4541
Chemistry
Marking Scheme
Mei
2007

BAHAGIAN SEKOLAH
KEMENTERIAN PELAJARAN MALAYSIA

PEPERIKSAAN PERTENGAHAN TAHUN 2007

FORM 5 CHEMISTRY
Marking Scheme for Papers 1, 2 and 3

Peraturan pemarkahan ini mengandungi 23 halaman bercetak.

Paper 1

1	B
2	C
3	A
4	D
5	D
6	A
7	C
8	B
9	B
10	D
11	C
12	A
13	B
14	C
15	B
16	C
17	A
18	C
19	C
20	B

21	C
22	D
23	A
24	A
25	D
26	B
27	D
28	C
29	D
30	C
31	A
32	B
33	C
34	D
35	D
36	A
37	D
38	C
39	A
40	B

41	C
42	C
43	B
44	C
45	D
46	C
47	A
48	C
49	C
50	C

Paper 2- Section A

1. (a) 17 1

(b) (i) 2.7 1

(ii) 2.8.7 1

(c) (i) 2 1

(ii) 3 1

(d) $^{36}_{17}Q$ 1

(e) (i) increase 1

(ii) decrease 1

(iii) increase 1

(f) $2Fe + 3Q_2 \rightarrow 2FeQ_3$ / $2Fe + 3Cl_2 \rightarrow 2FeCl_3$ 1

Total 10 marks

2 (a) The formula that gives the simplest whole number ratio of atoms of each element in a compound. 1

(b) $H_2SO_4 + Zn \rightarrow ZnSO_4 + H_2$ / any suitable reaction between an acid and a metal 1

(c) (i) mass of copper = 47.70 – 25.30 / 22.40 1
mass of oxygen = 53.30 – 47.70/ 5.60 1

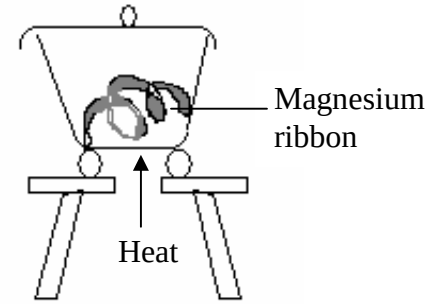
(ii) 1. $\frac{22.40}{64} : \frac{5.60}{16}$ 1

2. 0.35 : 0.35
1 : 1 1

(iii) CuO 1

(iv) $H_2 + CuO \rightarrow Cu + H_2O$ 1

(d)



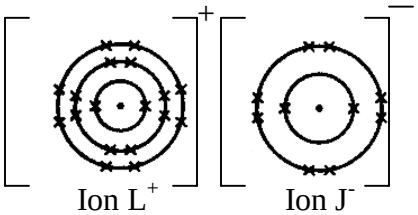
1. Set up of apparatus complete and functional 1
2. Labels correct 1

Total 10 marks

3. (a) (i) L^+ 1
(ii) E^{2-} 1

(b) 1. G 1
2. Electron arrangement for G is 2.8 // outermost shell is fully occupied with electrons/ is full with electrons. 1

(c) (i) ionic bond 1
(ii) LJ r: JL 1
(iii) [able to draw the diagram of electron arrangement correctly]



1.[all electrons and shells shown correctly] 1
2. [atoms labeled and charges shown] 1

(iv) 1.In aqueous solution // molten state 1
2.Ions can move freely//free to move 1

Total 10 marks

4. (a) SO_4^{2-} , OH^- 1

(b) (i) $Cu \longrightarrow Cu^{2+} + 2e^-$ 1

(ii) $Cu^{2+} + 2e^- \longrightarrow Cu$ 1

(c) (i) Remains unchanged 1

(ii) 1. The rate at which copper (II) ions produced at the anode is equal to the rate at which copper (II) ions are discharged at the cathode. 1

2. So, the final concentration of the copper (II) sulphate solution remains unchanged. 1

(d) (i) oxygen 1

(ii) copper 1

(e) 1. moles of gas = $\frac{24}{24000}$ / 0.001 1

2. number of molecules = $0.001 \times 6.02 \times 10^{23}$
$= 6.02 \times 10^{20}$ 1

10 marks

.

