

SPM SCIENCE

Latest Exam Tips Notes 2014 (We are Trying to Help)

Form 4 Chapter

1. Melting / boiling point
2. In / voluntary actions / brain & nerves
3. Sex determination
4. Non / metal / state of matter
5. Electroplating / Extraction of bauxite
6. Read all radioactive / nuclear
7. Colour filter / Lens
8. Read all alloy

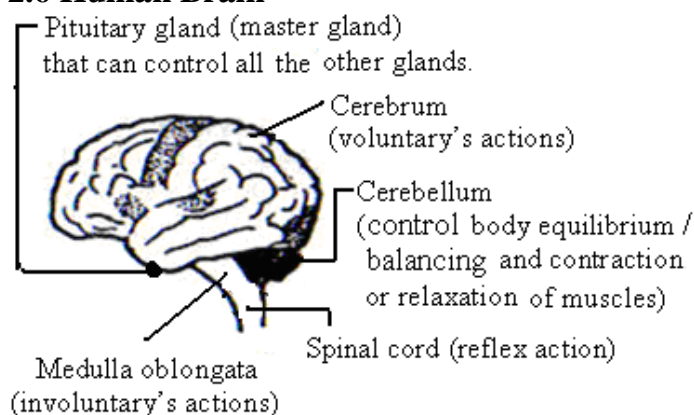
Form 5 Chapter

1. Factor affecting bacterial growth
2. Calories requirement
3. Pollutionwater / ways overcome
4. Fats / latex / alcohol
5. Archimedes / Bernoulli
6. Read all – Preservative / label
7. Read all – thermoset / plastics
8. Read all – radio / components

2.5 Differences between voluntary actions and involuntary actions.

Voluntary actions	Involuntary actions
- Under conscious control based on our needs. - Learning is required.	- Not under conscious control (automatic). - No learning is required.
- The same stimulus may lead to different response depending on different situations.	- The same stimulus always produces the same response.
- Controlled by the cerebrum .	- Controlled by the medulla oblongata or spinal cord.
- Can be quickened or slowered down.	- Can't be quickened or slowered down
- eg: writing, speaking, reading and dancing.	- eg: heartbeat, breathing, yawning, respiration digestion, growing.

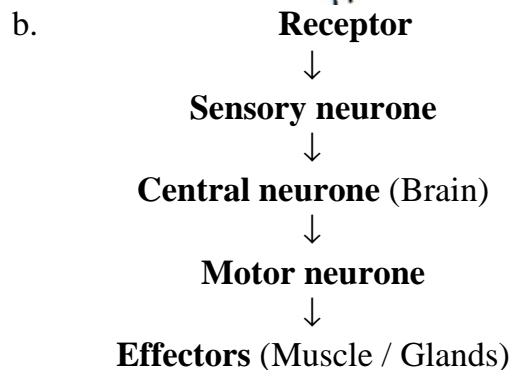
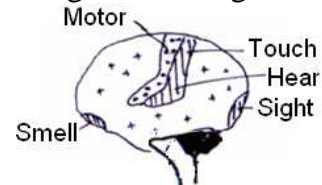
2.6 Human Brain



1. Protected by cranium.
2. Outer layer is grey matter which consists of cell bodies for the growth of the brain.
3. Inside is white matter which consists of nerve fibers (axons).
4. The brain is highly folded to increase the surface area **to pack more neurons**.

5. Divided into right and left cerebral hemispheres which control opposite side of the body movements.

6. a. **Cerebrum**(biggest part)
- Voluntary actions
eg: Speaking, reading, walking, thinking, swimming



Cerebrum consist of:

i. Sensory area 	Touch, sight, smell, taste, hearing
ii. Motor Area 	Movement of muscle
iii. Association area 	Thinking, speech memory, reasoning, imagination.

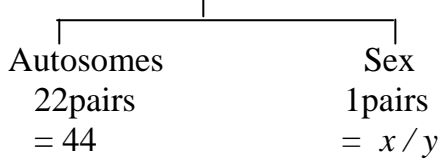
c. **Cerebellum**

- Maintaining body posture, equilibrium or body balancing. Control contraction and relaxation of muscles.

d. **Medulla Oblongata**

- Controls in involuntary actions, e.g. heartbeat, breathing, circulation of blood, peristalsis, swallowing, growing, digestion and respiration.
- If injured, the person will die.

1. a. Type of chromosomes (46)

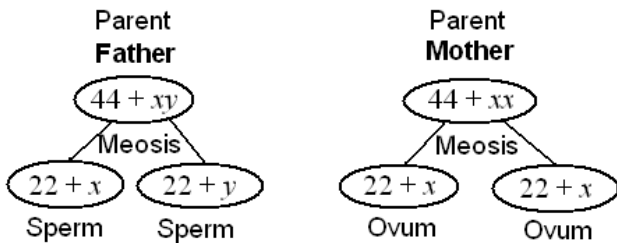


	Autosome		Sex		Total
Male	44	+	xy	=	46
Female	44	+	xx	=	46

b. Chromosomes in Gametes

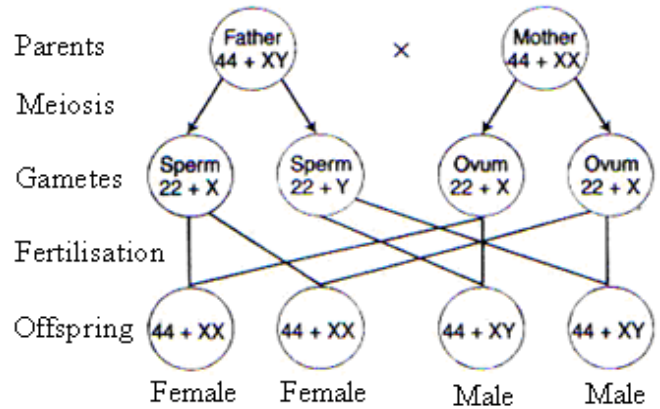
sperm = 22 + x / 22 + y
 ovum = 22 + x

c.

