BLANTYRE RURAL DISTRICT EXAMINATIONS

2024 MALAWI SCHOOL CERTIFICATE MOCK EXAMINATIONS

CHEMISTRY

Time Allowed: 2 hours
08:00 – 10:00 am

PAPER I

Theory
(100 marks)

Instructions:

1. This paper contains 11 printed pages. Please check.
2. Write your name at the top of each page.
3. This paper contains two sections, A and B. In section A there are ten short answer questions while in Section B there are three restricted essay questions.
4. Answer all the thirteen questions in the spaces provided.
5. Use of a calculator is allowed.
6. The maximum number of marks for each answer is indicated against each question.
7. In the table provided on this page, tick against the number of the question you have answered.

Question Number	Tick if answered	Do not write in these columns	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Section A (70 marks)

1. a. Define an acid according to Lowry-Bronsted theory.

_____(1mark)

b. Complete the equation by writing the conjugate acid-base

$H_2SO_4 + NH_3 \longrightarrow$ _____ + _____ (2marks)

c. Explain how hydronium ion is produced

_____

_____

_____(2 mark)

d. State one difference between strong acid and weak acid.

_____

_____(1 mark)

2. a. Define temporally water hardness.

_____

_____ (1 mark)

b. Explain the disadvantage of disposing wastes in landfills.

_____

_____

_____(2 marks)

c. Give **one** chemical property of acidic oxide.

_____

_____(1 mark)

d. Describe how the presence of a catalyst increases rate of chemical reaction?

_____

_____(2 marks)

3. a. Define "hydrocarbon"

_____ (1 mark)

b. Figure below shows formulae of some organic compounds A, B, C, D, E, F

C_3H_7OH	C_5H_{10}	C_2H_5COOH	C_9H_{20}	C_2H_5CHO	$C_5H_{10}O$
A	**B**	**C**	**D**	**E**	**F**

(i). Which compounds are hydrocarbons

_____ (2 marks)

(ii). Name compound **C** and **F**

C_____ (1 mark)

F_____ (1 mark)

(iii). Draw the structure of compound **E**

(2 marks)

(iv). Using relevant equations, explain how **E** is prepared from an alkanol through oxidation process

_____
_____
_____
_____
_____ (3 marks)

(v). Describe a test which could be done to distinguish compound **A** from **C**

_____
_____
_____
_____ (2 marks)

vii. Draw the structures of the two isomers of Hexanone ($C_6H_{12}O$)

(2 marks)

4. Figure 1 shows a graph of volume of hydrogen gas collected against time for the reaction between magnesium ribbon and an acid.

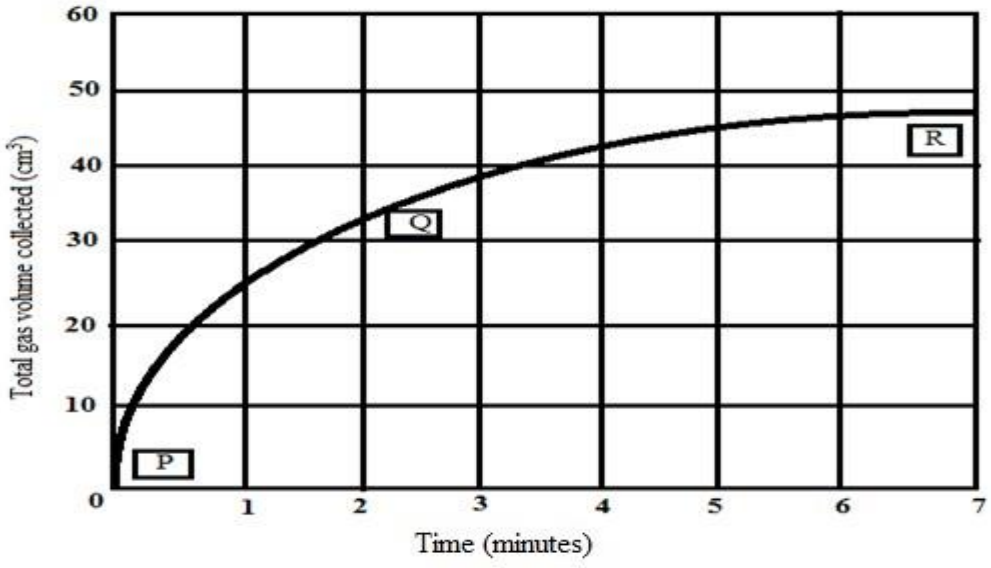


Figure 1

Figure 4

a. In which region along the graph (P, Q or R) is the rate of reaction fastest?

_____ (1 mark)

b. Give a reason for your answer to 4 (a) above.