5 (a) (i) Oxygen 1

(ii) Nitrogen dioxide 1

(iii) Lead (II) oxide 1

r : symbol

(b) Put a glowing wooden splinter into the test tube. 1

The glowing wooden splinter is lighted up 1

(c) (i) Lead (II) ion 1

(ii) $Pb^{2+} + 2OH^- \rightarrow Pb(OH)_2$ 1

(iii) Lead(II) hydroxide 1

(d) (i) Yellow precipitate is formed 1

(ii) Double decomposition reaction/precipitation 1

Total **10 marks**

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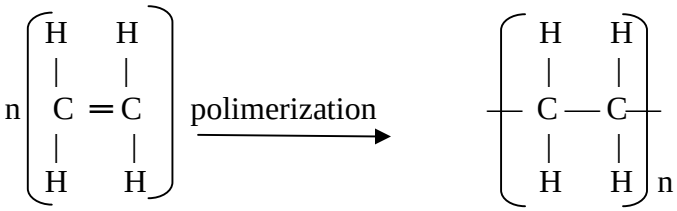
6 (a) A polymer is a large long-chain molecule formed by joining together many small monomer molecules. 1

(b) Starch / cellulose 1

(c) (i) protein : amino acid 1

(ii) polyethene : ethene 1

(d)



1+1

(e) Natural rubber/ wood/ cotton/any suitable example 1

(f) Petroleum. 1

(g) [Any one of the following two:] 1

- PVC is non-biodegradable. Thus, it can cause blockage of drainage system (As such it causes flash flood)
- Burning of PVC produces hydrogen chloride gas which is poisonous and acidic.

(h) Replacement for glass, lenses and optical fibres/ any suitable use 1

10 marks

Paper 2-Section B

7. (a)

No	Refrigerator	Kitchen cabinet
1	Low temperature	High temperature / Room temperature
2	Bacterial activity low / Bacteria inactive	Bacterial activity high / Bacteria active
3	Bacteria produces very little toxin	Bacteria produces a lot of toxin
4	Rate of decaying of food is low	Rate of decaying of food is high

(4)

(b) (i) Average rate of reaction for Experiment I = $\frac{50}{60}$ = 0.833 $cm^3 s^{-1}$ (1+1)

(b) (ii) Between experiment I and II

1. The rate of reaction in Experiment II is higher 1
2. The temperature in Experiment II is higher 1
3. At higher temperature, the kinetic energy of the particles is higher / particles move at a greater speed. 1
4. Frequency of collision between hydrogen ions ions and zinc atoms increases. 1
5. The frequency of effective collisions increases. 1 5

Between Experiment II and III.

6. The rate of reaction in Experiment III is higher. 1
7. The size of solid zinc is smaller 1
8. The total surface area of zinc in Experiment III is larger. 1
9. The frequency of collision between hydrogen ions and zinc atoms increases. 1
10. The frequency of effective collisions increases 1 5

7. (b) (iii)

1. No. of moles of HCl = $\frac{0.5 \times 25}{1000}$ = 0.0125 1
2. 2 moles of HCl produce 1 mol of H_2 1
3. No. of moles of H_2 = $\frac{0.0125}{2}$ = 0.00625 1
4. Volume of H_2 = 0.00625 x 24 = 0.15dm^3 1 4

