

Name: Marking Scheme Adm No: Class:
Index No.:

Candidate's Signature:

Date:

233/1

CHEMISTRY

Paper 1

THEORY

JULY 2019

Time: 2 hours

MOKASA II JOINT EVALUATION EXAMINATION

Kenya Certificate of Secondary Education

CHEMISTRY

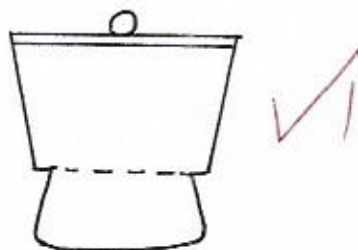
Paper 1

Instructions to Candidates

- ❖ *Write your name and index number in the spaces provided above.*
- ❖ *Sign and write the date of the examination paper.*
- ❖ *Answer **ALL** the questions in the spaces provided in the question paper.*
- ❖ ***ALL** working **MUST** be clearly shown where necessary.*
- ❖ *Mathematical tables and silent electronic calculators may be used.*
- ❖ *Candidates should check the paper to ascertain that all the pages are printed as indicated and that no questions are missing.*

QUESTIONS	MARKS OUT OF 80
1 - 27	

- 1.(a) i. Draw the apparatus used in the laboratory for keeping substances free from moisture. (1 mark)



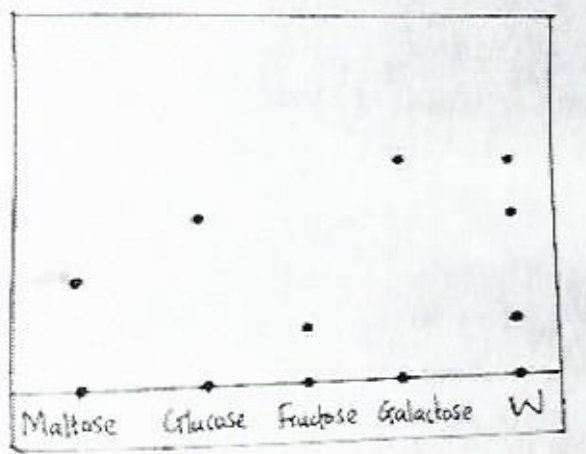
- ii. Name the apparatus used in the laboratory for supporting crucibles on tripod stand while heating. (1 mark)

Pipe-clay triangle. ✓

- (b) State two roles chemistry play in the society. (1 mark)

1. Manufacture of drugs to fight diseases ✓
 " food to fight hunger ✓
 " cheaper alternative fabric ✓
 " detergents ✓
 " fuels ✓
 Any 2 @ 1/2 ✓

1. A sugar called raffinose was treated with dilute hydrochloric acid. The resulting solution W was analyzed to find out the sugars present using chromatography. The following chromatogram was obtained.



- (a) Identify the sugars present in W. (1 1/2 marks)

Glucose, Fructose, Galactose ✓

- (b) Which of the sugars is less sticky? Explain. (1 1/2 marks)

Galactose ✓ Move farthest from the baseline ✓

2. a. Describe how simple acid-base indicators can be obtained from flower petals. . (2 marks)

Crush the flower petals using pestle and Mortar
Add Propanone (ethanol) while crushing
Decant into a boiling tube

