

Analysis Chemistry

[4541/1] [4541/2] [4541/3]

TOPICS	PAPER 1					PAPER 2					PAPER 3				
FORM 4	05	06	07	08	09	05	06	07	08	09	05	06	07	08	09
Introduction To Chemistry															
The Structure of The Atom	7	6	4	6	5	1	1		1	½	1	1	1		
Chemical Formulae and question	4	6	6	6	4		½	1	1	½					
Periodic Table of elements	2	3	3	3	5		1		1	½					1
Chemical Bonds	2	1	2	1	4	1		1	1	½					
Electrochemistry	3	3	5	3	5		½					1	1	1	
Acids and Bases	5	4	3	4	5	1		1				½			
Salts	1	0	2	0	2		1		1			½			
Manufactured Substances In Industry	4	3	4	3	1			1	1	1	1				
FORM 5															
Rate of Reaction	4	5	4	4	2			1	1	1		1			
Carbon compounds	6	7	6	7	3	1			1	1	1			1	1
Oxidation and reduction	6	7	4	6	5	1			1		1		1		
Thermo Chemistry	4	4	5	5	3	1	2			1				1	
Chemical For Consumer	2	1	2	2	3	1	1	1	1						
TOTAL	50	50	50	50	50	7	7	6	9	6	4	4	3	3	2



Chemistry Paper 1 (4541/1)

- 1 Which of the following processes, proved the kinetic theory of matter?
- A Diffusion
B Photosynthesis
C Respiration
D Neutralization
- 2 Which of the following is the formula for ammonium nitrate?
- A NH_4NO_3
B $(\text{NH}_4)_2\text{NO}_3$
C $(\text{NH}_3)_2\text{NO}_3$
D $(\text{NH}_4)_3(\text{NO}_3)_2$
- 3 Elements in the Periodic Table are arranged according to an increase in
- A proton number
B nucleon number
C relative atomic mass
D relative molecular mass
- 4 Which of the following substances is a covalent compound?
- A Hydrochloric acid
B Ammonia
C Lead(II) oxide
D Sodium chloride
- 5 Which of the following substances is an electrolyte?
- A Ethanol
B Molten naphthalene
C Glacial ethanoic acid
D Molten lead(II) chloride
- 6 Which of the following statements about a weak alkali is true?
- A Unable to neutralise an acid
B The pH value is less than 7
C Able to change blue litmus paper to red
D Ionises partially in water to produce hydroxide ions
- 7 Which of the following salt is insoluble in water?
- A Iron(II) sulphate
B Silver nitrate
C sodium carbonate
D Lead(II) sulphate
- 8 What are the materials used for making of reinforced concrete?
- A Concrete and small stones
B Concrete and steel
C Concrete and polythene
D Concrete and limestone
- 9 Diagram below shows the conversion of methanol into compound P and subsequently into compound Q?
- ```

 graph TD
 A[CH3OH] -- "Heated with acidified K2Cr2O7" --> B[Compound P]
 B -- "Reflux with C2H5OH and concentrated H2SO4" --> C[Compound Q]

```
- What is compound Q?
- A Methanoic acid  
B Methyl ethanoate  
C Ethyl methanoate  
D Ethyl ethanoate
- 10 Element R form an ion,  $\text{R}^-$ , with an electron arrangement of 2.8.8 Which of the following statements about R is not true
- A Element R can conduct electricity  
B A solution of R in water bleaches blue litmus paper  
C Atom R has electron arrangement of 2.8.7  
D Element R exist as a diatomic gas at room temperature



- Bromine water
- Acidified potassium manganate(VII)
- Acidified potassium dichromate(VI)

11 Which of the following is true about the substances?

- A Reducing agent
- B Oxidising agent
- C Dehydration agent
- D Hydration agent

12 Which of the following is true of an endothermic reaction?

- A The container becomes hotter
- B Heat energy is released to the surroundings
- C The heat energy is converted into kinetic energy
- D The temperature of mixture decreases

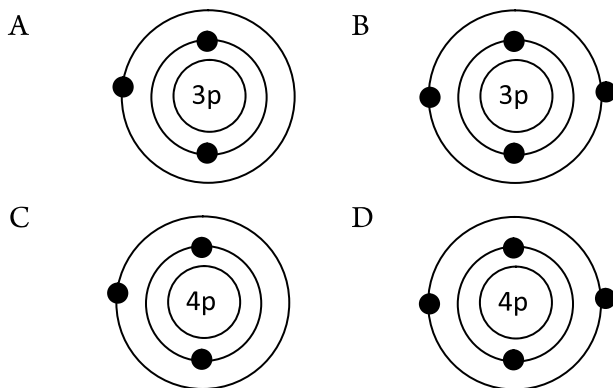
13 A person who is diabetic does not want any sugar in his coffee. Which of the following can be used to make his coffee sweet?

- A Acacia gum
- B Aspartame
- C Monosodium glutamate
- D Sodium benzoate

14 What is the main component of glass?

- A Silica
- B Calcium carbonate
- C Sodium carbonate
- D Aluminium silicate

15 Which of the following is the atomic structure of lithium atom, ?



16 The figure shows three elements in Period 3 of the Periodic Table.

|   |  |  |  |  |   |  |  |   |  |
|---|--|--|--|--|---|--|--|---|--|
|   |  |  |  |  |   |  |  |   |  |
|   |  |  |  |  |   |  |  |   |  |
| X |  |  |  |  | Y |  |  | Z |  |
|   |  |  |  |  |   |  |  |   |  |

Which of the following is true about the properties of oxide formed?

- A The oxide of Z is basic
- B The oxide of Y is acidic
- C The formula of oxide Y is YO
- D The oxide of X reacts with an acid to form salt and water

17 Elements combine to form compound because atoms of an element have to

- A Transfer or share electrons
- B Achieve the same electron arrangement
- C Achieve a stable electron arrangement in its outermost shell
- D Achieve the same numbers of electron in the outermost shell

18 Which of the following ions are present in copper(II) sulphate solution?

- A Hydrogen ions and hydroxide ions
- B Copper(II) ions and sulphate ions
- C Copper(II) ions, hydrogen ions, sulphide ions and oxide ions
- D Copper(II) ions, hydrogen ions, sulphate ions and hydroxide ions

19 Dry hydrogen chloride gas is passed through methyl benzene for a few minutes. Which of the following statements is true about the liquid produced?

- I it has a pH value of less than 7
- II it consists of hydrogen chloride molecules
- III it changes blue litmus to red
- IV it does not conduct electric current

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

- 20 P is an alkene with four carbon atoms.  
How many isomer does P have?

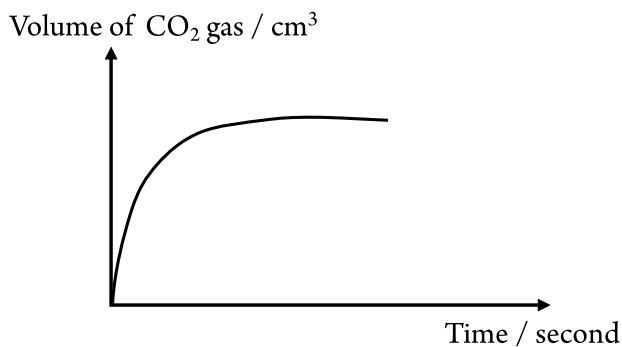
A 2  
B 3  
C 4  
D 5

- 21 Which pair of substances represented by the following formulae will result in a reaction when mixed together?

I  $\text{HNO}_3(\text{aq}) + \text{NaOH}(\text{aq})$   
II  $\text{HCl}(\text{aq}) + \text{NaCl}(\text{aq})$   
III  $\text{H}_2\text{SO}_4(\text{aq}) + \text{MgSO}_4(\text{aq})$   
IV  $\text{H}_2\text{CO}_3(\text{aq}) + \text{KOH}(\text{aq})$

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

- 22 The graph shows the volume of carbon dioxide gas produced against time for the reaction of calcium carbonate and sulphuric acid.



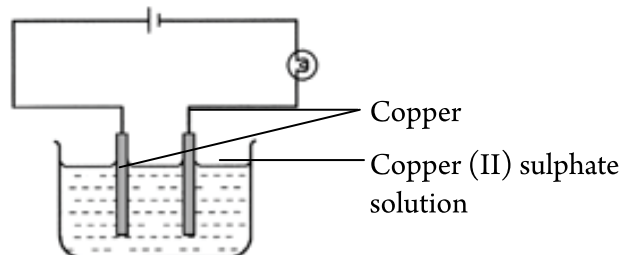
The gradient of the graph decreases with time because

A catalyst is not used  
B volume of mixture decreases  
C temperature of reaction decreases  
D concentration of sulphuric acid decreases

- 23 Which of the following salts is prepared by precipitation?