_____ (2 marks)

5. (a). Molten lead bromide ($PbBr_2$) undergoes electrolysis. Write down the equations occurring at the:

(i) anode _____ (2 marks)

(ii) cathode _____ (2 marks)

(iii) Overall balanced equation

_____ (2 marks)

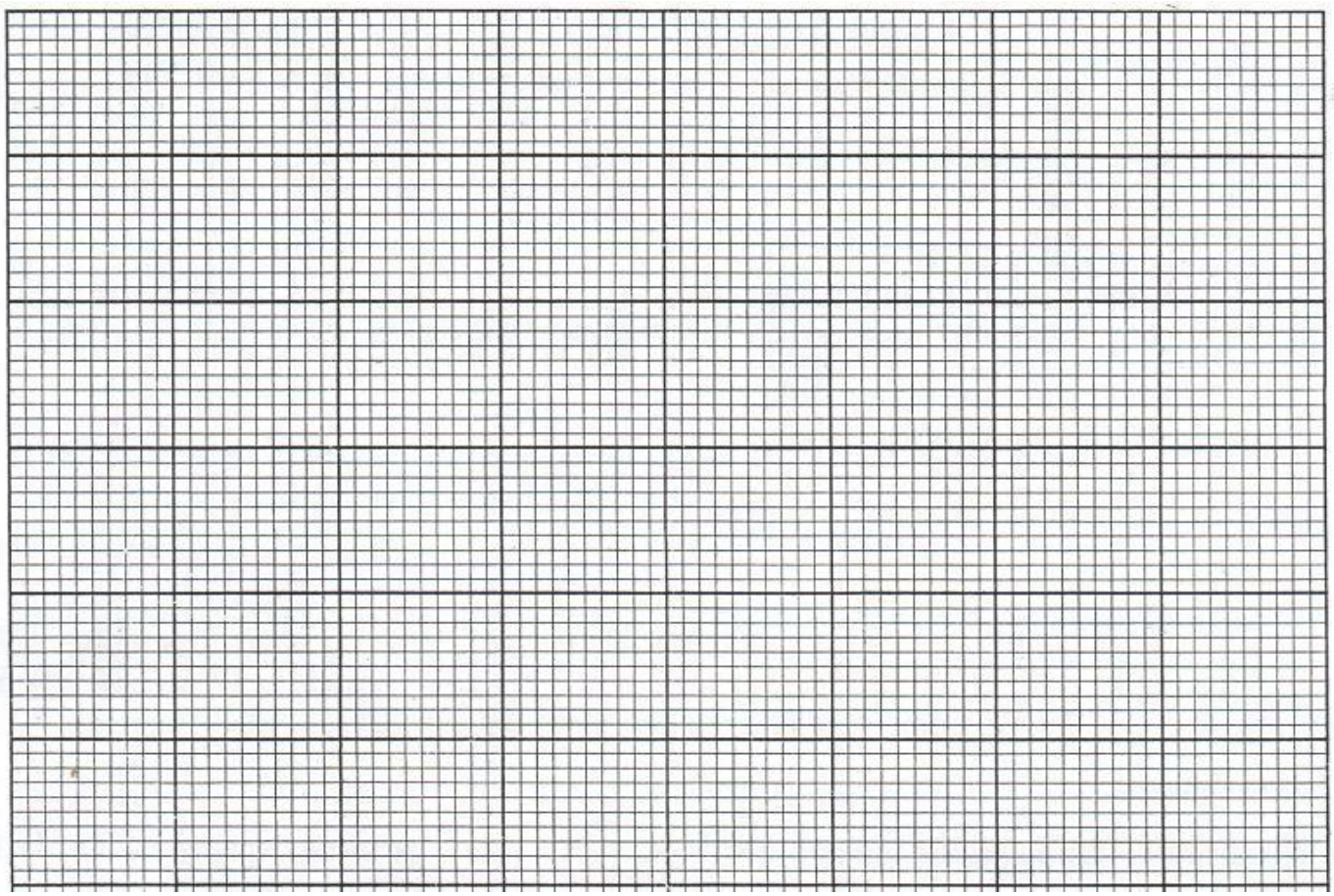
6. In an experiment to investigate changing mass of the reactants with time, a student mixed 2g of small marble chips and $40cm^3$ of 2.0M hydrochloric acid

$HCl + CaCO_3 \longrightarrow CaCl + H_2O + CO_2$

The following results were obtained

Loss in mass (g)	0.10	0.15	0.18	0.2	0.2
Time (s)	20	40	60	80	100

a) Use data in table above, to plot a graph of loss of mass against time. (4 marks)



b. On your graph sketch the time you would expect if the experiment were repeated with $40cm^3$ of 0.5 M hydrochloric acid (1 marks)

c. Explain your answer in 10b.

