SECTION A-46 MARKS
ATTEMPT ALL QUESTIONS IN THIS SECTION.

1. Beryllium, magnesium & calcium are group II elements.
   a. Write the general outer configuration of the elements. (01 mark)
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   b. Each of these elements reacts with carbon to form carbides. Write the equation for the reaction which occurs when each carbide reacts with water. (03 marks)
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2. a. Define nuclear stability. (01 mark)
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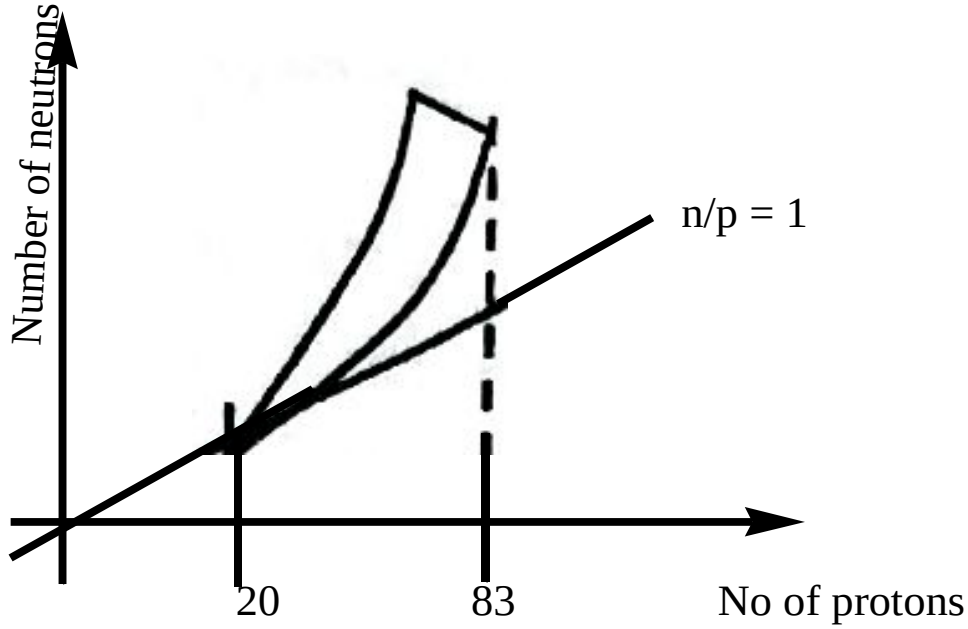
   b (i).The graph below shows the variation of numbers of neutrons in an atom with proton numbers.



Explain why the bend of nuclear stability deviates from $\frac{n}{p} = 1$ after atomic number 20. (02 marks)

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(ii).Given that the respective mass numbers and atomic numbers of thorium and lead are **232** and **90**,**208** and **82**.

Determine **the number of alpha** and **beta particles** that must be emitted by thorium to transform to lead. (02 marks)

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3. **50.0cm^3** of **0.1M** aqueous ammonia was added to **50.0cm^3** of **0.1 M** hydrochloric acid and the resultant solution had a **pH** less than 7.

a. Give a reason for this observation. (02 marks)

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b. Calculate the pH of the solution.

(Kh for the ammonium chloride is 6.34 X 10^{-8}mol/dm^3) (03 marks)

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4. State what would be observed and write equation between the following compounds and the reagent commonly used in identifying organic compounds.
   a. Neutral iron (III) chloride and phenol. (02 marks)
      Observations:
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      Equation:
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   b. Sodium nitrite in presence of concentrated hydrochloric acid and ethyl methylamine. (02 marks)
      Observations:
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      Equation:
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   c. Fehling's solution and ethanol. (02 marks)
      Observations:
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      Equation:
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5. a. (i).Define the term Ore. (01 mark)
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   (ii).Name the common ores for the following metals. (@0½ mark)
   Aluminium
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   Iron
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   Copper
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Zinc

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b. State the role of the following process in the extraction of metals. (@ 01 mark)

i. Froth flotation.

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ii. Roasting.

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iii. Smelting.