A Lead(II) nitrate  
B Sodium carbonate  
C Iron(II) sulphate  
D Barium sulphate

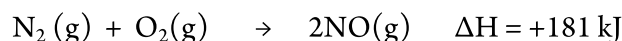
- 24 The diagram below shows the electrolysis process of copper(II) sulphate solution using copper as an electrode.



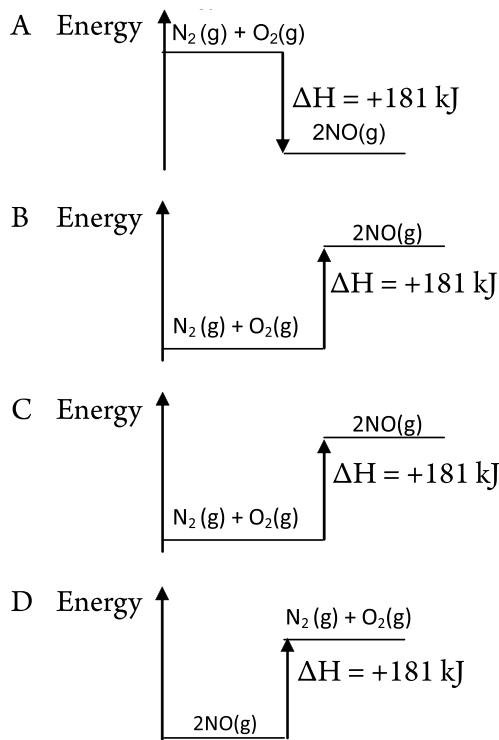
Which of the following substances are oxidized and reduced in this cell?

|   | Oxidised      | Reduced        |
|---|---------------|----------------|
| A | Hydroxide ion | Copper(II) ion |
| B | Hydroxide ion | Copper atom    |
| C | Copper atom   | Copper(II) ion |
| D | Copper atom   | Hydrogen ion   |

- 25 The reaction between nitrogen and oxygen can be represented by the following equation:



Which of the following energy level diagrams represent the above reaction?





26 The widespread use of plastics contribute to the pollution of our environment. Why does the use of plastics contribute to the pollution of our environment?

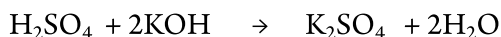
- I Plastics are organic compounds
- II Plastics are non biodegradable
- III Plastics give out poisonous gas when burnt
- IV Plastics can cause cancer

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

27 The electron arrangement of the atom of noble gas can be represented by

- A 2.1
- B 2.7
- C 2.8.4
- D 2.8.8

28 The equation below shows the reaction between sulphuric acid and sodium hydroxide solution.



What is the number of moles of sodium sulphate salt produced if 0.2 mol of sodium hydroxide is used?

- A 0.10 mol
- B 0.05 mol
- C 0.22 mol
- D 0.25 mol

29 The table shows the electron arrangements of atoms of four elements.

| Element              | F   | Al    | Cl    | K       |
|----------------------|-----|-------|-------|---------|
| Electron Arrangement | 2.7 | 2.8.3 | 2.8.7 | 2.8.8.1 |

Which of the following is the correct arrangement of the elements according to increasing order of electronegativity?

- F, Al, Cl, K
- F, Cl, Al, K
- K, Cl, Al, F
- K, Al, Cl, F

30 The number of valence electrons of atoms X and Y are 2 and 7 respectively. Which of the following chemical formulae and types of bonding are true for the compound formed between X and Y?

|   | Chemical Formula     | Type of Bonding |
|---|----------------------|-----------------|
| A | $\text{XY}_2$        | ionic           |
| B | $\text{XY}_2$        | covalent        |
| C | $\text{X}_2\text{Y}$ | ionic           |
| D | $\text{X}_2\text{Y}$ | covalent        |

31 When the electrolysis process is done to the concentrated sodium chloride solution, What is the product formed at the anode and cathode?

|   | Anode         | Cathode       |
|---|---------------|---------------|
| A | $\text{O}_2$  | $\text{H}_2$  |
| B | $\text{Cl}_2$ | $\text{H}_2$  |
| C | $\text{Cl}_2$ | $\text{Na}$   |
| D | $\text{O}_2$  | $\text{Cl}_2$ |

32 The diagram below shows 5 steps for preparing a standard solution of sodium hydroxide, NaOH but not in correct order.

- P - Transfer the solid sodium hydroxide into volume into the volumetric flask.
- Q - Weigh the mass of sodium hydroxide
- R - Add distilled water until the graduation mark.
- S - Rinse the weighing bottle and pour the solution into the volumetric flask.
- T - Shake the volumetric flask.

Which of the following steps is correct?

- A Q, S, P, R, T
- B R, Q, S, P, T
- C Q, P, S, R, T
- D R, Q, S, T, P



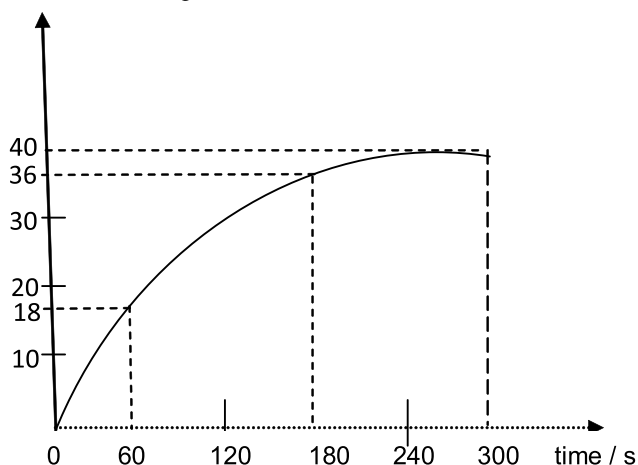
33 Which of the following cation form a white precipitate that soluble in excess sodium hydroxide solution?

- I  $Mg^{2+}$   
 II  $Zn^{2+}$   
 III  $Al^{3+}$   
 IV  $Pb^{2+}$
- A I and II only  
 B II and IV only  
 C II, III and IV only  
 D I, II, III and IV

34 All the following medicines relieve pain except?

- A aspirin  
 B streptomycin  
 C paracetamol  
 D codeine

35 Volume of  $H_2$  gas /  $cm^3$



A group of students carried out an experiment to determine the rate of reaction of zinc metal with dilute hydrochloric acid. The diagram above shows the graph for the total volume of gas collected against time. The average rate of reaction for the whole experiment is :

- A  $0.3 \text{ cm}^3/\text{s}$   
 B  $0.25 \text{ cm}^3/\text{s}$   
 C  $0.17 \text{ cm}^3/\text{s}$   
 D  $0.13 \text{ cm}^3/\text{s}$

36 The monomer for natural rubber is 2-methylbut-1,3-diene. Which of the following is its structural formula?

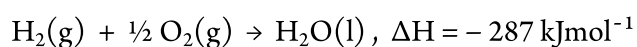
- A  $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_2 = \text{C} - \text{CH} = \text{CH}_2 \end{array}$   
 B  $\text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_2$   
 C  $\begin{array}{c} \text{CH}_3 \quad \text{CH}_3 \\ | \quad | \\ \text{CH}_2 - \text{CH} - \text{CH} - \text{CH}_2 \end{array}$   
 D  $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$

37 Animal fats contain mainly saturated fatty acids whereas vegetable oil contain mainly unsaturated fatty acid. Which of the following can be used to differentiate between saturated and unsaturated fatty acids?

- I Bromine water  
 II Sodium hydroxide solution  
 III Acidified potassium manganate(VII) solution  
 IV Ferum(II) sulphate solution

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

38 The following equation shows the formation of water



Which of the following is true regarding the above equation?

- A Activation energy for the reaction is high  
 B If 1 mole of oxygen reacts 574 kJ of heat energy is absorbed  
 C Combustion of 1 mole of hydrogen releases 287 kJ of heat energy  
 D 1 mole of water that is formed in the reaction received 287 kJ heat energy





- 47 What mass of sodium hydroxide, NaOH must be dissolved in water to prepare 500 cm<sup>3</sup> of 0.1 moldm<sup>-3</sup> NaOH solution?

[Relative Atomic Mass : Na, 23 ; O, 16 ; H, 1]

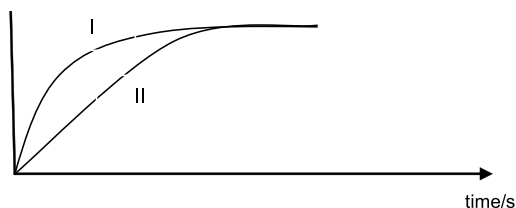
- A 0.5 g  
B 2.0 g  
C 4.0 g  
D 20 g

- 48 An experiment is carried out to study the rate of reaction between zinc and hydrochloric acid.