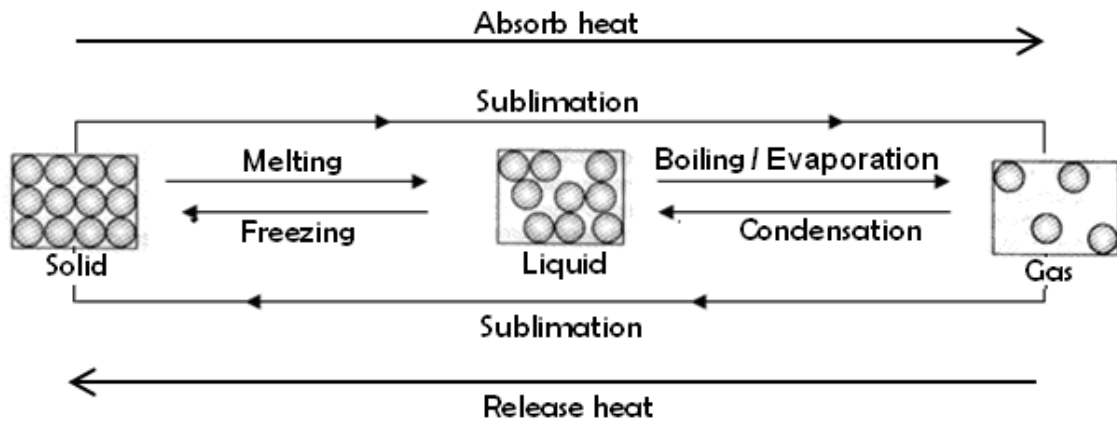


2. Sex determination- by the chromosome in sperm

- The probability of having a male or female child is the 50% because half of the sperms carry y chromosome and half of other sperms carry x chromosome (Ratio 1 : 1)

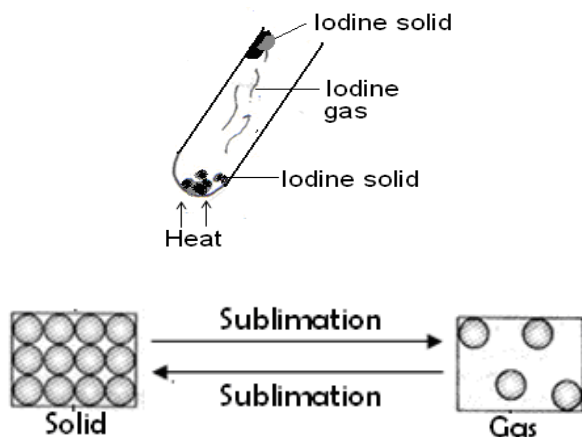


1.



Solid	Liquid	Gas
- Particles are arranged closely and orderly in fixed positions. - Cannot be compressed. - Vibrates at their fixed positions. - Attraction forces are very strong - Kinetic energy is very low	- Particles are not orderly arranged - Cannot be compressed. - Particles keep contact with one another with spaces between particles. - Move freely - Attraction forces is weak. - Kinetic energy is higher.	- Particles are further apart - Move freely in random in all direction. - Attraction force is very weak and compressible. - Kinetic energy is the highest.

2. Sublimation



- process where **solid** changes to **gas** or **gas** to **solid** without going through the liquid.
- e.g. iodine, dry ice, ammonium chloride and naphthalene.

5. Diffusion

- can occur because particles move into the space in between the particles of solids, liquids and gases.
- eg: when 50 cm^3 of ethanol and 50 cm^3 of distilled water are mixed, only 98 cm^3 of mixture are obtained. This is because the ethanol and water particles occupy each other spaces between the particles.

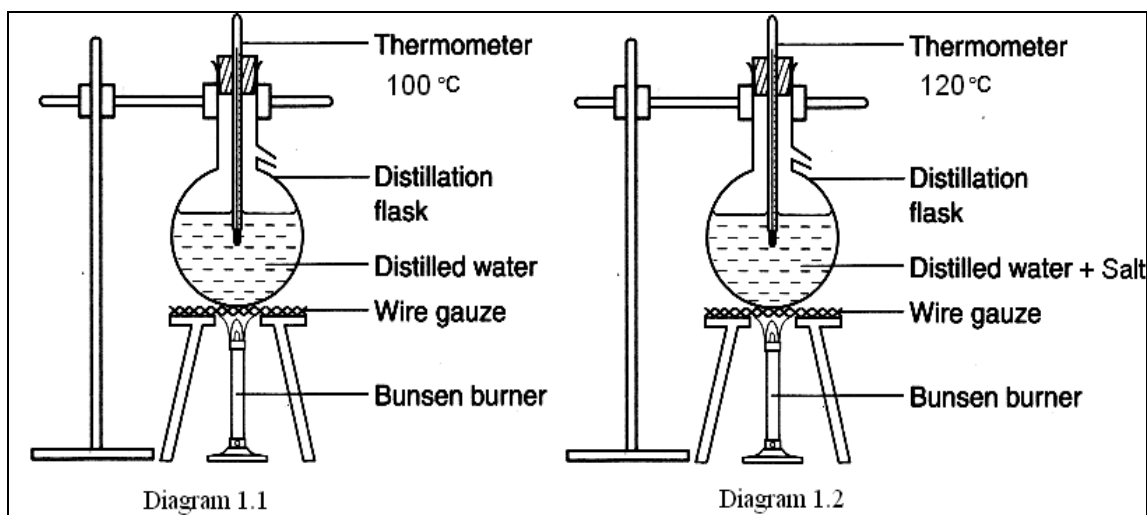
6. Brownian motion

- Is random movement example shown by smoke particles or pollen grains when knocked about by air particle

3. a. Characteristic or Properties of Metals and Non-Metals

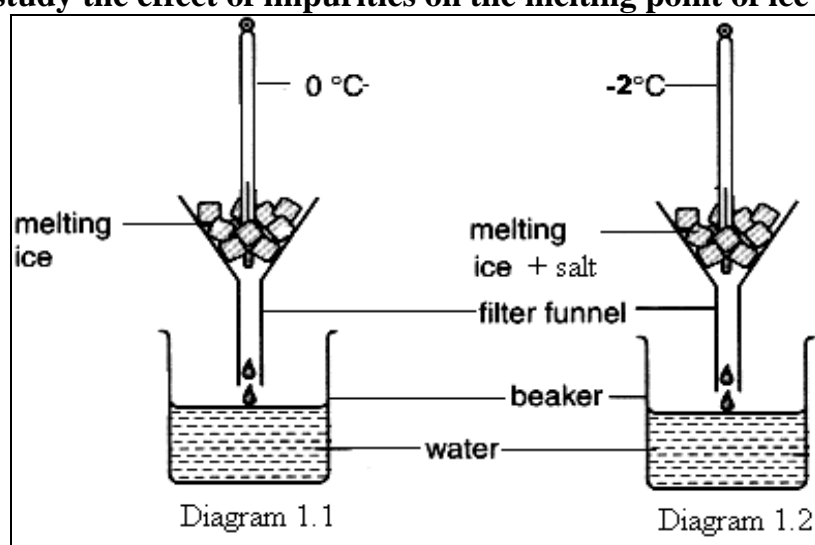
Metal	Non-Metal
a. Shiny and lustrous	a. Dull
b. Ductile ; can be pulled into a wire.	b. Brittle or fragile and breaks easily
c. Malleable ; can be beaten into thin sheet because atoms in metal can slide over one another easily.	c. Not malleable
d. Tensile ; very strong because of strong metallic bonding.	d. Weak and snaps easily
e. Good conductor of electricity because of free electrons.	e. Insulator
f. Good conductor of heat.	f. Poor conductor of heat
g. Very dense because atoms in metal are closely packed.	g. Low density
h. Very high boiling and melting points because of very strong atomic / metallic bonding.	h. Low boiling or melting points because of weak Van der Waal force.
i. e.g. iron, gold, copper, aluminium, zinc.	i. e.g. sulphur, glass, chlorine, sulphur.
j. Aluminium is used as food wrapper.	
k. Gold is used to make jewellery because malleable (easily slide over one another), shiny and non-rusting.	

