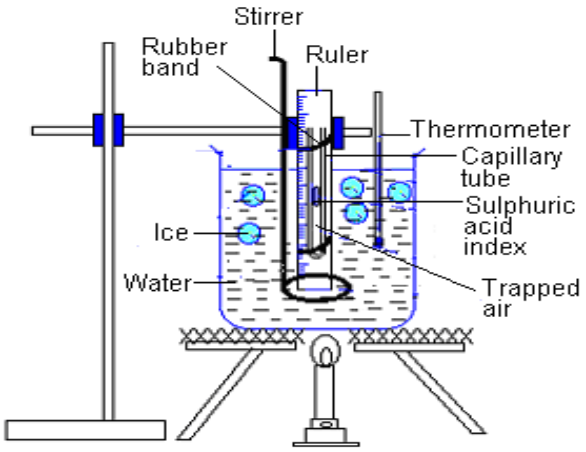
Question 10 [Heat]

(a)	Inference	Air pressure depends on the temperature.
(b)	hypothesis	The pressure increases as the temperature increases.
(c)	Aim	To study the relationship between the pressure exerted by the air and its temperature
	(ii) Variables	**Manipulated** : temperature, T **Responding** : pressure, P **Fixed** : volume, mass of air
	(iii) List of apparatus and materials	Round bottom flask, big beaker, Bourdon gauge, thermometer, rubber tube, retort stand and bunsen burner.
	(iv)Arrangement of apparatus	**States the workable arrangement of the apparatus** 
	(v)Procedure	**States the method of controlling the manipulated variable** The water is heated until temperature is 40°C. Stir to maintain a uniform temperature. **States the method of measuring the responding variable** Take the reading of the Bourdon gauge. **Repeat the experiment at least 4 times**

	(vi)tabulate data	Repeat the experiment at temperatures of 50°C, 60 °C, 70 °C and 80 °C. Temperature, T / °C | Pressure, P /Pa 40 | 50 | 60 | 70 | 80 |
	(vii)analyse data	**State how data will be analysed** Temperature, T / °C  Pressure, P /Pa

Question 11 [heat]

(a)	**Inference**	**State a suitable inference** The volume of gas depend on its temperature
(b)	**Hypothesis**	**State a relevant hypothesis** .The volume of gas increases as its temperature increases
(c)	**(i) Aim**	**State the aim of experiment** To investigate the relationship between the volume of gas and its temperature.
	(ii) Variables	**State the manipulated variable and the responding variable** **Manipulated :** Temperature **Responding :** The volume of gas
		State ONE variable that kept constant Mass of gas
	List of Apparatus and material	**Complete list of apparatus and materials** Capillary tube, thermometer, water, metre rule and sulphuric acid
		Arrangement of apparatus :



State the method of controlling the manipulated variable

1. Apparatus is set as shown in the above figure.
2. Water is heated to 30^0C.

State the method of measuring the responding variable

3. The vertical column of trapped air is measured by using metre rule.

Repeat the experiment at least 4 times

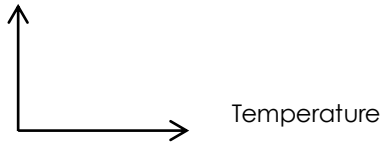
4. The experiment is repeated using the temperature 40^0C, 50^0C, 60^0C and 70^0C.

Tabulation of data:

Temperature, T (^{o}C)	Volume of gas, V (cm^3)
30	
40	
50	
60	
70	

Analyse the data .

Volume of gas

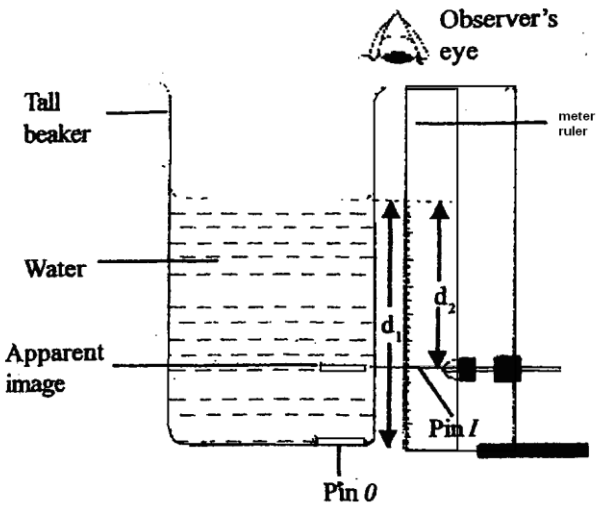


Temperature

Question 12 (Light)

(a)	**Inference**	**State a suitable inference** The distance of image (apparent depth) depend on Depth of water
(b)	**Hypothesis**	**State a relevant hypothesis** The more the depth of water, the more the apparent depth of image.
(c)	**(ii) Aim**	**State the aim of experiment** To investigate the relationship between the apparent depth of image and depth of water.
	(ii) Variables	**State the manipulated variable and the responding variable** **Manipulated :** depth of water **Responding :** apparent depth of image
		State ONE variable that kept constant **Constant : density of liquid**
	List of Apparatus and material	**Complete list of apparatus and materials** Apparatus : Beaker, Water, Pins, Set of retort stand, meter ruler.

Arrangement of apparatus :



State the method of controlling the manipulated variable.

A pin is placed at the base of the beaker.

Another pin is clamped to the retort clamp outside the beaker.

Fill beaker with water to a depth of d_1 = 10 cm.

State the method of measuring the responding variable

Move the pin outside the beaker to obtain the apparent position of the pin in the beaker.

Measure the position of the pin from the surface of the water to the pin, h_1

Repeat the experiment at least 4 times

Repeat the previous steps by increasing the depth of water : d_2, d_3, d_4, d_5,.

