

SECTION A

[60 marks]

Answer All Questions

1. Table 1 shows the proton number and nucleon number of four atoms T, U, V, and W.

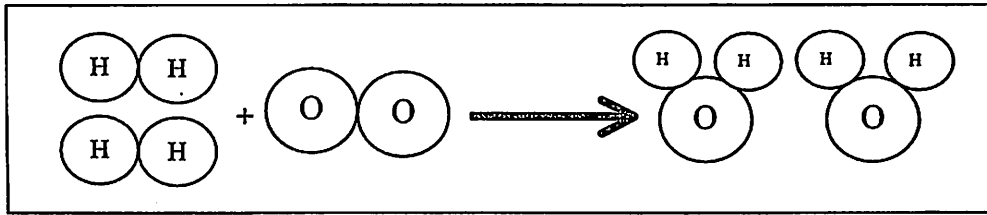
Atom	Proton number	Nucleon number	Electron arrangement
T	9	19	2.7
U	15	16	2.8.5
V	17	35	
W	17	37	2.8.7

Table 1

Based on Table 1:

- (a) (i) Write the arrangement of V atom. [1 mark]  
\_\_\_\_\_
- (ii) How many valence electrons does an atom of U have? [1 mark]  
\_\_\_\_\_
- (iii) State the number of shells does an atom of T have. [1 mark]  
\_\_\_\_\_
- (iv) Draw the electron arrangement of atom U. [2 marks]  
\_\_\_\_\_
- (b) Atom T reacts with oxygen to form a covalent compound.
- (i) State two physical properties of covalent compound. [2 marks]  
\_\_\_\_\_  
\_\_\_\_\_
- (ii) Write the chemical formula of covalent compound formed. [1 mark]
- (iii) Complete the relationship below. [1 mark]  
Nucleon number = proton number +

2. The diagram below represents a reaction between hydrogen and oxygen to produce water.



(a) (i) Name the type of particle present in water,  $H_2O$ .

[1 mark]

(ii) Calculate the relative molecular mass of water.  
 [Relative atomic mass:  $H = 1$ ;  $O = 16$ ]

[1 mark]

(b) 20g of hydrogen are reacting completely with excess oxygen to form water.

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

[2 marks]

(ii) Calculate the numbers of moles are the in 20g of hydrogen.

[2 marks]

(c) (i) Presence of water can showing the properties of acid.  
 State the role of water in showing the properties of acid.

[1 mark]

(ii) Ethanoic acid,  $CH_3COOH$  dissolved in propanone,  $CH_3COCH_3$ , has no effect on blue litmus paper. Explain this observation.

[2 marks]

3. E, F, G, H, J, K, and L are the symbols used to represent elements. They form compounds in which they exist as ions with the following formulae in the Table 3

$E^{2+}$ , $F^{3+}$ , $G^+$ , $H^{2-}$ , $J$ , $L^+$ , and $L^{2+}$ K does not form any compound
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Table 3

Based on Table 3:

- (a) State the Group of element F in the Periodic Table. [1 mark]
- 
- (b) Which element is a noble gas? Explain your answer. [2 marks]
- 
- (c) (i) State the elements is most likely to form coloured compound and gives a reason for your answer. [2 marks]
- 
- (ii) Write the formulae of the two oxides this element is likely to for [2 marks]
- 
- (d) (i) Which element forms an amphoteric oxide? [1 mark]
- 
- (ii) Write the equation for the reaction of this Oxide with hydrochloric acid. [2 marks]
-

4. Hydrogen sulphide is a compound of hydrogen and sulphur. Sulphur is an element found in Group 16 of the Periodic Table.

(a) What is a compound?

[1 mark]

(b) Name two types of chemical bonds.

[1 mark]

(c) (i) What type of bond is formed between the hydrogen and sulphur atom?

[1 mark]

(ii) Draw the electron arrangement of the bond formed between hydrogen and sulphur atom.

[2 marks]

(d) (i) Hydrogen sulphide has the melting point of  $-85^{\circ}\text{C}$  and a boiling point of  $-61^{\circ}\text{C}$ . Write the physical state of hydrogen sulphide at  $28^{\circ}\text{C}$ .

[1 mark]

(ii) Draw the arrangement of particles in the substance in d (i).

