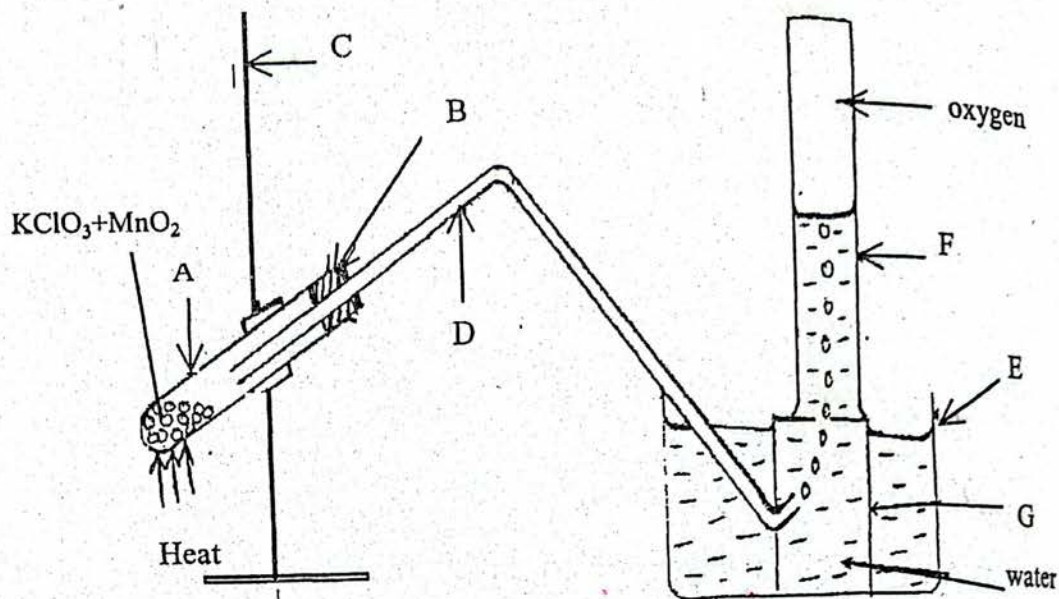
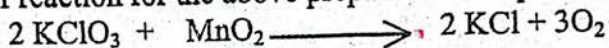


1. The diagram below represents laboratory preparation of oxygen.



The equation of reaction for the above preparation is represented as:



- (a) Give the names of the apparatuses labelled A to G. (7 marks)
- (b) What is the function of MnO_2 in this experiment? (1 mark)
- (c) Why is the preparation of oxygen done by water displacement and not by air displacement? Give two reasons. (2 marks)
2. A student titrated 25.00 mls of sodium hydroxide solution against 0.05 M succinic acid, $(\text{CH}_2)_2\text{COOH}_2$. The volume of the pipette was 25 cm^3 . Succinic acid is a weak organic acid. The student obtained the following data:

Burette Readings:

Experiment	Pilot	1	2
Final reading (cm^3)	24.70	43.60	33.60
Initial reading (cm^3)	1.00	20.00	10.00
Titre volume (cm^3)			

- (a) Complete the table above. (2 marks)
- (b) Calculate the average volume of the acid used. (1 mark)

(c) If the acid reacted with the alkali according to the equation:



- calculate (i) the molarity of the alkali (3 marks)
- (ii) the concentration in g/dm^3 of the alkali. (3 marks)

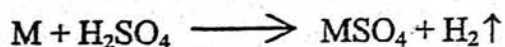
(d) Name a suitable indicator for this titration. (1 mark)

3. 0.1 Mole of Metal M in a lump form was added to 60 cm^3 of 0.5 M sulphuric acid. The rate of reaction was measured by timing the evolution of hydrogen gas. The experiment was repeated by using 0.1 mole of the same metal in powder form and 60 cm^3 of 0.5 M sulphuric acid.

The results were as tabulated below:

Amount of Metal M (Moles)	Volume of Sulphuric Acid (cm^3)	Rate of evolution of Hydrogen $\times 10^{-3} \text{ mol/sec.}$
Lump 0.1	60	3.6
Powder 0.1	60	12.7

Metal M reacts with sulphuric acid according to the equation:



- (a) Explain four factors which affect the rate of a chemical reaction. (4 marks)
- (b) (i) Which factor affected the rate of evolution of hydrogen from the reaction of metal M and sulphuric acid? (1 mark)
- (ii) How many moles of H_2SO_4 are present in 60 cm^3 of 5 M H_2SO_4 solution? (2 marks)
- (iii) Calculate the volume of hydrogen gas evolved at S.T.P. when excess of M is mixed with 0.3 mole of H_2SO_4 solution. (3 marks)

4. (a) Dilute copper (II) sulphate was electrolysed using copper electrodes as an attempt to verify Faraday's 1st law of electrolysis. The mass of metal deposited at the cathode was taken at constant intervals of 900 seconds.

Experiment	Current I (A)	Time t(s)	Mass of Copper deposited m(g)	Quantity of Electricity Q (C)	Electrochemical equivalent z (g c ⁻¹)
1	0.2	900	0.063		
2	0.2	1800	0.129		
3	0.2	2700	0.187		
4	0.2	3600	0.260		

Complete the table above by calculating

- (i) the quantity of electricity passed in experiment 1, 2, 3 and 4
 (ii) the electrochemical equivalent z of copper in experiment 1, 2, 3 and 4. (8 marks)

(b) Which substance will be deposited at the

- (i) cathode
 (ii) anode? (2 marks)

5. Sample Q contains ONE anion and ONE cation. A list of experiments were done to identify the cation and anion. Use the observations made from the experiments to give the correct conclusion and then identify the cation and anion present in the sample.

EXPERIMENT	OBSERVATION	INFERENCE
(a) Appearance	White crystalline salt	
(b) A little solid Q was heated in dry test tube	<ul style="list-style-type: none"> - white sublimate - brown fumes evolved - A gas which relights a glowing splint was evolved 	
(c) To a little Q in a test tube distilled water was added and stirred	<ul style="list-style-type: none"> - colourless solution was formed 	
(d) To solid Q in a test tube conc. H_2SO_4 was added	Brown fumes evolved	
(e) To aqueous solution of Q in a test tube, freshly prepared Iron II Sulphate solution was added followed by conc. H_2SO_4 slowly along the sides of the test tube	A brown ring formed between the two liquids	
(f) To aqueous solution Q in a test tube, $NaOH(aq)$ was added and boiled	A gas with pungent smell evolved which turned moist red litmus paper blue	

(08 marks)

The cation was _____ and anion was _____

(1 mark)

The compound was _____

(1 mark)