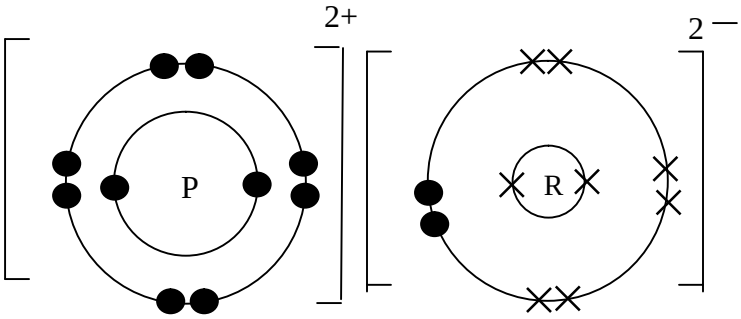
TOTAL 20

8. (i) P – 2.8.2 1

Q- 2.4 1 2

(b) (i) Between P and R

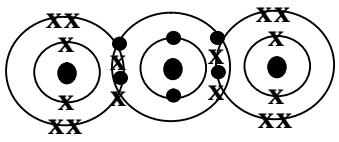
1. Atom P has 2 valence electrons 1
2. Atom P loses/donates/transfers 2 electrons to achieve a stable octet structure/ Stable electron arrangement / diagram 1
3 To form ion P^{2+} / P $\rightarrow P^{2+} + 2e^-$ 1
4. Atom R has 6 valence electrons 1
5. Atom R gains/receives 2 electrons from atom P to achieve a stable octet structure/ Stable electron arrangement /diagram 1
6. to form ion R^{2-} / R $+ 2e^- \rightarrow R^{2-}$ 1
7. The two oppositely-charged ions are bonded together by a strong electrostatic force to form an ionic bond 1



The P^{2+} ions and R^{2-} ions formed are bonded together by ionic bonds to form an ionic compound with a formula of PR_2 1 8

(ii) Between Q and R

1. Atom Q has 4 valence electrons and atom R has 6 valence electrons. 1
2. Two atoms of element R will each contribute 2 electrons from the valence shell to an atom Q 1
3. for sharing so as to achieve a stable octet structure/stable electron arrangement respectively// diagram 1
4. Atoms P and Q share two pairs of electrons to form a PQ_2 molecule through double covalent bonds 1 4



Molecules PQ_2

R Q R

(c) 1. Aluminium oxide has high melting and boiling point 1

2. Tetrachloromethane has low melting and boiling point 1

3. The oppositely-charged aluminium ions and oxide ions in aluminium oxide are held together by strong ionic bonds (or electrostatics forces of attraction) 1

4 A lot of heat energy is required to break the strong ionic bonds during melting and boiling thus it has high melting and boiling points 1

5. Tetrachloromethane consists of covalent molecules held together by weak forces of attractions (Van der Waals) 1

6. Only a small amout of heat energy is needed to overcome the weak forces between the molecules thus it has low melting and boiling points 1 6

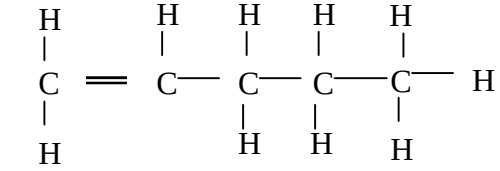
Total 20 marks

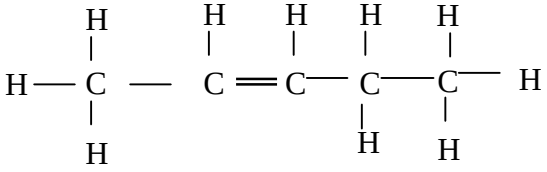
Paper 2 Section C

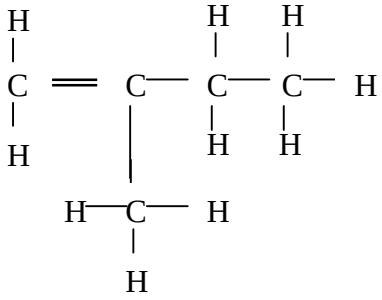
9 (a) (i) Double bonds between 2 carbon atoms 1

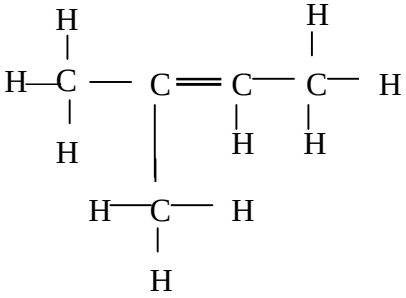
(ii) C_5H_{10} , pentene 1+1

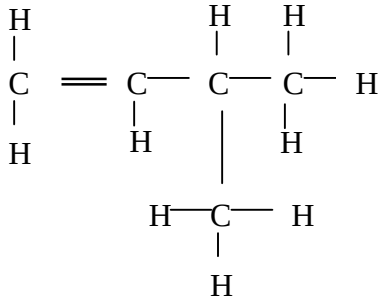
(iii) Any three of the following isomers. 1+1+1



