NAME:………………………………………………..CLASS:……….ADM NO:……

LANET JOINT EVALUATION (LANJET 2022)

CHEMISTRY FORM 4
PAPER 1
END OF TERM 2 2022
TIME: 2 HOURS

INSTRUCTIONS.
Answer all the questions in the spaces provided.

1. Explain why luminous flame of a Bunsen burner appears yellow.   (2mks)

2. The empirical formula of a compound is CH_2 and it has a molecular mass of 42.
    a) What is the molecular formula of this compound?   (1mk)

    b) Write the general formula of the homologous series to which the compound belongs.   (1mk)

    c) Draw the structural formula of the third member of this series and give its IUPAC name.   (1mk)

3. 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.
    a) Identify:
        i. Residue T.   (1mk)

        ii. Gas D   (1mk)

        iii. Write an equation for the liberation of gas D.   (1mk)

4. Study the enthalpes of sodium chloride given below and answer the questions that follow.
    $Na^+(g) + Cl^-(g) \longrightarrow NaCl(s)$ $\Delta H_1 = -781 KJmol^{-1}$
    $NaCl(s) \xrightarrow{H_2O} Na+(aq) + Cl-(aq)$ $\Delta H_2 = +7 KJmol^{-1}$

a) What is the name of ΔH_1? (1mk)

b) Calculate the heat change for the process represented by the equation: (2mks)
$$Na^+(g) + Cl^-(g) \xrightarrow{\quad H_2O(l)\quad} Na^+(aq) + Cl^-(aq)$$

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)

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

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

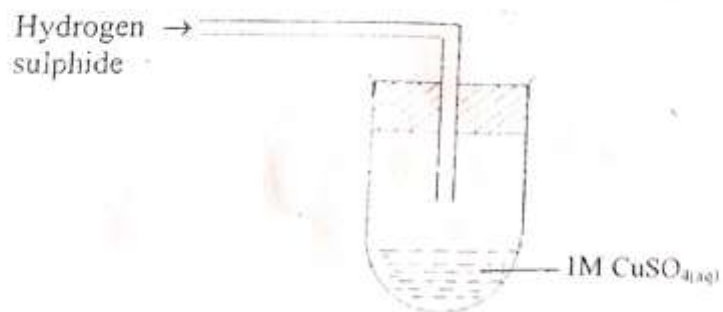Which of the substances;
   i.   Is a metal? (½ mk)

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

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

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

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

Hydrogen → sulphide

1M CuSO₄(aq)

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

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

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

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

$2A(g) + 2B(g) \rightleftharpoons 2AB(g)$

Energy (KJ)

2A(g) +2B(g)

2AB(g)

Reaction progress
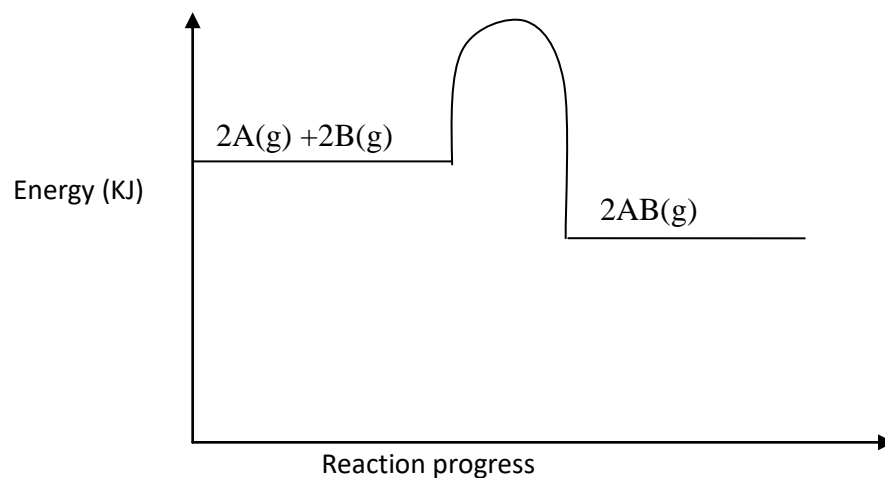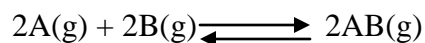
a) Explain how the following conditions would affect the yield of AB.
    i.   Increase in pressure.   (1 ½ mks)

    ii.   Decrease in temperature.   (1 ½ mks)

