

4541/1
CHEMISTRY
PAPER 1
AUGUST
2003
1 1/4 hour



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CHEMISTRY
Paper 1
One hour and fifteen minutes

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO

1. *This question paper contains 50 questions*
2. *Answer **all** questions*
3. *The figures are not drawn to scale unless stated*
4. *Usage of scientific calculator which is non programmable is allowed*

Instruction: For questions 1 to 50 , each question is followed by four possible answers A, B, C, and D. Choose one answer or the best answer for every question and shade the suitable space in your objective answer sheet.

- 1 Which of these is the correct sequence of scientific method of investigation?
- A Observation → deriving an inference → determining the variables → doing the experiment.
 - B Analysing data → collecting data → arriving at a conclusion → identifying the problem.
 - C Deriving hypothesis → doing the experiment → arriving at a conclusion → deriving an inference
 - D Doing the experiment → deriving hypothesis → analysing the data → deriving an inference
- 2 The elements in the Periodic Table are arranged according to the increase in
- A number of protons
 - B number of electrons
 - C number of neutrons
 - D relative atomic mass
- 3 Which of the following substances conducts electricity in its molten state?
- A Glucose
 - B Sulphur
 - C Naphthalene
 - D Potassium iodide
- 4 Which of the following has a pH value less than 7?
- A An aqueous solution of ammonia
 - B An aqueous solution of sodium hydroxide
 - C An aqueous solution of hydrogen chloride
 - D An aqueous solution of copper(II) chloride

- 5 Which of the following substances when added to a solution of pH 4 can change its pH to pH 7?
- A Methyl orange
 - B Ethanoic acid
 - C Sodium chloride
 - D Sodium carbonate
- 6 The following are made from composite substances **except**
- A fabrics for clothing
 - B camera lenses
 - C car windows
 - D super conductors
- 7 A type of alloy contains copper and another metal, X. This alloy is used to make trophies . Metal X could be
- A iron
 - B tin
 - C zinc
 - D calcium
- 8 Which of the following processes can be used to change ethene to ethanol?
- A Hydrogenation
 - B Hydration
 - C Neutralization
 - D Fermentation
- 9 Which of the following reactions will yield an ester?
- A The reaction between carboxylic acid and alcohol
 - B The reaction between alkane and carboxylic acid
 - C The reaction between alkene and alcohol
 - D The reaction between alkane and alkene

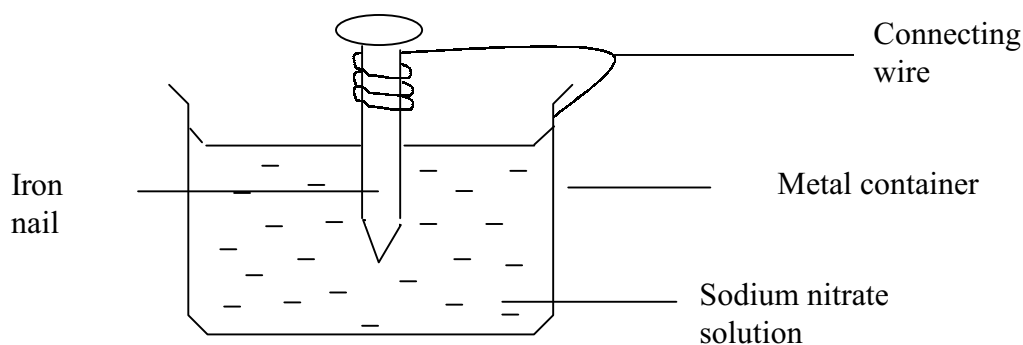


FIGURE 1

10 Figure 1 shows a set of apparatus to study the corrosion of an iron nail. The rate of corrosion of the iron nail is fastest if the metal container is made of

- A zinc
- B tin
- C lead
- D silver

11 Which of the following reactions is an endothermic reaction?

- A $\text{KNO}_3 (\text{s}) \rightarrow \text{KNO}_3 (\text{aq})$
- B $\text{NaOH} (\text{s}) \rightarrow \text{NaOH} (\text{aq})$
- C $\text{N}_2 (\text{g}) + 3\text{H}_2 (\text{g}) \rightarrow 2\text{NH}_3 (\text{g})$
- D $\text{Cu} (\text{s}) + 2\text{AgNO}_3 (\text{aq}) \rightarrow 2\text{Ag} (\text{s}) + \text{Cu}(\text{NO}_3)_2 (\text{aq})$

12 The industrial process of soap making is known as

- A polymerization
- B esterification
- C saponification
- D sulfonation

13 Which of the following is an analgesic?

- A Insulin
- B Penicillin
- C Cortisone
- D Paracetamol

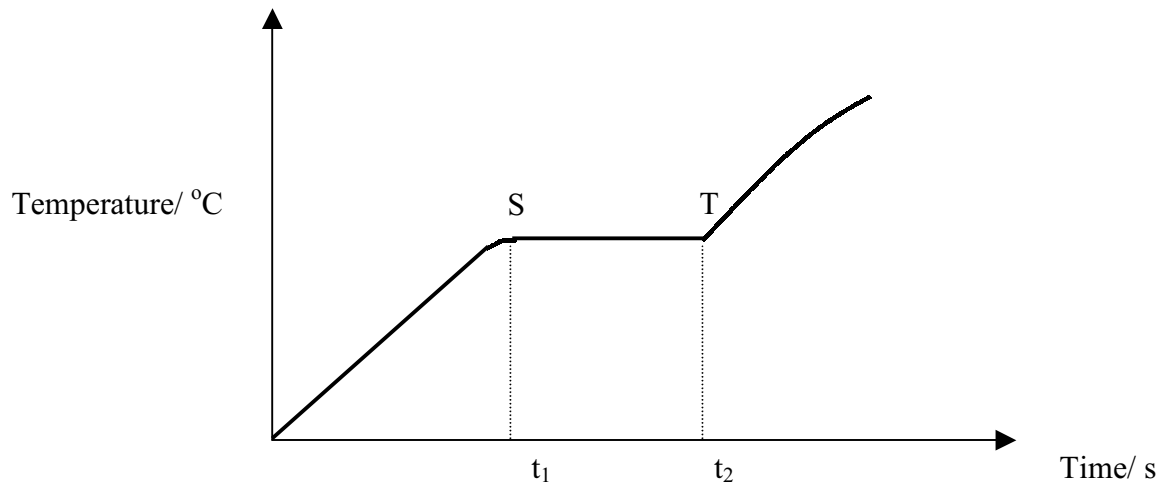


FIGURE 2

- 14 Figure 2 shows the melting curve of substance M. Which of the following describe what happen between points S and T ?

- I Substance M is both in solid and liquid form
- II The force of attraction between particles are getting weaker
- III The particles rotate and vibrate at their fixed position
- IV Heat energy, which is absorbed at this stage, is used to overcome the forces of attraction between particles

- A I and II only
- B II and III only
- C I, II and IV only
- D I, III and IV only

- 15 Which of the following describe the characteristics of ceramics?

- I Hard
- II Brittle
- III High melting point
- IV Good electrical insulator

- A I and IV only
- B II and III only
- C I, II and IV only
- D I, II, III and IV

- 16 Which of the following are redox reactions?
- I Corrosion of iron
 - II Displacement of copper (II) sulphate by zinc
 - III Electrolysis of dilute potassium bromide solution
 - IV Neutralization of hydrochloric acid with sodium hydroxide
- A I and II only
B III and IV only
C I, II and III only
D I, II, III and IV
- 17 Ethanoic acid reacts with ethanol to form compound X. Which of the following are the characteristics of compound X?
- I Insoluble in water
 - II Fruity smell
 - III Molecular formula, CH_3COOH
 - IV Decolourizes purple, acidic potassium manganate(VII) solution
- A I and II only
B III and IV only
C I, II and III only
D I, II, III and IV
- 18 Which of the following are true of covalent compounds?
- I. Usually volatile
 - II. Soluble in organic solvents
 - III. Formed by the sharing of electrons between atoms
 - IV. Conduct electricity in the melt
- A I and II only
B III and IV only
C I, II and III only
D I, II, III and IV

- 19 The heat of displacement of copper can be determined by adding excess magnesium powder to copper(II) sulphate solution. Besides the rise in temperature, the other data needed are

- I mass of the magnesium powder
- II volume of copper(II) sulphate solution
- III relative atomic mass of magnesium
- IV molarity of the copper (II) sulphate solution

- A I and III only
- B II and IV only
- C I, II and III only
- D II, III and IV only

- 20 Which of the following are correctly matched?

