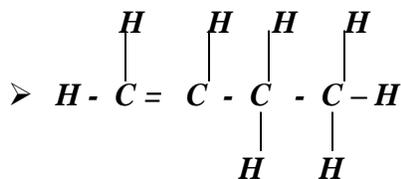


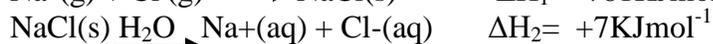
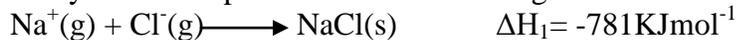
LANET JOINT EVALUATION- LANJET 2022**CHEMISTRY FORM 4****PAPER 1****END OF TERM 2 2022****LANJET****TIME: 2 HOURS****INSTRUCTIONS.****Answer all the questions in the spaces provided.**

- Explain why luminous flame of a Bunsen burner appears yellow. (2mks)
 - *Due to incomplete combustion of the gas resulting to production of carbon particles which glow in presence of heat to yellow.*
- The empirical formula of a compound is CH_2 and it has a molecular mass of 42.
 - What is the molecular formula of this compound? (1mk)
 - $(\text{CH}_2)_n = 42$
 $(12+2)n=42$
 $14n=42$
 $n=3$
 $M.F = 3(\text{CH}_2)$
 C_3H_6
 - Write the general formula of the homologous series to which the compound belongs. (1mk)
 - C_nH_{2n}
 - Draw the structural formula of the third member of this series and give its IUPAC name. (1mk)



- Magnesium was burnt in air forming a white residue T. when put in a boiling tube with water effervescence was noticed and a colourless gas D with a characteristic pungent smell was evolved.
 - Identify:
 - Residue T. (1mk)
 - *Magnesium nitride (Mg_3N_2)*
 - Gas D (1mk)
 - *Ammonia / NH_3*
 - Write an equation for the liberation of gas D. (1mk)
 - $\text{Mg}_3\text{N}_2(\text{s}) + 6\text{H}_2\text{O}(\text{l}) \longrightarrow 3\text{Mg}(\text{OH})_2(\text{aq}) + 2\text{NH}_3(\text{g})$

4. Study the enthalpies of sodium chloride given below and answer the questions that follow.



- a) What is the name of ΔH_1 ? (1mk)

➤ **Lattice energy**

- b) Calculate the heat change for the process represented by the equation: (2mks)



➤ $\Delta H_3 = \Delta H(\text{latt}) + \Delta H(\text{soln})$

$$= -781 + 7$$

$$= -774 \text{KJmol}^{-1}$$

5. Both methane (CH_4) and diamond have covalent bonds. Explain why methane is a gas whereas diamond is a solid at room temperature. (2mks)

➤ **Methane has simple molecular structure with weak van der Waals forces while diamond has giant atomic/covalent structures with strong covalent bond.**

6. Study the table below of certain properties of substance A, B, C and D.

	Melting point ($^{\circ}\text{C}$)	Solubility in water	Electrical conductivity
A	-119 $^{\circ}\text{C}$	Soluble	Solution does not conduct
B	1020	Soluble	Solution conducts
C	1740	Insoluble	Does not conduct
D	1600	Insoluble	Conduct at room temp

Which of the substances;

- i. Is a metal? (½ mk)

➤ **D**

- ii. Has a simple molecular structure? (½ mk)

➤ **A**

- iii. Has a giant ionic structure? (½ mk)

➤ **B**

- iv. Has a giant covalent structure? (½ mk)

➤ **C**

7. In an experiment hydrogen sulphide was passed through 1.0M CuSO_4 solution in a boiling tube as shown in the diagram.

a) State the observation made in the boiling tube. (1mk)