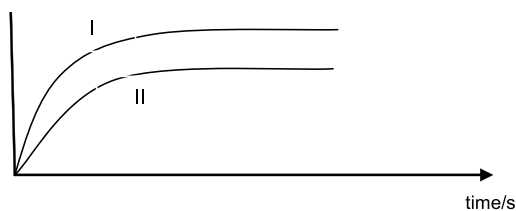
| Experiment | substances                                                                       |
|------------|----------------------------------------------------------------------------------|
| I          | Excess zinc and 50 cm <sup>3</sup> of 2.0 moldm <sup>-3</sup> hydrochloric acid  |
| II         | Excess zinc and 100 cm <sup>3</sup> of 1.0 moldm <sup>-3</sup> hydrochloric acid |

Which of the following graphs represents the two experiments?

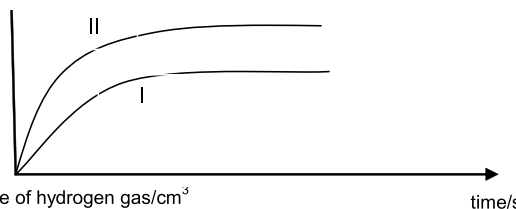
- A. Volume of hydrogen gas/cm<sup>3</sup>



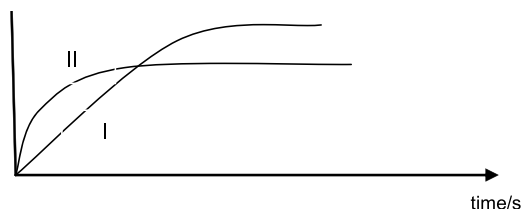
- B. Volume of hydrogen gas/cm<sup>3</sup>



- C. Volume of hydrogen gas/cm<sup>3</sup>



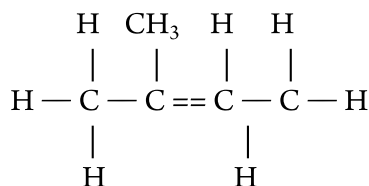
- D. Volume of hydrogen gas/cm<sup>3</sup>



- 49 Which of the following equations represents a redox reaction?

- A  $\text{Pb}(\text{NO}_3)_2 + \text{CuSO}_4 \rightarrow \text{PbSO}_4 + \text{Cu}(\text{NO}_3)_2$   
B  $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow \text{CH}_3\text{COOH} + \text{H}_2\text{O}$   
C  $\text{Mg} + \text{CuSO}_4 \rightarrow \text{MgSO}_4 + \text{Cu}$   
D  $\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 2\text{H}_2\text{O}$

- 50 Diagram below shows the structural formula of an organic compound.



What is the IUPAC name for this compound?

- A pent-2-ene  
B 2-methylbut-1-ene  
C 2-methylbut-2-ene  
D 3-methylbut-1-ene



## Chemistry Paper 2(4541/2)

### Section A Answer all questions

1. Diagram 1 shows the structural soap and detergent.

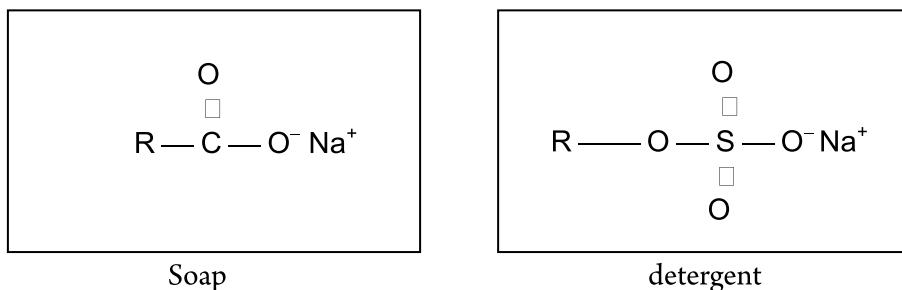


Diagram 1

(a) Name the process of making of soap?

[1 mark]

(b) Between soap and detergent, which is more suitable as cleansing agent in sea water? Explain why.

[2 marks]

(c) State two advantages of using detergent compared to soap.

[2 marks]

Table 1 shows the several food additives and examples.

| Food additives   | Example                    |
|------------------|----------------------------|
| Preservatives    | Sodium nitric              |
| Flavouring agent | Monosodium glutamate (MSG) |

(d) (i) State the function of preservatives.

[1 mark]

(ii) Beside as preservatives in the frozen meat, state another function of sodium nitric.

[1 mark]

(e) (i) Name one traditional preservative.

[1 mark]

(ii) Explain how the substance in (b)(i) can prevent food from spoiled?

[2 marks]



2. Diagram 2 below shows atom A and atom B.

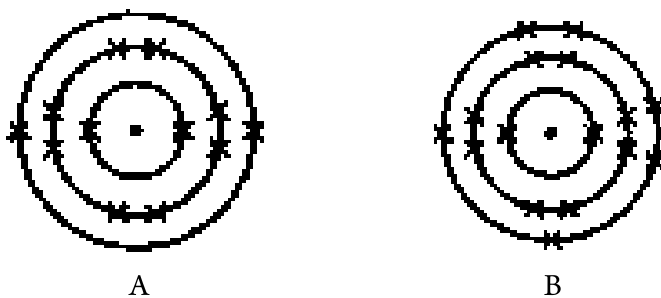


Diagram 2

(a) Write the electron arrangement for atom A and atom B.

A : \_\_\_\_\_ B : \_\_\_\_\_ [2 marks]

(b) Atom A and atom B can form a compound.

(i) What type of bond holds atom A and B together?

\_\_\_\_\_ [1 mark]

(ii) Explain the formation of bonding in (b)(i).

\_\_\_\_\_  
 \_\_\_\_\_ [2 marks]  
 \_\_\_\_\_

(iii) Draw the electron arrangement for the compound formed in (b)(ii).

(iv) State one physical property for the compound formed in (b)(ii). [2 marks]

\_\_\_\_\_ [1 mark]

(c) Carbon atom, C, with electron arrangement 2.4 can combine with atom B to form a compound.

(i) What is the molecular formula for the compound formed?

\_\_\_\_\_ [1 mark]

(ii) If relative atomic mass of carbon is 12 and B is 32, what is the relative molecular mass (RMM) of the compound in (c)(i).

\_\_\_\_\_ [1 mark]



3. Diagram 3 shows the apparatus set up to study about Daniell cell .

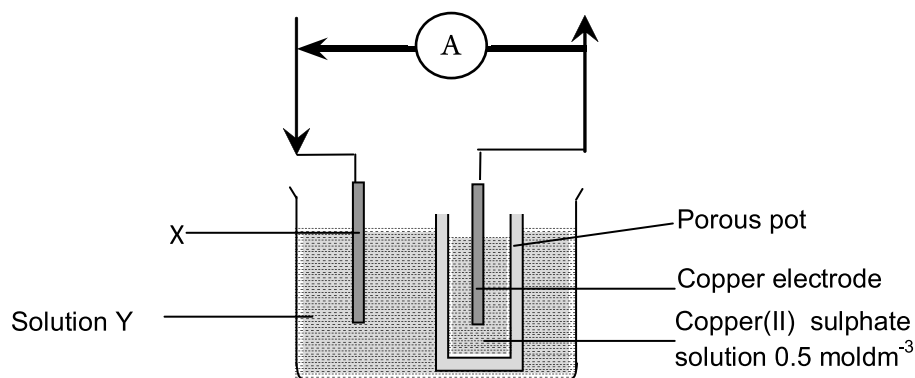


Diagram 3

Arrow shows the flow of electron in this experiment.

(a) Name the suitable substance for the:

- (i) Electrode X : \_\_\_\_\_  
(ii) Solution Y : \_\_\_\_\_

[2 marks]

(b) Write half equation that occurred in (a)(i).

[2 marks]

(c) What happen to the intensity of color of copper(II) sulphate in diagram 3? Explain why.

[2 marks]

(d) Diagram 3.1 shows the set up of the apparatus to arrange metal W, X, Y and Z based on the potential difference of the metals.