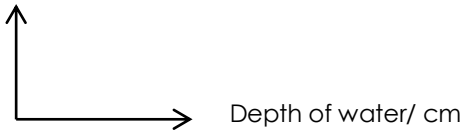
Determine the corresponding apparent depth, h_2, h_3, h_4, h_5

Tabulation of data:

Depth of water/ cm	Apparent depth/cm

Analyse the data

Apparent depth/cm



Question 13 [Light]

<table>
<tr><td></td><td>Inference</td><td>State a suitable inference
The image distance/size of image depends on the object distance</td></tr>
<tr><td>(a)</td><td>Hypothesis</td><td>States a relevants hypothesis
The longer the object distance, the smaller the image distance/size of image</td></tr>
<tr><td>(b)</td><td>Aim</td><td>State the aim of experiment
To study the relationship between the object distance and the/image distance// the height of the image</td></tr>
<tr><td>(c)</td><td>(Variables</td><td>State the manipulated variable and the responding variable

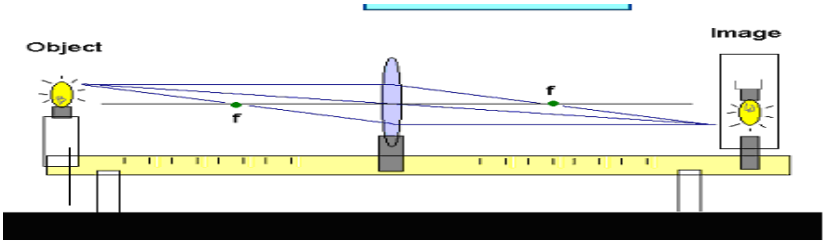
Manipulated variable : Object distance, u
Responding variable : image distance, v // height of the image

State ONE variable that kept constant

Fixed variable : The power of the lens.

Complete list of apparatus and materials

Convex lens, meter rule, screen, lens holder, object

States the workable arrangement of the apparatus
 

States the method of controlling the manipulated variable

The object distance is measured to be u = 20.0 cm.

States the method of measuring the responding variable

The image distance // the height of the image that formed on the screen is measured using the meter rule.

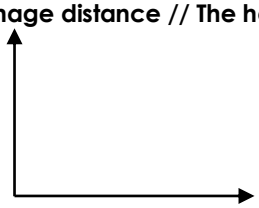
Repeat the experiment at least 4 times

The experiment is repeated by using different values of u = 25 cm, 30 cm, 35 cm, 40 cm and 45 cm.

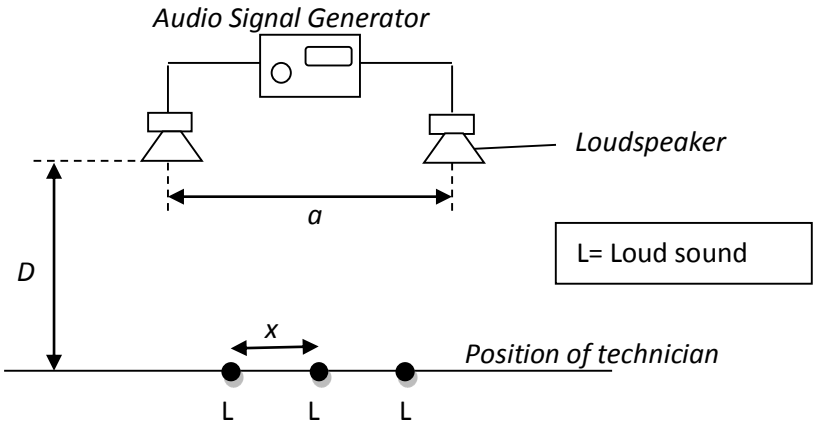
Tabulating of data

<table>
<tr><th>The object distance, u (cm)</th><th>The image distance, v (cm)</th></tr>
<tr><td>20.0</td><td></td></tr>
<tr><td>25.0</td><td></td></tr>
<tr><td>30.0</td><td></td></tr>
<tr><td>35.0</td><td></td></tr>
<tr><td>40.0</td><td></td></tr>
</table>

State how data will be analysed</td></tr>
</table>

		Plot graph of object distance against the image distance // the height of image Graph of v against u **The image distance // The height of image(cm)**  **The object distance, u (cm)**

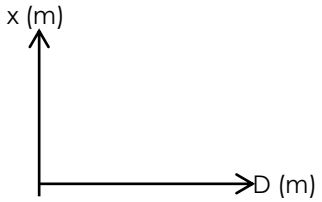
Question 14 [Waves]

(a)	**Inference**	**State a suitable inference** The distance between two successive positions of clear and loud sound depends on the distance of the loudspeakers and the position of technician.
(b)	**Hypothesis**	**State a relevant hypothesis** The distance between two successive loud sounds, x, increases when the distance between the loudspeakers and position of the technician, D, increases.
(c)	**(iii) Aim**	**State the aim of experiment** To investigate the relationship between distance, x, and D.
	(ii) Variables	**State the manipulated variable and the responding variable** **Manipulated :** Distance between loudspeakers and position of technician, D **Responding :** Distance between two successive positions of loud sound, x
		State ONE variable that kept constant Distance between the two loudspeakers / frequency of sound wave.
	List of Apparatus and material	**Complete list of apparatus and materials** Audio signal generator, two (identical) loudspeakers, connecting wires, metre rule or measuring tape.
		Arrangement of apparatus : Arrangement of apparatus: 
		State the method of controlling the manipulated variable 1. The apparatus is set up with the two loudspeakers placed apart at a

<table>
<tr><td></td><td></td><td>distance , a = 1.0 m as shown in the diagram.
2. The observer will stand at a distance, D = 5 m, from the speakers.
3. The audio generator is switched on and set at a frequency, f = 600 Hz.
4. The observer will move along a parallel straight line at a distance D = 5.0 m from the loudspeakers.

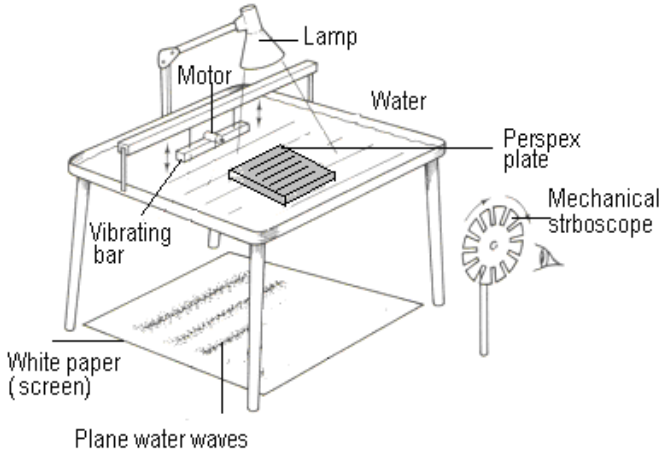
State the method of measuring the responding variable

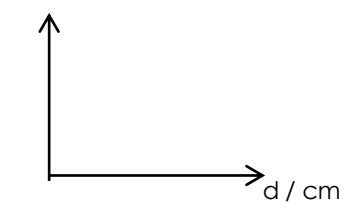
5. The positions of loud sound that can be heard are marked as L.
6. Distance between 2 successive loud sound, x is measured using a metre rule and recorded.