➤ **A black solid is formed.**

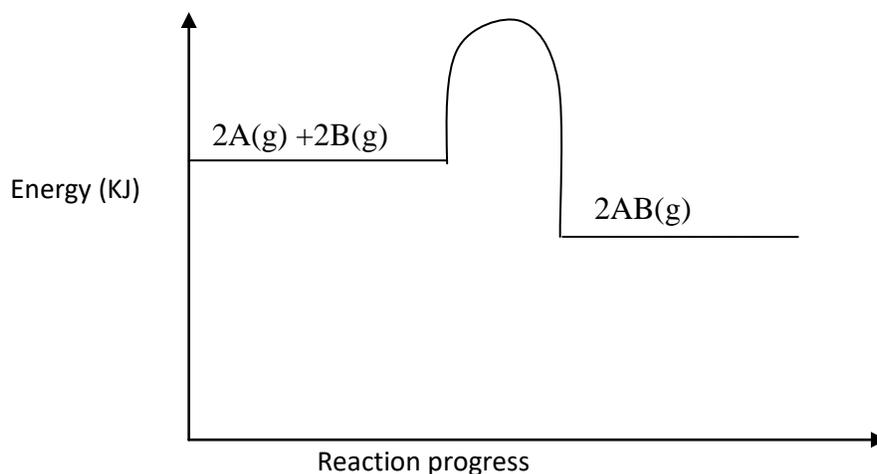
b) Write the ionic equation for the above reaction. (1mk)

➤ $\text{Cu}^{2+}(\text{aq}) + \text{S}^{2-}(\text{aq}) \longrightarrow \text{CuS}(\text{s})$

c) What precaution should be taken in carrying out this experiment? Explain. (1mk)

➤ **Experiment should be done in a fume chamber since H_2S gas is poisonous.**

8. The figure below is an energy level diagram for the reaction.



a) Explain how the following conditions would affect the yield of AB.

i. Increase in pressure. (1 ½ mks)

➤ **The yield of AB is increased. The forward reaction is accompanied by a decrease in volume. Equilibrium shifts to the right following the forward reaction.**

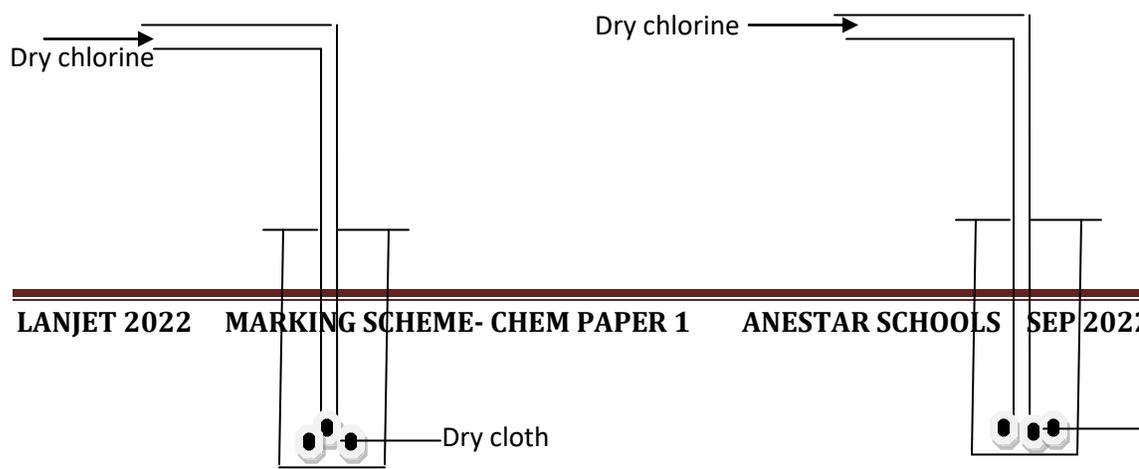
ii. Decrease in temperature. (1 ½ mks)

➤ **The yield AB is increased. The forward reaction is exothermic; decrease in temperature favours the forward reaction hence equilibrium shifts to the right.**

b) Explain why the rate of reaction is found to increase with temperature. (2mks)

➤ **Increase in temperature results in increase in the kinetic energy of the particles. This makes particles move faster and collide frequently leading to faster rate of reaction.**

9. Dry chlorine gas was passed through two pieces of coloured cotton cloth as shown.



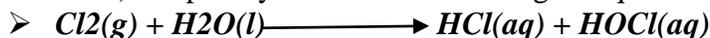
Exp 1

Exp 2

a) State what is observed in each experiment. (2mks)