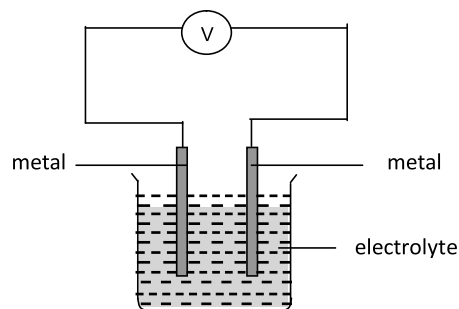


Diagram 3.1

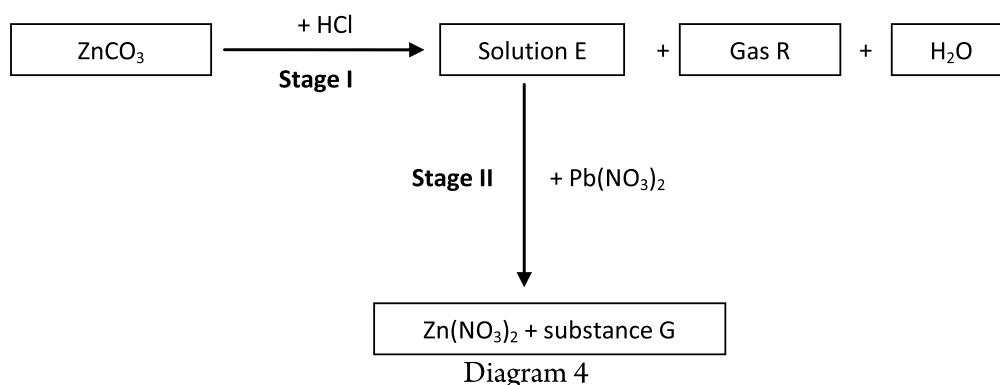
Table 2 shows the result of the experiment.

| Pairs of metals | Potential difference (V) | Negative terminal |
|-----------------|--------------------------|-------------------|
| W and X         | 0.5                      | X                 |
| X and Y         | 0.3                      | Y                 |
| W and Z         | 1.1                      | Z                 |

Table 2

- (i) Arrange metal W, X, Y and Z in descending order of the electropositivity of metal. [1 mark]
- (ii) Metal X and Z are used as electrodes in diagram 2.1. State which metal acts as positive electrode? Explain why. [2 marks]
- (iii) Predict the voltage of the cell in (d)(ii). [1 mark]

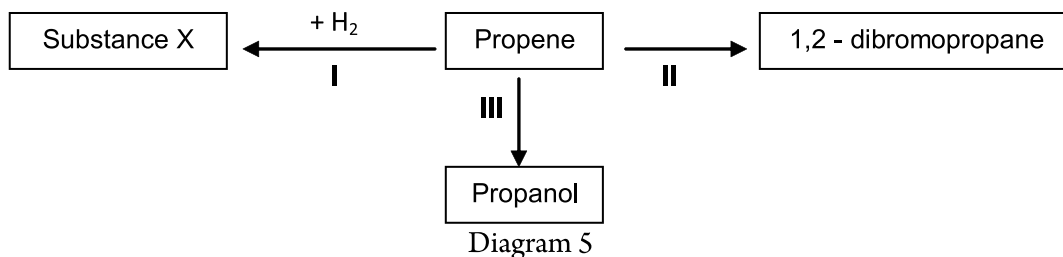
4. Diagram 4 shows a series of reaction for the production of zinc nitrate and substance G with zinc carbonate as the initial reactant.



- (a) Name
- (i) Solution E. [1 mark]
- (ii) Substance G [1 mark]
- (b) In stage I,  $20 \text{ cm}^3$  of  $1.0 \text{ mol dm}^{-3}$  hydrochloric acid is reacted with excess zinc carbonate powder.
- (i) Write the chemical equation for this reaction. [2 marks]
- (ii) Calculate the maximum volume of gas R that can be produced at room condition. [1 mol gas occupied  $24 \text{ dm}^3$  of volume at room condition] [3 marks]
- (c) (i) State the type of reaction that takes place in stage II. [1 mark]
- (iii) Explain how to separate substance G from the mixture. [2 marks]



5. Diagram 5 shows the conversion of organic compound from one homologous series to another.



- (a) (i) Name the reaction occurs in conversion I.

[1 mark]

- (ii) Write the chemical equation for the conversion I.

[2 marks]

- (iii) Describe the test how to differentiate between propene and substance X.

[3 marks]

- (b) Name the reagent used in conversion II.

[1 mark]

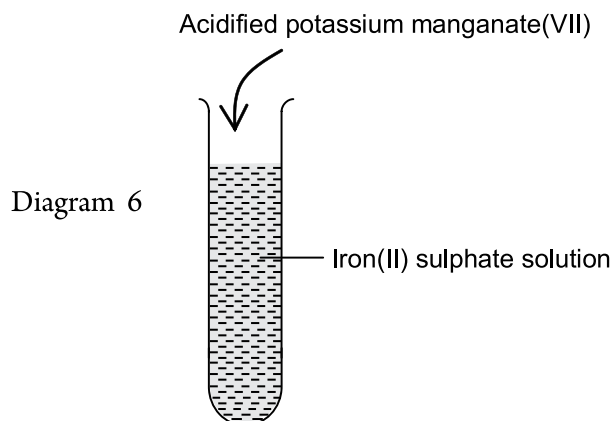
- (c) Name the reaction in conversion III.

[1 mark]

- (d) Ester is produced when propanol is reacted with methanoic acid. Draw the structural formula and name the ester produced.

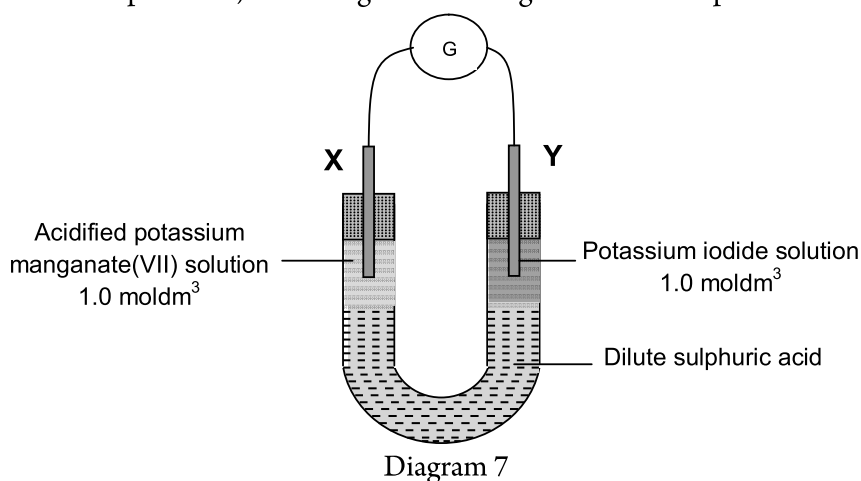
[2 marks]

6. Diagram 6 shows the set up apparatus to investigate a redox reaction.



Acidified potassium manganate(VII) solution is added drop by drop into the test tube until no more change is observed.

- (a) (i) What is the colour of the solution produced when a complete reaction takes place?  
 \_\_\_\_\_ [1 mark]
- (ii) How to identify the product that you have mentioned in (a)(i).  
 \_\_\_\_\_ [2 marks]
- (b) State the change in the oxidation number of iron.  
 \_\_\_\_\_ [1 mark]
- (c) Name the oxidizing agent for this reaction.  
 \_\_\_\_\_ [1 mark]
- (d) Name one reagent that can replaced the acidified potassium manganate(VII) in this experiment  
 \_\_\_\_\_ [1 mark]
- (e) In another experiment, the arrangement in diagram 7 was set up to show the transfer of electron at a distance.



The half equation for the reaction that occurs around the X electrode is as follow.  
 $\text{MnO}_4^- + 8\text{H}^+ + 5\text{e}^- \rightarrow \text{Mn}^{2+} + 4\text{H}_2\text{O}$

- (i) Name the reaction that represent by the half equation above.  
 \_\_\_\_\_ [1 mark]
- (ii) Calculate the oxidation number of manganese, Mn in  $\text{MnO}_4^-$ .  
 \_\_\_\_\_ [2 marks]
- (iii) Brown solution is observed around Y electrode. Write half equation for this reaction.  
 \_\_\_\_\_ [1 mark]





Section B

Answer **one** questions from this section

7. Table 3 shows the proton number of atoms of elements W, X, Y and Z.

| Element | Proton Number |
|---------|---------------|
| W       | 1             |
| X       | 3             |
| Y       | 6             |
| Z       | 8             |

Table 3

- (a) State the arrangement of elements X, Y and Z in the order of increasing atomic radius.  
Explain your answer. [4 marks]
- (b) The reaction between elements X and Y form a chemical compound.  
Explain the formation of this compound. [6 marks]
- (c) The reaction between elements Z and W form another chemical compound.  
(i) Draw the electron arrangement of the compound formed. [2 marks]  
(ii) Compare two physical properties below for the compounds formed in (b) and (c).  
• Melting point  
• Electric conductivity.  
Explain the differences in each physical property. [8 marks]

8. (a) A student carried out an experiment to determine the heat of combustion of ethanol using the set up apparatus as shown in the diagram 8 below.