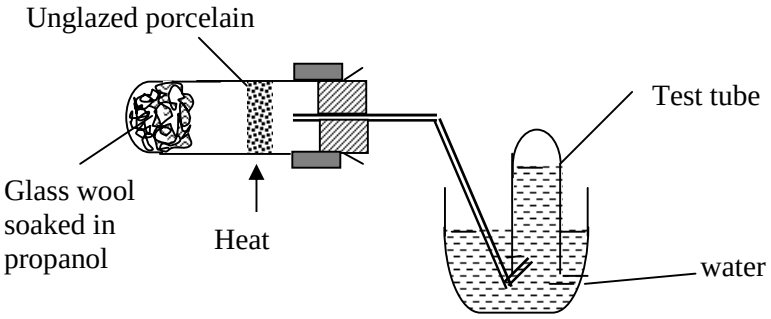








(b) 1. Diagram of set up of apparatus complete and functional 1
2. Labels of set up of apparatus correct 1
3. Place some glass wool in a boiling tube. 1
4. Use a dropper to add propan-1-ol to wet the glass wool. 1
5. Clamp the boiling tube horizontally and placed unglazed porcelain chips in the mid section of the boiling tube. 1



6. Heat the unglazed porcelain chips strongly. 1
7. Then heat the glass wool gently to vaporize the propanol. 1
8. [Description of the chemical test to the gas collected in the test tube.] 1
Add 1 cm^3 of bromine water and shake well.
Or,
Add 1 cm^3 of acidified potassium manganate(VII) solution and shake well.

9. [Observation]: 1
Reddish brown colour of bromine decolourised.
Or,
Purple colour of potassium manganate(VII) solution decolourised
10 Chemical equation: $C_3H_7OH \rightarrow C_3H_6 + H_2O$ 1

10

(ii) 1.Propane. 1
2 [Calculation of percentage of carbon by mass for propane and value] 1
3 [Calculation of percentage of carbon by mass for propene and value] 1
4 [Conclusion] Propene has a higher percentage of carbon by mass, so propene produces more soot. 1

Total 20 marks

10

(a)	1.	Use a pipette to draw up 25 cm^3 of an alkali (eg : sodium hydroxide)	1	
	2.	Transfer sodium hydroxide solution into a conical flask.	1	
	3.	Add 2-3 drops of indicator (eg :phenolphthalein)	1	
	4.	Fill a burette with a standard acid solution (0.1- 2.0 mol/dm^3 hydrochloric acid) and record initial burette reading.	1	
	5.	Add acid solution from the burette drop by drop into the alkali solution.	1	
	6.	The mixture is continuously shaken.	1	
	7.	Continue adding an acid solution until a permanent colour change of indicator is observed (eg : pink to colourless)	1	
	8.	Record final burette reading.	1	
	9.	[Result] Initial reading of burette = x_1 cm^3 Final reading of burette = x_2 cm^3 Volume of acid required = $x_2 - x_1 = x$ cm^3	1	
	10	[Chemical equation]	1	
	11	$\frac{M_1V_1}{M_2V_2} = \frac{a}{b}$	1	
	12	$M_1 = \frac{aM_2V_2}{bV_1}$ mol dm^{-3}	1	12

(b)	1.	Copper (II) oxide is added into a beaker filled with nitric acid solution and is heated	1	
	2.	Stir the mixture during heating	1	
	3.	Filter the mixture to remove excess solid	1	
	4.	The filtrate is filled into a beaker and is added with sodium carbonate.	1	
	5.	Stir and then filter the mixture.	1	
	6.	Rinse the residue collected using distilled water.	1	
	7.	Dry the residue	1	
	8.	Chemical equations : $CuO + 2HNO_3 \rightarrow Cu(NO_3)_2 + H_2O$ $Cu(NO_3)_2 + Na_2CO_3 \rightarrow CuCO_3 + 2NaNO_3$	1 1	
				Max 8

TOTAL **20 MARKS**

END OF MARKING SCHEME FOR PAPER 2

PAPER 3

1 (a) KK0503 – Measuring and using numbers

Score	Rubric
3	[Able to state all 5 readings correctly] Suggested answer : 43s, 26s, 19s, 15s, 12s
2	[Able to state any 4 readings correctly]
1	[Able to state any 3 readings correctly]
0	No response or wrong response

