233/1
CHEMISTRY
PAPER 1
Time: 2 Hours

BAHATI GIRLS HIGH SCHOOL
MOCK EXAM

INSTRUCTIONS TO CANDIDATES

- Answer all the questions
- Electronic calculators and mathematical tables may be used

For Examiner's only

MAXIMUM SCORE	ATTAINED SCORE
80	

This paper consists of 7 printed pages.

Candidates should check the question paper to ensure that all the pages are printed as indicated and that no questions are missing.
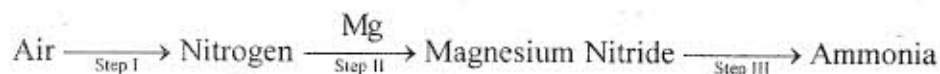
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TURNOVER

1. (a) Write an equation to show how $^{234}_{92}U$ decays by emission of an α - particle to form thorium (1 mark)

    (b) Give two uses of radio active isotopes (2 marks)

2. Use the information in the table below to answer the questions that follow. (The letters do not represent the actual symbols of the elements).

Element	B	C	D	E	F
Atomic number	18	5	3	5	20
Mass number	40	10	7	11	40

    (a) Give two letters which represent the same element. Give a reason (1 mark)

    (b) Give the number of neutrons in an atom of element D. (1 mark)

3. 3.2g of XOH reacts completely with 20cm³ of 2m dilute Sulphuric acid solution. (O = 16, H = 1)

    (a) Write the chemical equation of the reaction. (1 mark)

    (b) Calculate the R.A.M of X in the formula XOH (2 marks)

4. Study the sequence below and answer the questions that follow

$$Air \xrightarrow[Step\ I]{} Nitrogen \xrightarrow[Step\ II]{Mg} Magnesium\ Nitride \xrightarrow[Step\ III]{} Ammonia$$

    (a) Name the process in step I (1 mark)

    (b) Name a reagent that can be used in step III (1 mark)

    (c) Write a balanced equation for step II (1 mark)

85

5. Using Lead(II)Oxide, dilute Nitric(V)acid and dilute Sulphuric(VI)acid, describe how a sample of Lead (II) Sulphate could be prepared in the laboratory. (3 marks)

6. 280cm³ of Nitrogen gas diffuses through a porous pot in 70 seconds. How long will it take for 400 cm³ of Carbon(IV)Oxide to diffuse through the some porous pot?
(R.A.M C = 12, O = 16, N = 14) (3 marks)

7. When compound Q was heated a brown gas was produced and the residue formed was yellow when hot and turned white on coding.

(a) Name the brown gas (1 mark)

(b) Write the chemical formula of the residue formed (1 mark)

8. Compound Y decolourizes bromine liquid and forms a compound Z whose structural formula is

$$CH_3 - \underset{\underset{Br}{|}}{\overset{\overset{H}{|}}{C}} - \underset{\underset{H}{|}}{\overset{\overset{Br}{|}}{C}} - H$$
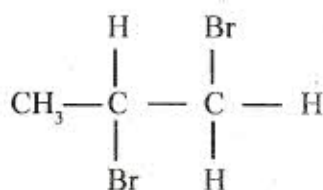
(a) Give the systematic name of compound Z (1 mark)
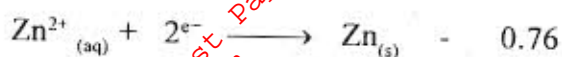
(b) Write down the structural formula of compound Y (1 mark)

(c) What is the name of the homologous series to which Y belong? (1 mark)