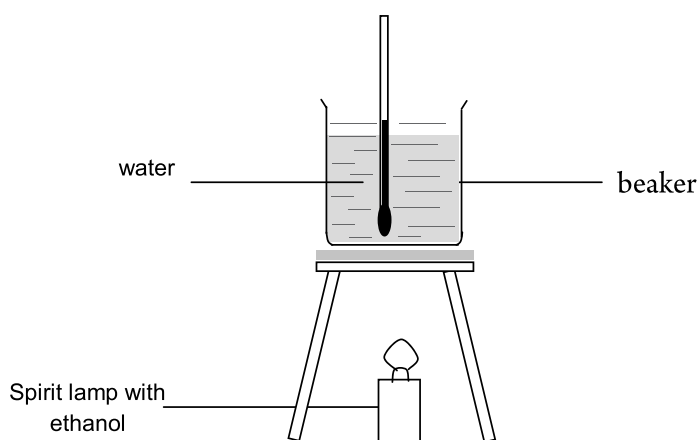


Diagram 8

- (i) It was found that the heat of combustion of ethanol obtained from the experiment was lower than the theoretical value. Suggest four methods from diagram 8 can be improved to obtain more accurate result. [4 marks]
- (ii) After correcting the set up of apparatus, the student found that the heat of combustion of ethanol still less than the theoretical value. Identify two other causes for this error. [2 marks]
- (iii) What meant by the heat of combustion? [2 marks]
- (iv) Write the chemical equation for the combustion of ethanol and draw the energy level diagram for the combustion of ethanol if heat of combustion of ethanol is  $1376 \text{ kJmol}^{-1}$ . [4 marks]

- (b) Given that the heat of combustion of ethanol is  $1376 \text{ kJmol}^{-1}$ . 0.23 g of ethanol is used to heat 500 cm<sup>3</sup> of water. Calculate the final temperature of the water if the initial temperature of water is 28.0 °C.  
[Relative Atomic Mass : H, 1 ; C, 12 ; O, 16 ; specific heat capacity =  $4.2 \text{ Jg}^{-1} \text{ °C}^{-1}$ ] [5 marks]
- (d) Heat of combustion of methanol is  $710 \text{ kJmol}^{-1}$ . Briefly explain the trend of change of the heat of combustion of alcohols in the homologous series. [3 marks]

## Section C

Answer one questions from this section

9. (a) (i) What is a catalyst?  
(ii) State two characteristics of a catalyst.  
(iii) Name one chemical process and the catalyst used in industry. [4 marks]
- (b) State two factors other than catalyst which can affect the rate of reaction. Based on collision theory, explain how the factors that you mentioned can affect the rate of reaction. [8 marks]
- (c) Knowledge about the factors that affect the rate of reaction is very useful in human life. State two activities at home and explain how the knowledge about the factors that affect the rate of reaction is applied in the activities mentioned. [8 marks]
10. (a) Vinegar was electrolysed using carbon electrode. What is produced in cathode? Write a half equation for the reaction. [2 marks]
- (b) Diagram 5 shows two type of cell.

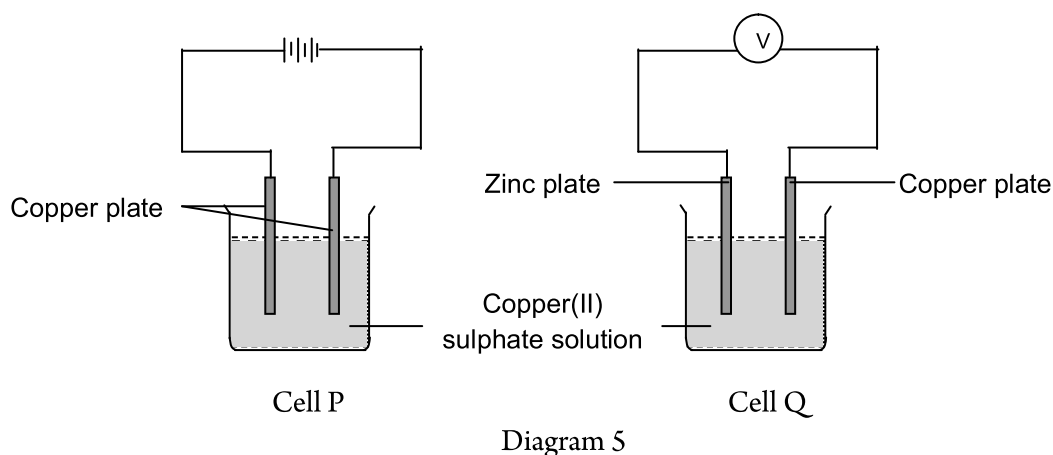


Diagram 5

Compare and contrast cell P and cell Q. Include in your answer the observation and the half equation for the reaction of the electrodes in both cells. [8 marks]

- (c) A student intends to electroplate an iron key with suitable metal to beautiful it. Design a laboratory experiment to electroplate an iron key. Your answer should consist the following.
- Chemical required
  - Procedures of the experiment
  - Diagram showing the set up apparatus
  - Chemical equation involved in the reaction

Also explain how you can get good result in your electroplating process. [10 marks]

## Chemistry Paper 3(4541/3)

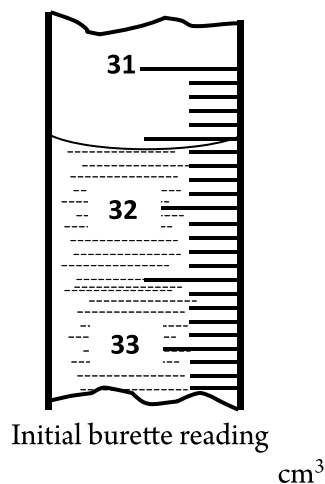
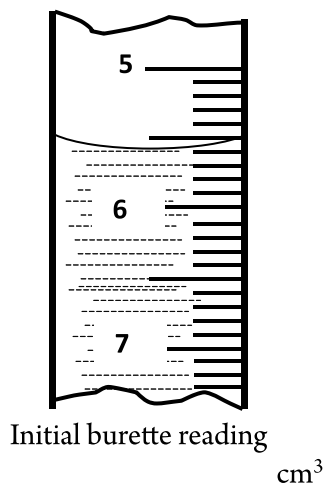
Answer all questions

The time suggested answering Question 1 and Question 2 is 45 minutes.

- Two experiment was carried out to determine the volume of acid used in neutralisation reaction for hydrochloric acid and sulphuric acid.

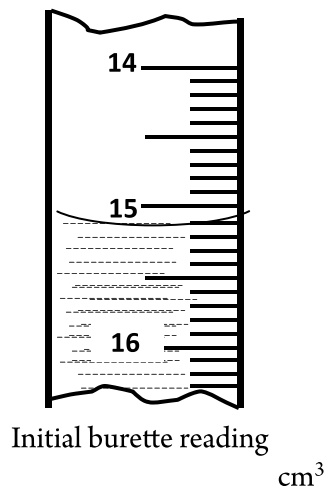
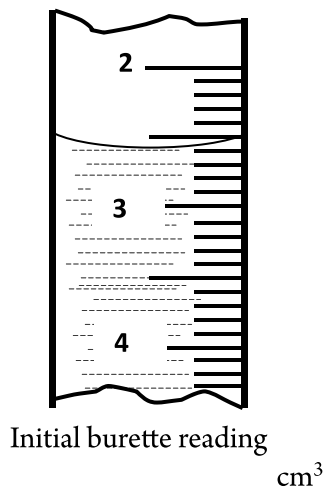
### Experiment 1.

Diagrams below show the burette readings for the experiment between  $25 \text{ cm}^3$  of  $2.0 \text{ mol dm}^{-3}$  sodium hydroxide solution with hydrochloric acid.



### Experiment 2

Diagrams below show the burette readings for the experiment between  $25 \text{ cm}^3$  of  $2.0 \text{ mol dm}^{-3}$  sodium hydroxide solution with sulphuric acid.



- Record all the reading of burette in the spaces provided [3 marks]
- Construct the table to record initial burette reading, final burette reading and volume of acid used. [3 marks]

- (c) Explain why the volume of hydrochloric acid used is different with volume of sulphuric acid in this experiment? [3 marks]
- (d) From the experiment, state all the variables:
- (i) Manipulated
  - (ii) Responding
  - (iii) Constant
- [3 marks]
- (e) State the hypothesis for this experiment.
- (f) State the observation for this experiment when the end point is reached? [3 marks]
- (g) What is operational definition of end point? [3 marks]
- (h) (i) Write the chemical equation for experiment 2. [3 marks]  
(ii) Calculate the concentration of sulphuric acid used in experiment 2. [3 marks]
- (i) (i) If nitric acid with same concentration is used to replace hydrochloric acid in this experiment, predict the volume of nitric acid needed. [3 marks]  
(ii) Explain your answer. [3 marks]
- (j) Classify the acid given in the below into weak acid and strong acid.

