

233/1
CHEMISTRY
Paper 1
THEORY
Time: 2 hours

**MANGU HIGH SCHOOL
MOCK EXAM**

INSTRUCTIONS TO CANDIDATE

1. Answer **ALL** the questions in the spaces provided after each question paper.
2. Non-programmable silent calculators and KNEC Mathematical tables may be used.
3. All working **MUST** be clearly shown where necessary.
4. Candidates may be penalized for not following the instructions given in this paper.

For Examiner's use only

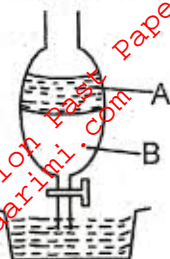
Questions	Maximum Score	Candidate's Score
1 - 18	80	
TOTAL SCORE	80	

This paper consists of 8 printed pages.

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

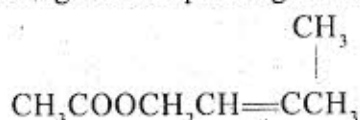
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1. The apparatus below was used to separate a mixture of liquid A and B.



State two properties of the liquids that make it possible to separate them using such apparatus (1 mark)

2. Study the organic compound given below



Draw the structural formulae of two organic compounds that can be used to prepare the above compound. (2 marks)

3. Excess chlorine is bubbled into hot concentrated sodium hydroxide.

(a) Write equation of the above reaction (1 mark)

(b) Calculate the oxidation number of the chlorine in the chlorite formed. (2 marks)

4. A metal oxide has the formula N_2O_3 . Write a reaction to show how an ion of N is formed.

(2 marks)

5. Substance W reacted with steam to form ethanol as shown.



What is the formula of W?

(1 mark)

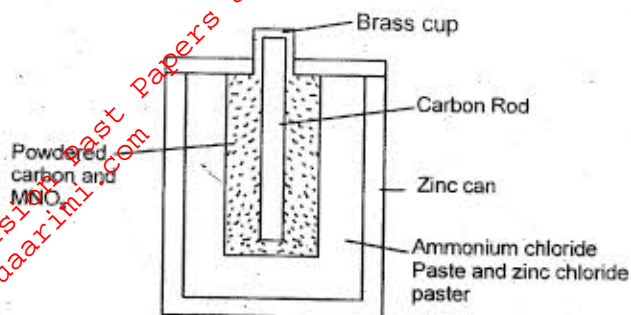
6. Carbon is known to have three isotopes of which one of them (carbon -14) is radioactive.

(i) Explain how radioactive carbon - 14 is formed in nature (2 marks)

(ii) Carbon-14 is unstable and emits beta particles. Write a balanced nuclear equation for this process. (1 mark)

(iii) The amount of carbon-14 in a wood is found to be $\frac{1}{8}$ of the amount present in a fresh piece of wood. Calculate the age of the wood (t $\frac{1}{2}$ of C -14 is 57000 years) (3 marks)

7. Study the diagram below of a Leclanche cell.



(i) Identify the positive terminal of the cell

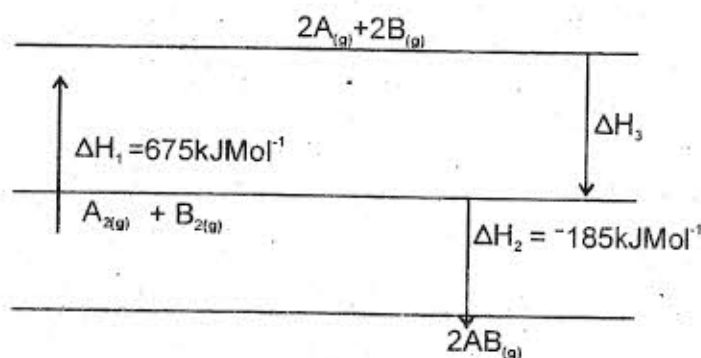
(1 mark)

(ii) Write the chemical reaction that occurs at the positive terminal

(1 mark)

(iii) Give the cell representation of the above cell.

8. Study the energy level diagram shown below.



(a) Why is the ΔH_2 of the reaction negative?

(1 mark)

(b) Why is the ΔH_1 of the reaction positive?

(1 mark)

(c) Determine the enthalpy change ΔH_3 .

(1 mark)

9. The following pairs of compounds were reacted together and the maximum temperature rise recorded for each reaction.

A 100cm³ of 1M sodium hydroxide and 100cm³ of 1M ethanoic acid.

B 100cm³ of 1M ammonia solution and 100cm³ of 1M ethanoic acid.

C 100cm³ of 1M sodium hydroxide and 100cm³ of 1M hydrochloric acid.