9. Using dots (•) and crosses (×), show the bonding in hydronium ion H_3O^+ (2 marks)

10. In terms of oxidation numbers used indicate the reduction process in the following reaction. (Show your working)
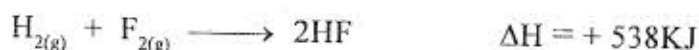
(2 marks)

$$2MnO_4^- + 5SO_3^{2-} + Mn_{(aq)}^{2+} + 5SO_4^{2-} + 3H_2O_{(l)}$$
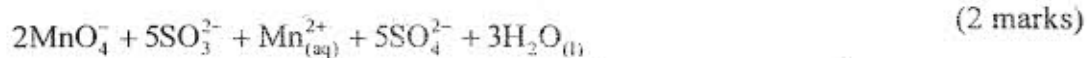
11. The following are reduction potentials of some elements
E /volts

$$Zn^{2+}_{(aq)} + 2e^- \longrightarrow Zn_{(s)} \quad - \quad 0.76$$

$$Al^{3+}_{(aq)} + 3e^- \longrightarrow Al_{(s)} \quad - \quad 0.66$$

$$Fe^{2+}_{(aq)} + 2e^- \longrightarrow Fe_{(s)} \quad - \quad 0.44$$

Using the information above, explain whether it is advisable or not to store Iron (ii) Sulphate solution in Aluminium container. (3 marks)

12. Hydrogen and Fluorine react according to the equation.

$$H_{2(g)} + F_{2(g)} \longrightarrow 2HF \qquad \Delta H = + 538KJ$$

(a) Sketch an energy level diagram for the forward reaction (2 marks)

(b) Calculate the molar enthalpy of formation of HF (1 mark)

13. State and explain the function of Tartaric acid in baking powder (2 marks)

14. When an electric current of 0.5A was passed through a fused Chloride of element J for 32 minutes and 10 seconds, a mass of 0.44g of J was deposited at the cathode. J belongs to Group I element (IF = 96,500C)

(a) Calculate the quantity of electricity required to deposit 1 mole of J (2 marks)

(b) Calculate the relative atomic mass of J (3 marks)

15. The table below gives the rate of decay for a radioactive element Y.

No. of days	Mass (g)
0	384
270	48

Calculate the half - life of radioactive element Y (2 marks)

87

16. (a) Name the chief ore from which Copper metal is extracted (1 mark)

(b) Silica (SiO_2) is used in the extraction of Copper. Describe its use in the process and write an equation (2 marks)

17. In the Haber process, the industrial manufacture of Ammonia is given by the following equation

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} \qquad \Delta H = -97 \text{ kJ/mol}$$

(i) What information about this reaction is given by $\Delta H = -97$ kJ/mol (1 mark)

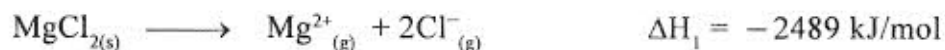(ii) State the catalyst used in the reaction above (1 mark)

(iii) What is the effect of increasing on the yield of Ammonia. Explain (2 marks)

18. A solution containing 2.84g of Sodium Sulphate was mixed with a solution containing 9.93g of Lead (iii) Nitrate to form Sodium Nitrate according to the equation below

$$Pb(NO_3)_{2(aq)} + Na_2SO_{4(aq)} \longrightarrow PbSO_{4(s)} + 2NaNO_{3(aq)}$$

Determine the maximum amount of Sodium Nitrate obtained from this reaction
(RFM of $Na_2SO_4 = 143$, $Pb(NO_3)_2 = 331$ and $NaNO_3 = 85$) (3 marks)

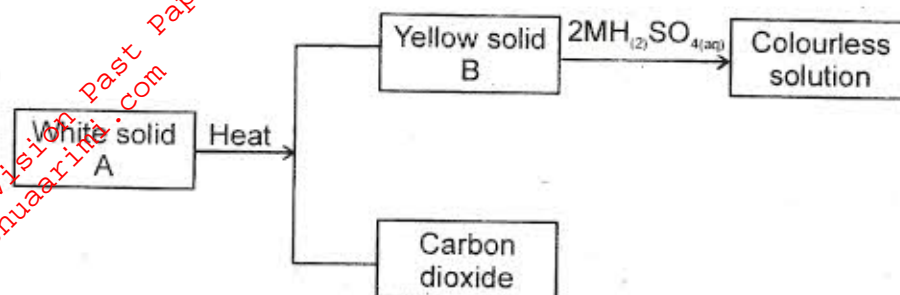19. Study the information below and answer the question that follow

$$MgCl_{2(s)} \longrightarrow Mg^{2+}_{(g)} + 2Cl^-_{(g)} \qquad \Delta H_1 = -2489 \text{ kJ/mol}$$

$$MgCl_{2(s)} + aq \longrightarrow MgCl_{2(aq)} \qquad \Delta H_2 = -5142 \text{ kJ/mol}$$

$$2Cl^-_{(g)} + (aq) \longrightarrow 2Cl^-_{(aq)} \qquad \Delta H_3 = -762 \text{ kJ/mol}$$