	Type of food additive	Function
I	Preservative	Prevents the growth of microorganism in foods so that it keeps longer
II	Antioxidant	Prevents oxidation of the oil in food by oxygen
III	Flavouring	Gives and enhances the flavour of foods
IV	Colouring	Gives and restores certain colour in foods

- A I and III only
- B I, II and IV only
- C II, III and IV only
- D I, II, III and IV

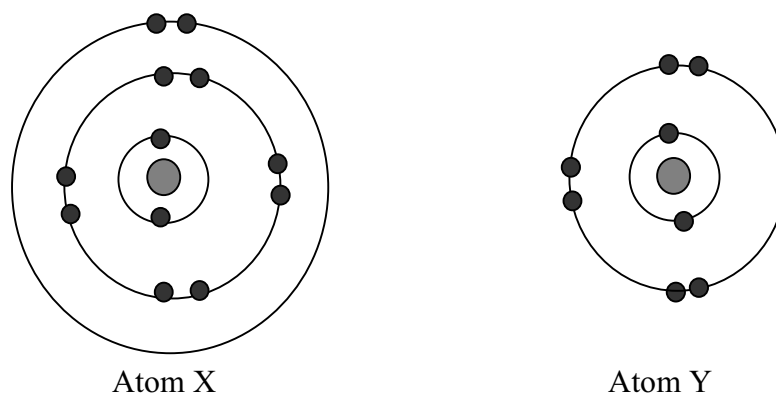


FIGURE 3

21 Atom X can react with atom Y to form a compound. The formula of the compound formed will be

- A XY
- B X_2Y
- C Y_2X
- D Y_2X_2

22

Particle	Number of electrons	Nucleon number
E	8	16
Q	9	18
R^{2-}	10	18
T^+	10	22

TABLE 1

Table 1 shows the number of electrons and nucleon number for particles E, Q, R^{2-} and T^+ . Which of the following is a pair of isotopes of an element?

- A E and R
- B Q and R
- C E and T
- D Q and T

23

Element	Electron Arrangement
V	2.8
W	2.8.2
X	2.8.4
Y	2.8.7
Z	2.8.8.1

TABLE 2

Table 2 shows the electron arrangement of atoms of elements V, W, X, Y and Z. Which of the pair of elements will combine to form a compound which will conduct electricity in molten state?

- A V and X
- B W and Z
- C X and Y
- D Y and Z

24

Pairs of metal	Negative Terminal	Voltmeter Reading/V
Lead / Manganese	Manganese	1.05
Zinc / Manganese	Manganese	0.42
Nickel / Zinc	Zinc	0.51

TABLE 3

Table 3 shows the voltmeter reading when the pairs of metal are immersed in its salt solution and connected by a salt bridge. What will be the voltmeter reading for an electrochemical cell that consists of lead/nickel pair?

- A 0.12V
- B 0.63V
- C 0.93V
- D 1.98V

25 Which of the following solutions has the highest concentration of hydrogen ions?

- A 50 cm³ of 2 mol dm⁻³ hydrochloric acid
- B 50 cm³ of 2 mol dm⁻³ ethanoic acid
- C 50 cm³ of 2 mol dm⁻³ nitric acid
- D 50 cm³ of 2 mol dm⁻³ sulphuric acid

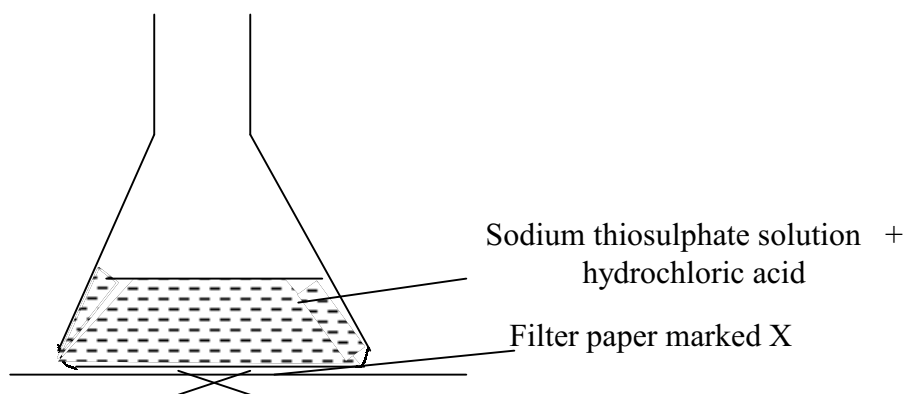
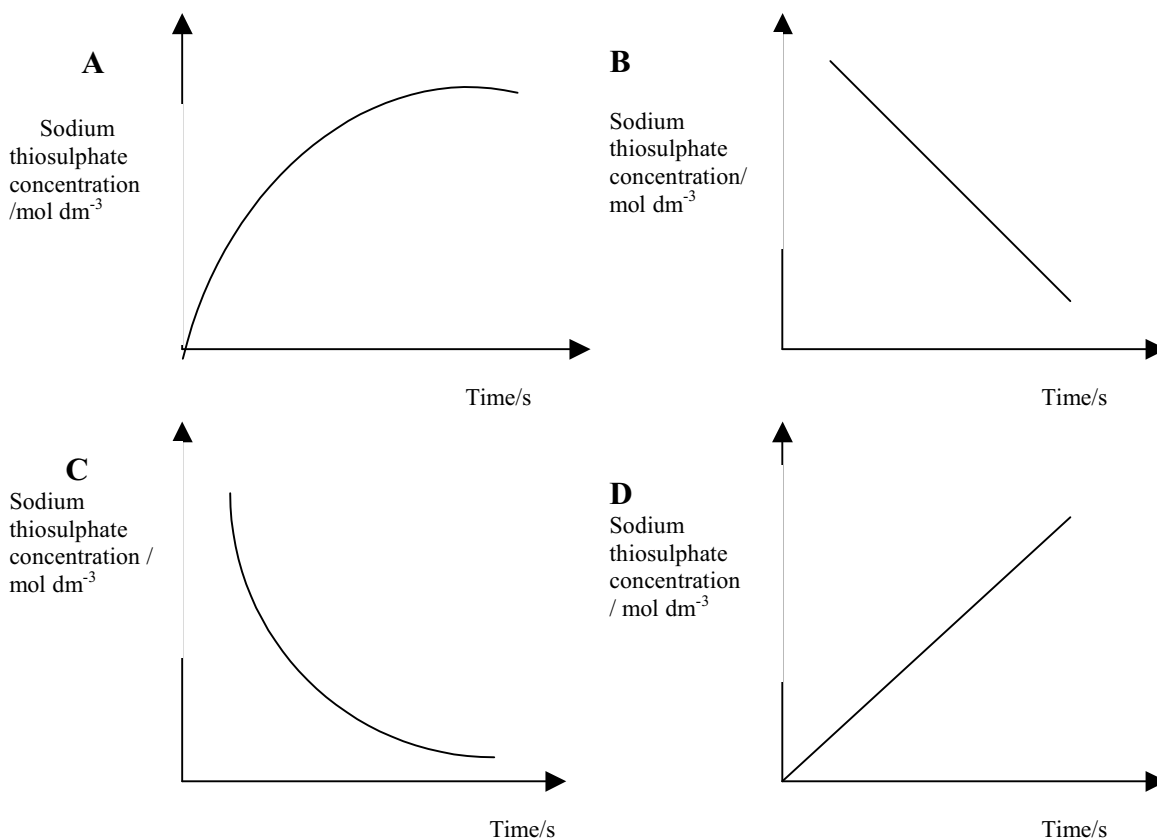


FIGURE 4

26 Sodium thiosulphate solution reacts with hydrochloric acid to form a yellow precipitate as shown in Figure 4. Time taken for the mark 'X' to be obscured from vision represents the reaction time. Which of the following graphs below shows the relationship between sodium thiosulphate concentration and the reaction time?



- 27 What is the oxidation number of chlorine in the following molecules or ions?