(a) State the pair which showed:

(i) the highest temperature rise

(1 mark)

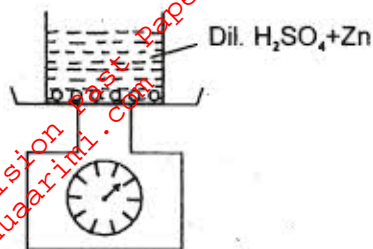
(ii) the lowest temperature rise

(1 mark)

(b) Explain your answer

(1 mark)

10. The diagram below represents the set up used to investigate the reaction between Zinc and dilute sulphuric acid.

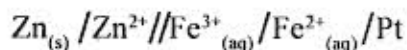


- (a) Sketch the curve you would obtain if the balance reading is plotted against time. (1 mark)

- (b) Explain the curve (1 mark)

11. 15.0cm³ of 0.1M of acid was completely neutralized by 45.0cm³ of 0.1M of sodium hydroxide solution. Calculate the basicity of the acid. (1 mark)

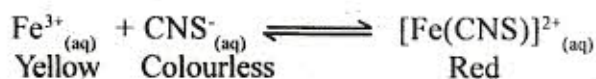
12. Consider the following electrochemical cell



- (i) Name the electrodes for the cells (1 mark)

- (ii) Write the cell reaction for the above electrochemical cell. (1 mark)

13. When aqueous solution of iron (III) chloride and potassium thiocyanate are mixed. The equilibrium is established as shown below.



State and explain the effect of decreasing the concentration of Fe³⁺_(aq) in the equilibrium mixture

14. The table below gives the first four ionization energies of the elements W, X, Y and Z

Element	1 st	2 nd	3 rd	4 th
W	500	4500	6940	9550
X	807	2730	3660	25000
Y	737	1400	7730	10500
Z	425	3080	4600	5870

- (a) What is meant by the first ionization energy? (1 mark)

- (ii) Which atoms belong to the same group? (1 mark)
- (iii) Which element is in group 2 of the periodic table. (1 mark)
- (iv) Identify element X given that it has an atomic number less than or equal to 10. (1 mark)

15. When brine was electrolyzed using graphite for a long time, two gases were obtained at the anode

- (i) Name the two gases (2 marks)
- (ii) Explain the observation in (i) above. (1 mark)

16. When potassium nitrate crystals are dissolved in water, the temperature of the solution formed is lower than that of water. Explain (1 mark)

17. 3.55g of chlorine gas reacted completely with 3.0g of a certain alkane.

(a) Work out the molecular formula of the alkane. (3 marks)

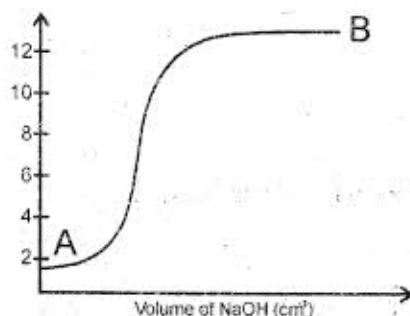
(b) What is the structural formula of the product formed. (1 mark)

18. A soluble chloride was dissolved in distilled water. A little dilute nitric acid and silver nitrate solutions were added forming a white precipitate. When solution Q was added, the precipitate dissolved.

(i) Write an ionic reaction leading to formation of white precipitate. (1 mark)

(ii) What is solution Q? (1 mark)

19. The graph below shows the changes in pH as sodium hydroxide was added to a solution of hydrochloric acid.



(i) What would be the colour of
I - Methyl orange at A? (1 mark)

II - Phenolphthalein at B? (1 mark)

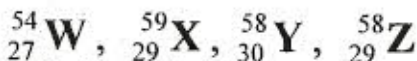
20. Given the following bond energies,

C — H	414 kJmol ⁻¹
Cl — Cl	244 kJmol ⁻¹
C — Cl	326 kJmol ⁻¹
H — Cl	431 kJmol ⁻¹

Calculate the enthalpy change when methane reacts with excess chlorine.

(3 marks)

21. Four nuclides are represented by the following



(i) Which nuclides are isotopes?

(1 mark)

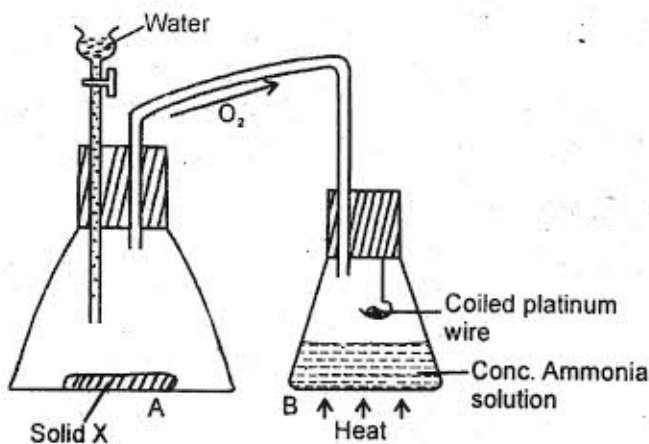
(ii) Name the nuclides which could be produced from another by emission of β -particle.

(1 mark)

(iii) Write the nuclear equation for the reaction above.

(1 mark)

22. Study the set up below and answer the questions that follow



(a) Name substance X.

(1 mark)

(b) Write the chemical reaction taking place in the flask A.

(1 mark)

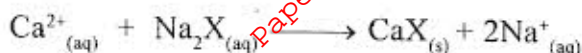
(c) Explain why the platinum wire stays red hot without being heated.

(1 mark)

(d) Write the chemical reaction taking place in flask B.