Repeat the experiment at least 4 times
7. The experiment is repeated with different values of D which is 10 m, 15 m, 20 m and 25m.
8. All the readings are tabulated.</td></tr>
<tr><td></td><td></td><td>Tabulation of data:
<table>
<tr><th>D (m)</th><th>x (m)</th></tr>
<tr><td>5</td><td></td></tr>
<tr><td>10</td><td></td></tr>
<tr><td>15</td><td></td></tr>
<tr><td>20</td><td></td></tr>
<tr><td>25</td><td></td></tr>
</table></td></tr>
<tr><td></td><td></td><td>Analyse the data .
 
</td></tr>
</table>

Question 15 [Waves]

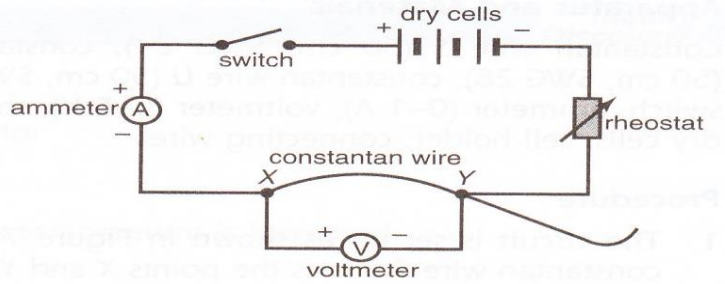
(a)	**Inference**	**State a suitable inference** The wavelength depends on the depth of water
(b)	**Hypothesis**	**State a relevant hypothesis** The depth of water increases as the wavelength of water waves increases.
(c)	**(iv) Aim**	**State the aim of experiment** To investigate the relationship between the depth of water and the wavelength of water waves.
	(ii) Variables	**State the manipulated variable and the responding variable** **Manipulated :** depth of water **Responding :** wavelength
		State ONE variable that kept constant Fixed variable: frequency
	List of Apparatus and material	**Complete list of apparatus and materials** Ripple tank, lamp, motor ,wooden bar , power supply white paper , protractor ,plane reflector , perspex plate , metre rule and mechanical stroboscope.
		Arrangement of apparatus :

<table>
<tr><td></td><td></td><td> 
</td></tr>
<tr><td></td><td></td><td>State the method of controlling the manipulated variable
Apparatus is set as shown in the diagram
The depth of water on a perspex is measured by using a metre rule = d_1
The power supply is switched on to produce plane waves which propagate onto the perspex plate .
State the method of measuring the responding variable
The waves are freeze by a mechanical stroboscope.
The waves are sketched on the screen.

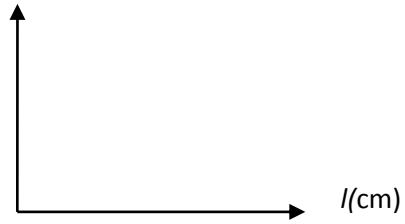
The distance between two successive bright bands is measured by the metre rule = x
The wavelength is calculated
Repeat the experiment at least 4 times
The experiment is repeated by increasing the number of perspex plate to change the depth the water, d_2,d_3,d_4 and d_5.</td></tr>
<tr><td></td><td></td><td>Tabulation of data:
<table>
<tr><td>d / cm</td><td>λ / cm</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td></td><td>Analyse the data .
λ / cm
 
</td></tr>
</table>

Question 16 [Electricity]

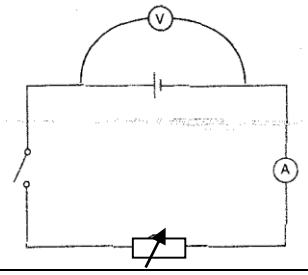
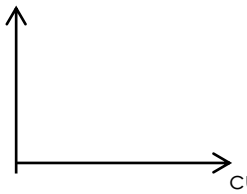
(a)	**Inference**	**State a suitable inference** The length of wire influences the resistance.
(b)	**Hypothesis**	**State a relevant hypothesis** When the length of wire increases, the resistance also increases.
(c)	**(v) Aim**	**State the aim of experiment** To determine the relationship between the length of wire, *l* with resistance, R.
	(ii) Variables	**State the manipulated variable and the responding variable**

		Manipulated : length of wire, *l* **Responding :** resistance, R
		State ONE variable that kept constant Diameter of wire
	List of Apparatus and material	**Complete list of apparatus and materials** metre rule, voltmeter, ammeter, dry cell, rheostat, constantan wire
		Arrangement of apparatus : 
		State the method of controlling the manipulated variable Apparatus is set as shown in the above diagram Measure length of wire, *l* = 20.0 cm with a metre-rule **State the method of measuring the responding variable** Adjust the rheostate so that current, I = 0.01 A throughout the experiment. Use current with smaller value so that the temperature of the constantan wire is constant. Calculate the resistance, R = $\frac{V}{I}$ Voltage, V is obtained from the voltmeter Current, I is obtained from the ammeter **Repeat the experiment at least 4 times** Repeat the experiment with *l* = 40.0 cm, 60.0 cm, 80.0 cm, 100.00 cm
		Tabulation of data:

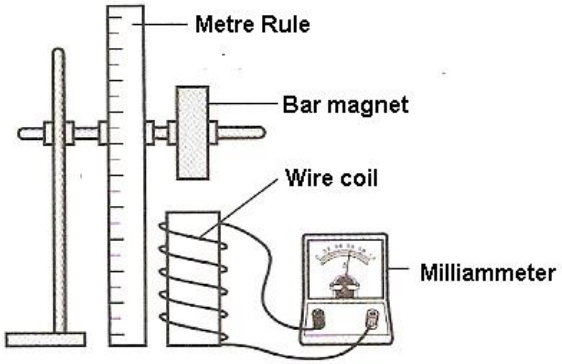
l (cm)	V (V)	I (A)	R= $\frac{V}{I}(\Omega)$
20.0		0.01	
40.0		0.01	
60.0		0.01	
80.0		0.01	
100.0		0.01	

		Analyse the data . *R* (Ω) 