- ***In experiment I; No change on the dry cloth because of the absence of hypochlorous acid responsible for bleaching.***
- ***In experiment II; the wet cloth turned white due to bleaching as chlorine dissolves in water in the wet cloth to form hypochlorous acid.***

b) Explain your observation using an equation. (1mk)



10. During the extraction of copper and zinc from their ores, some of the processes include;

- i. Crushing
- ii. Mixing of the crushed ore with oil and water and bubbling air through it.

a) Name the process (ii) above. (1mk)

➤ ***Froth floatation***

b) What is the purpose of (ii) above? (1mk)

➤ ***To concentrate the mineral ore by making impurities to sink at the bottom.***

c) Bronze is an alloy of copper and another metal. Identify the other metal. (1mk)

➤ ***tin (Sn)***

11. The diagram below represents an electrochemical cell.

a) On the diagram:

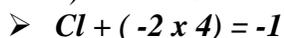
i. Label the salt bridge. (1mk)

ii. Show the direction of flow of electrons. (1mk)

b) Write the overall ionic equation. (1mk)



c) What is the oxidation number of chlorine in ClO_4^- . (1mk)



$Cl - 8 = -1$

$Cl = -1 + 8$

$Cl = +7$

12. A gas at $27^\circ C$ and 750mmHg was found to occupy 36cm^3 . Calculate the temperature at which the same mass of gas will occupy twice the volume at a pressure of 100mmHg pressure.

(2mks)

➤ $P_1 = 750\text{mmHg}$

$V_1 = 36\text{cm}^3$

$T_1 = (27 + 273) = 300\text{K}$

$P_2 = 100\text{mmHg}$

$V_2 = 72\text{cm}^3$

$T_2 = ?$

$T_2 = \frac{P_2 V_2 T_1}{P_1 V_1}$

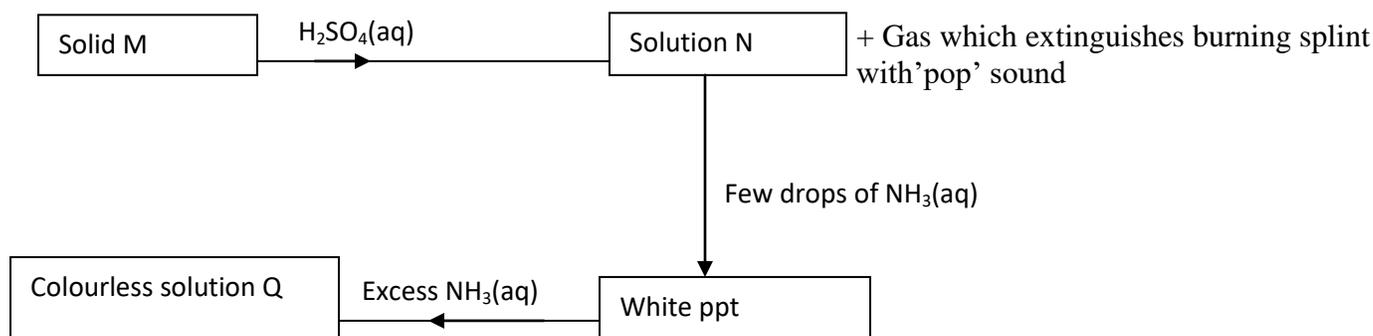
$\frac{100 \times 72 \times 300}{750 \times 36}$

$= 100 \times 72 \times 300$

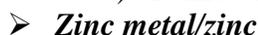
750×36

$= 80\text{K or } 193^\circ C$

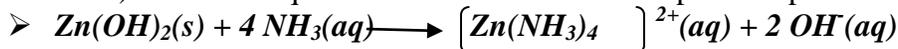
13. Study the scheme below and answer the questions that follow.