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

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

Dry chlorine

Dry chlorine

Dry cloth

Wet cloth

Exp 1

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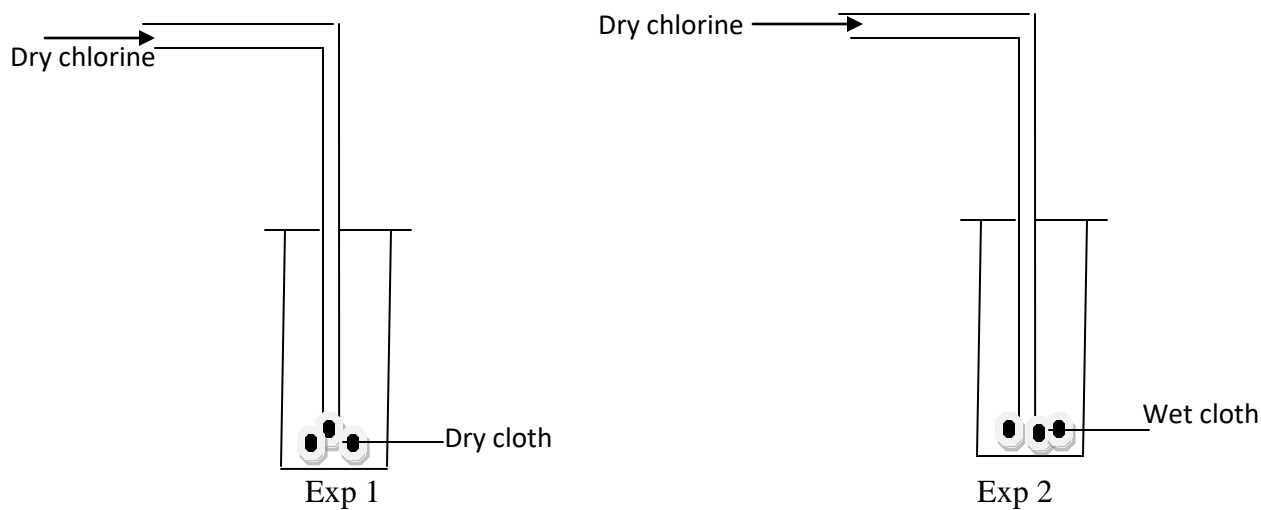
   a) State what is observed in each experiment.   (2mks)

   b) Explain your observation using equations.   (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)

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

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

11. The diagram below represents an electrochemical cell.
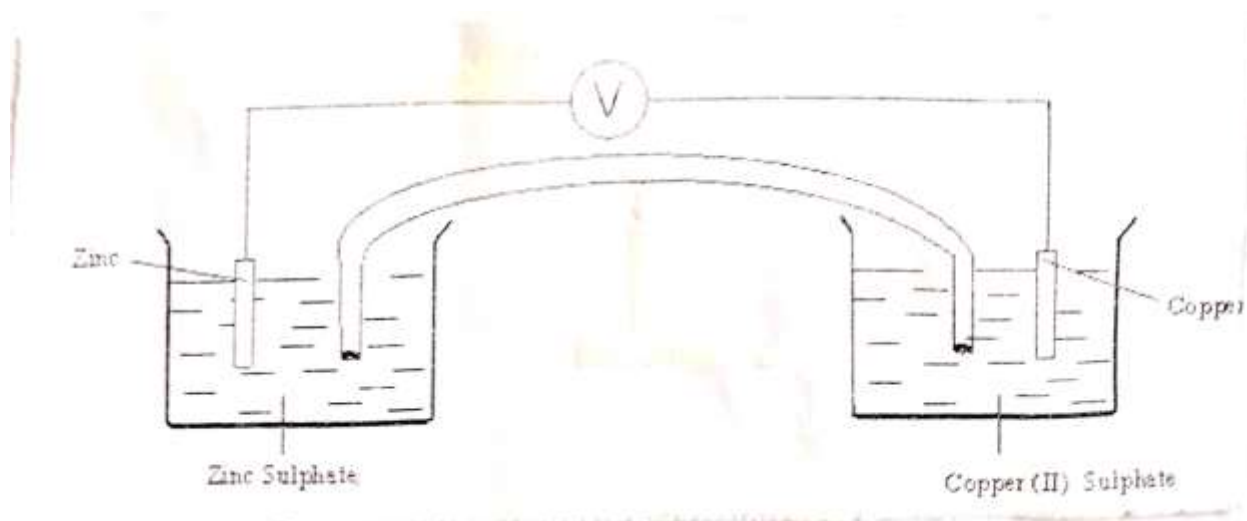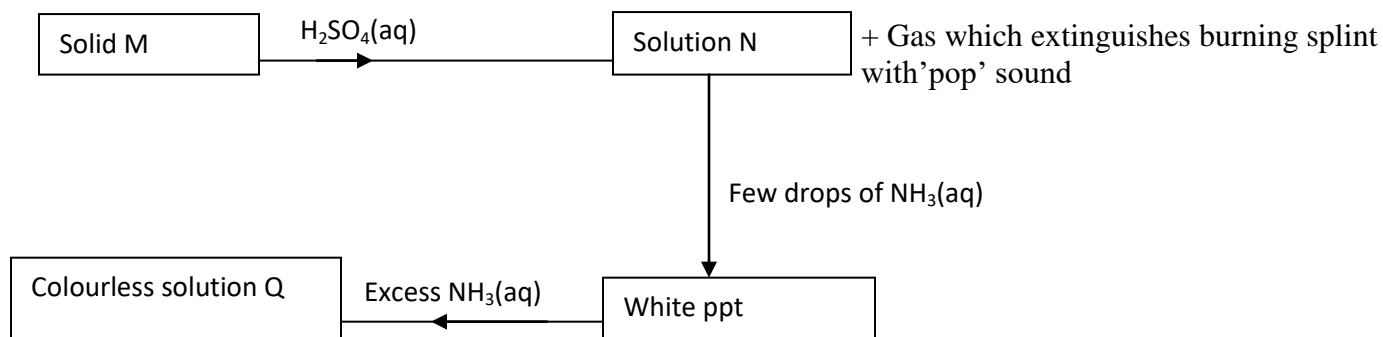