(1 mark)

23. Zeolites (Na_2X) is a complex compound used to soften hard water in the ion exchange methods according to the equation below.



After sometime the zeolites gets exhausted and ceases to soften water. Write a reaction to show how zeolites is reactivated. (2 marks)

24. (a) What is metallurgy? (1 mark)

(b) Name the chief ore of iron (1 mark)

(c) Name the method used to obtain iron metal from the ore you have named in (b) above. (1 mark)

25. A solution of hydrogen chloride in methylbenzene does not react with a carbonate; but on adding water and shaking, there is vigorous effervescence. Explain. (2 marks)

26. Use the following information to answer the questions that follow.

Halogens	Heat of vapourisation kJMol^{-1}
A	15.0
B	3.16
C	22.0
D	10.2

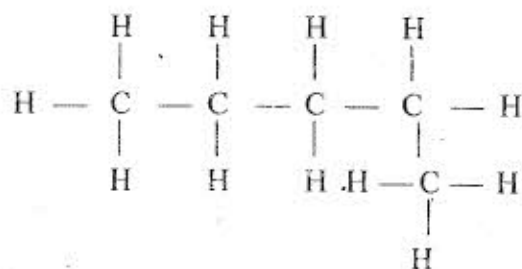
(i) Using the heat of vapourisation, identify the halogens in group seven namely A, B, C and D? (2 marks)

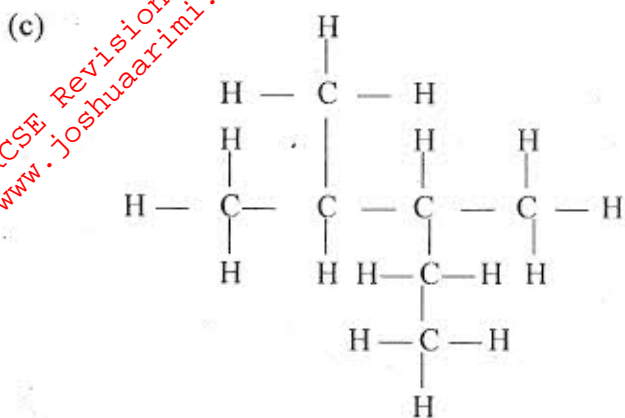
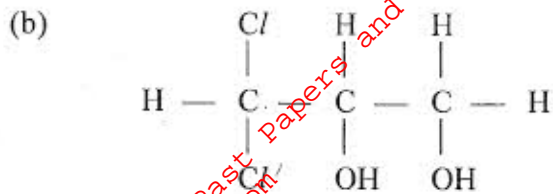
(ii) Justify your answer in (i) above. (1 mark)

27. The mass of a solution of salt A is 120g. This solution has 8g of salt A dissolved in it. The solubility of this salt is $25\text{g}/100\text{cm}^3$ of water at 30°C . 55g of salt A are added to the solution at 30°C . How much of salt A will remain undissolved. (2 marks)

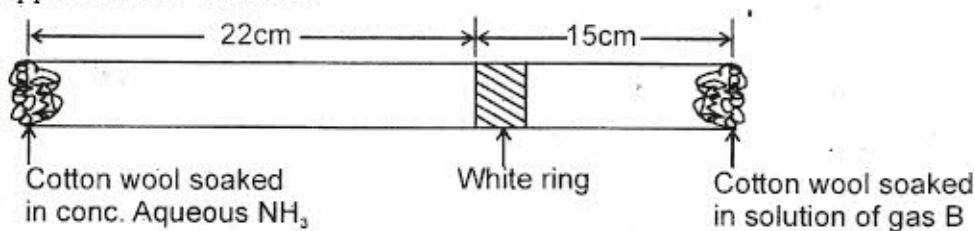
28. Give the IUPAC name of the following

(a)



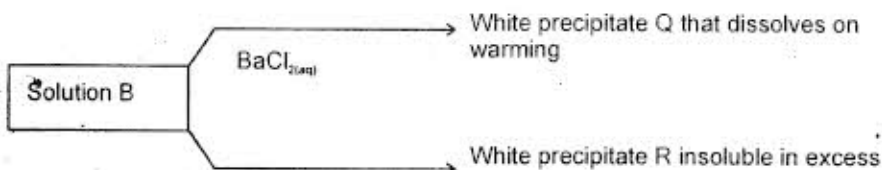


29. The diffusion of molecules of ammonia and an unknown gas **B** through air was investigated. The distance covered by the two gases are shown by the apparatus below. A white ring indicated appeared after 4 minutes



- (i) Calculate the molar mass of gas **B**. (2 marks)
- (ii) In which group of periodic table does gas **B** belong? (1 mark)

30. Study the flow chart below



- (i) Identify the cation in solution **B**. (1 mark)
- (ii) What is white precipitate **R**? (1 mark)

31. Ammonium chloride reacts with calcium hydroxide.

- (a) Write the chemical equation (1 mark)
- (b) Calculate the volume of ammonia at room temperature produced when 2.14g of ammonium chloride is reacted with calcium hydroxide. (2 marks)
- (N = 14, H = 1, Cl = 35.5)