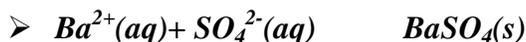
a) Name solid M. (1mk)



b) Write an equation for formation of a complex ion present in solution Q. (1mk)



c) Write an ionic equation of the reaction between barium nitrate and solution N. (1mk)



14. When a current of 2.5 amperes was passed through a cell containing a cell containing N^{2+} ions of a metal for 25 minutes, the mass of the cathode increased by 0.36g. determine the relative atomic mass of element N. (IF= 96500 coulombs) (3mks)

$$Q = It$$

$$Q = 2.5 \times 25 \times 60 = 3750C$$

$$N^{2+} - 2 \text{ faradays}$$

$$1F = 96500$$

$$2F = 193,000C$$

$$3750C = 0.36g$$

$$193000C = ?$$

$$\frac{193000 \times 0.36}{3750}$$

$$= 18.528$$

$$= 18.5$$

15. An oxide of potassium has a relative formula mass of 110, if 2.75g of the oxide contains 1.95g of potassium; determine the formula of the oxide. (K=39.0, O=16.0) (3mks)

$$\text{Mass of Oxygen} = 2.75 - 1.95 = 0.8$$

Element	K	O
Mass	1.95	0.8
RAM	39	16
Moles	0.05	0.05
M.R	$\frac{0.05}{0.05}$	$\frac{0.05}{0.05}$
	1:	1

EFKO

$$(KO)_n = 110$$

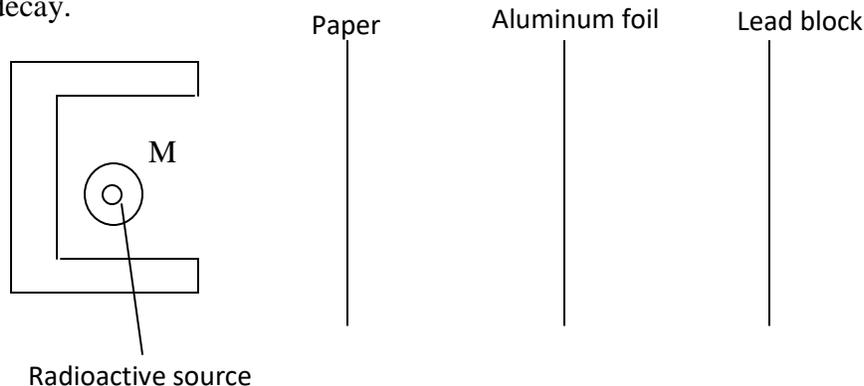
$$(39+16)n = 110$$

$$55n = 110$$

$$n = 2$$

formula K_2O_2

- a) The arrangement below was used to compare the penetrating power of emissions in a radioactive decay.



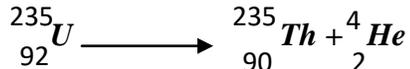
- b) Name the radio-active that can be detected at A, B and C. (2 ½ mks)

A **Alpha, Beta, Gamma**

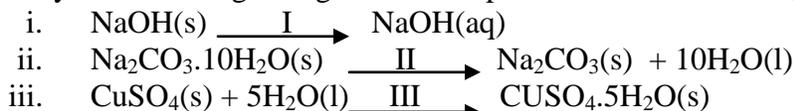
B **Beta, Gamma**

C Gamma

- c) The half life of ${}_{92}^{234}\text{U}$ is 4500 years. The isotope decays by alpha emission. Write a nuclear equation for its decay to form Thorium (Th) (1mk)



16. Study the following changes that took place when the following substances are exposed in air.



Name the process I,II and III. (3mks)

- i. **Deliquescence**
 ii. **Efflorescence**
 iii. **Hygroscopy**

17. Complete the table below to show the observations made when concentrated sulphuric (VI) acid is added to the substances shown. (2mks)

Substance	Observation
Iron fillings	<i>Effervescence occurs</i> <i>Bubbles of colourless gas with a pungent smell</i> <i>A brown solution is formed</i>
Crystal of white sugar	<i>Black spongy solid</i>

b. Give reason for the observations made using;

- i. Iron fillings (1mk)
 ➤ **Sulphuric (VI) acid oxidizes iron to iron (III) sulphate while it is reduced to SO_2 and water.**
 ii. Crystal's of white sugar. (1mk)
 ➤ **Formation of carbon by dehydration of sugar.**

18. A saturated solution of a salt at 30°C weighs 60g. when evaporated to dryness, it leaves a dry mass of 10g.

- i. What is the solubility of the salt at 30°C ? (2mks)

Mass of solvent = 60-10 =50g
50g of solvent contains 10g of salt
100g of solvent = ?
= $\frac{100 \times 10}{50}$

= 20g/100g of water

- ii. A compound whose general formula is Y(OH)_3 reacts as shown by the equation below.