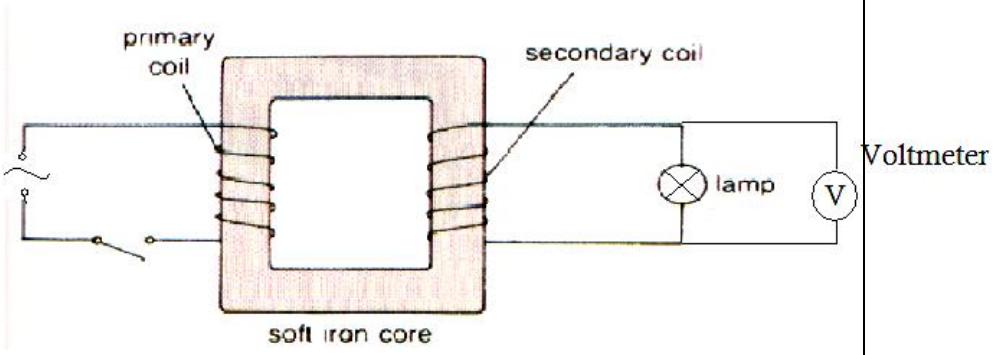
Question 17 [Electricity]

<table>
<tr><td>(a)</td><td>Inference</td><td>State a suitable inference
The potential difference across dry cell is depend on the current flow through the circuit</td></tr>
<tr><td>(b)</td><td>Hypothesis</td><td>State a relevant hypothesis
The potential difference across dry decreases as current flow through the circuit increases</td></tr>
<tr><td>(c)</td><td>(vi) Aim</td><td>State the aim of experiment
To investigate the relationship between potential difference across dry cell and the current flow through the circuit</td></tr>
<tr><td></td><td>(ii) Variables</td><td>State the manipulated variable and the responding variable
Manipulated : current flow through the circuit, I
Responding : potential difference across dry cell, V</td></tr>
<tr><td></td><td></td><td>State ONE variable that kept constant
No. of dry cell / power supply</td></tr>
<tr><td></td><td>List of Apparatus and material</td><td>Complete list of apparatus and materials
Ammeter (0 — 1 A), voltmeter (0—5 V), battery holder, 1.5 V dry cell, rheostat, switch, bulb, connecting wires</td></tr>
<tr><td></td><td></td><td>Arrangement of apparatus :
 
</td></tr>
<tr><td></td><td></td><td>State the method of controlling the manipulated variable
Apparatus is set as shown in the above diagram.
Switch on the switch.
Adjust the rheostat so that the ammeter reading is I = 0.2 A.
State the method of measuring the responding variable
Take the reading of the voltmeter.
Repeat the experiment at least 4 times
Repeat the experiment with I = 0.3 A, 0.4 A, 0.5 A and 0.6 A.</td></tr>
<tr><td></td><td></td><td>Tabulation of data:
<table>
<tr><td>current flow through the circuit, I / A</td><td>potential difference across dry cell, V / V</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td></td><td>Analyse the data .
potential difference across dry cell, V / V
 
current flow through the circuit, I / A</td></tr>
</table>

Question 18 [Electromagnetism]

<table>
<tr><td>(a)</td><td>Inference</td><td>State a suitable inference
The brightness of the light depends on the speed of rotation of the wheel.</td></tr>
<tr><td>(b)</td><td>Hypothesis</td><td>State a relevant hypothesis
The greater the velocity of the magnet in the coil wire, the greater magnitude of the induced current.
(When the height of the magnet is higher, its velocity increases)</td></tr>
<tr><td>(c)</td><td>(vii) Aim</td><td>State the aim of experiment
To identify the relationship between the velocity of the magnet and the magnitude of the induced current.</td></tr>
<tr><td></td><td>(ii) Variables</td><td>State the manipulated variable and the responding variable
Manipulated : velocity/ height of magnet
Responding : induced current</td></tr>
<tr><td></td><td></td><td>State ONE variable that kept constant
no. turns of coil</td></tr>
<tr><td></td><td>List of Apparatus and material</td><td>Complete list of apparatus and materials
Bar magnet, a coil of cooper wire, millammeter, meter ruler, connecting wires</td></tr>
<tr><td></td><td></td><td>Arrangement of apparatus :
 
</td></tr>
<tr><td></td><td></td><td>State the method of controlling the manipulated variable
The height of bar magnet is adjusted at h = 20 cm.
State the method of measuring the responding variable
The bar magnet is dropped into the coil wire. Take the reading of miliammeter
Repeat the experiment at least 4 times
The steps are repeated for h = 30 cm, h = 40 cm, h = 50 cm and h = 60 cm</td></tr>
<tr><td></td><td></td><td>Tabulation of data:
<table>
<tr><td>height of bar magnet, h / m</td><td>reading of miliammeter, I / mA</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
</table></td></tr>
<tr><td></td><td></td><td>Analyse the data .
reading of miliammeter, I / mA
 
height of bar magnet, h / m</td></tr>
</table>

Question 19 [Electromagnetism]

<table>
<tr><td>(a)</td><td>Inference</td><td>State a suitable inference
The number of turns of wire in the secondary coil affects the output voltage</td></tr>
<tr><td>(b)</td><td>Hypothesis</td><td>State a relevant hypothesis
The greater the number of turns of wire in the secondary coil, the greater the output voltage</td></tr>
<tr><td>(c)</td><td>(viii) Aim</td><td>State the aim of experiment
To investigate the relationship between number of turns of wire in the secondary coil, Ns and the output voltage, Vs</td></tr>
<tr><td></td><td>(ii) Variables</td><td>State the manipulated variable and the responding variable
Manipulated : number of turns of wire in secondary coil, Ns
Responding : output voltage, Vs</td></tr>
<tr><td></td><td></td><td>State ONE variable that kept constant
The number of turns of wire in the primary coil, Np</td></tr>
<tr><td></td><td>List of Apparatus and material</td><td>Complete list of apparatus and materials
insulated wire coil, voltmeter, two pieces of soft iron core, ac power supply, bulb, switch</td></tr>
<tr><td></td><td></td><td>Arrangement of apparatus :
 
</td></tr>
<tr><td></td><td></td><td>State the method of controlling the manipulated variable

The set up of the apparatus is as shown in figure above.
100 turns of wire is wound on the secondary coil of a transformer.

State the method of measuring the responding variable

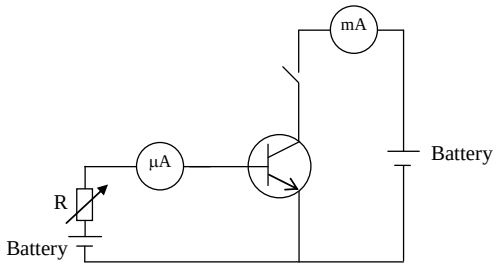
The switch is on and the output voltage is measured by using a voltmeter.