	ClO^-	ClO_3^-	Cl_2O_7
A	+1	-5	+7
B	+1	+5	-7
C	+1	+5	+7
D	-1	+5	+7

- 28

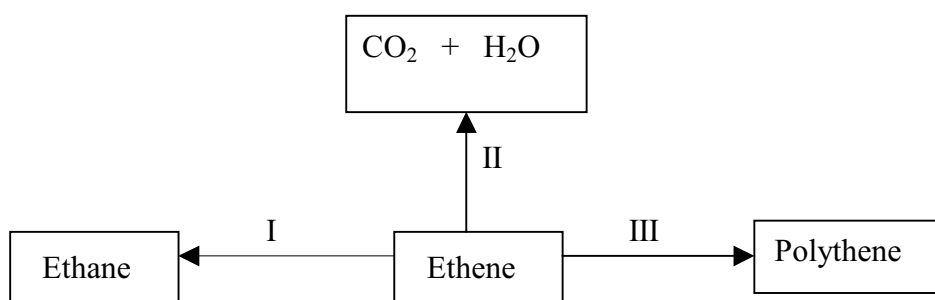


FIGURE 5

Reactions of hydrocarbon are shown in Figure 5. Name the reactions I, II and III.

	I	II	III
A	Reduction	Combustion	Oxidation
B	Addition	Dehydration	Combustion
C	Addition	Combustion	Polymerization
D	Reduction	Oxidation	Hydration

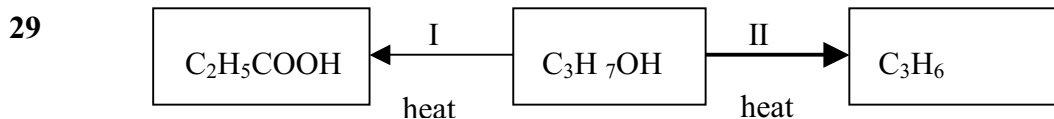


FIGURE 6

Figure 6 shows the reactions of propanol, $\text{C}_3\text{H}_7\text{OH}$. Which of the following need to be added to produce reaction I and reaction II ?

	I	II
A	Dilute sulphuric acid	Yeast
B	Acidified potassium manganate(VII) solution	Porcelain chips
C	Steam	Acidified potassium dichromate(VI) solution
D	Phosphoric Acid	Dilute sulphuric acid

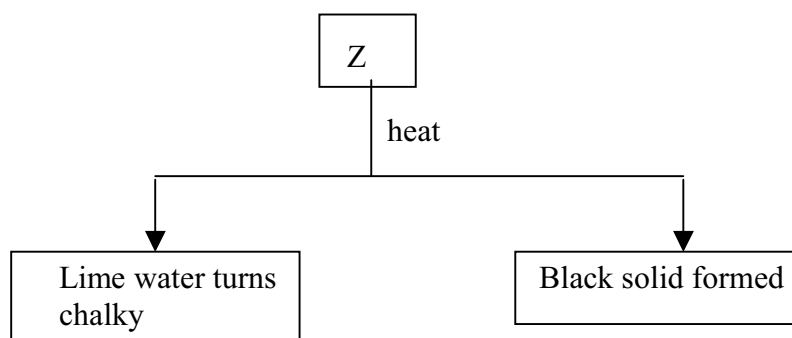


FIGURE 7

30 Figure 7 shows the results of the action of heat on solid Z. Which of the following represents solid Z ?

- A Magnesium carbonate
- B Copper carbonate
- C Magnesium nitrate
- D Copper nitrate

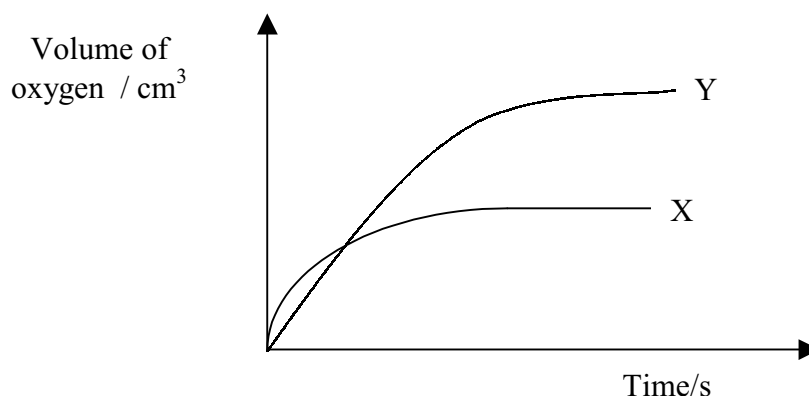
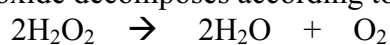


FIGURE 8

- 31 Hydrogen peroxide decomposes according to the equation below.



The rate of decomposition for 100 cm³ of 1.0 mol dm⁻³ hydrogen peroxide using manganese(IV) oxide as a catalyst is shown as curve X in Figure 8. Which of the following changes will produce curve Y?

- A Increasing the quantity of manganese (IV) oxide
- B Addition of water to hydrogen peroxide solution, 1.0 mol dm⁻³
- C Addition of 50 cm³, 0.2 mol dm⁻³ hydrogen peroxide solution to the original solution
- D Using granules of manganese(IV) oxide instead of powdered manganese (IV) oxide

Element	Na	Mg	Al	Si	P	S	Cl	Ar
Proton number	11	12	13	14	15	16	17	18

TABLE 4

- 32 Table 4 shows the proton number of elements in period 3. Which of the following represent changes crossing the period, from left to right?

- I. Increase in atomic size
- II. Decrease in electronegativity
- III. Increase of valence electrons
- IV. Decrease of metallic properties

- A I and IV only
- B II and III only
- C III and IV only
- D I, III and IV only

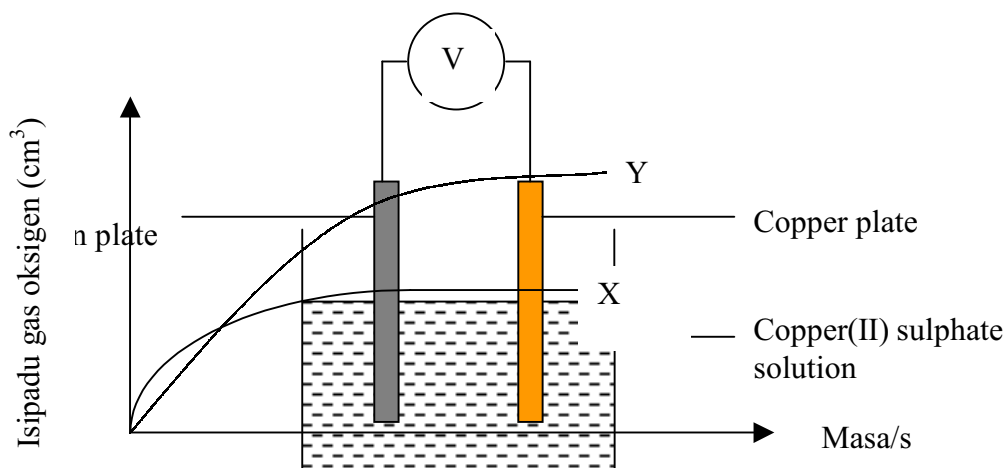


FIGURE 9

- 33 Which of the following are true for the cell in Figure 9?
- I Chemical energy is changed into electrical energy.
 - II Reduction process occurs at the copper plate.
 - III Electron flows from iron plate to copper plate.
 - IV Voltmeter reading increases if iron plate is replaced with magnesium plate
- A I and III only
 - B II and IV only
 - C I, II and III only
 - D I, II, III and IV

Test	Observation
Solid K was heated.	<ul style="list-style-type: none"> • A brown gas evolved
The gas evolved was tested using damp litmus paper and glowing splint.	<ul style="list-style-type: none"> • The gas changed blue litmus paper to red • The gas evolved lights up the glowing splint. • The residue was brown when hot, turned yellow when cold.