Hydrochloric acid, ethanoic acid, sulphuric acid, nitric acid, methanoic acid

[3 mark]

2.

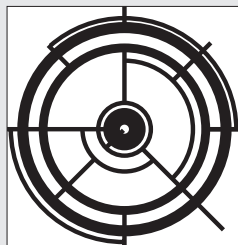
Brass is harder than pure copper

Refer to the statement above, plan an experiment to compare the hardness of brass and pure copper.

Your planning should include the following aspects:

- (a) Statement of the problem
  - (b) All variables
  - (c) Statement of the hypothesis
  - (d) List of materials and apparatus
  - (e) Procedure of the experiment
  - (f) Tabulation of data
- [17 marks]





# Jawapan Chemistry

[4541/1] [4541/2] [4541/3]

## Chemistry Paper 1 (4541/1)

| No | Answer |
|----|--------|
| 1  | A      |
| 2  | A      |
| 3  | A      |
| 4  | B      |
| 5  | D      |
| 6  | C      |
| 7  | D      |
| 8  | B      |
| 9  | C      |
| 10 | A      |

| No | Answer |
|----|--------|
| 11 | B      |
| 12 | D      |
| 13 | B      |
| 14 | A      |
| 15 | C      |
| 16 | D      |
| 17 | C      |
| 18 | D      |
| 19 | B      |
| 20 | A      |

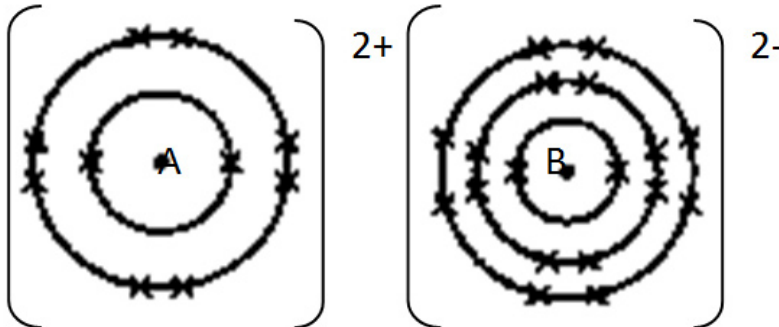
| No | Answer |
|----|--------|
| 21 | A      |
| 22 | D      |
| 23 | D      |
| 24 | C      |
| 25 | B      |
| 26 | C      |
| 27 | D      |
| 28 | A      |
| 29 | A      |
| 30 | A      |

| No | Answer |
|----|--------|
| 31 | B      |
| 32 | C      |
| 33 | C      |
| 34 | B      |
| 35 | C      |
| 36 | A      |
| 37 | A      |
| 38 | C      |
| 39 | A      |
| 40 | C      |

| No | Answer |
|----|--------|
| 41 | B      |
| 42 | A      |
| 43 | C      |
| 44 | B      |
| 45 | B      |
| 46 | B      |
| 47 | B      |
| 48 | A      |
| 49 | C      |
| 50 | C      |

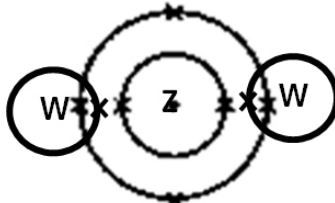
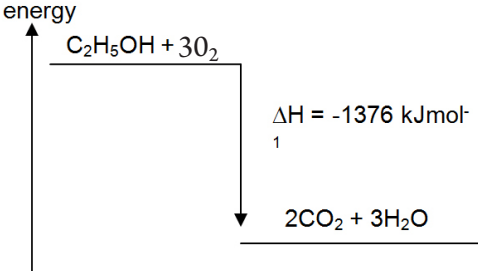


## Chemistry Paper 2(4541/2)

| Q      | Mark scheme (sample answer)                                                                                                                          | Sub Mark | Total Mark |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------|
| 1(a)   | Saponification                                                                                                                                       | 1        | 1          |
| (b)    | 1. Detergent<br>2. Detergent does not form scum                                                                                                      | 1<br>1   | 2          |
| (c)    | 1. Detergent more effective in hard water<br>2. Detergent more effective in acidic water                                                             | 1<br>1   | 2          |
| (d)(i) | To prevent the growth of bacteria // to make sure food last longer.                                                                                  | 1        | 1          |
| (ii)   | To make meat look fresh                                                                                                                              | 1        | 1          |
| (e)(i) | Salt//sugar//vinegar                                                                                                                                 | 1        | 1          |
| (ii)   | 1. absorb water out of the food<br>2. bacteria cannot live without water                                                                             | 1<br>1   | 2          |
|        |                                                                                                                                                      |          | 10         |
| 2.(a)  | A : 2,8,2 // 2.8.2<br>B : 2,8,6 // 2.8.6                                                                                                             | 1<br>1   | 2          |
| (b)(i) | Ionic bond                                                                                                                                           | 1        | 1          |
| (ii)   | 1. Atom A donate 2 electrons to form A <sup>2+</sup><br>2. Atom B receive 2 electron to form B <sup>2-</sup>                                         | 1<br>1   | 2          |
| (iii)  |                                                                  | 1+1      | 2          |
| (iv)   | High melting and boiling point //<br>Can conduct electricity in molten and aqueous solution//<br>Soluble in water//<br>Insoluble in organic compound | 1        | 1          |
| (c)(i) | CB <sub>2</sub>                                                                                                                                      | 1        | 1          |
| (ii)   | 76                                                                                                                                                   | 1        | 1          |
|        |                                                                                                                                                      |          | 10         |

|        |                                                                                                                                                                                                                                                                                       |                          |         |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|---------|
| 3.     |                                                                                                                                                                                                                                                                                       |                          |         |
| (a)(i) | Silver metal // silver                                                                                                                                                                                                                                                                | 1                        | 1       |
| (ii)   | Silver nitrate                                                                                                                                                                                                                                                                        | 1                        | 2       |
| (b)    | $\text{Ag}^+ + \text{e} \rightarrow \text{Ag}$                                                                                                                                                                                                                                        | 1                        | 1       |
| (c)    | 1. Intensity increase<br>2. Because the concentration of $\text{Cu}^{2+}$ ions increase                                                                                                                                                                                               | 1<br>1                   | 2       |
| (d)(i) | Z, Y, X, W                                                                                                                                                                                                                                                                            | 1                        | 1       |
| (ii)   | 1. X<br>2. Because X less electropositive than Z // vice versa                                                                                                                                                                                                                        | 1<br>1                   | 2       |
| (iii)  | 0.6 v                                                                                                                                                                                                                                                                                 | 1                        | 1<br>10 |
| 4.     |                                                                                                                                                                                                                                                                                       |                          |         |
| (a)(i) | Zinc chloride                                                                                                                                                                                                                                                                         | 1                        |         |
| (ii)   | Lead(II) chloride                                                                                                                                                                                                                                                                     | 1                        | 2       |
| (b)(i) | $\text{ZnCO}_3 + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$                                                                                                                                                                                            | 1+1                      | 2       |
| (ii)   | 1. Mol HCl = $\frac{(1.0)(20)}{1000}$<br>= 0.02<br><br>2. From equation, 2 mol HCl produce 1 mol R<br>So, 0.02 mol HCl produce 0.01 mol R<br><br>3. Volume R = $0.01 \times 24 \text{ dm}^3$<br>= $0.24 \text{ dm}^3 / 240 \text{ cm}^3$                                              | 1<br><br>1<br><br>1<br>1 | 3<br>1  |
| (c)(i) | Precipitate reaction // double decomposition reaction                                                                                                                                                                                                                                 | 1                        |         |
| (ii)   | 1. The mixture is filtered<br>2. the residue is rinsed with distilled water                                                                                                                                                                                                           | 1<br>1                   | 2<br>10 |
| 5.     |                                                                                                                                                                                                                                                                                       |                          |         |
| (a)(i) | Hydrogenation                                                                                                                                                                                                                                                                         | 1                        | 1       |
| (ii)   | $\text{C}_3\text{H}_6 + \text{H}_2 \rightarrow \text{C}_3\text{H}_8$                                                                                                                                                                                                                  | 1+1                      | 2       |
| (iii)  | 1. Put $2 \text{ cm}^3$ of propene and substance X into two difference test tube.<br>2. add bromine water / acidified $\text{KMnO}_4$ into both test tube<br>3. Brownish colour of bromine / purple colour of acidified $\text{KMnO}_4$ is decolourised for propene. No change for X. | 1<br>1<br>1              | 3       |