4. Experiment : To study the effect of impurities on the boiling point of distilled water



- i. **Variables**
Manipulated : presence of salt
Constant : volume of distilled water
Responding : reading of the thermometer / boiling point
- ii. **Definition of distilled water** – Distilled water is pure water that boil at 100°C
- iii. **Definition of impure water** – Water that contain dissolve substances that boil at 102°C
- iv. **Inference** : Salt can increase the boiling point of distilled water.
- v. **Conclusion** : Impurities can affect the boiling point of distilled water.

5. Experiment : **To study the effect of impurities on the melting point of ice**

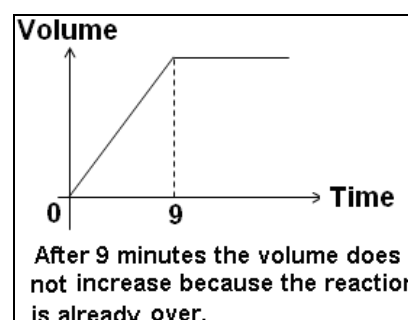
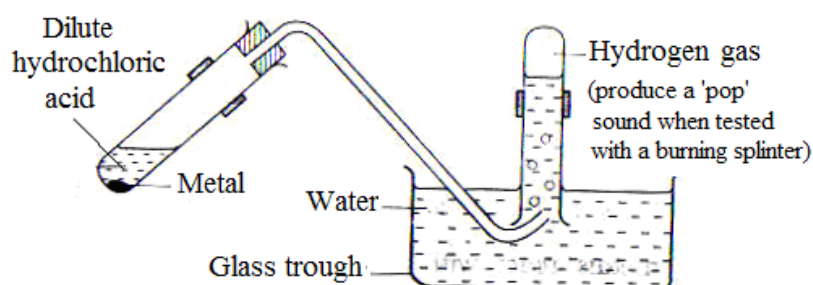


- i. **Variables**
Manipulated : presence of salt
Constant : mass of ice
Responding : reading of the thermometer
- ii. **Definition of distilled water** – Distilled water is pure water that melt at 0°C
- iii. **Definition of impure water** – Water that contain dissolve substances that melt at -2°C
- iv. **Inference** : Salt can decrease the melting point of ice
- v. **Conclusion** : Impurities can affect the melting point of ice.
- vi. **Application:** Workers pour salt onto the snow to prevent the snow from melting too fast.

FORM 4 CHAPTER 5 ENERGY AND CHEMICAL CHANGES

1.

Reactivity of metal with acid / water



Relationship:

The volume of gas increase with time.

Metal	+	Acid	→	Salt	+	Hydrogen
Zinc	+	Sulphuric acid	→	Zinc sulphate	+	Hydrogen
Iron	+	Hydrochloric acid	→	Iron chloride	+	Hydrogen

Aim: To determine the reactivity of different metal with acid

Hypothesis: Zinc produces more hydrogen gas than iron and copper.

Variables:

Manipulated variable: type of metal

Responding variable: volume of gas collected

Constant variable: mass of metal / presence of acid

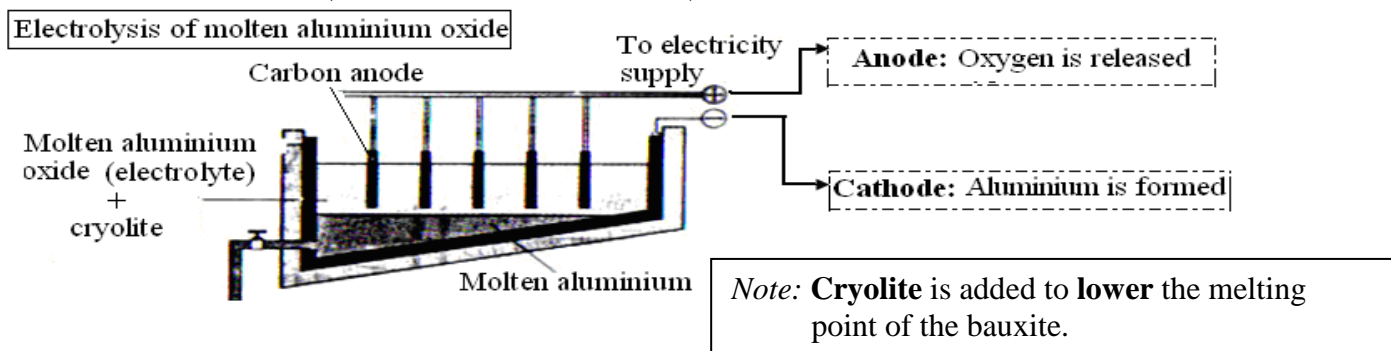
Inference: Zinc is more reactive than iron and copper

Operational definition of

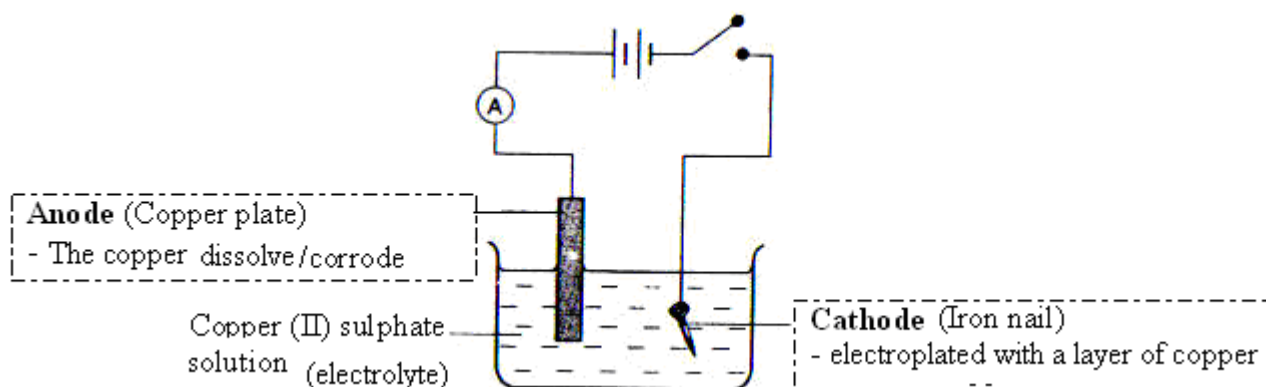
Rate of reactivity: Volume of gas collected

Conclusion: Different metal has different rate of reactivity with acid

2a. Extraction of Metals (Aluminium from bauxite)



c. Electroplating of Metals (Electroplating iron nail with copper)



****Note:** Copper (II) sulphate solutions colour unchanged because the copper ions that deposited onto the cathode is replaced by copper ions that dissolved from the anode.

i. The aims / advantage of electroplating:

- Prevent the metal from corrosion (rusting)
- Make the metal look more attractive

ii. The following methods should be taken into consideration to obtain a good quality and attractive electroplated product.