(b) KK0506 – Communicating

Score	Rubric
3	[Able to design a table and record the temperature, time and correctly for this experiment. 1 time Suggested answer :
2	[Able to state any 4 readings correctly]
1	[Able to state any 3 readings correctly]
0	No response or wrong response

Temperature (°C)	30	35	40	45	50
Time (s)	43	26	19	15	12
1 / time (s^{-1})	0.023	0.038	0.053	0.067	0.083

(c) KK0506 Communicating

Score	Rubric
3	[Able to draw a graph of temperature against $\frac{1}{\text{time}}$ with all the 4 items below correctly] i) suitable scale used ii) axes labelled correctly iii) all points plotted correctly iv) straight line of best fit drawn
2	[Able to draw a graph of temperature against $\frac{1}{\text{time}}$ with at least 3 items correctly]
1	[Able to manipulate two items correctly]
0	No response or wrong response

(d) KK 0504 – Making inference

Score	Rubric
3	[Able to deduce the relationship between the rate of reaction and temperature correctly] i) temperature is directly proportional to $\frac{1}{\text{time}}$ ii) Rate of reaction is directly proportional to $\frac{1}{\text{time}}$ iii) So, rate of reaction is directly proportional to temperature
2	[Able to deduce at least two relationships correctly]
1	[Able to state at least one relationship correctly]
0	No response or wrong response

(e) KK 0505 - Predicting

Score	Rubric
3	[Able to predict the time taken for the required temperature accurately] i) Method of predicting shown on the graph ii) Calculation shown iii) Answer to one decimal place iv) Time taken = $\frac{1}{0.064}$ = 15.6s
2	[Able to predict the time taken for the required temperature but inaccurate answer] i) Method of predicting shown on the graph ii) Calculation shown iii) Answer inaccurate iv) Time taken = $\frac{1}{0.064}$ = 15.625s or 15.63s
1	[Not able to predict the time taken for the required temperature correctly] i) Method of predicting shown on the graph ii) Calculation not shown Time taken = 0.064s
0	No response or wrong response

2 (a) KK0510 – Controlling variables

Score	Rubric
3	[Able to give 3 correct and complete variables] Suggested answer : Manipulated variable : The concentration of ammonia solution. Respond variable : pH value Fixed variable : Volume of ammonia solution
2	Able to give 2 correct and complete variables // 3 incomplete variables
1	Able to give one correct and complete variable // 2 incomplete variables
0	No response or wrong response

(b) KK0511- Making hypothesis

Score	Rubric
3	[Able to give correct and complete relationship] Suggested answer : The higher the concentration of hydroxide ions, the higher the pH value.
2	[Able to give incomplete relationship] Suggested answer : The concentration of hydroxide ions is directly proportionally to the pH value.
1	[Able to give an idea] Suggested answer : The concentration of hydroxide ions affect the pH value
0	No response or wrong response

(c) KK0509 – Operational definition

Score	Rubric
3	[Able to give correct and complete operational definition] Suggested answer : Ammonia solution has a low concentration of hydroxide ions // Sodium hydroxide has a high concentration of hydroxide ions.
2	[Able to give incomplete relationship] Suggested answer : Ammonia solution partially ionises in water to produce low concentration of hydroxide ions // Sodium hydroxide completely ionises in water to produce high concentration of hydroxide ion.
1	[Able to give an idea] Suggested answer : Ammonia solution / Sodium hydroxide has pH value more than 7.
0	No response or wrong response

(d) KK0505 – Predicting

Score	Rubric
3	[Able to predict accurate pH value]. Suggested answer : Range $7.5 < pH < 8.0$
2	[Able to predict but inaccurate pH value] . Suggested answer : Range $7.0 < pH < 7.5$
1	[Able to give an idea.] Suggested answer : Range 1.0 – 14.0
	No response or wrong response

(e) KK0506 - Communicating

Score	Rubric
3	[Able to give accurate ionisation equation.] **Suggested answer :** $NH_4OH \rightarrow NH_4^+ + OH^-$
2	[Able to give inaccurate ionisation equation.] **Suggested answer :** H_2O $NH_3 \rightarrow NH_4^+ + OH^-$
1	[Able to give an idea]. **Suggested answer :** $NH_3 \rightarrow NH_4^+ + OH^-$
0	No response or wrong response