|        |                                                                                                                                                                                                                                                                                                                                   |                       |    |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----|
| (b)    | Bromine water                                                                                                                                                                                                                                                                                                                     | 1                     | 1  |
| (c)    | Hydration                                                                                                                                                                                                                                                                                                                         | 1                     | 1  |
| (d)    | 1. Propyl methanoate                                                                                                                                                                                                                                                                                                              | 1                     |    |
|        | $  \begin{array}{ccccccc}  & \text{O} & & \text{H} & \text{H} & \text{H} & \\  &   & &   &   &   & \\  2. & \text{H} - \text{C} - \text{O} - & \text{C} - & \text{C} - & \text{C} - \text{H} \\  & &   &   &   & & \\  & & \text{H} & \text{H} & \text{H} & &   \end{array}  $                                                    | 1                     | 2  |
| 6.     |                                                                                                                                                                                                                                                                                                                                   | 1                     | 1  |
| (a)(i) | Brown colour                                                                                                                                                                                                                                                                                                                      |                       |    |
| (ii)   | 1. add sodium hydroxide solution                                                                                                                                                                                                                                                                                                  | 1                     |    |
|        | 2. brown precipitate is formed                                                                                                                                                                                                                                                                                                    | 1                     | 2  |
| (b)    | From +2 to +3                                                                                                                                                                                                                                                                                                                     | 1                     | 1  |
| (c)    | Acidified potassium manganate(VII) solution                                                                                                                                                                                                                                                                                       | 1                     | 1  |
| (d)    | Acidified potassium dichromate(VI) // Chlorine water // bromine water                                                                                                                                                                                                                                                             | 1                     | 1  |
| (e)(i) | Reduction                                                                                                                                                                                                                                                                                                                         | 1                     | 1  |
| (ii)   | $X + 4(-2) = +1$ $x = +7$                                                                                                                                                                                                                                                                                                         | 1                     | 1  |
| (iii)  | $2\text{I}^- \rightarrow \text{I}_2 + 2\text{e}^-$                                                                                                                                                                                                                                                                                | 1+1                   | 2  |
|        |                                                                                                                                                                                                                                                                                                                                   |                       | 10 |
| 7.(a)  | When the number of proton increase, the number of electron also increase.<br>The force attraction between nucleus and valence electron increase<br>The size of atom become smaller<br>Z, Y, X                                                                                                                                     | 1<br>1<br>1<br>1      | 4  |
| (b)    | The electron arrangement of X is 2.1 and Z is 2.6<br>X and Y are hold together by ionic bond<br>Two atom X donate its valence electron to form $\text{X}^+$ ions<br>One atom Z receive two electron to form $\text{Z}^{2-}$ ion<br>$\text{X}^+$ ions and $\text{Z}^{2-}$ ion achieve stable duplet and octet electron arrangement | 1<br>1<br>1<br>1<br>1 |    |
|        |                                                                                                                                                                                                                                                                                                                                   | 1                     | 6  |

| (c)(i)                                                           | 1. right electron arrangement<br>2. has nucleus                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  | 1<br>1                       | 2                     |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------|-----------------------|----------------------|---------------------------------------------------|------------------------------------------------|------------------------------------------------------------------|---------------------------------------------|---------------------------------------|----------------------------|--|--|---------|
| (ii)                                                             | <table><tr><th>Compound in (b)</th><th>Compound in (c)</th></tr><tr><td>1. high melting point</td><td>2. low melting point</td></tr><tr><td>3. because electrostatic force is a strong force.</td><td>4. because van der waals force is a weak force</td></tr><tr><td>5. can conduct electricity in molten state and aqueous solution.</td><td>6. cannot conduct electricity in any state.</td></tr><tr><td>7. because it has freely moving ions.</td><td>8. Because it has no ions.</td></tr></table> | Compound in (b)                                                                   | Compound in (c)              | 1. high melting point | 2. low melting point | 3. because electrostatic force is a strong force. | 4. because van der waals force is a weak force | 5. can conduct electricity in molten state and aqueous solution. | 6. cannot conduct electricity in any state. | 7. because it has freely moving ions. | 8. Because it has no ions. |  |  | 8<br>20 |
| Compound in (b)                                                  | Compound in (c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                   |                              |                       |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
| 1. high melting point                                            | 2. low melting point                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                   |                              |                       |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
| 3. because electrostatic force is a strong force.                | 4. because van der waals force is a weak force                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                   |                              |                       |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
| 5. can conduct electricity in molten state and aqueous solution. | 6. cannot conduct electricity in any state.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                   |                              |                       |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
| 7. because it has freely moving ions.                            | 8. Because it has no ions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                   |                              |                       |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
| 8.(a)                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                   |                              |                       |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
| (i)                                                              | 1. remove the wire gauze.<br>2. use a windshield<br>3. replace beaker with copper can.<br>4. place the spirit lamp on a wooden block.                                                                                                                                                                                                                                                                                                                                                                  |                                                                                   | 1<br>1<br>1<br>1             | 4                     |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
| (ii)                                                             | 1. some heat loss to the surrounding<br>2. incomplete combustion of ethanol<br>3. some of ethanol evaporate                                                                                                                                                                                                                                                                                                                                                                                            | } any two                                                                         | 1<br>1<br>1                  | 2                     |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
| (iii)                                                            | 1. Heat change / release when 1 mol of compound<br>2. burnt completely in excess oxygen.                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                   | 1<br>1                       | 2                     |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
| (iv)                                                             | $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$<br>1. correct reactant and product<br>2. balance equation                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                   | 1+1                          | 2                     |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                   |                              |                       |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
|                                                                  | 1. y-axis with energy label.<br>2. correct product, reactant<br>3. correct value of heat of combustion with correct unit.                                                                                                                                                                                                                                                                                                                                                                              |                                                                                   | 1+1+1                        | 3                     |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |
| (b)                                                              | 1. Mol ethanol = $\frac{0.23}{46} = 0.005$<br>2. 1 mol ethanol release 1376 kJ heat<br>So, heat release for 0.005 mol ethanol = $0.005 \times 1376 \text{ kJ} = 6880 \text{ J}$<br>3. $6880 = 500 \times 4.2 \times \theta$<br>$\theta = 3.3 ^\circ\text{C}$ .<br>4. final temperature = $28.0 + 3.3$<br>$= 31.3 ^\circ\text{C}$ (with correct unit)                                                                                                                                                   |                                                                                   | 1<br><br>1<br><br>1<br><br>1 | 4                     |                      |                                                   |                                                |                                                                  |                                             |                                       |                            |  |  |         |

|                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                       |                                                                                                                                                                                 |  |         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------|
| (c)                                                                                                                                                                   | 1. when going down the homologous series the number of carbon atom and hydrogen atom increase<br>2. more number of molecules of carbon dioxide and water produced.<br>3. the heat of combustion also increase.                                                                                                                                                                                                                                                  | 1<br>1<br>1                                                                                                                                                           | 3<br>20                                                                                                                                                                         |  |         |
| 9.                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1                                                                                                                                                                     | 1                                                                                                                                                                               |  |         |
| (a)(i)                                                                                                                                                                | Substance that can change the rate of reaction.                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                       |                                                                                                                                                                                 |  |         |
| (ii)                                                                                                                                                                  | 1. use in a small amount.<br>2. Remain unchanged until the end of reaction.<br>3. Specific in action.<br>4. cannot change the product of reaction.                                                                                                                                                                                                                                                                                                              | <div>Any two</div><br>1+1                                                                                                                                             | 2                                                                                                                                                                               |  |         |
| (iii)                                                                                                                                                                 | 1. Harber process // contact process // hydrogenation // Ostwald<br>2. Iron // vanadium pentoxide // nickel // platinum                                                                                                                                                                                                                                                                                                                                         | 1<br>1                                                                                                                                                                | 2                                                                                                                                                                               |  |         |
| (b)                                                                                                                                                                   | 1. size of reactant (total surface area)<br>2. smaller size of reactant has the large total surface area.<br>3. more surface area expose to the collision.<br>4. affective collision increase, rate of reaction increase<br>5. the temperature of reactant.<br>6. the higher the temperature, the higher the rate of reaction<br>7. kinetic energy of particle increase and particle move faster<br>8. affective collision increase, rate of reaction increase. | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1                                                                                                                                  | 8                                                                                                                                                                               |  |         |
| (c)                                                                                                                                                                   | <table><tr><td>1. cooking meat in small pieces.<br/>2. small pieces of meat have large total surface area.<br/>3. more surface area of meat expose to the heat.<br/>4. meat cook faster</td><td>5. store food in freezer.<br/>6. in freezer, temperature is low.<br/>7. bacteria become inactive.<br/>8. the decomposition of food by bacteria become slow.<br/>9. food last longer</td></tr></table>                                                           | 1. cooking meat in small pieces.<br>2. small pieces of meat have large total surface area.<br>3. more surface area of meat expose to the heat.<br>4. meat cook faster | 5. store food in freezer.<br>6. in freezer, temperature is low.<br>7. bacteria become inactive.<br>8. the decomposition of food by bacteria become slow.<br>9. food last longer |  | 8<br>20 |
| 1. cooking meat in small pieces.<br>2. small pieces of meat have large total surface area.<br>3. more surface area of meat expose to the heat.<br>4. meat cook faster | 5. store food in freezer.<br>6. in freezer, temperature is low.<br>7. bacteria become inactive.<br>8. the decomposition of food by bacteria become slow.<br>9. food last longer                                                                                                                                                                                                                                                                                 |                                                                                                                                                                       |                                                                                                                                                                                 |  |         |