- The surface of the metal to be plated must be clean by sand paper beforehand.
- Electric current supplied should not be too big

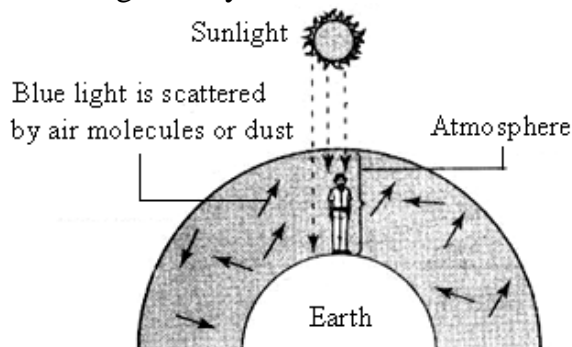
- c) Dilute electrolyte should be used.
- d) The period of electroplating should take a longer time.
- e) The nail must be rotated slowly.
- iii. The metal used in anode must same with the metal compound solution.
- iv. The electrolyte must has same type of metal ion with the anode

FORM 4 CHAPTER 7 LIGHT, COLOUR AND LIGHT

1. Phenomenon of Scattering of light

a. Sky looked blue

- The blue, indigo and violet lights are scattered by air molecules to the sky causing the sky looked blue.

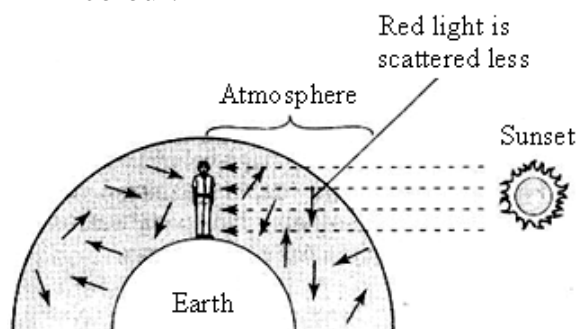


b. Sunrise / sunset looked reddish in colour

- The blue, indigo and violet lights are scattered by air molecules. Only red



and yellow lights reach our eyes make the sunset / sunrise looked reddish in colour.



2. Formation of rainbow (light dispersion)

- After raining, the water droplets in the atmosphere act as glass prism and dispersed the sunlight to form a spectrum of light called rainbow.

FORM 5 CHAPTER 2 NUTRITION AND FOOD PRODUCTION

NUTRITION AND GOOD EATING HABIT

1. Calorific value.

- Is the energy content of a food / energy produced when 1 g of food completely burnt in air.
- Can be measured by using a Bomb Calorimeter.

2a. Calorific value of

- i. Carbohydrates = 17.2kJ g^{-1}
- ii. Protein = 22.2kJ g^{-1}
- iii. Fats = 38.5kJ g^{-1} (2 x carbohydrates) (highest calorific value)

1 calorie = heat required to rise 1 g of water to 1°C

Vegetables, vitamins, water and minerals do not contain any energy at all.

- b. A pupil takes 20g of bread and 100g of milk. What is the total energy consumed?

Answer:

$$\text{Bread: } 20\text{g} \times 17.2\text{kJg}^{-1} = 344\text{J}$$

$$\text{Milk : } 100\text{g} \times 22.2\text{kJg}^{-1} = 2220\text{J}$$

$$\text{Total} = \underline{2564\text{J}}$$

3. Factors affecting the calorie requirement.

- a. Gender/sex
- b. Body size
- c. Age
- d. State of health
- e. Physical activities/job (a labourer needs more energy than a clerk)
- f. Climate.

4. Health problems

- a. **Malnutrition** – is diet which contains **insufficient** of nutrients etc;

Diseases	Insufficient of / lack of
i. Scurvy/ Gums bleeding	Vitamin C
ii. Rickets/	Vitamin D,

iii. Osteoporosis	Calcium and Phosphorus
iv. Night blindness	Vitamin A
v. Kwashiorkor (big tummy but skinny / too fat)	Protein

b. **Obesity** - Extra calories which form fats because of **overeating** etc;

Obesity Diseases	Excessive intake of
i. High blood pressure	Salts, fats and cholesterol
ii. Diabetes mellitus	Sugar and carbohydrates

iii. Gout	Protein / amino acid
iv. Cholesterol	Fats
v. Arteriosclerosis	Fats

c. **Anorexia nervosa – too thin**

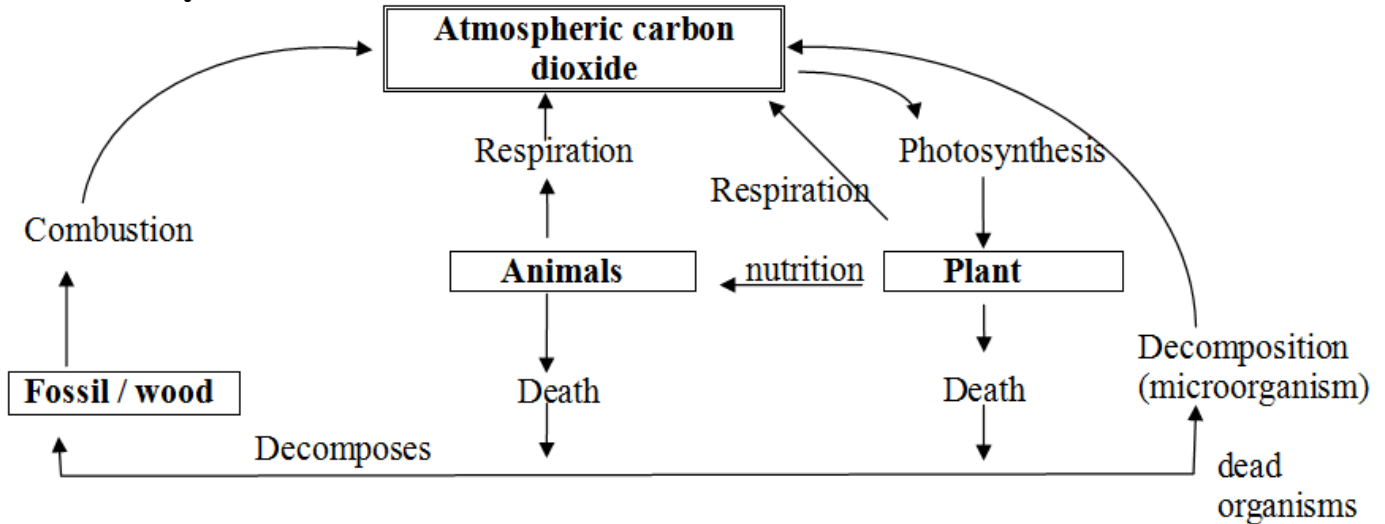
- is a psychological illness of dislike eating/refuse to eat.