a) On the diagram:
   i.   Label the salt bridge. (1mk)

   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)

12. A gas at 27^OC 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)

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

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┌──────────┐   H₂SO₄(aq)        ┌────────────┐  + Gas which extinguishes burning splint
│ Solid M  │ ─────────────────▶ │ Solution N │    with'pop' sound
└──────────┘                    └────────────┘
                                      │
                                      │ Few drops of NH₃(aq)
                                      ▼
┌──────────────────────┐  Excess NH₃(aq)  ┌────────────┐
│ Colourless solution Q │ ◀───────────────│ White ppt  │
└──────────────────────┘                  └────────────┘
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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 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)

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)

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

Paper   Aluminum foil   Lead block

M

A   B   C

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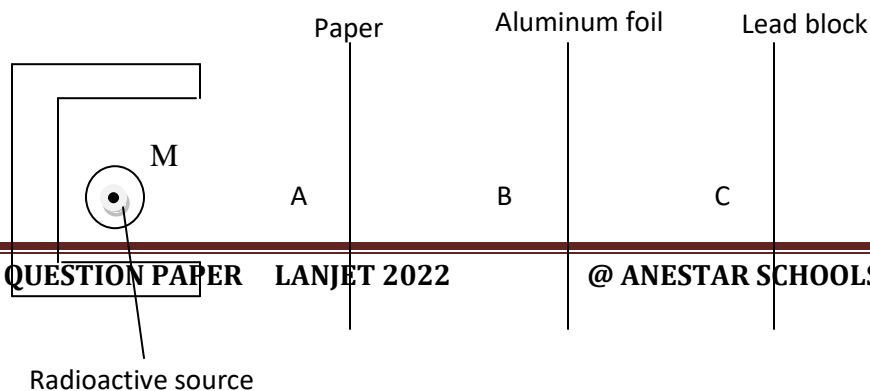
a) Name the radio-active that can be detected at A, B and C. (2 ½ mks)

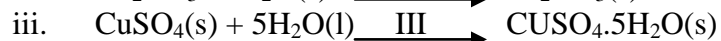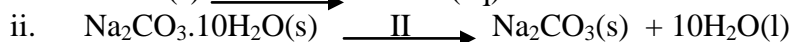A

B

C

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

17. Study the following changes that took place when the following substances are exposed in air.
    i. $NaOH(s) \xrightarrow{\quad I \quad} NaOH(aq)$
    ii. $Na_2CO_3.10H_2O(s) \xrightarrow{\quad II \quad} Na_2CO_3(s) + 10H_2O(l)$
    iii. $CuSO_4(s) + 5H_2O(l) \xrightarrow{\quad III \quad} CUSO_4.5H_2O(s)$

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

18. 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	
Crystal of white sugar	

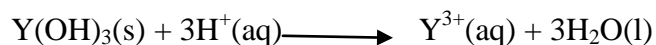b. Give reason for the observations made using;
    i.   Iron fillings (1mk)

    ii. Crystal's of white sugar. (1mk)

19. 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)