(f) KK0507 - Using the relationship of space and time

Score	Rubric
3	[Able to give correct and complete statement.] **Suggested answer :** The higher the concentration of acid, the lower the pH value.
2	[Able to give incomplete statement.] **Suggested answer :** The concentration of acid is directly proportional to the pH value.
1	[Able to give an idea] **Suggested answer :** The higher the concentration of acid, the higher the pH value.
0	No response or wrong response

3 (a) KK051201 - Problem statement

Score	Rubric
3	[Able to state the problem statement clearly and accurately] **Suggested answer** How does the reactivity of Group 1 elements change when they react with water?
2	[Able to state the problem statement slightly inaccurate] **Suggested answer** To study the reactivity of Group 1 elements.
1	[Able to provide an idea of a problem statement] **Suggested answer** The reactivity of Group 1 elements.
0	No response or wrong response

3 (b) KK051202 – Stating all variables

Score	Rubric
3	[Able to state all the corresponding variables accurately] **Suggested answer** Manipulated variable : Type of Group 1 metals Responding variable : Reactivity of reaction Fixed variables : Water, size of metals
2	[Able to state two corresponding variables accurately].
1	[Able to state any one corresponding variable correctly].
0	No response or wrong response

3 (c) KK051205 – List of materials and apparatus

Score	Rubric
3	[Able to list all materials and apparatus correctly] **Suggested answer** Materials A small piece of lithium, sodium, potassium and water Apparatus [Suitable container], forceps, Knife, filter paper
2	[Able to list the basic materials and apparatus required] **Suggested answer** A small piece of lithium, sodium and potassium, water Apparatus [Suitable container], forceps
1	[Able to provide an idea of materials and apparatus used] **Suggested answer** Group 1 metals, water, forceps
0	No response or wrong response

3(d) KK051204 – Experimental procedure

Score	Rubric
3	[Able to state all experimental steps correctly] **Suggested answer** 1. Cut a small piece of lithium using a knife and forceps. 2. Dry the oil on the surface of the lithium with filter paper. 3. Place the lithium slowly onto the water surface in a trough 4. Observe the reactivity of the reaction 5. Repeat steps 1 to 4 using sodium and potassium to replace lithium
2	[Able to provide 3 steps correctly to carry out the experiment] Steps 3,4 and 5
1	[Able to provide minimum of 2 steps correctly to carry out the experiment] Steps 3 and 4
0	No response or wrong response

3 (e) KK 0501-05 – Tabulation of data

<table>
<tr><th>Score</th><th>Rubric</th></tr>
<tr><td>3</td><td>[Able to construct a table correctly containing the following elements]
- Columns and rows
- Observation for each metal

Suggested answer
<table><tr><td>Metals</td><td>Observations</td></tr><tr><td>Lithium</td><td></td></tr><tr><td>Sodium</td><td></td></tr><tr><td>Potassium</td><td></td></tr></table></td></tr>
<tr><td>2</td><td>[Able to construct a tabulation of data containing the following elements]
- Rows and columns present
- Observation for metals

Suggested answer
<table><tr><td>Metals</td><td>Observation</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table></td></tr>
<tr><td>1</td><td>[An idea of a tabulation of data]
- Minimum of 2 rows and columns

<table><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table></td></tr>
<tr><td>0</td><td>No response or wrong response</td></tr>
</table>

Marks of excellence

Score	Rubric
2	Points given based on student's written plan. a) Candidate's display of all aspects of the planning 1 Problem statement 2 Statement of variables 3 List of materials and apparatus 4 Procedure 5 Tabulation of data b) Candidate's display of all aspects with a minimum score of 2 for each aspect
1	Points given based on student's written plan. a) Candidate's display of all aspects of the planning 1 Problem statement 2 Statement of variables 3 List of materials and apparatus 4 Procedure 5 Tabulation of data b) Candidate's display of all aspects with a minimum score of 1 for each aspect
0	No response or wrong response

Nota utk pemeriksa*

$$\frac{\text{Markah Kertas 1} + \text{Markah Kertas 2} + \text{Markah Kertas 3}}{2} = \text{Markah keseluruhan}$$

$$\frac{50 + 100 + 50}{2} = 100\%$$

END OF MARKING SCHEME