TABLE 5

- 34 A test to identify a solid K is carried out as in Table 5. Which of the following ions may be found in solid K?
- I. Zn^{2+}
 - II. Pb^{2+}
 - III. CO_3^{2-}
 - IV. NO_3^-
- A I and III only
 - B I and IV only
 - C II and III only
 - D II and IV only

35 There is a gradual change of the physical properties of alkanes with the increase in their molecular mass. According to the above statement, butane is different from hexane because hexane has

- I. higher heats of combustion
- II. higher combustibility
- III. higher viscosity
- IV. higher boiling point

- A. I and II only
- B. II and III only
- C. I, III and IV only
- D. I, II, III and IV

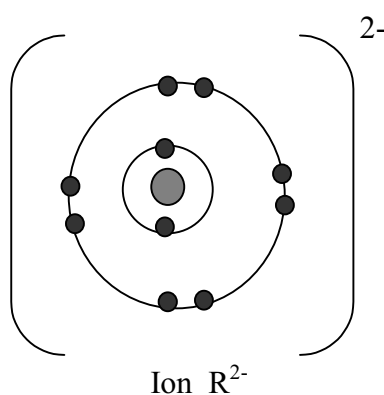


FIGURE 10

36 Figure 10 shows electron arrangement for ion R^{2-} . Which of the following is true for atom R?

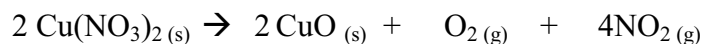
- A. Atom R is in group 18
- B. Atom R is in period 2
- C. Electron arrangement R is 2.8
- D. Number of proton in atom R is 10

Element	Proton number
G	11
J	12
L	18
M	19

TABLE 6

- 37 Table 6 shows the proton number for G, J, L and M. Which of the following is true?
- A Solid J conducts electricity.
 - B G and M are in different groups in the periodic table.
 - C G reacts with L to form an ionic compound.
 - D M is a diatomic molecule.
- 38 Which of the following contains the same number of atoms as in 0.32 g of oxygen?
[Relative atomic mass: He, 4; C, 12; N, 14; O, 16; Cl, 35.5]
- A 0.71 g chlorine gas
 - B 0.44 g carbon dioxide gas
 - C 0.14 g nitrogen gas
 - D 0.04 g helium gas
- 39 5.4 g metal M reacts with oxygen gas to produce 10.2 g M oxide with the formula M_2O_3 . What is the relative atomic mass for metal M ?
[Relative atomic mass: O, 16]
- A 27
 - B 34
 - C 51
 - D 54

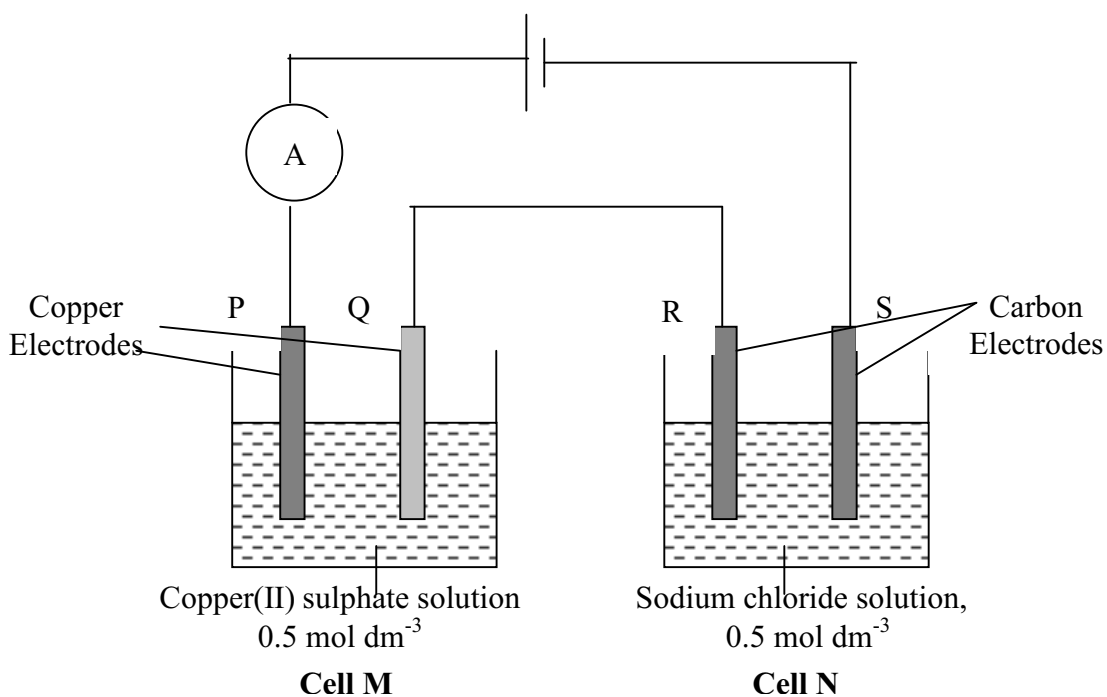
- 40 When copper (II) nitrate is heated, it decomposed according to the following reaction:



Which of the following will be produced when 1.88 g solid copper(II) nitrate is strongly heated ?

[Relative atomic mass: C, 12; N, 14; O, 16; Cu, 64; Molar volume of gas: 24 dm³ at room conditions]

- A 0.01 mol oxygen
- B 1.6 g copper (II) oxide
- C 0.03 mol gases evolved
- D 480 cm³ nitrogen dioxide gas



- 41 Figure 11 shows electrolytic cells M and N. Which of the following happens when an electric current is passed through for 30 minutes ?

	Cell M	Cell N
A	Gas bubbles evolved at electrode P	A yellow gas evolved at electrode R
B	Brown solid deposited at electrode Q	Gas bubbles evolved at electrode S
C	The colour intensity of copper(II) sulphate solution decreased.	The concentration of sodium chloride solution increased.
D	Electrode P corroded	Grey solid deposited at electrode S

Metal \ Solution	X	Y	Z
Solution of X nitrate	-	X is deposited	X is deposited
Solution of Y nitrate	No changes	-	No changes

TABLE 7

- 42 Table 7 shows the experimental results when metals X, Y and Z were immersed in the salt solutions of the nitrates of X and Y. Which of the following shows the decreasing ability for the metals to ionize ?

- A X, Z, Y
 B Y, Z, X
 C Z, X, Y
 D Y, X, Z

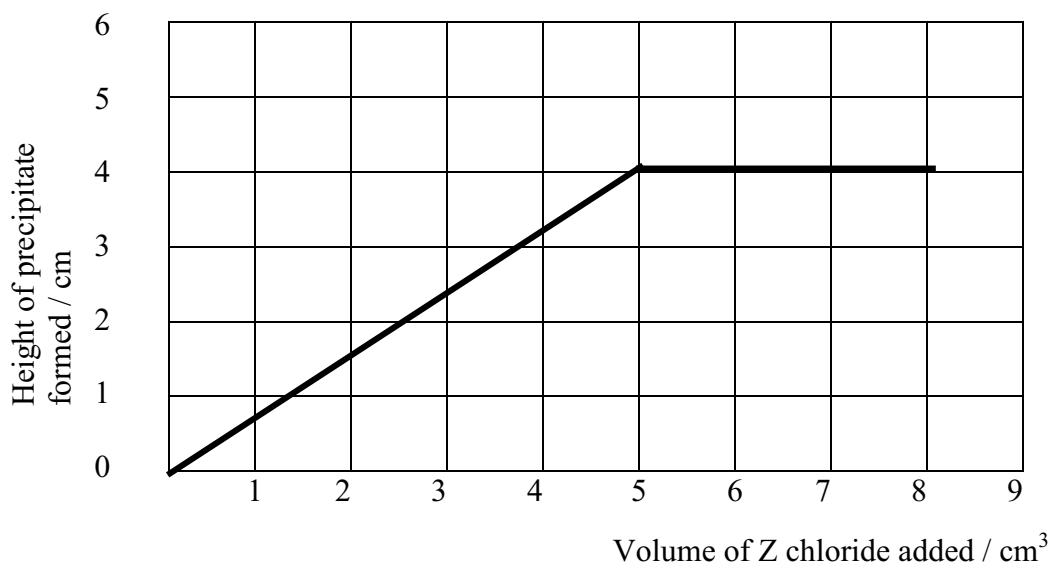


FIGURE 12

- 43 5.0 cm³ of 0.5 mol dm⁻³ sodium sulphate solution was placed into eight different test tubes of the same size. Different volumes of 0.5 mol dm⁻³ Z chloride solution was added to each test tube. The mixture was shaken and the height of the precipitate formed was measured after one hour. The result is shown in Figure 12.

What is the empirical formula of the precipitate formed ?