[1 mark]

(e) Hydrogen sulphide has the smell of rotten eggs but sodium sulphide has no smell. Explain why sodium sulphide has no smell?

[2 marks]

5. The diagram below shows the reaction between magnesium with sulphuric acid.

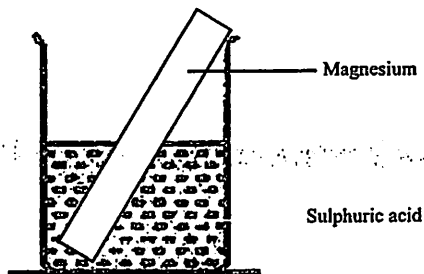


Diagram 5

- (a) (i) Write the balance chemical equation for the reaction. [1 mark]  
\_\_\_\_\_
- (ii) Write an ionic equation for this reaction. [2 marks]  
\_\_\_\_\_
- (b) In this reaction, which substance is
- (i) oxidised? = \_\_\_\_\_
- (ii) reduced? = \_\_\_\_\_
- (iii) oxidizing agent? = \_\_\_\_\_
- (iv) reducing agent? = \_\_\_\_\_ [4 marks]

(c) Magnesium also can react with copper (II) sulphate,  $\text{CuSO}_4$  solution. The chemical equation as follows:



- (i) Write half-equations showing what happen to the reactants. [2 marks]  
\_\_\_\_\_  
\_\_\_\_\_
- (ii) Explain why this is a redox reaction. [2 marks]  
\_\_\_\_\_  
\_\_\_\_\_

6. A student carried out an experiment to determine the heat of precipitation for the reaction between lead (II) nitrate,  $\text{Pb}(\text{NO}_3)_2$ , solution and sodium sulphate,  $\text{Na}_2\text{SO}_4$  solution. In this experiment,  $50 \text{ cm}^3$  of  $2.0 \text{ mol dm}^{-3}$  lead (II) nitrate solution was added to  $50 \text{ cm}^3$  of  $2.0 \text{ mol dm}^{-3}$  sodium sulphate solution. The result are given below:

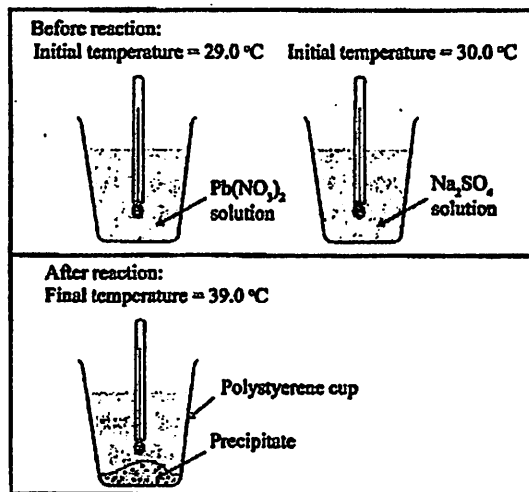


Diagram 6

- (a) State the meaning heat of precipitation.

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

- (b) Why is a polystyrene cup used in the experiment?

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

- (c) State the type of reaction that occurred in this experiment.

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

- (d) (i) State the colour of the precipitate formed in this experiment.

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

- (ii) Give the reason for observation in (d) (i).

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

- (e) (i) Complete the ionic equation for the reaction that occurred.



- (ii) Calculate the heat change of the precipitation reaction between lead (II) nitrate and sodium sulphate.

[Specific heat capacity of solution =  $4.2 \text{ Jg}^{-1}\text{ }^\circ\text{C}^{-1}$ . Assume that  $1 \text{ cm}^3$  of a solution is equal to  $1 \text{ g}$  of the solution]

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

- (iii) Calculate the heat of precipitation for this experiment.

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

**SECTION B**

[20 marks]

Answer any **one** Questions

7 (a) The following are three examples of chloride salts that can be prepared in the laboratory

- Silver chloride, AgCl
- Lead(II) chloride, PbCl<sub>2</sub>
- Potassium chloride, KCl

(i) From these examples, identify the soluble and insoluble salts

[2 marks]

(ii) State the reactants for the preparation of lead(II) chloride, PbCl<sub>2</sub>

[2 marks]

(b) With the aid of a labelled diagram, explain the preparation of soluble salts which are potassium chloride, KCl

[6 marks]

(c) Table 7 shows the observations from some tests carried out from salt X

	Test	Observation
I.	Heating of salt X solid	A metal oxide is formed, effervescence occurs and the gas evolved turns lime water milky
II.	Salt X solution is mixed with excess sodium hydroxide solution	A white precipitate which is soluble in excess sodium hydroxide solution is formed.