| 10.(a)                                                                                                                        | 1. hydrogen gas.<br>$2\text{H}^+ + 2\text{e} \rightarrow \text{H}_2$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1<br>1                                                             | 2        |                                                                   |                                                              |                                                                   |                                                     |                                                 |                                                     |                                                                                                                               |                                                                                                                               |  |   |
|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------|-------------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------------------|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--|---|
| (b)                                                                                                                           | <table><tr><th>Cell P</th><th>Cell Q</th></tr><tr><td>1. electrolytic cell // electric energy change to chemical energy</td><td>2. voltaic cell // chemical energy change to electric energy</td></tr><tr><td>3. use the same type of electrode // both using copper electrode.</td><td>4. use two different electrode // different metals.</td></tr><tr><td>5. Cathode become thicker, anode become thinner</td><td>6. cathode become thicker, anode become thinner and</td></tr><tr><td>7. cathode : <math>\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}</math><br/>Anode : <math>\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}</math></td><td>8. cathode : <math>\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}</math><br/>Anode : <math>\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}</math></td></tr></table> | Cell P                                                             | Cell Q   | 1. electrolytic cell // electric energy change to chemical energy | 2. voltaic cell // chemical energy change to electric energy | 3. use the same type of electrode // both using copper electrode. | 4. use two different electrode // different metals. | 5. Cathode become thicker, anode become thinner | 6. cathode become thicker, anode become thinner and | 7. cathode : $\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}$<br>Anode : $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}$ | 8. cathode : $\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}$<br>Anode : $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}$ |  | 8 |
| Cell P                                                                                                                        | Cell Q                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                    |          |                                                                   |                                                              |                                                                   |                                                     |                                                 |                                                     |                                                                                                                               |                                                                                                                               |  |   |
| 1. electrolytic cell // electric energy change to chemical energy                                                             | 2. voltaic cell // chemical energy change to electric energy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                    |          |                                                                   |                                                              |                                                                   |                                                     |                                                 |                                                     |                                                                                                                               |                                                                                                                               |  |   |
| 3. use the same type of electrode // both using copper electrode.                                                             | 4. use two different electrode // different metals.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                    |          |                                                                   |                                                              |                                                                   |                                                     |                                                 |                                                     |                                                                                                                               |                                                                                                                               |  |   |
| 5. Cathode become thicker, anode become thinner                                                                               | 6. cathode become thicker, anode become thinner and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                    |          |                                                                   |                                                              |                                                                   |                                                     |                                                 |                                                     |                                                                                                                               |                                                                                                                               |  |   |
| 7. cathode : $\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}$<br>Anode : $\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}$ | 8. cathode : $\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}$<br>Anode : $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                    |          |                                                                   |                                                              |                                                                   |                                                     |                                                 |                                                     |                                                                                                                               |                                                                                                                               |  |   |
| (c)                                                                                                                           | <p>Example : electroplate iron key with silver.</p> <p>1. Chemical : silver metal, <math>0.5 \text{ mol dm}^{-3}</math> silver nitrate solution.</p> <p>Procedure:</p> <p>2. iron key is placed at the anode and silver metal at cathode of cell.</p> <p>3. iron key and silver metal are dipped in the silver nitrate solution.</p> <p>4. the switch is on.</p> <p>5. diagram.</p> <div><p>Iron key</p><p>Silver metal</p><p>Silver nitrate solution</p></div> <p>6. cathode : <math>\text{Ag}^+ + \text{e} \rightarrow \text{Ag}</math></p> <p>7. anode : <math>\text{Ag} \rightarrow \text{Ag}^+ + \text{e}</math></p> <p>8. to get best result : use a small current (0.5A)</p> <div><p>Rotate the iron key continuously</p><p>Clean iron key using sand paper</p><p>} any one</p></div>                                  | 1<br><br>1<br>1<br>1<br>1<br><br>1<br><br>1<br>1<br><br>1<br>total | 10<br>20 |                                                                   |                                                              |                                                                   |                                                     |                                                 |                                                     |                                                                                                                               |                                                                                                                               |  |   |

## Chemistry Paper 2(4531/2)

1. (a) [able to record three burette reading correctly with two decimal places and correct unit]

Exp. 1 : Initial burette reading = 5.60 cm<sup>3</sup>  
 Final burette reading = 30.60 cm<sup>3</sup>

Exp. 2 : Initial burette reading = 2.60 cm<sup>3</sup>  
 Final burette reading = 15.10 cm<sup>3</sup>

- (b) [able to construct table with three columns and three rows with correct unit]

|                                             | Exp. 1 | Exp. 2 |
|---------------------------------------------|--------|--------|
| Initial burette reading / cm <sup>3</sup>   | 5.60   | 2.60   |
| Final burette reading / cm <sup>3</sup>     | 30.60  | 15.10  |
| Total volume of acid used / cm <sup>3</sup> | 25.00  | 12.50  |

- (c) - sulphuric acid is diprotic acid, hydrochloric acid is mono protic acid.  
 - 1 mole of sulphuric acid produce 2 mol of H<sup>+</sup> ions,  
 - the volume of sulphuric acid used half than volume of hydrochloric acid

- (d) [able to state all three variable correctly]

- (i) Manipulated : type of acids used  
 (ii) Responding : Volume of acid used  
 (iii) Constants ; concentration of sodium hydroxide used, size of conical flask

- (e) [able to state hypothesis correctly]

The higher the concentration of H<sup>+</sup> ions in acid, the lower the volume of acid used for the neutralisation process.

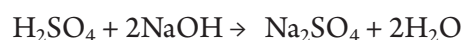
- (f) [able to state the observation correctly]

The pink colour of phenolphthalein turn to colourless.

- (g) [able to state operation definition correctly]

The volume of acid needed to neutralise sodium hydroxide accurately from the titration of acid-base.

- (h) (i) [able to write the reactants and products correctly also able to balance correctly]



- (ii) [able to calculate concentration of acid with correct unit for the answer]

$$\begin{aligned} \text{Mol of NaOH} &= \frac{25.0 \times 2.0}{1000} \\ &= 0.05 \end{aligned}$$

From equation, 1 mol of  $\text{H}_2\text{SO}_4$  need 2 mol of NaOH,

$$\begin{aligned}\text{So, mol of H}_2\text{SO}_4 \text{ needed} &= \frac{0.05}{2} \\ &= 0.025\end{aligned}$$

$$\begin{aligned}\text{Concentration of hydrochloric acid} &= \frac{0.025 \times 1000}{25} \\ &= 1.0 \text{ mol dm}^{-3}\end{aligned}$$

(i) (i) [able to predict the volume correctly with correct unit. ]

$$25.00 \text{ cm}^3$$

- (ii) - because nitric acid also monoprotic acid same as hydrochloric acid  
- 1 mol of nitric acid produce 1 mol of  $\text{H}^+$  ions.

(j) [able to classify the acid given correctly]

| Strong acid       | Weak acid      |
|-------------------|----------------|
| Hydrochloric acid | Ethanoic acid  |
| Sulphuric acid    | Methanoic acid |
| Nitric acid       |                |

2. (a) Problem statement.

Does the brass harder than pure copper?

(b) All variables

Manipulated : Brass and copper block

Responding : Diameter of dent produced

Constant : steel ball , mass of weighed, distance of weighed from the block .

(c) Hypothesis.

The harder the substance, the smaller the diameter of dent produced.

(d) List of materials and apparatus.

Brass block, copper block, meter ruler, 1 kg of weighed, retort stand, steel ball, thread and cellophane tape.

(e) Procedure of the experiment

1. A steel ball is taped on the copper block using a cellophane tape.
2. 1 kg of weighed is suspended about 1 meter from the copper block.
3. The weighed is released to the steel ball on the copper block
4. The dent produced is measured using the ruler.
5. Step 1 until 4 are repeated twice to get the average of dent produced.
6. Experiment was repeated by replace the copper block with brass block.

(f) Tabulation of data

|              | Diameter of dent |   |   |         |
|--------------|------------------|---|---|---------|
|              | 1                | 2 | 3 | Average |
| Copper block |                  |   |   |         |
| Brass block  |                  |   |   |         |