Repeat the experiment at least 4 times

The experiment is repeated by winding the wire on secondary coil with 200 turns, 300 turns, 400 turns and 500 turns.</td></tr>
<tr><td></td><td></td><td>Tabulation of data:
<table>
<tr><th>Number of turns of wire in secondary coil, Ns</th><th>Output voltage, Vs / V</th></tr>
<tr><td>100</td><td></td></tr>
<tr><td>200</td><td></td></tr>
<tr><td>300</td><td></td></tr>
<tr><td>400</td><td></td></tr>
<tr><td>500</td><td></td></tr>
</table></td></tr>
<tr><td></td><td></td><td>Analyse the data .</td></tr>
</table>

		Output Voltage,Vs / V ↑ → No. of turns

Question 20 [Electronic]

(a)	**Inference**	**State a suitable inference** Brightness of the bulb at collector circuit is affected by current in base current
(b)	**Hypothesis**	**State a relevant hypothesis** The larger the input current in a base circuit, the larger the output current in collector circuit.
(c)	**(ix) Aim**	**State the aim of experiment** To investigate the relationship between the collector current and base current
	(ii) Variables	**State the manipulated variable and the responding variable** **Manipulated :** base current, I_B **Responding :** collector current, I_C
		State ONE variable that kept constant Voltage supply, V
	List of Apparatus and material	**Complete list of apparatus and materials** npn transistor, 2 batteries, microammeter, miliammeter, rheostat, connecting wires.
		Arrangement of apparatus : 
		State the method of controlling the manipulated variable Circuit is prepared as shown in the above diagram The rheostat is adjusted until the readings of microammeter for base current, I_B = 25 μA. **State the method of measuring the responding variable** The readings of the miliammeter for collector current, I_C is recorded. **Repeat the experiment at least 4 times** The steps are repeated for the values of microammeter, I_B = 50, 75,100,125μA.
		Tabulation of data:

Base current, I_B / μA	Collector current, I_C / mA
25.0	
50.0	
75.0	
100.0	
125.0	

		Analyse the data . Collector current, I_C / mA ↑ → Base current, I_B / μA

SPM FORMAT : Paper 2 Section A [No. 5, 6, 7, 8]

SET 1 http://cikguadura.wordpress.com/

Question 5 [Pressure In Liquid]

(a) the force acting normally on a unit of surface area

(b) M1 The depth of the water in Diagram 6.1 is higher than in Diagram 6.2
M2 The water spurts out in Diagram 6.1 is at a higher rate than in Diagram 6.2
M3 The water spurts out further in Diagram 6.1 than in Diagram 6.2

(c) M1 The deeper the water, the further the distance of water spurt
M2 The deeper the water, the higher the pressure of the water

(d) As the diver goes deeper the depth of water increases hence pressure increases therefore he experiences more pain.

Question 6 [Radioactivity]

(a) (i) To stabilize the unstable nucleus
(ii) The mass before decay is greater than the mass after decay
(iii) Change to energy
(iv) $E = mc^2$
(v) The greater the mass defect, the greater the energy release.
(vi) The time taken for the activity of radioactive substance to be reduced to half of it original activity
(v) Radium-226, Because its half life is shorter than the half life for Carbon-14.

Question 7 [generator]

(a) (i) Mechanical/kinetic energy → electrical energy.
(ii) M1 The coil cut the magnetic flux
M2 produce induce current.
(iii) Fleming Right Hand Rule

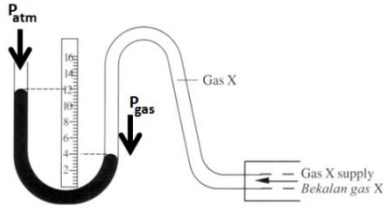
(b) (i) Laminated → reduced eddy current
(ii) diode → convert a.c to d.c

(c) $N_P : N_S = 240 : 6$
$= 40 : 1$

Question 8 [Gas and Atmospheric Pressure]

(a) Atmospheric pressure is pressure due to the weight of the air

(b) (i) Gas pressure is larger than atmospheric pressure
(ii) Diagram



(c) (i) 76 + (12 – 4) = 84 cm Hg
(ii) P = (13600 x 10 x 0.84) = 114 240 Pa / 1.14×10^5 Pa

(d) (i) M1 size of the fan is big
M2 it can suck out more air
(ii) M1 diameter of wand is small // 4.0 cm
M2 the speed of air is high / low pressure

(e) Choose vacuum cleaner K

SET 2 http://cikguadura.wordpress.com/

Question 5 [Forces & Motion]

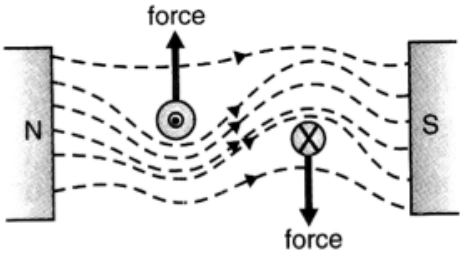
5. (a) The rate of change of momentum
(b) (i) Hammer in Diagram 5.2 is harder.
(ii) Ceramic in Diagram 5.2 cracks
(iii) The time of impact between the hammer and the ceramic in Diagram 5.2 is shorter.
(c) When the surface of hammer harder, the time of impact is shorter.
(d) (i) When the time decreases, impulsive force increases.
(ii) Cover the hammer or the ceramic with soft material.

Question 6 [Pressure in liquid]

6. (a) Pressure is force per unit area
(b) (i) $h_1 > h_2$
(ii) $x_1 > x_2$
(iii) the higher the pressure, the higher the horizontal distance
(iv) the higher the depth, the higher the pressure
(c) density of liquid and gravitational acceleration, g.

Question 7 [Electromagnetism : motor]

(a) (i) D.C motor
(ii) Reverse the direction of current in the oil every half cycle so the coil will continue rotate in same direction.
(b) (i) & (ii)



(iii) By Increasing :
1. current
2. number of turn
3. strength of magnet

(c) Use curve magnet to produce radial magnetic field hence it will increase the magnetic field.