- i. Due to intense fear of gaining weight and starving oneself to become thin.
- ii. Lead to malnutrition, lost of weight or even death.
(treatment through counselling only)

FORM 5

CHAPTER 3 PRESERVATION AND CONSERVATION OF THE ENVIRONMENT

1. Carbon cycle



2. Ways to maintain the balance of nature.

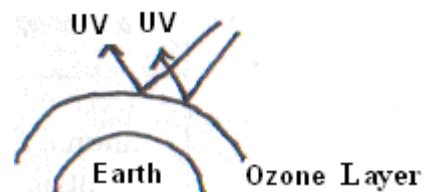
- a. **Enforcement of law**
 - i. Environment Quality Act 1974 (to prevent and control pollution)
 - ii. Ban open burning
- b. **Use of technology**
 - i. Reduce air pollution by fixing catalytic converters in exhaust pipes of vehicle.
 - ii. Reduce smoke by fixing electrostatic precipitator in the chimney.
- c. **Use of biological control**
 - i. use bacteria to treat sewage before release into the river.
 - ii. Reduces the usage of pesticides that cause pollution and kill other organisms.

d. Ways of preservation and conservation

- Reduce extensive logging and land clearing. **Encourage tree replanting.**
- Reduce vehicles on the road
- Fix filter on the chimney

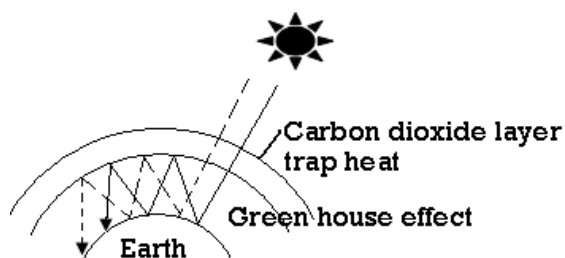
e. Important of preservation & conservation

3. Ozone



- a. consists of three oxygen atoms

- b. protect the earth from harmful ultraviolet
 - c. can be depleted by chlorofluorocarbon (CFC)
4. **Chlorofluorocarbon (CFC)**
- a. it chlorine atoms set free when chlorofluorocarbon exposed to ultraviolet rays.
 - b. these chlorine atoms deplete the ozone molecules
 - c. used as cooling agent for air-con, refrigerator, polystyrene, **aerosol** can
5. **Effects of ultra violet rays caused:**
- a. skin cancer
 - b. eye cataract / mutation
 - c. weakens body immune system
destroy phytoplankton / kill algae which is food for fish
 - d. cause ecosystem unbalanced
6. **Effort to save ozone layer**
- replace *CFC* with *HFC*
7. **Greenhouse effect**



- Carbon dioxide**
- trap heat in our atmosphere and cause **greenhouse effect** or **global warming**

- produced by burning of fossil fuel, exhaust from vehicles, extensive logging/deforestation due to urbanization, open burning or opening land.

8. **Effects of Greenhouse effect / Global warming**

- a. sea levels increase due to iceberg melting at the poles of the earth
- b. droughts which causes low yield of crops and famine

9. **Carbon monoxide**

- from exhaust fumes of vehicles can reduce intake of oxygen to the brain.

10. **Sulphur dioxide, carbon dioxide and nitrogen dioxide** can cause acid rain which corrode buildings and roof-top.

11. **(Euthrophication Process)** Excessive chemical fertiliser can dissolve into rain water and flow into pond cause algae to grow. When algae dies, it decays and reduces the amount at oxygen and cause the fish to die.

12. **Ways to solve green house effects**

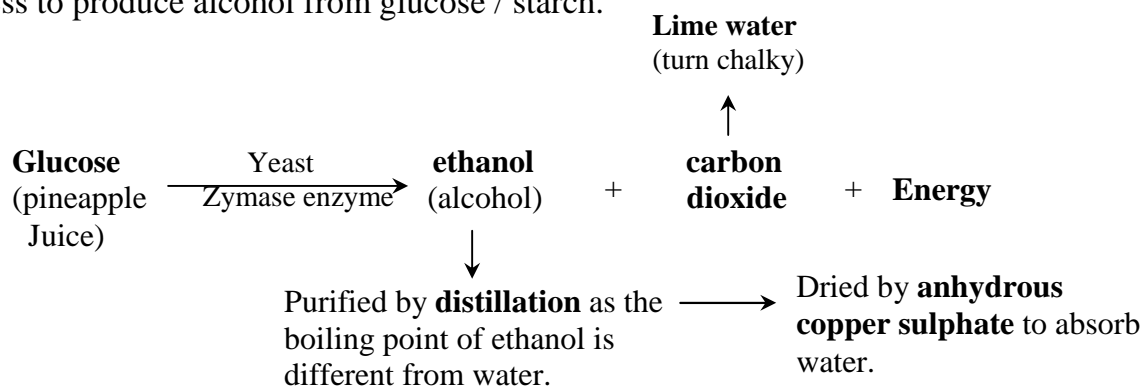
- Reforestation/tree replanting
- Ban open burning
- Reduce vehicles on the road / practice car-pool system
- Use public transport

1. **Alcohol**

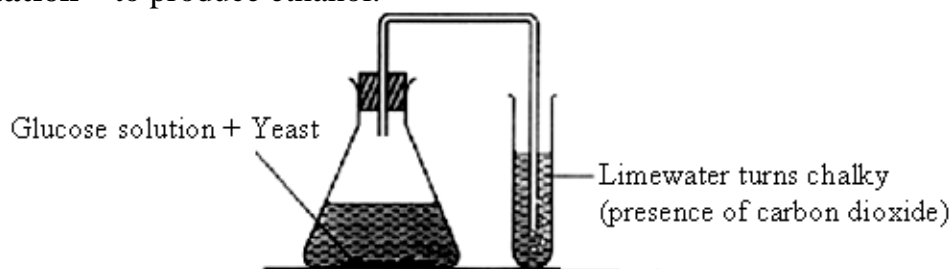
- a. Consists of carbon, hydrogen and oxygen.
- b. e.g. methanol, ethanol, propanol, butanol.....
- c. **Ethanol** is used to make alcoholic drinks.
- d. **Methanol** is poisonous and can cause blindness or even death.

2. Fermentation

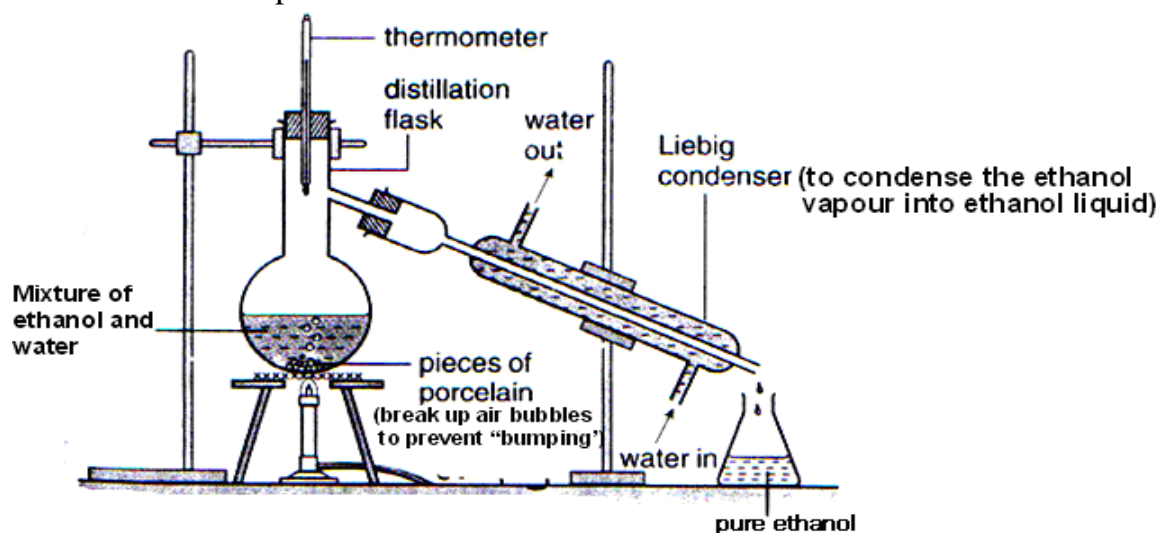
a. Is a process to produce alcohol from glucose / starch.