- a) What name is given to compounds which behave like Y(OH)_3 in the two reactions. (1mk)

➤ **Amphoteric hydroxides.**

- b) Name an element whose hydroxide behave like that of Y. (1mk)

➤ **Zinc/lead/zluminium**

19. a. Define a flame. (1mk)

➤ **a flame is a mass of burning gases**

b. Name the type of a flame produced by the Bunsen burner when the air hole is closed. (1mk)

➤ *Luminous flame*

20. Carbon (II) Oxide gas was passed over heated iron (III) oxide as shown below.

a) Give one observation made in tube P. (1mk)

➤ *The brown solid turns to grey solid.*

b) Write an equation for the reaction which takes place in tube P. (1mk)

➤ $Fe_2O_3(s) + 3CO(s) \longrightarrow 2Fe(s) + 3CO_2(g)$

c) The flame at the end of combustion tube P is blue in colour. Explain how the flame is obtained. (1mk)

➤ *The flame is obtained by burning excess carbon (II) oxide gas.*

21. The diagram below is a set up to investigate the effect of heat on hydrated Copper (II) Sulphate. Study it and answer the questions that follow.

a) Why is the boiling tube slanted as shown? (1mk)

➤ *Prevent water formed from running back to the hot part of the apparatus which could crack.*

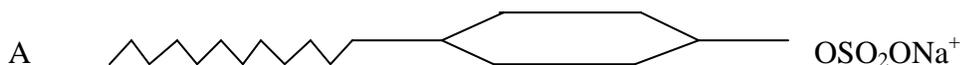
b) What is observed in the boiling tube? (1mk)

➤ *Blue solid (CuSO₄) turns white/crystals turn to powder/ colourless liquid condenses on the cooler parts of combustion tube.*

c) Identify liquid G. (1mk)

➤ **G is water**

22. The following diagrams represent two types of detergents. Study them and answer the questions that follow.



i. Identify the two types of detergents. A and B. (2mks)

➤ **A – Soapless detergent**

➤ **B – Soapy detergent**

ii. What is the problem of continued use of substance B? (1mk)

➤ **It is non-biodegradable hence a pollutant.**

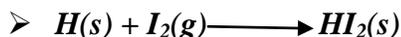
23. The table below is part of the periodic table. The letters are not the actual symbols of the element. Study it and answer the questions that follow.

				C	D	E	F	
G	H					I		

a) Select an element which is stored in paraffin in the laboratory. (1mk)

➤ **G**

b) Element H and I react to form a compound. Write the equation that takes place. (1mk)



c) How do the ionic radii of E and I compare? Explain. (2mks)

➤ **The ionic radius of I is bigger than that of E since I has more energy levels than E.**

24. Describe an experiment to show that group one elements react with cold water to form alkaline solutions. (3mks)

➤ **Put water in a water trough/ beaker. Cut a small piece of sodium metal and put it in water.**

➤ **After the reaction is over, put a red litmus in the resultant solution. The red litmus paper turns blue indicating that the solution is alkaline.**

25. A solution was made by dissolving 8.2g of calcium nitrate to give 2 litres of solution. (Ca=40.0, N=14.0, O=16.0)

Determine the concentration of nitrate ions in moles per litre. (3mks)

➤ **RFM of $Ca(NO_3)_2 = 40 + 28 + 96 = 164$**

➤ **Thus 164g – 1mol**

➤ $8.2g = \frac{8.2 \times 1}{164}$
 $= 0.05mols$

➤ **2 litres = 0.05 moles**

➤ **1litres = ?**

- $= \frac{1 \times 0.05}{2}$
- $= 0.025 \text{ moles}$
- $\text{Ca}(\text{NO}_3)_2 \rightarrow \text{Ca}^{2+} + 2\text{NO}_3^-(\text{aq})$
- $1 : 2$
- $\text{Conc. Of } \text{NO}_3^- \text{ ions} = 0.025 \times 2$
- $= 0.05\text{m}$

26. Identify the method used to distain oil from nut seeds.

(1mk)

- *Solvent extraction*