Question 8 [Force and Motion]

(a) The ability to do work
(b) Write all the answers correclty 2 marks
Any one or two answers correct 1 mark

1	2	3	4	5	6	Average
5.4	5.5	5.6	6.1	6.3	6.5	5.9
5.8	6.0	6.5	6.9	7.7	8.5	6.9
6.1	6.2	6.0	6.1	6.1	6.1	6.1

(c) (i) M1 Correct substitution
(48)(10)(3)
M2 Correct answer and correct unit
1440 J
(ii) M1 State substitution
$\frac{1440}{5.9}$
M2 Correct answer
244 W

(d) (i) M1 State the choice correctly with reason
A
M2 State the correctly with reason
shortest time taken
(ii) M1 C
M2 Time is consistent over a longer period

(e) State the reason correctly
Longest average time/time is not consistent/time increases with each run

SET 3 http://cikguadura.wordpress.com/

Question 5 [Forces and Motion]

(a) Gravitational force
(b) (i) the mass of the slotted weight in Diagram 5.1 is smaller
(ii) the net forces acting on the systems on the table in Diagram 5.1 is smaller
(iii) the acceleration of the 3 kg load move on the table in Diagram 5.1 is smaller
(c) when the net forces increases, the acceleration of the load increases
(d) (i) the net force for the systems in Diagram 5.3 is bigger
(ii) the acceleration of the load in Diagram 5.3 is bigger
(iii) In Diagram 5.3, the weight of the object is not acted perpendicular to the direction of the motion of the object, so the net force increases.

Question 6 [Forces and Pressure]

(a) the force acting normally on a unit of surface area
(b) (i) the level of the apple in the oil is deeper
(ii) the volume of liquid displaced by the apple in the oil is bigger
(iii) the density of oil is smaller
(c) (i) when the density of the liquid increases, the volume of liquid displaced decreases
(ii) same
(d) Archimedes' principle
(e) water is pump out from the ballast tank // air is pump into the ballast tank, to reduce the weight of submarine, then the submarine will rise up because buoyant force bigger than weight. It will float when buoyant force = weight of submarine

Question 7 [Waves]

(a)(i)	Transverse wave // mechanical wave
(a)(ii)	The gap is bigger than the wavelength
(b)	✓ smaller amplitude ✓ same wavelength
(c)(i)	✓ made of concrete ✓ because concrete is strong
(c)(ii)	✓ make many holes on the wall ✓ diffraction // spread of energy
(d)	✓ The water is shallow ✓ load and unload by using small boats

Question 8 [Electronic]

(a) Convert AC to DC

(b) (i) Four diode
Reason: full wave rectifcation

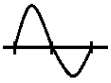
(ii) With capacitor
Reason: smoother the current

(c) Circuit R

(d) Allows current to flow in only one direction

(e) (i) T = 4 x 0.02 = 0.08 s

(ii) f = 1/0.08
= 12.5 Hz

(iii)  no change in amplitude, Half period

SPM FORMAT : Paper 2 Section B [No. 9 / 10] http://cikguadura.wordpress.com/

Question 1 [Gas laws : Pressure Law]

<table>
<tr><td>9.a.i</td><td colspan="2">the degree of hotness or coldness of an object</td><td>1</td></tr>
<tr><td>9.a.ii</td><td>M1
M2
M3
M4
M5</td><td>the temperature of gas in Diagram 9.2 is bigger // vice versa
the volume of gas is same
the reading of Pressure Gauge in Diagram 9.2 is bigger // vice versa
when the temperature of gas increases, the reading of pressure gauge/gas pressure increases.
Pressure Law</td><td>5</td></tr>
<tr><td>9.b</td><td>M1
M2
M3
M4</td><td>when heat is supplied to air inside the ping-pong ball, the kinetic energy of air particle increases, so the temperature of air inside ping-pong ball increases
The rate of collision between molecules and wall of the ball will increase so the pressure will increase,
the ball will expand, so the volume will increase
when the volume increased, area of collision increased, so lastly the pressure will remain the same (air pressure = atmospheric pressure)</td><td>4</td></tr>
<tr><td>9.c</td><td colspan="2"><table><tr><th>Suggestion</th><th>Reason</th></tr><tr><td>Thickness of the pot is high</td><td>to withstand high pressure</td></tr><tr><td>specific heat capacity of the pot is low</td><td>heats up quickly and food will be cooked faster</td></tr><tr><td>specific heat capacity of the handle is high</td><td>heats up slowly and can be held with bare hands</td></tr><tr><td>Have lid</td><td>To trap hot air in the pot, so the pressure can be increased</td></tr><tr><td>safety valve is needed</td><td>to releases extra steam so that the pressure is the cooker does not reach a dangerous stage</td></tr></table></td><td>10</td></tr>
<tr><td colspan="3">TOTAL</td><td>20</td></tr>
</table>

Question 2 [Archimedes' Principle]

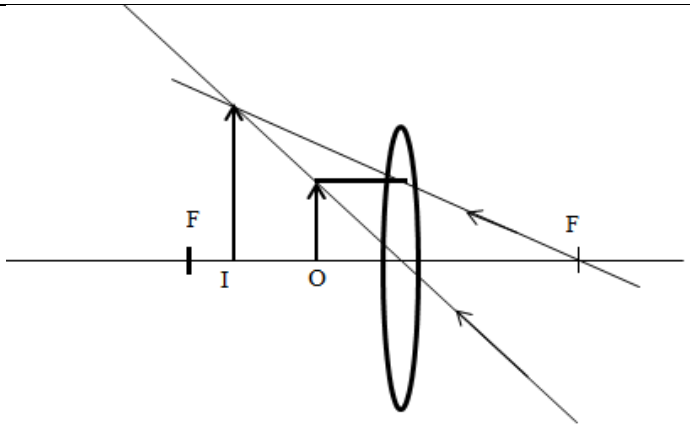
<table>
<tr><td>9.a</td><td colspan="2">Gravitational force</td><td>1</td></tr>
<tr><td>9.b.i</td><td>M1
M2
M3</td><td>the total weight of the boys in Diagram 9.2 is bigger // vice versa
the volume of water displaced in Diagram 9.2 is bigger // vice versa
the buoyant force in Diagram 9.2 is bigger is bigger // vice versa</td><td>3</td></tr>
<tr><td>9.b.ii</td><td>M1
M2</td><td>when the volume of water displaced increases, the buoyant force increases
when the weight of water displaced increases, the buoyant forces increases // weight of water displaced = buoyant force</td><td>2</td></tr>
<tr><td>9.b.iii</td><td colspan="2">Archimedes' principle</td><td>1</td></tr>
<tr><td>9.c</td><td>M1
M2
M3
M4</td><td>when the apple falls into water, buoyant force increases when volume of water displaced increase
buoyant force > weight of block // density of apple < density of water
buoyant force push the apple upward
buoyant force = weight of the apple when the apple float</td><td>4</td></tr>
<tr><td>9.d</td><td colspan="2"><table><tr><th>Suggestion</th><th>Reason</th></tr><tr><td>Strong material</td><td>Can withstand great force</td></tr><tr><td>Low density material</td><td>Light weight</td></tr><tr><td>Two stage plimsoll line</td><td>Save in fresh and salt water</td></tr><tr><td>Big size</td><td>Can place more goods</td></tr><tr><td>Aerodynamic shape</td><td>Reduce water friction</td></tr></table></td><td>10</td></tr>
<tr><td colspan="3">TOTAL</td><td>20</td></tr>
</table>