b. **Fermentation** – to produce ethanol.



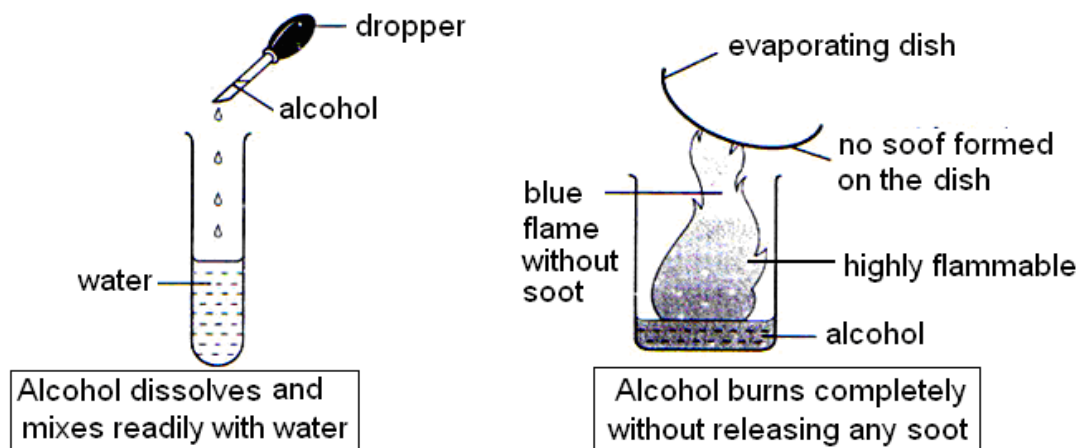
c. **Distillation** – to obtain pure ethanol.



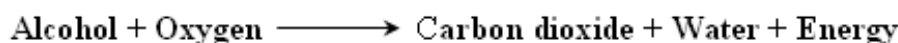
3. a. **Properties of alcohol**

- i. Colourless, neutral, pleasant / sharp smell.
- ii. Soluble and mixed easily with water.
- iii. Highly flammable / combustible, no soot is released.
- iv. Low boiling point.
- v. Volatile / vapourise easily.

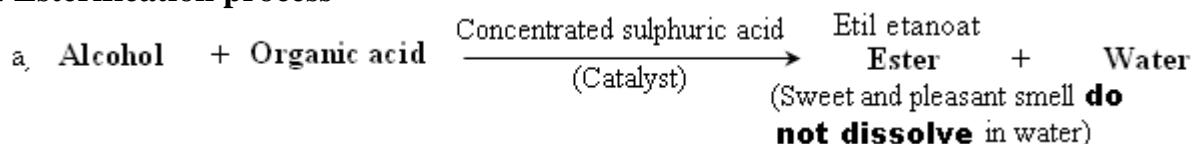
b.



c. **Combustible** (burn completely without soot)



4. Esterification process



b. **Ester** is used in food **flavouring**, **fragrances**, **perfumes** and **cosmetics**.

5. Uses of alcohol

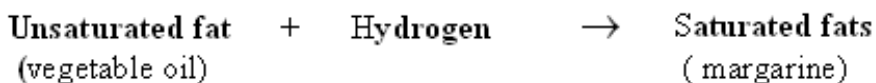
- Ethanol is used to make alcoholic drinks such as beer, wine, brandy and whisky.
- Organic solvents for shellac, inks, perfumes, cosmetics, or medicine such as cough mixture.
- Disinfectant to kill microorganism e.g. is rubbed on skin before an injection is given.
- Antiseptics such as iodine solutions.
- Ether is used to prepare artificial flavours.
- As fuels, burn completely without soot.
- Methanol to prepare formalin for preservation.
- To make ethanoic acid / vinegar.
- Thermometric liquid to measure temperature.

6. Effects of excessive consumption of alcohol on health

- cause nervous system slows down.
 - Become drunk, poor body coordination, cause accidents, disturb body's balancing and vision blur.
 - Damage the stomach, liver (cirrhosis), kidneys and heart.
 - cause addiction and social problems.
 - cause retardation to foetal growth.
7. **Fats** is molecule of Glycerol and Fatty acid.
- Consist of **carbon, hydrogen, and oxygen**.
 - Provide double energy than carbohydrate.
 - As insulator for our body.
 - Solvent for vitamins A, D, E and K.
 - Excessive cause obesity and raise the level of cholesterol.

Fats	
Saturated	Unsaturated
<ul style="list-style-type: none"> - contains maximum hydrogen atoms. - Mainly animal fats. - Solid in room temperature. - Raise the cholesterol level. - Higher melting point. - e.g. butter, cheese, ghee, meat..... 	<ul style="list-style-type: none"> - still can receive hydrogen atoms - Mainly plant oil. - Liquid form in room temperature. - Cholesterol free - e.g. palm oil, corn oil, peanut oil, soy oil, olive oil

8. Hydrogenation process

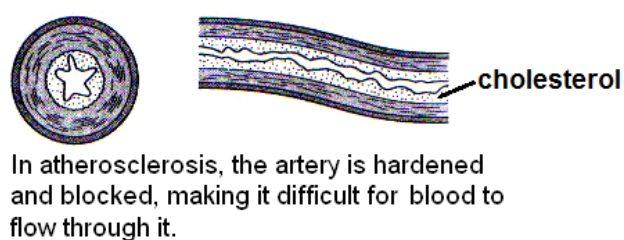
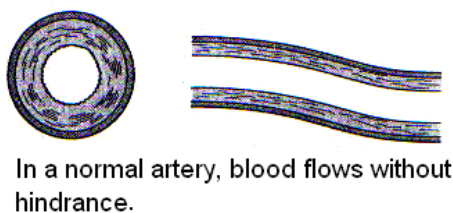


9. Cholesterol

Cholesterol	
LDL (Bad)	HDL (Good)