- A Z₂SO₄
 B Z(SO₄)₂
 C ZSO₄
 D Z₂(SO₄)₃

H

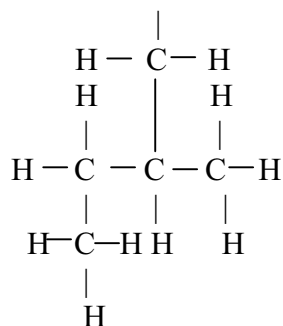


FIGURE 13

44 Which of the following is an isomer of the structure in Figure 13?

- A**
- $$\begin{array}{c}
 \text{H} \\
 | \\
 \text{H} \quad \text{H} - \text{C} - \text{H} \quad \text{H} \\
 | \quad | \quad | \\
 \text{H} - \text{C} - \text{C} - \text{C} - \text{H} \\
 | \quad | \quad | \\
 \text{H} \quad \text{H} - \text{C} - \text{H} \\
 | \\
 \text{H}
 \end{array}$$
- B**
- $$\begin{array}{c}
 \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\
 | \quad | \quad | \quad | \\
 \text{H} - \text{C} - \text{C} - \text{C} - \text{C} - \text{H} \\
 | \quad | \quad | \quad | \\
 \text{H} \quad \text{H} \quad \text{H} - \text{C} - \text{H} \\
 | \\
 \text{H}
 \end{array}$$
- C**
- $$\begin{array}{c}
 \text{H} \\
 | \\
 \text{H} - \text{C} - \text{H} \\
 | \quad | \quad | \quad | \\
 \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\
 | \quad | \quad | \quad | \\
 \text{H} - \text{C} - \text{C} - \text{C} - \text{C} - \text{H} \\
 | \quad | \quad | \quad | \\
 \text{H} \quad \text{H} \quad \text{H} \quad \text{H}
 \end{array}$$
- D**
- $$\begin{array}{c}
 \text{H} \\
 | \\
 \text{H} - \text{C} - \text{H} \quad \text{H} \quad \text{H} \\
 | \quad | \quad | \\
 \text{H} - \text{C} - \text{C} - \text{C} - \text{H} \\
 | \quad | \quad | \\
 \text{H} \quad \text{H} - \text{C} - \text{H} \quad \text{H} \\
 | \\
 \text{H}
 \end{array}$$

- 45 When 25 cm³ of 2.0 mol dm⁻³ sodium hydroxide solution was added to 25 cm³ of 2.0 mol dm⁻³ of nitric acid solution, the temperature increased by T °C. What is the increase in temperature if 25 cm³ of 2.0 mol dm⁻³ sodium hydroxide solution was added to 25 cm³ of 2.0 mol dm⁻³ sulphuric acid ?

- A T
B 2T
C 3T
D 4T

- 46 The thermochemical equation below represents the combustion of methane in excess oxygen.



Which of the following are true when 3.2 g methane was burnt in excess oxygen ?

[Relative atomic mass: H, 1; C,12; O,16; Molar volume of gas; 24 dm³ at room conditions]

- I 178 kJ heat was evolved
II. 0.2 mol of oxygen used
III 7.2 g water produced
IV 240 cm³ carbon dioxide evolved

- A I and III only
B II and IV only
C I, II and III only
D I, II, III and IV

- 47 Which of the following has the same volume as in 4.4 g carbon dioxide, CO₂ at standard temperature and pressure?

(Relative atomic mass: H,1; C,12; O,16; Ne,20; S,32; Cl,35.5)

- I 0.2 g hydrogen gas, H₂
II. 2.0 g neon gas, Ne
III 7.1 g chlorine gas, Cl₂
IV 6.4 g sulphur dioxide gas, SO₂

- A I and III only
B II and IV only
C I, III and IV only
D I, II, III and IV

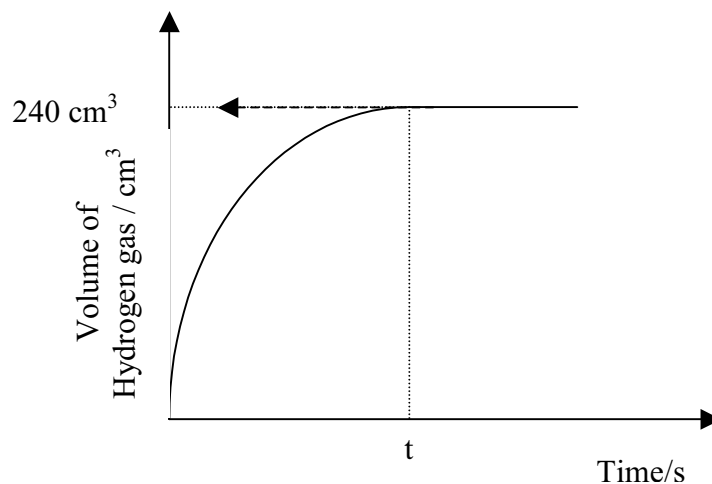


FIGURE 14

- 48 Figure 14 shows the graph of volume of hydrogen gas evolved against time when magnesium reacted with excess 0.5 mol dm^{-3} sulphuric acid solution. Which of the following statements are true?

[Relative atomic mass: Mg, 24; Molar volume of gas: 24.0 dm^3 at room conditions]

- I. 0.1 mol sulphuric acid was used up
 - II. 0.24 g of magnesium reacted
 - III. Rate of gas evolved decreases with time
 - IV. Rate of reaction can be increased by adding manganese(IV) oxide
-
- A I and IV only
 - B II and III only
 - C I, II and III only
 - D I, II, III and IV

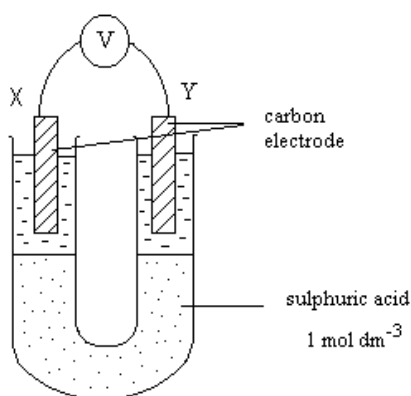


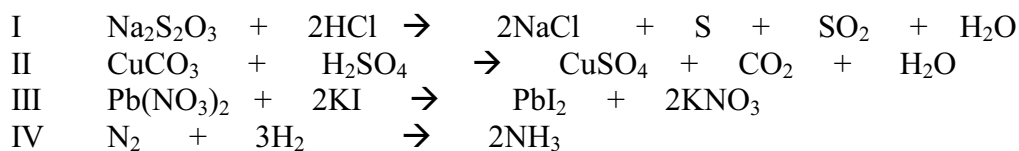
FIGURE 15

- 49 Which of the following pairs of reactants caused electron flow from X to Y through the external circuit in Figure 15 ?

	X	Y
I	KI (aq)	KMnO ₄ (aq)
II	KBr (aq)	Cl ₂ (aq)
III	KMnO ₄ (aq)	KBr (aq)
IV	K ₂ Cr ₂ O ₇ (aq)	FeSO ₄ (aq)

- A I and II only
 B II and III only
 C I and IV only
 D II, III and IV only

- 50 Which of the following chemical equations represent redox reactions?



- A I and III only
 B I and IV only
 C II, III and IV only
 D I, II, III and IV

Name :

Index No. :

CONFIDENTIAL
Chemistry
Paper 2
September 2003
2 ½ hours

4541/2



<http://cikguadura.wordpress.com/>
TRIAL EXAMINATION
SIJIL PELAJARAN MALAYSIA 2003
Paper 2
Two hours and thirty minutes

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

1. *This paper consists of three sections:
Section A, Section B and Section C.*
2. *Answer **all** questions in **Section A**, **one** question from **Section B** and **one** question from **Section C.***
3. *All answers from three sections must be handed in **together.***
4. *Answers to **Section A** must be written in the space provided. Important steps in the calculation must be shown clearly.*
5. *Answers to **Section B** and **Section C** must be written in the papers provided. Your answers for **Section B** and **Section C** must be longer but clear and logical. All the equations, figures, tables, graphs and any additional information can be included in the answers.*
6. *The figures are not drawn to scale.*
7. *In your explanation, name of chemical substance (not symbol or formula) must be used.*
8. *Maximum marks allotted are shown inside the bracket at the end of each question.*
9. *Usage of scientific calculator which is **non** programmable is allowed.*

<i>For Examiner's Use</i>		
Section	Question	Marks
A	1	
	2	
	3	
	4	
	5	
	6	
TOTAL		
B	1	
	2	
TOTAL		
C	1	
	2	
TOTAL		
TOTAL		

Section A
[60 marks]

Answer **all** the questions in this section. The suggested time for answering Section A is 90 minutes.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
																	He
Li													C		O		
	Mg											Al				Cl	

TABLE 1

1 Table 1 shows the position of a few elements from period 1 to period 3 in the Periodic Table. Number 1 to 18 represents the group number. Answer the following questions based on the information given in Table 1.