Question 3 [Electricity]

<table>
<tr><td>10.a</td><td>Energy dissipated by the bulb is 24 Joule of energy per unit second when the bulb is connected to 9 V of dry cell.</td><td>1</td></tr>
<tr><td>10.b.i</td><td>Electrical energy → light energy + heat energy</td><td>1</td></tr>
<tr><td>10.b.ii</td><td>M1 the brightness of the bulb in Diagram 10.2 is bigger
M2 the amount of current flow in Diagram 10.2 is bigger
M3 the internal resistance in Diagram 10.2 is smaller
M4 when the amount of current flow increases, the brightness of the bulb increases
M5 when the internal resistance increases, the brightness of the bulb decreases</td><td>5</td></tr>
<tr><td>10.c</td><td>M1 8 dry cells are arranged in series so the total internal resistance is
8 x 0.5 = 4 Ω
M2 Current flow, I = V/R = 12 / 4 = 3 A
M3 Small current cannot start the engine</td><td>3</td></tr>
<tr><td>10.d</td><td><table><tr><th>Suggestion</th><th>Reason</th></tr><tr><td>Use fluorescent lamp</td><td>Consume less power and economic</td></tr><tr><td>Use more efficient fluorescent lamp</td><td>It brightens the room more clear //
prevent wastage //
Helps the temperature in the room to be not too hot due to less energy loss in form of heat energy</td></tr><tr><td>Fuses should be connected to the fluorescent lamp</td><td>To prevent overheating of lamps might cause the fluorescent lamp to blow out</td></tr><tr><td>Increase the number of lamp</td><td>brighter</td></tr><tr><td>More lamp are arrange in parallel</td><td>If one lamp blows the rest are still functioning</td></tr></table></td><td>10</td></tr>
<tr><td colspan="2">TOTAL</td><td>20</td></tr>
</table>

SPM FORMAT : Paper 2 Section C [No. 11 / 12] http://cikguadura.wordpress.com/

Question 1 [Gas laws : Pressure Law]

<table>
<tr><td rowspan="5">1</td><td>(a)(i)</td><td>Focal point is a point which incident parallel rays converge after refracted through a lens</td><td>1</td></tr>
<tr><td>(ii)</td><td> 

M1- place object correctly
M2- draw two rays refracted out
M3- two rays diverge to form image
M4- image</td><td>4</td></tr>
<tr><td>(b)</td><td><table>
<tr><td>Characteristic</td><td>Reason</td></tr>
<tr><td>Type of the Projection lens : convex</td><td>Can produce real image</td></tr>
<tr><td>Surface of the reflector: black</td><td>Can absorb heat</td></tr>
<tr><td>Power of the bulb: high</td><td>Can produce bright light</td></tr>
<tr><td>Distance between LCD to the screen: far</td><td>Can produce large image</td></tr>
<tr><td colspan="2">**R** is chosen because it uses convex lens, has black surface, high bulb power and far from the screen.</td></tr>
</table></td><td>2
2
2
2
2</td></tr>
<tr><td>(c)(i)</td><td>$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$, v = -15 cm ,

$\frac{1}{u} = \frac{1}{10} - \left(\frac{1}{-15}\right)$

u = 6 cm</td><td>1

1

1</td></tr>
<tr><td>(ii)</td><td>$\frac{v}{u} = \frac{h_i}{h_o}$

$h_i = \frac{15 \times 3}{6}$

= 7.5 cm</td><td>

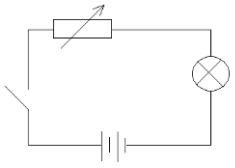
1

1</td></tr>
<tr><td></td><td>Total</td><td>20</td></tr>
</table>

Question 2 [Waves]

2	(a)	Reflection of waves	1
	(b)	<table><tr><td>Radio waves</td><td>Sound waves</td></tr><tr><td>Transverse</td><td>longitudinal</td></tr><tr><td>Can travel without medium</td><td>Need medium to travel</td></tr><tr><td>Have long wavelength</td><td>Short wavelength</td></tr></table> Any 2 comparison	4
	(c)	<table><tr><td>Characteristic</td><td>Reason</td></tr><tr><td>longitudinal</td><td>Because sonar is a sound waves</td></tr><tr><td>High frequency</td><td>Has high energy//can penetrate deeper into the sea</td></tr><tr><td>High speed</td><td>Can travel faster</td></tr><tr><td>High penetrating power</td><td>Can penetrate through medium easily</td></tr><tr><td>The most suitable waves is S</td><td>Because the waves is longitudinal,high frequency,high penetrating power and has high speed</td></tr></table>	2 2 2 2 2
	(d)(i)	d=vt/2 = (1500x1)/(2x 15) = 50m	1 1 1
	(ii)	-to detect the depth of seabed -to detect the condition of baby in the womb	1 1
			20

Question 3 [Electricity]

3	(a)(i)	To control resistance / electric current	1
	(ii)	Electrical energy to heat energy to light energy	1
	(iii)		1
	(b)	Length of wire decreases Resistance decreases Current increase [Max 2 marks]	1 1
	(c)(i)	$I = \frac{P}{V}$ $= \frac{3}{6}$ = 0.5 A Total I = 0.5 x 2 = 1 A	1 1 1
	(ii)	E = VIt = 6 x 0.5 x 60 = 180 J	1 1
	(d)	<table><tr><td>Aspect</td><td>Reasoning</td></tr><tr><td>P step up, Q step down</td><td>P to increase voltage, Q to decrease voltage to consumer</td></tr><tr><td>Big Diameter</td><td>Reduce resistance</td></tr><tr><td>Current with high voltage</td><td>Small current flows // Reduced power/ heat loss</td></tr><tr><td>Cable on pylon</td><td>Safety reason</td></tr><tr><td>L is chosen</td><td>P step up Q step down, Big Diameter, Current with high voltage, Cable on pylon</td></tr></table>	2 2 2 2
		Total	20

Question 4 [Radioactivity]