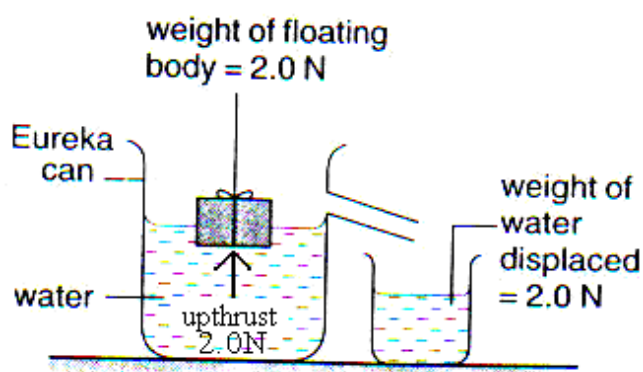
b. Bad (LDL) cholesterol cause

- Formation of bile stones which cause jaundice.
- Accumulated of cholesterol on the wall of the arteries which narrow the passage of arteries such as:
 - **Atherosclerosis** (artery blocked)
 - **Thrombosis** (blockage of blood vessels)
 - **Stroke** (thrombosis in artery leading to the brain)
 - **Heart attack** (thrombosis in the coronary artery and out off oxygen to the heart)



FORM 5 Chapter 5 MOTION

Archimedes' Principle

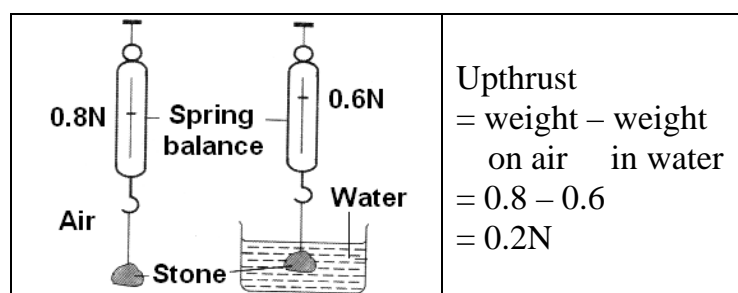


Upthrust force

$$\begin{aligned} &= \text{weight of the object} \\ &= \text{weight of water displaced} \\ &= mg \\ &= \rho v g \end{aligned}$$

$$\frac{m}{v} = \rho$$

$$m = \rho v$$



$$\begin{aligned} \text{Upthrust} &= \text{weight on air} - \text{weight in water} \\ &= 0.8 - 0.6 \\ &= 0.2\text{N} \end{aligned}$$

Note: Denser water such as seawater which contain salt produce bigger upthrust. The denser the water, the greater the upthrust / the lighter the object float.

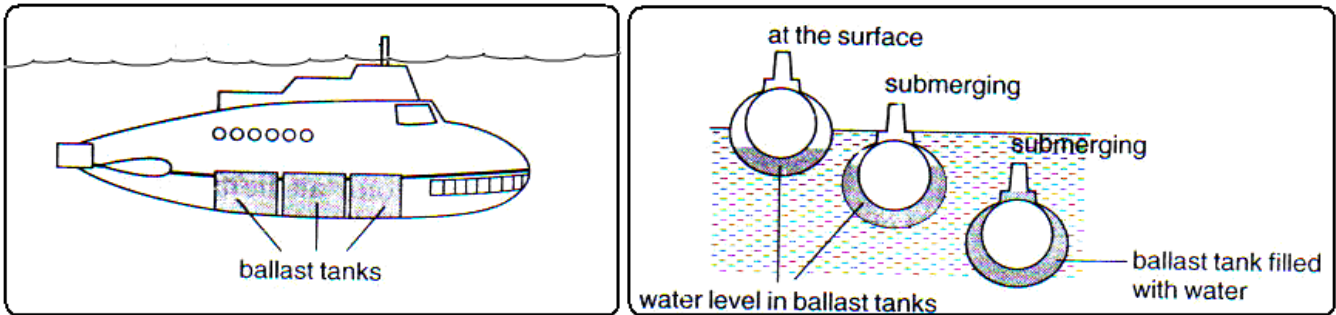
Application of Archimedes' Principle

1. Plimsoll line

- show how much the ship can be safely loaded when sailing in the sea

2. Submarine

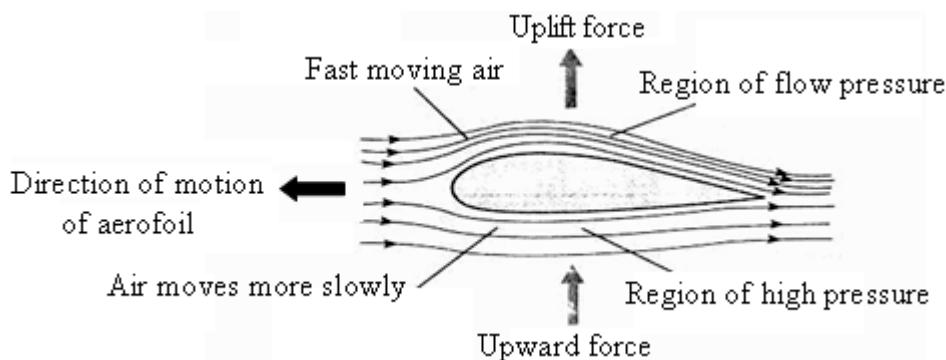
- A submarine has ballast tanks. The submarine becomes dense and submerged in the sea when the ballast tanks are filled with the sea water.
- The submarine becomes less dense and rises to the surface when the ballast tanks are emptied.



	Picture	Characteristics
Aircraft		<ul style="list-style-type: none"> - When an aircraft is in flight, the shape of its wings causes air to move faster above the wings than below the wings. This creates slower pressure above the wings. Air pushing upwards on the wings produces a lift (upward force). - When an aircraft is flying with a uniform velocity at a fixed height, then: <div style="border: 1px dashed black; padding: 5px; text-align: center;"> $\text{Thrust} = \text{drag}$ $\text{Lift} = \text{weight}$ </div>
Hot air balloon		<ul style="list-style-type: none"> - The hot air inside the balloon is less dense than the atmospheric air. - The weight of air displaced by the balloon is heavier than the weight of the balloon and its hot air.