(a) (i) Write the electron arrangement for Cl atom.

_____ [1 mark]

(ii) Suggest the number of neutrons in Cl atom?

_____ [1 mark]

(b) $^{12}_6C$ and $^{14}_6C$ are the isotopes of C.

(i) What is meant by isotopes?

_____ [1 mark]

(ii) Explain why $^{12}_6C$ and $^{14}_6C$ have the same chemical properties.

_____ [1 mark]

- (c) Arrange the elements *He*, *Li*, *C*, *O* and *Mg* according to the atomic size in ascending order.

[1 mark]

- (d) *Mg* reacts with oxygen to form a compound.

- (i) Write a chemical equation for the reaction.

[1 mark]

- (ii) Draw a diagram showing the electronic structure of the compound formed.

[2 marks]

- (e) There is no reaction between *He* and *Li*. Explain why.

[2 marks]

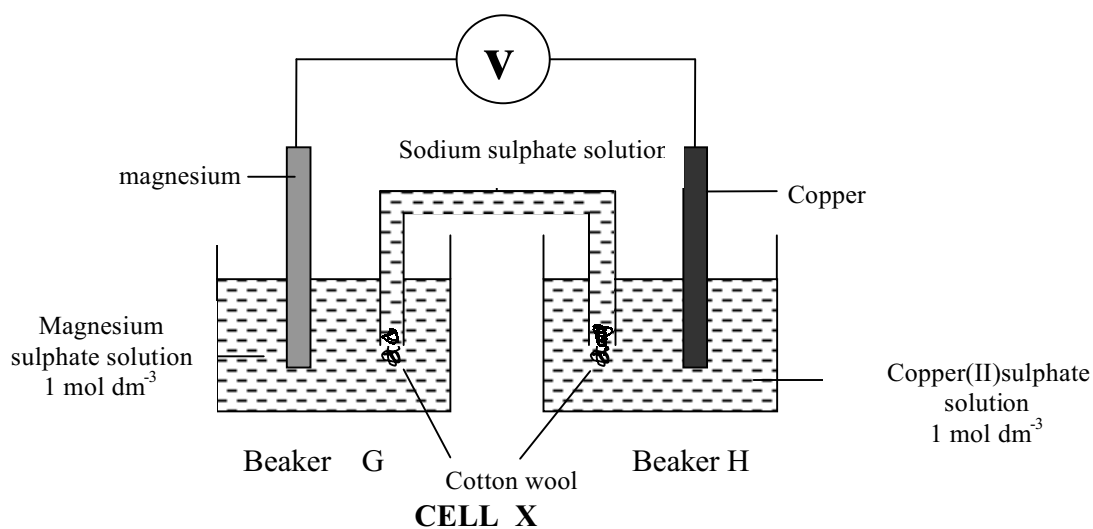


FIGURE 1

2 Figure 1 shows an electrochemical cell labelled X. The potential difference is 2.5 V.

(a) Write the formula of sodium sulphate.

_____ [1 mark]

(b) State the observations in Beaker G and Beaker H after the experiment has been conducted for a few minutes.

Beaker G : _____

Beaker H : _____ [2 marks]

(c) State the direction of electron flow in Cell X.

_____ [1 mark]

(d) (i) Write an ionic equation for the overall reaction in Cell X.

_____ [1 mark]

- (ii) State the change in oxidation number for magnesium in this reaction.

[1 mark]

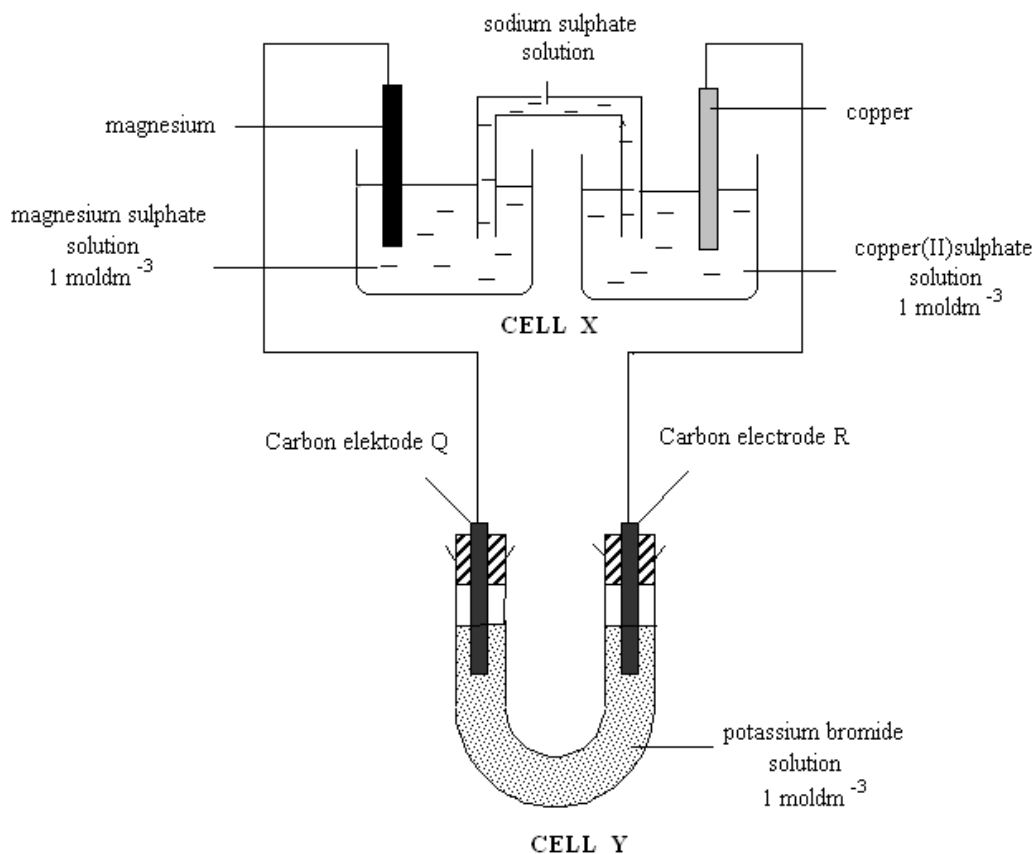


FIGURE 2

- (e) In another experiment, as shown in Figure 2, magnesium and copper electrodes in Cell X were connected to the carbon electrodes in Cell Y. The circuit was left connected for a few minutes.

- (i) State the observation at electrode R.

[1 mark]

- (ii) Write a half equation for the reaction occurring at electrode R.

[1 mark]

- (f) The products formed at electrode R was added to iron(II) sulphate solution. Iron(II) sulphate solution changes colour from green to brown. Explain briefly why the changes occurred in the iron(II) sulphate solution.

[2 marks]

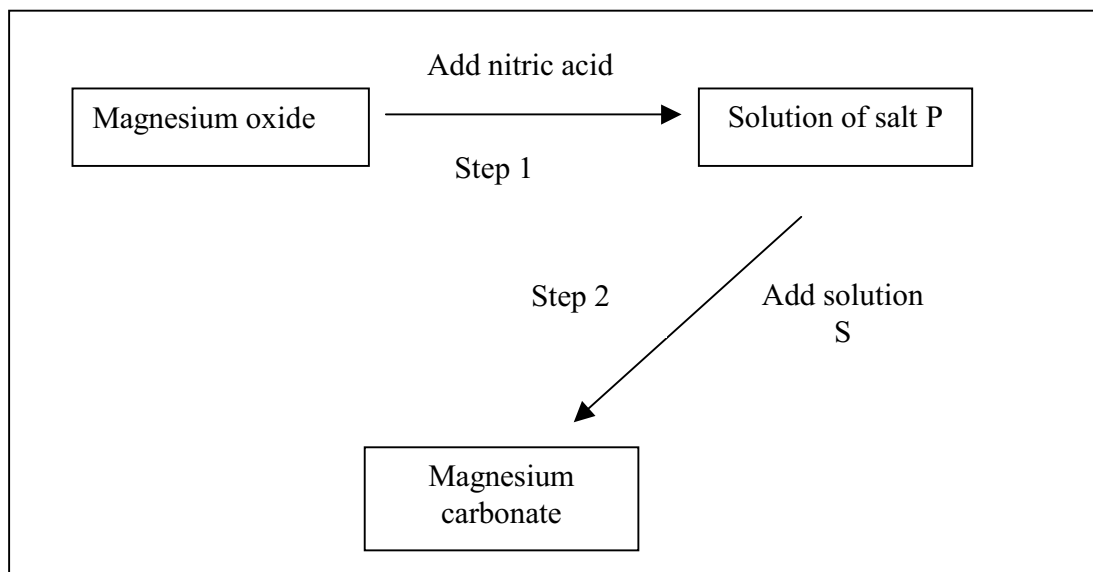


FIGURE 3

3 Figure 3 shows the steps taken to prepare magnesium carbonate.

(a) Write a chemical equation for the production of P.