<table>
<tr><td>4</td><td>(a)</td><td>Unstable isotope</td><td>1</td></tr>
<tr><td></td><td>(b)</td><td>When the water level is high, radioactive rays pass through the water
Water absorbs part of the radiation
Detector shows reading decreases
Detector activates the outlet valve controller to open the outlet valve</td><td>1
1
1
1</td></tr>
<tr><td></td><td>(c)</td><td><table><tr><td>Aspect</td><td>Reasoning</td></tr><tr><td>High</td><td>Much higher than the background radiation</td></tr><tr><td>Beta</td><td>High penetrating power and less dangerous to the user</td></tr><tr><td>Long</td><td>Can last longer / no need to change often</td></tr><tr><td>High</td><td>Always in solid state which is easier to handle
State most suitable choice of radioisotope and justification correctly</td></tr><tr><td>R</td><td>High initial activity, emission of beta particle with long half-life, and changes from solid to liquid at 1538 °C.</td></tr></table></td><td>2
2
2
2
2</td></tr>
<tr><td></td><td>(d)(i)</td><td>83-35 // 48</td><td>1</td></tr>
<tr><td></td><td>(ii)</td><td>krypton</td><td>1</td></tr>
<tr><td></td><td>(iii)</td><td>$^{83}_{35}\mathrm{Br} \rightarrow {}^{83}_{36}\mathrm{Kr} + {}^{0}_{-1}\mathrm{e}$</td><td>1</td></tr>
<tr><td></td><td>(iv)</td><td>$\frac{9.6}{2.4}$ // 4 // 4 decays by showing 4 arrows in the substitution
24 counts per minute</td><td>1
1</td></tr>
<tr><td></td><td>Total</td><td></td><td>20</td></tr>
</table>

SPM FORMAT : Paper 3 Section A [No. 1 / 2] http://cikguadura.wordpress.com/

SET 1

Question 1 [Forces & Motion]

(a) (i) mass of plasticine, m

(ii) time for 10 oscillations, t

(iii) distance from the plasticine ball to the clamp

(b)

m / g	t_1 / s	t_2 / s	$t_{average}$ / s	T / s	T^2 / s^2
10.0	4.0	4.2	4.1	0.41	0.17
20.0	5.4	5.2	5.3	0.53	0.28
30.0	6.8	7.0	6.9	0.69	0.48
40.0	8.0	8.2	8.1	0.81	0.66
50.0	8.8	9.0	8.9	0.89	0.79

(d) T^2 is directly proportional to m.

Question 2 [Electricity]

(a) (i) R is directly proportional to $\frac{1}{d^2}$ // R is inversely proportional to d^2

(ii) d = 0.20 mm , $\frac{1}{d^2} = 25$ R = 33 Ω

(b) (i) $m = \frac{60 - 0}{45 - 0}$

$= 1.3333\ \Omega\ mm^2$

(ii) $\rho = \frac{\pi R d^2}{4l}$

$R = \frac{4\rho l}{\pi d^2}$

$m = \frac{4\rho l}{\pi}$

(iii) $1.333\ \Omega\ mm^2 = \frac{4\rho\ (1000\ mm)}{\pi}$

$\rho = 1.0469 \times 10^{-3}\ \Omega\ mm$

$= 1.0469 \times 10^{-6}\ \Omega\ m$

(c) $\rho = \frac{\pi R d^2}{4l}$

$1.0469 = \frac{\pi R (0.00025)^2}{4(2)}$

$R = 42.655\ \Omega$

(d) The connection of the wires should be fasten to ensure the resistance in the circuit unchanged.

SET 2 http://cikguadura.wordpress.com/

Question 1 [Heat]

1. (a)

(i) Temperature / θ

(ii) Length / ℓ

(iii) Pressure of the trapped air / diameter of the capillary tube

(b) (i) Top section of the meniscus

(ii) - θ and ℓ shown in the table
- State the θ and ℓ units of correctly
- All values of ℓ are correct
- The values of ℓ are consistent to one decimal point. 1m

θ /° C	ℓ / cm
0	7.1
20	7.6
30	7.9
40	8.1
50	8.4
60	8.7
70	9.0

(c) A. Show ℓ on the Y axis and θ on X axis √
B. State the units of the variables correctly √
C. Both axes are marked with uniform scale √
D. All 7 points are plotted correctly √√
E. Best straight line is drawn √
F. - Show the minimum size of graph √
- at least 5 x 4 (2cm x 2 cm) square
- counted from the origin until the furthest point.

Score

Number of ticks	Score
7	5
5-6	4
3-4	3
2	2
1	1

(d) ℓ increases linearly with θ

(e) The capillary tube and the ruler scale must be parallel //
trapped air column must always be below the water level.

Question 2 [Light]

2(a)(i) $\frac{1}{m}$ increases linearly with *u*.

(ii) Show working on graph

$\frac{1}{m}$ = 1.5

m = 0.67

(iii) $Gradient = \frac{3.5-0}{45-10}$

= 0.1 cm^{-1}

Show working on graph

b(i) $\frac{1}{m} = (\frac{1}{f})u - 1$

$\frac{1}{f} = Gradient$

(ii) $\frac{1}{f} = 0.1cm^{-1}$

f = 10 cm

(c) The object, the optical centre of the lens and the screen must lie on the principal axis of the lens.

SET 3 http://cikguadura.wordpress.com/

Question 1 [Electronic]

(a) For the experiment described identify

(i) the manipulated variable : base current, I_b

(ii) the responding variable : collector current, I_c

(iii) the fixed variable : The power supply

(b)

I_B/μA	I_C/mA
10	0.8
20	1.6
30	2.4
40	3.1
50	3.9
60	4.8

(c) A. Show I_C on the Y axis and I_B on X axis √

B. State the units of the variables correctly √

C. Both axes are marked with uniform scale √

D. All 6 points are plotted correctly √√

E. Best straight line is drawn √

F. - Show the minimum size of graph √
- at least 5 x 4 (2cm x 2 cm) square
- counted from the origin until the furthest point.

Score

Number of ticks	Score
7	5
5-6	4
3-4	3
2	2
1	1

(d) I_C is directly proportional to I_B

Question 2 [Forces & Motion / Waves]

(a) *k* decreases

(b) (i) $\frac{1}{k} = 0.9$, $T^2 = 4.5$

$T = 2.1213$ s

(ii) gradient = $\frac{3.7 - 0}{0.8 - 0}$

= 4.625 kg

(iii) $T^2 = 4\pi^2 \frac{m}{k}$

Gradient = $4\pi^2 m$

$4.625 = 4\pi^2 m$

$m = 0.1172$ kg

(c) Unchanged