(a) Give the specific names of the enthlapies ΔH_1 and ΔH_2 (2 marks)

(b) Determine the enthlapy for the reaction (2 marks)

$$Mg^{2+}_{(g)} + (aq) \longrightarrow Mg^{2+}_{(aq)}$$

88
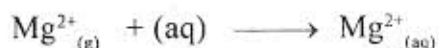
20. The scheme below represents some reactions starting with a white solid A

(a) Identify the solids A and B (2 marks)

(b) Write an ionic equation for the reaction between B and 2m Sulphuric acid (1 mark)

21. Carbon and Silicon both belong to the same group of the periodic table, yet carbon dioxide is a gas while Silicon dioxide is a solid with high melting point. Explain (2 marks)

22. Explain why divers and mountain climbers carry Oxygen gas mixed with helium rather than pure Oxygen (2 marks)

23. (a) In the manufacture of Ammonia, Hydrogen is reacted with Nitrogen in presence of finely divided Iron catalyst. Explain why the catalyst is finely divided (1 mark)

(b) 2dm³ of a mixture of Ammonia, Nitrogen and Hydrogen were bubbled through 0.1 dm³ of 0.3m Hydrochloric acid. The final concentration of the acid was found to be 0.2m. Calculate the percentage of Ammonia at equilibrium (3 marks)

24. The graphs A and B below refer to the reaction $N_2O_{4(g)} \longrightarrow 2NO_{2(g)}$
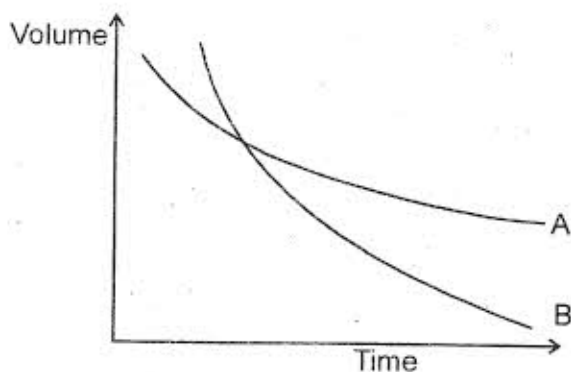
(a) Which graph was obtained at higher temperature (1 mark)

(b) Name the substance whose volume is plotted on the graphs (1 mark)

25. The results given below were obtained in an experiment to determine the amount of crystallization in $ZnSO_4 \cdot X\,H_2O$ crystals

Mass of crucible	21.30g
Mass of crucible + crystals	27.04g
Mass of crucible + resolve	24.52g

Calculate the value of X (3 marks)
(Zn = 65, S = 32, O = 16, H = 1)

26. Calculate the volume of Hydrogen gas that would be produced when 1.6g of Magnesium ribbon is reacted with excess Hydrochloric acid. (3 marks)
Molar gas volume = $22.4dm^3$ Mg = 24g

27. Solution A, B, C and D have the P.H values shown in the table below.

Solution	A	B	C	D
P.H	3	7	6	13

(a) Which solution is likely to be

(i) Rain water collected from an industrial area (1 mark)

(ii) Potassium Chloride solution (1 mark)

(b) Identify the solution which when concentrated should not be heated in glass tube. (1 mark)

28. Draw the structures of the following compounds

(i) 2 - methyl but - 2 - ene (2 marks)

(ii) heptanoic acid (2 marks)

90

29. Two reagents that can be used to prepare Chlorine gas are Manganesian Oxide and concentrated Hydrochloric acid.

(i) Write an equation for the reaction (2 marks)

(ii) Give the formula of another reagent that can be reacted with concentrated Hydrochloric acid to produce Chlorine (1 mark)

(iii) Describe how the Chlorine gas could be dried in the laboratory (3 marks)