_____

_____ (2 marks)

7. a. State three uses of phosphorus

_____

_____

_____ (3 marks)

b. (i). State any **two** conditions necessary for rusting to take place

_____

_____ (1 mark)

(ii). How does galvanizing iron sheets prevent them from rusting.

_____

_____

_____ (2 marks)

8. **Table 1** shows results of an experiment on displacement reactions involving copper (Cu), Magnesium (Mg), Zinc and their aqueous solutions

Reaction	Observations
$Cu(s) + MgSO_4(aq)$	No reaction
$Mg(s) + CuSO_4(aq)$	Fast reaction
$Zn(s) + CuSO_4(aq)$	Slow reaction
$Mg(s) + ZnCl_2(aq)$	Moderate reaction
$Zn(s) + MgSO_4(aq)$	No reaction

(i).Write a balanced chemical equation for the reaction between magnesium (Mg) and Copper sulphate ($CuSO_4$) solution _____ (1 mark)

(ii). Arrange the metals in order of increasing reactivity

(2 marks)

(iii). Name the oxidizing agent and the reducing agent in the question 6b (i)

_____

_____ (2 marks)

9. The diagrams in figure 2 represent the bonding structures of two substances X and Y.

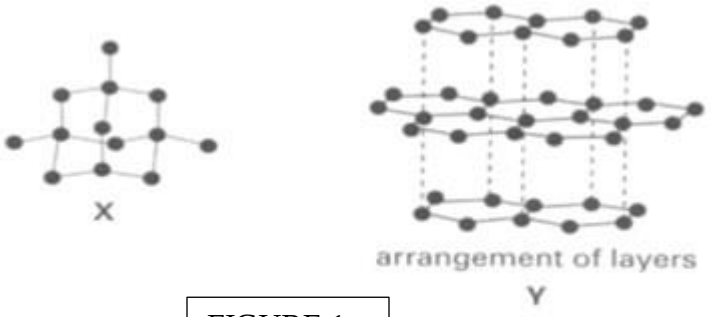


FIGURE 1

(i) Name the following substances.

X_____Y_____ (2 marks)

(ii) Which substance is the hardest between X and Y?

_____ (1 marks)

(iii) Suggest one reason for your answer to (ii) above.

_____

_____ (1 marks)

10. a. What are biodegradable wastes?

_____

_____ (1 mark)

b. Describe how the presence of Sulphur dioxide (SO2) can be tested using Potassium dichromate (VI) paper.

_____

_____

_____ (2 marks)

11. a. Define molar gas volume.

_____

_____(1 mark)

b. Calculate the volume occupied by 47.6g of ammonia gas (NH3) gas at r.t.p.? (RAM, N = 14; H = 1 and Molar gas volume r.t.p is (22.4dm3).

(3 marks)

12. a. **Figure** 3 is a diagram for Plastics.

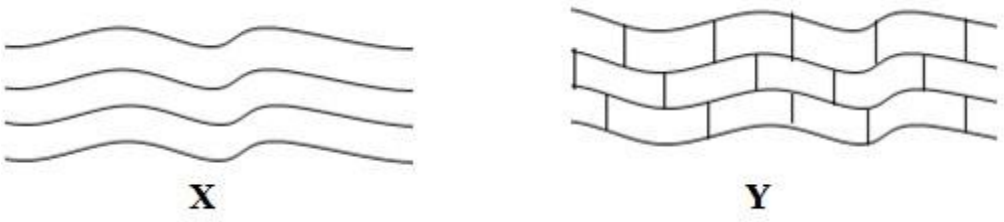


Figure 3

i. Name the type of plastic labelled.

X._____ (1 mark)

Y._____ (1 mark)

ii. State **one** difference between plastic X and plastic Y.

_____

_____ (1 mark)

13. If 12g of sodium hydroxide is dissolved in 100mL of water, what would be the concentration in mol/L of the solution? [RAM: Na = 23, O = 16, H = 1]

(3 marks)

Section B (30 marks)

Answer **all** the **three** questions in this section.

14. Describe how nitric acid is produced using Ostwald process. In your answer include relevant chemical equations.

(10 marks)

15. a. Describe how Fehling's test can be used to distinguish alkanals from alkanones.

(5 marks)

b. Describe a test that can be done to distinguish carbon dioxide gas (CO_2) from hydrogen gas (H_2)

(5 marks)

13.a. Describe the functions of the three pipes during the extraction of Sulphur.

(6 marks)

b. Describe how electroplating is used in metal extraction

(4 marks)

End of Question Paper