_____ [1 mark]

(b) Describe briefly how solution P can be prepared.

_____ [2 marks]

(c) (i) Name solution S that needs to be added to solution P to produce magnesium carbonate?

_____ [1 mark]

(ii) Write an ionic equation for the formation of magnesium carbonate.

_____ [1 mark]

(d) 50 cm³ of 0.5 mol dm⁻³ nitric acid reacts with excess magnesium oxide powder.
[Relative Atomic Mass; C, 12; O, 16; Mg, 24]

(i) Calculate the number of moles of salt P formed?

[1 mark]

(ii) Calculate the maximum mass of magnesium carbonate that can be formed.
[Relative Atomic Mass; C, 12; O, 16; Mg, 24]

[2 marks]

(e) Magnesium carbonate can be converted to magnesium oxide. Describe how this conversion can be done.

[1 mark]

- (c) Under certain conditions, propene reacts to form polypropene. Write a balanced equation for the formation of polypropene in Process II. .

[1 mark]

- (d) Explain briefly how Process III is carried out in industries.

[2 marks]

- (e) Name a reagent that can be used to carry out Process V.

[1 mark]

- (f) Combustion of propane is represented by process IV.

- (i) Write a chemical equation for the combustion of propane in excess oxygen.

[1 mark]

- (ii) If 2.0 dm^3 propane gas undergoes complete combustion at room conditions, calculate the mass of water formed.

[1 mol of gas occupies 24 dm^3 at room conditions;
Molar mass of water = 18 g mol^{-1}]

[3 marks]

<i>Alloy</i>	<i>Composite Material</i>	<i>Soap</i>
Brass and Bronze	Concrete, Reinforced plastic	Sodium palmitate

TABLE 2

5 Table 2 shows a few examples of industrial products.

(a) (i) What is an *alloy* ?

[1 mark]

(ii) What is the composition of brass?

[1 mark]

(iii) Explain why bronze is stronger and tougher than pure copper.

[2 marks]

(b) (i) Most composite materials consist of two phases. State the two phases.

[1 mark]

(ii) What is the matrix used in reinforced plastics?

[1 mark]

- (iii) Name a substance added in reinforced concrete used in construction of buildings.

[1 mark]

- (c) (i) If one molecule of palmitic acid has 16 carbon atoms, write a chemical formula of sodium palmitate.

[1 mark]

- (ii) The soap, sodium palmitate does not function effectively in acidic water. Explain.

[2 marks]

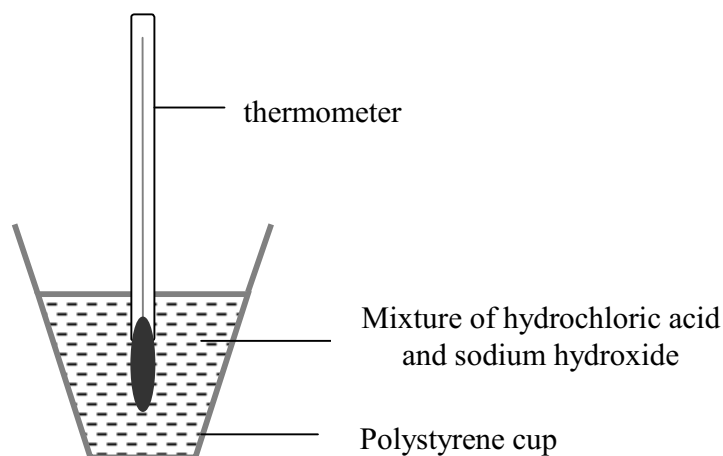


FIGURE 5

- 6 An experiment was carried out using the set up as shown in Figure 5. 50.0 cm^3 of 1.0 mol dm^{-3} aqueous sodium hydroxide was poured into a polystyrene cup. The initial temperature was recorded. 50.0 cm^3 of 1.0 mol dm^{-3} hydrochloric acid was measured and its initial temperature recorded. The acid was then added to the aqueous sodium hydroxide in the cup. The mixture was stirred and the maximum temperature recorded
- | | |
|--|-------------------------------|
| Initial temperature of sodium hydroxide | = $28 \text{ }^\circ\text{C}$ |
| Initial temperature of hydrochloric acid | = $28 \text{ }^\circ\text{C}$ |
| Maximum temperature of mixture | = $34 \text{ }^\circ\text{C}$ |

(a) Write an ionic equation for the above reaction

[1 mark]

(b) Calculate:

- (i) The energy change in the reaction.
(Specific heat capacity $4.2 \text{ Jg}^{-1}\text{ }^\circ\text{C}^{-1}$)

[1 mark]

(ii) The heat of neutralization for the above reaction.

[2 marks]

(c) Draw the energy diagram for the above reaction.

[2 marks]

(d) “The heat of neutralization obtained from the experiment is less than the standard value”

(i) Explain the above statement.

_____ [1 mark]

(ii) Suggest a way to improve the results obtained from this experiment.

_____ [1 mark]

(e) If acid gets into a student’s eye, it is suggested that he washed it with plenty of water and not to neutralize it with alkaline solutions. Explain.

_____ [2 marks]

Section B

[20 marks]

Answer **one** question from this section. The suggested time for answering section B is 30 minutes.



FIGURE 6

- 1** Figure 6 shows the symbols for isotopes of oxygen.
- (a) Based on Figure 6, state the proton number and the nucleon number for both isotopes.
Determine the position of oxygen in the Periodic Table. Explain. [4 marks]
- (b) Ethanol (C₂H₅OH) is an efficient fuel. Complete combustion of ethanol produces carbon dioxide and water.
During an experiment, a student burned 2.3 g ethanol in excess oxygen.
- (i) Write an equation for the complete combustion of ethanol [1 mark]
- (ii) Calculate the volume of carbon dioxide evolved at room conditions.
[Relative atomic mass: H:1; C:12; O:16;
1 mol gas occupies 24 dm³ at room conditions] [3 marks]

Compound	Melting Point (°C)	Boiling Point (°C)
M	801	1420
N	-117	78

TABLE 3

- (c) Table 3 shows the melting and boiling points of compounds M and N. Explain the differences in the boiling and melting points of compounds M and N with respect to the types of particles present and the types of bonding.

[8 marks]

Atom	Electron arrangement
Sodium	2.8.1
Chlorine	2.8.7
Carbon	2.4

TABLE 4

- (d) Based on Table 4, draw an electronic structure for the compound formed between
- sodium and chlorine
 - carbon and chlorine

[4 marks]

Time (sec)	0	60	120	180	240	300	360	420
Volume of gas (cm³)	0.0	5.0	9.5	13.0	16.5	18.5	19.0	19.0

TABLE 5

- 2 Table 5 shows the data obtained when 2.0 g of calcium carbonate granules were added to 20.0 cm³ of 0.1 mol dm⁻³ aqueous hydrochloric acid in a conical flask.

- (a) Based on Table 5, plot a graph of volume of gas produced against time. [4 marks]
- (b) From the graph, determine
- the average rate of reaction during the *second* of the 60 seconds intervals. [2 marks]
 - the rate of reaction at 210 seconds. [2 marks]
 - the average rate of reaction for the whole experiment. [2 marks]
- (c) Using the Collision Theory, explain how temperature and size of particles affect the rate of reaction. [8 marks]
- (d) Explain why potatoes fried in hot oil cooks faster than potatoes boiled in hot water. [2 marks]

SECTION C

[20 marks]

Answer any **ONE** question from this section. The suggested time for answering section C is 30 minutes.