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

$$Y(OH)_3(s) + OH^-(aq) \longrightarrow \left[Y(OH)_4\right](aq)$$

$$Y(OH)_3(s) + 3H^+(aq) \longrightarrow Y^{3+}(aq) + 3H_2O(l)$$
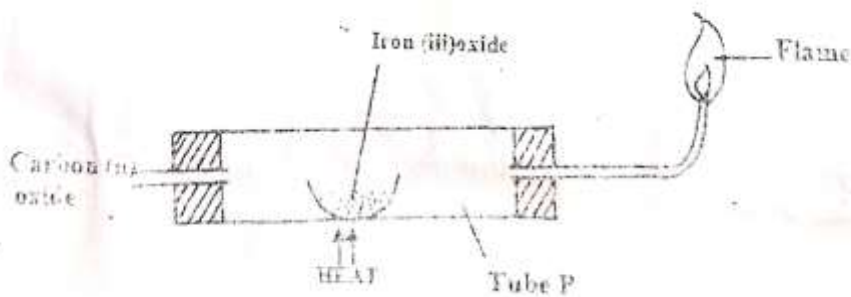
    a) What name is given to compounds which behave like $Y(OH)_3$ in the two reactions.   (1mk)

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

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

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

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


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

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

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

22. 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.
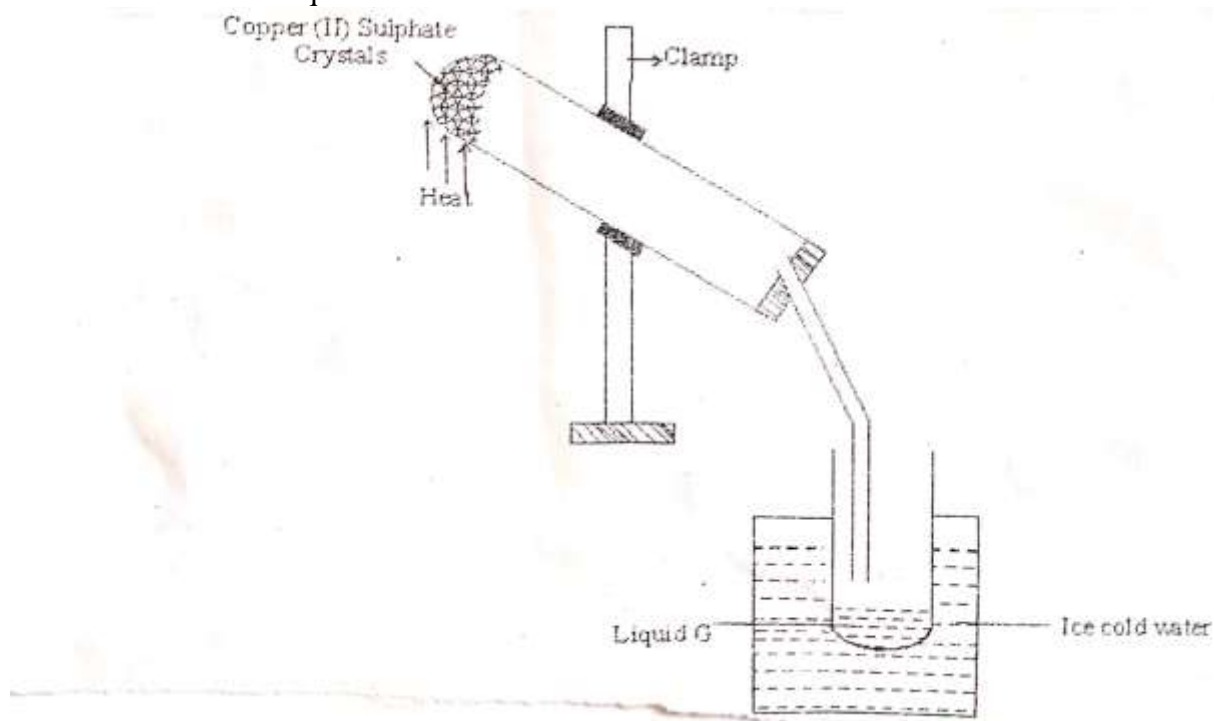
a) Why is the boiling tube slanted as shown?   (1mk)

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

c) Identify liquid G.   (1mk)

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

A ⎓⎓⎓⎓⎓⟨⎓⟩ OSO_2ONa^+

B ⎓⎓⎓⎓ $CH_3COO^-Na^+$
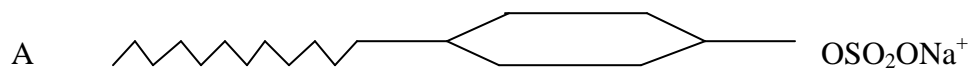
    i.   Identify the two types of detergents. A and B.   (2mks)

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

24. 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)

    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)

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

26. 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)

27. Identify the method used to obtain oil from nut seeds. (1mk)