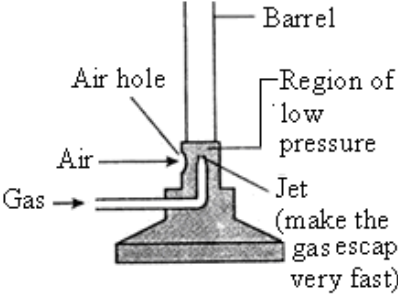
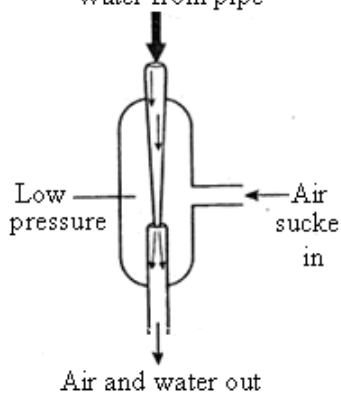
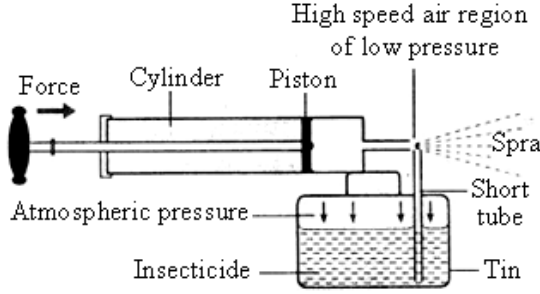
Application of Bernoulli's Principle

1. Aerofoil



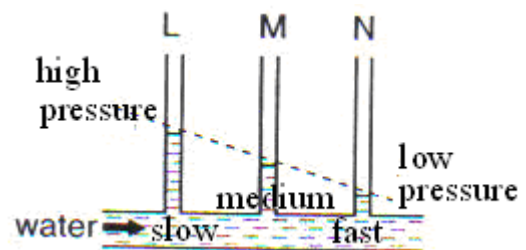
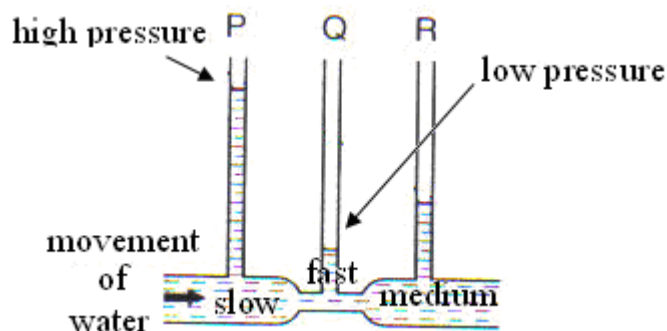
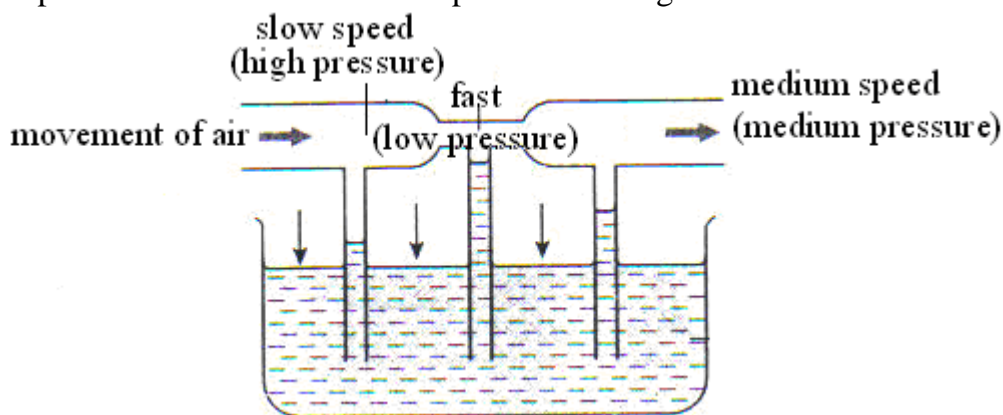
- The high speed of air moving above the aerofoil produces a low pressure.
- The slower speed of air moving below the aerofoil produces higher pressure.
- The differences of pressure cause an uplift force on the aerofoil.

2. Other apparatus using Bernoulli's Principle

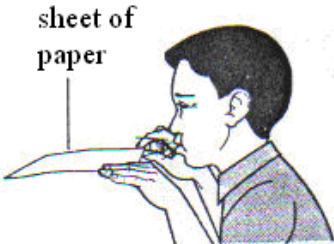
a. Bunsen burner	b. Filter pump	c. Insecticide spray
 <p>Barrel Air hole Air Gas Region of low pressure Jet (make the gas escape very fast)</p>	 <p>Water from pipe Low pressure Air sucked in Air and water out</p>	 <p>High speed air region of low pressure Force Cylinder Piston Atmospheric pressure Insecticide Short tube Tin Spray</p>

Bernoulli's Principle

- States that the pressure decreases when the speed of fluid / gas increases.



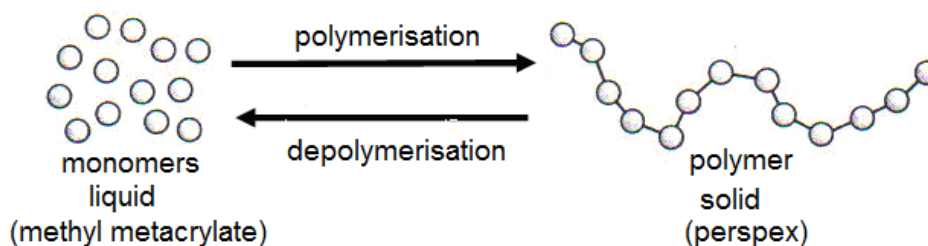
Bernoulli Effects

Diagram	Activity and observation	Reason
 <p>sheet of paper</p>	<p>Blow hard across the surface of a sheet of paper held horizontally in front of the mouth. This causes the paper to rise.</p>	<p>The air moving across the top of the paper at a fast speed causes a region of low air pressure above the paper. Atmospheric pressure below the paper pushes the paper upwards.</p>

	<p>Blow air at a fast speed down the filter funnel. The ping pong ball does not fall.</p>	<p>The air pressure in the space above the ball is lowered because of the fast flowing air. Atmospheric pressure which is greater pushes up the ball and supports it.</p>
	<p>Hang a ping pong or polystyrene ball near a fast stream of water from a tap. The ball is attracted towards the water.</p>	<p>The fast moving stream of water produces a region of low air pressure around it. Atmospheric pressure being greater, pushes the ball towards the water.</p>

CHAPTER 7 SYNTHETIC MATERIALS IN INDUSTRY

1.a. **Polymer** is along chain of molecules / monomers that are combined together.



c.

Polymer	
Natural polymer	Synthetic polymers
<ul style="list-style-type: none"> - from plants / animals - Latex (isoprene) - cellulose (glucose) - starch (glucose) - protein (amino acid) - silk - cotton 	<ul style="list-style-type: none"> - Made by human from natural gas or fractional distillation of petroleum contain carbon, hydrogen and oxygen elements such as <ol style="list-style-type: none"> a. Synthetic rubber b. Synthetic fibres c. Plastics / perspex

4. Effects of improper disposal of plastics

- a. Non-biodegradable plastics can clog up the waterways and cause flash flood.
- b. Burning of plastics cause air pollution
 - It release toxic gases such as dioxin and chlorine.
 - It release acidic gases such as carbon dioxide and carbon monoxide.
- c. Thrown plastics in the sea can destroy marine lives.
- d. Thrown plastics can destroy the surrounding beauty.
- e. Develop breeding ground for vector
- f. Rivers become smelly

5. Proper management of disposal of plastics

- a. Non-biodegradable plastics are compacted and **buried** in landfills
- b. Recycle plastics waste into useful items
- c. Burnt in incinerators
- d. Source reduction such as using less plastic to manufacture a product
- e. Use paper biodegradable bags or recycle bags instead of plastic bags.