- 1 (a) Salt is widely used in various fields. Name **one** example of salt and its uses in each of the following fields:
- (i) agriculture
 - (ii) food preparation.
- [2 marks]
- (b) A reagent bottle contains an unknown concentration of sodium hydroxide solution. You are asked by your chemistry teacher to determine the concentration of the sodium hydroxide solution using titration method. Explain how you will go about doing it. In your explanation include all the calculations involved.
- [10 marks]
- (c) There are three unlabelled reagent bottles containing aqueous solution of lead(II) nitrate, zinc nitrate and aluminium nitrate. Describe the chemical tests that can be used to identify each solution.
- [8 marks]

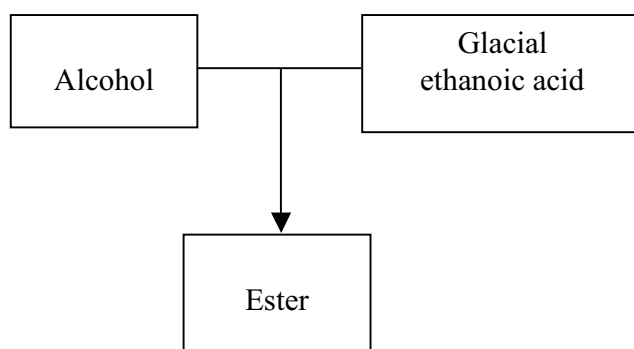


FIGURE 7

- 2 Figure 7 shows the formation of ester from the reaction between glacial ethanoic acid and any alcohol. Various types of esters can be formed from this reaction.
- (a) Name **one** possible ester that can be formed and write the chemical equation involved.
- [2 marks]

- (b) With the help of a labelled diagram, describe the steps that you would take to prepare the named ester in (a) in the laboratory.

[10 marks]

Substance	Molecular Formula
V	C_6H_{14}
T	C_6H_{12}

TABLE 6

- (c) Table 6 shows two hydrocarbon compounds V and T which are colourless liquids at room temperature. Describe **two** chemical tests used in the laboratory to differentiate liquid V and T.

[8 marks]

END OF QUESTION PAPER
<http://cikguadura.wordpress.com/>

4541/3 Name : Index No. :

Chemistry

Paper 3

August

2003

1½ hours

**SIJIL PELAJARAN MALAYSIA 2003**

<http://cikguadura.wordpress.com/>

CHEMISTRY

Paper 3

Written Practical Exam

One hour thirty minutes

DO NOT OPEN THE QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO

1. *Answer **all** questions.*
2. *Write your answers in the spaces provided.*
3. *The elements and aspects evaluated are indicated with each question.*
4. *You are required to hand in all additional answer sheets and graph papers used with the question paper.*
5. *Usage of scientific calculator which is non programmable is allowed.*
6. *Figures accompanying the question are meant to give valuable information in answering the question.*

Information for candidates:

Answers will be graded as follows:

Score	Description
3	Candidate is capable of giving excellent response.
2	Candidate is capable of giving satisfactory response.
1	Candidate is capable of giving an inaccurate response
0	Candidate is not capable of giving any response or a wrong response.

Information for examiners:

Fill in the score in column provided.

Element Code	Aspect Code	Sub Questions	Score
KK05	KK0501	2 (a)	
	KK0502	1 (e)	
	KK0503	2 (b)	
	KK0504	2 (d)	
	KK0505	1 (d)	
	KK0506	1 (a)	
	KK0507	2 (e)	
	KK0508	2 (c)	
	KK0509	2 (f)	
	KK0510	1 (c)	
	KK0511	1 (b)	
	KK051201	3 (a)	
	KK051202	3 (b)	
	KK051204	3 (d)	
	KK051205	3 (c)	
	KK051208	3 (e)	
	KK051209	3 (f)	

Cell	Metal pairs	Cell Voltage	Negative terminal
1	Cu / Zn	1.10 V	Zinc
2	Cu / Al	2.00 V	Aluminium
3	Cu / Fe	0.75 V	Iron
4	Cu / Ag	0.45 V	Copper

TABLE 1

1 An experiment was conducted to investigate the voltage of four different pairs of metals in a simple cell using 1 mol dm^{-3} sulphuric acid as the electrolyte. The voltage of each cell is shown in Table 1.

(a) Draw a labelled diagram to illustrate the experiment in cell 1.

[KK0506 – *Communicating*]

(b) State the hypothesis of the experiment.

[KK0511 – *Making hypothesis*]

- (c) State the manipulated variable, the responding variable and the constant variable in the experiment.

Manipulated variable:

Responding variable:

Constant variable:

[KK0510 – *Controlling variable*]

- (d) Predict the expected voltage for a cell using silver and zinc.

[KK0505 – *Predicting*]

- (e) Based on results in Table 1, arrange all the metals according to decreasing electropositivity.

[KK0502 – *Classifying*]

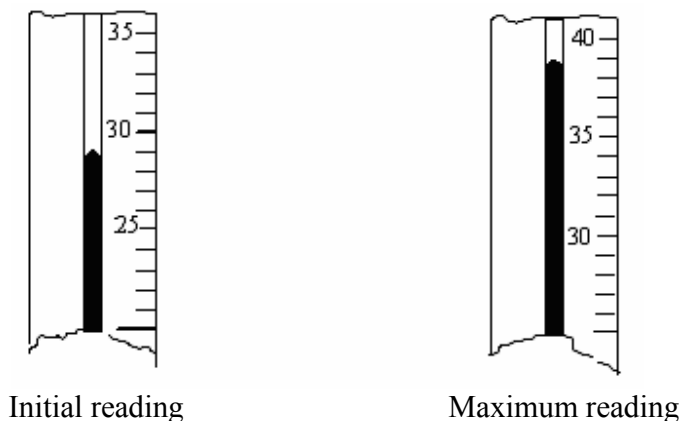


FIGURE 1

2 An experiment was carried out by a student to determine the heat of displacement of copper. In the experiment 25.0 cm^3 of 0.2 mol dm^{-3} aqueous copper(II) chloride was added to excess zinc powder.
The initial and the maximum reading are illustrated in Figure 1.

(a) State three observations from the experiment.

[KK0501 – Observing]

(b) With reference to Figure 1 determine the following temperature:

Initial temperature : _____

Maximum temperature: _____

Temperature change : _____

[KK0503 – Measuring and using number]

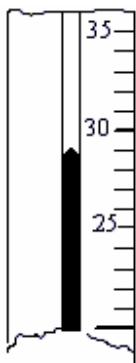
- (c) Determine the heat evolved in the experiment.
 (Specific Heat Capacity = $4.2 \text{ J g}^{-1} \text{ } ^\circ\text{C}^{-1}$, Density of solution, 1 g cm^{-3})

[KK0508 – *Interpreting data*]

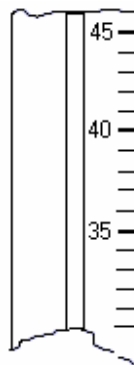
- (d) State the inference based on the observation and the temperature readings in 2(a) and 2(b).

[KK0504 – *Making inference*]

- (e) In another experiment zinc powder was replaced with magnesium powder while the concentration of copper(II) chloride was similar as in previous experiment. Draw the mercury level of the thermometer in Figure 2 to show **the maximum** reading expected for the mixture.



Initial reading



Maximum reading

FIGURE 2

[KK0507 – *Using space and time relationship*]

- (f) Why is the reading in 2(b) and 2(e) different? Explain.

[KK0504-*Defining through operations*]

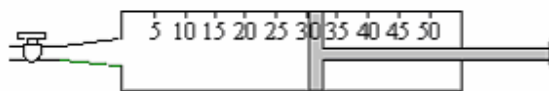


FIGURE 3 (a)

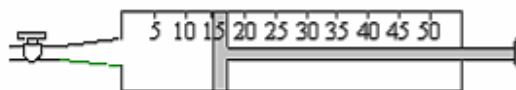


FIGURE 3 (b)

3 Experiment I

Figure 3(a) shows a syringe containing oxygen gas produced from the decomposition of 10-volume hydrogen peroxide with the presence of substance X after 90 seconds.

Experiment II

Figure 3(b) shows a syringe containing oxygen gas produced from the decomposition of 10-volume hydrogen peroxide without the presence of substance X after 90 seconds.

You are required to plan an experiment based on the above observations. Your description should include the following:

- (a) Aim of experiment
- (b) All the variables involved
- (c) List of materials and apparatus
- (d) Experimental method
- (e) Data tabulation

[KK0512 – *Stating problem*]

[KK0512 – *Stating variables*]

[KK0512 – *Listing out the materials and apparatus*]

[KK0512 – *Choosing techniques*]

[KK0512 – *Schematic displays*]

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