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6. a. Explain the term partition law. (01½ marks)

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b. An aqueous solution contains **10.0g** of **H** in a litre of solution. **100.0cm³** of this solution was shaken with **20.0cm³** of ether and the ether extracted **0.8g** of **H**.
Calculate the volume of the ether that is required to extract **80%** of **H** from **500.0cm³** of the aqueous solution. (03 marks)

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c. Give a reason why extracting using aliquots improves the yield. (01½ marks)

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7. Both Aluminium and phosphorus form compounds in the oxidation states of **+3**.

a. Briefly explain in terms of the electronic configuration why aluminium conducts electricity but all the common allotropes of phosphorus do not. (03 marks)

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b. Write equation for the reaction between each element with sodium hydroxide solution. (03 marks)

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8. Complete the following equations and name the main organic product. (@01½ marks)

a. $(CH_3CH_2COO)_2Ca \xrightarrow{Heat}$ ……

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b. $2CH_3CHO \xrightarrow{Dil.NaOH}$ ……

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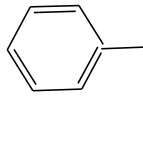
c.  + 2 Na $\xrightarrow{\text{Ether}}$ .....

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9. a. State **Graham's law of gaseous diffusion**. (01 mark)

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b. Nickel forms a carbonyl; $Ni(CO)_n$. **Deduce the value of n** if carbon monoxide diffuses **2.46 times** faster than the carbonyl compound. (03 marks)

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c. State:

i. **Oxidation state** of Nickel in the compound. (0½ mark)

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ii. **Co-ordination numbers** of Nickel in the compound. (0½ mark)

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SECTION B-54 MARKS

ATTEMPT ANY SIX QUESTIONS IN THIS SECTION.

10. Write equations to show how the following synthesis can be carried out. In each case indicates the necessary reagents and conditions.

a. Benzene to 2-phenylpropene. (03 marks)

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b. Ethane to hydroxyethanoic acid. (02½ marks)

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c. Chloroethane to propanamide. (03½ marks)

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11. A compound **Z** contains **19.15%** nitrogen, **43.5%** oxygen and the **rest** being manganese.

a. (i). Calculate the **empirical formula of Z**. (01½ marks)

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(ii).**10.0g** of **Z** in **1000.0g** of water lowered to freezing point of water by **0.127°C**.
Calculate the **molecular formular** of **Z**. (**K_f** for water is **1.86°C/mol/kg**) (02 marks)

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b. **Z** was dissolved in water to form a **pink solution** and divided in to two parts. State would be **observed** and **write equation** for the reaction that took place when:

i. Acidified potassium manganite (VII) solution was added to the first part. (02 marks)

Observations:

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Equation:

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ii. Concentrated nitric acid and lead (IV) oxide was added to the second part and the mixture boiled. (02 marks)

Observations:

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Equation:

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12. Complete the following equations and write the suggested mechanism for the reaction.

a. $CH_3CH_2CH_2CH_2OH \xrightarrow[\text{Heat}]{\text{Conc.}H_2SO_4}$ ..... (03½ marks)

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b.  $\xrightarrow[35^0C]{\text{Fuming } H_2SO_4}$ ..... (03 marks)

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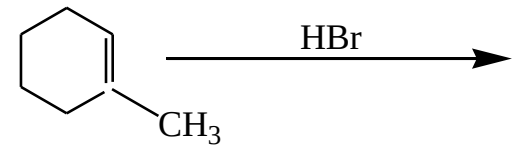
c. 

…… (02½ marks)

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13. **25moles** of hydrogen and **18moles** of iodine vapour were heated in a **1 litre** sealed tube at **465°C**. When equilibrium was attained, the tube was rapidly cooled and found to contain **30.8moles** of hydrogen iodide.

a. Give a **reason** why the tube was rapidly cooled. (02 marks)

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b. Calculate the:

i. Value of the equilibrium constant, **Kc** for the reaction taking place in the flask. (03 marks)

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ii. Degree of dissociation of hydrogen iodide. (02 marks)

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c. State what would happen to the equilibrium position of the reaction in the flask above when sodium thiosulphate solution was added to the flask. Give a reason for your answer. (02 marks)

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14. Explain the following observations:

a. When sodium carbonate solution was added to a solution of chromium (III) sulphate, bubbles of a colourless gas and green precipitate were observed. (03 marks)

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b. The bond angle of phosphorus triflouride is **96°** while that of phosphorus trichloride is **100°**. (03 marks)

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c. Aluminium utensils should be cleaned using soap. (03 marks)

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15.a). State **rate law**. (01 mark)

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b).Explain why reactions with **high molecularity are rare**. (03 marks)

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c).A solution of hydrogen peroxide titrated against acidified potassium manganate (VII) solution at different time intervals, give the following results.