Table 7

Based on the information in table 7 :

(i) Identify an anion that is present in Test I and describe a chemical test to verify the anion.

[4 marks]

(ii) Identify two cations that are present in Test II and describe a chemical test to verify the cations

[6 marks]

8. (a) What is meant by the heat of neutralisation? [1 mark]

(b) Two experiments are carried out to compare the heat of neutralisation:

neutralisation

Experiment I	Experiment II
20 cm <sup>3</sup> of 1.0 mol dm <sup>-3</sup> hydrochloric acid is added to 20 cm <sup>3</sup> of 1.0 mol dm <sup>-3</sup> sodium hydroxide solution in a polystyrene cup	20 cm <sup>3</sup> of 1.0 mol dm <sup>-3</sup> ethanoic acid is added to 20 cm <sup>3</sup> of 1.0 mol dm <sup>-3</sup> sodium hydroxide solution in a polystyrene cup

Experiment	I	II
Initial temperature/°C	29.7	29.5
Final temperature / °C	36.4	36.0

(i) Explain the difference of temperature changes between experiment I and experiment II.

[4 marks]

(ii) Calculate the heat change in Experiment I and Experiment II.  
 [Specific heat capacity of solution = 4.2 Jg<sup>-1</sup>°C<sup>-1</sup>. Assume that 1 cm<sup>3</sup> of a solution is equal to 1g of the solution]

[4 marks]

(iii) Based on Experiment I and Experiment II, explain both experiment according to their:

- Balanced equation
- Number of moles of water
- Heat of neutralisation

[11 marks]



SECTION C

[20 marks]

Answer any **one** Questions

9. Diagram 9 shows the arrangement of particles of a compound in molten state and solid state.

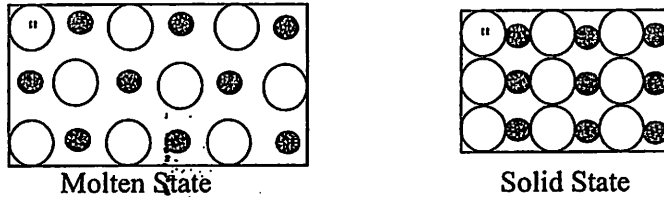


Diagram 9

- (a) The compound can conduct electricity in molten state but cannot do so in solid state. Name one example of a compound with this property. [1 mark]
- (b) Write one of the two half equations for the electrolysis of the compound you named in 9(a). [3 marks]
- (c) Draw a labeled diagram of the apparatus that you can use to electrolyse the compound you named in 9 (a). In your drawing show by using arrows the movement of particles that that occurs in the compound. [10 marks]
- (d) Describe the electrolysis process that occurs in 9 (a). [6 marks]

10. Table 10 shows the data from Experiment I and Experiment II that were carried out to study the rate of reaction of zinc with two acids, P and Q.

Experiment	Reactants	Product	Observation
I	2.6 g of zinc and 50 cm <sup>3</sup> of hot dilute acid P 2.0 mol dm <sup>-3</sup>	zinc sulphate and hydrogen gas	The temperature of the mixture increases
II	2.6 g of zinc and 50 cm <sup>3</sup> of hot dilute acid Q 2.0 mol dm <sup>-3</sup>	zinc chloride and hydrogen gas	The temperature of the mixture increases

Table 10

- (a) (i) By choosing either experiment I or Experiment II, state the name of the acid used. Write the chemical equation for the reaction of this acid with zinc.

[2 marks]

- (ii) Draw an energy profile diagram for the reaction in 10 (a)(i). On the energy profile Diagram shows the:

- Heat of reaction,  $\Delta H$
- Activation energy without a catalyst,  $E_a$
- Activation energy with a catalyst,  $E_a$

Explain the energy profile diagram.

[10 marks]

- (b) Compare the rate of reaction between Experiment I and Experiment II. Explain the difference in the rate of reaction in the experiments accordingly to the collision theory.

[8 marks]

**END OF QUESTIONS PAPER**