Times (Minutes)	0	10	20
Volume of accidified $KMnO_4$ used (cm^3)	23.8	14.7	9.1

i. Show that the **decomposition** of hydrogen peroxide is first. (03½ marks)

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ii. Calculate the **half-life** of decomposition of hydrogen peroxide. (01½ marks)

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16. The chemistry of fluorine differs from that of chlorine.

a. (i). State **two differences** between the **chemistry** of **chlorine** and **fluorine** besides their reactions with **sodium hydroxide solution**. (02 marks)

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(ii). Write the **equations of reaction between hot concentrated potassium hydroxide solution** and: (@01½ marks)

i. Fluorine

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ii. Chlorine

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b. Write **equation for ionisation of hydrogen fluoride** in aqueous solutions that are: (@01½ marks)

i. Dilute

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ii. Concentrated

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c. State **one reason** why the chemistry of fluorine differs from that of chlorine. (01 mark)

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17.a). (i). Define **enthalpy of a reaction**. (01 mark)

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(ii). State **three factors affecting the quantity of an enthalpy change** of a reaction. (03 marks)

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b). The **standard heat of formation** of ethanol, carbon dioxide and water are **$^{-}$227.0, $^{-}$393.5, & $^{-}$285.5KJ/mol** respectively.

i. Draw a **Born-Haber cycle** to relate the energy changes stated above. (02 marks)

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ii. Calculate the **standard heat of combustion** of ethanol using the drawn cycle. (01½ marks)

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iii. From **your calculation in b (ii) above** and **energy changes** in b (i), what can be **ideal use of ethanol in chemistry**. Give **a reason** for **your answers**. (01½ marks)

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THE PERIODIC TABLE

1	2											3	4	5	6	7	8
1.0 H 1																1.0 H 1	4.0 He 2
6.9 Li 3	9.0 Be 4											10.8 B 5	12.0 C 6	14.0 N 7	16.0 O 8	19.0 F 9	20.2 Ne 10
23.0 Na 11	24.3 Mg 12											27.0 Al 13	28.1 Si 14	31.0 P 15	32.1 S 16	35.4 Cl 17	40.0 Ar 18
39.1 K 19	40.1 Ca 20	45.0 Sc 21	47.9 Ti 22	50.9 V 23	52.0 Cr 24	54.9 Mn 25	55.8 Fe 26	58.9 Co 27	58.7 Ni 28	63.5 Cu 29	65.7 Zn 30	69.7 Ga 31	72.6 Ge 32	74.9 As 33	79.0 Se 34	79.9 Br 35	83.8 Kr 36
85.5 Rb 37	87.6 Sr 38	88.9 Y 39	91.2 Zr 40	92.9 Nb 41	95.9 Mo 42	98.9 Tc 43	101 Ru 44	103 Rh 45	106 Pd 46	108 Ag 47	112 Cd 48	115 In 49	119 Sn 50	122 Sb 51	128 Te 52	127 I 53	131 Xe 54
133 Cs 55	137 Ba 56	139 La 57	178 Hf 72	181 Ta 73	184 W 74	186 Re 75	190 Os 76	192 Ir 77	195 Pt 78	197 Au 79	201 Hg 80	204 TI 81	207 Pb 82	209 Bi 83	209 Po 84	210 At 85	222 Rn 86
223 Fr 87	226 Ra 88	227 Ac 89															

139 La 57	140 Ce 58	141 Pr 59	144 Nd 60	147 Pm 61	150 Sm 62	152 Eu 63	157 Gd 64	159 Tb 65	162 Dy 66	165 Ho 67	167 Er 68	169 Tm 69	173 Yb 70	175 Lu 71
227 Ac 89	232 Th 90	231 Pa 91	238 U 92	237 Np 93	244 Pu 94	243 Am 95	247 Cm 96	247 Bk 97	251 Cf 98	254 Es 99	257 Fm 100	256 Md 101	254 No 102	260 Lw 103

♥ ===END===

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