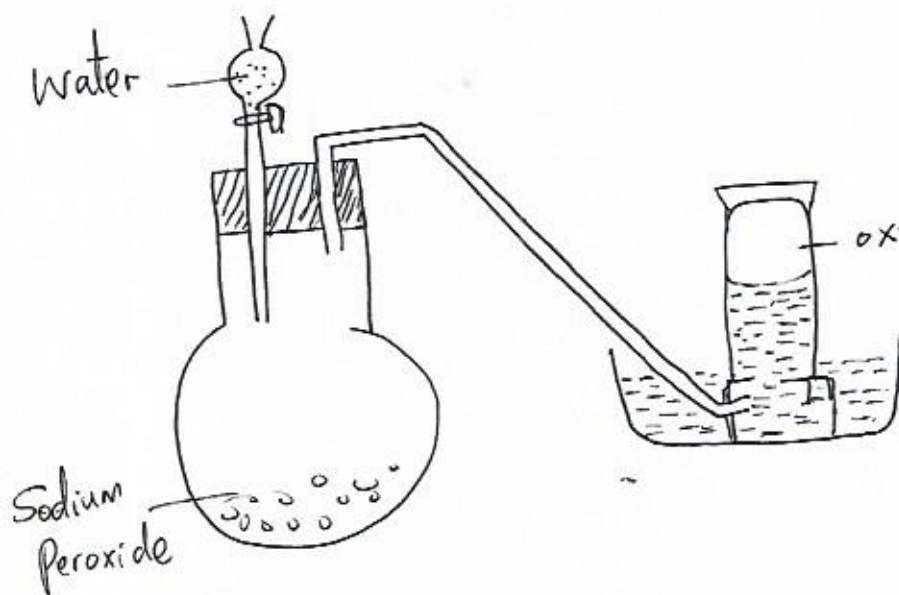
- b. What is the disadvantage of using phenolphthalein indicator over other commercial indicators. (1 mark)

- doesn't show distinction between neutral and acidic solutions. (w.t.e)

4. State and explain two observations made when a burning magnesium ribbon is lowered into a gas jar full of carbon (IV) oxide. (3 marks)

- the ribbon continues to burn.
- formation of a white solid and black specks.
the heat of a burning Mg is strong enough to decompose CO_2 into C (black) and O_2 . It continues to burn in the O_2 to form MgO (white)

5. Draw a well labeled set-up of apparatus that can be used in the laboratory preparation of oxygen gas in the laboratory using sodium peroxide and water. (3 marks)



Method of collection - ✓
Verifiability - ✓
Apparatus = ✓

6. Potassium consists of three isotopes with mass numbers Y, 40 and 41 having relative abundances 93.1%, 0.01% and 6.89% respectively. Determine the value of Y given the atomic number of potassium is 19 and its relative atomic mass is 39.1379 (2 marks)

$$39.1379 = (93.1 \times Y) + (40 \times 0.01) + (6.89 \times 41)$$

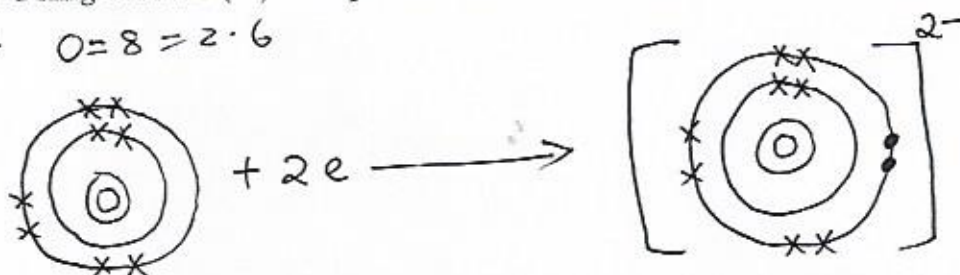
follow through

$$Y = 39 \quad \checkmark \quad \text{No units}$$

7. a. Define the term ionization energy. (1 mark)

- the minimum amount of energy required to remove an electron from the outermost energy level of an atom in gaseous state.

b. Using crosses (x) to represent electrons, illustrate ion formation by an oxygen atom. $O = 8 = 2 \cdot 6$ (2 marks)



8. In an experiment to electrolyse a nitrate of element X in solution state using inert electrodes, 386 C of charge produced by passing a current of 0.2A increased the mass of the cathode by 0.128g. If the relative atomic mass of X is 64, determine the oxidation state in an ion of X. (1F = 96500C) (2 marks)

$$386 \text{ C} = 0.128 \text{ g} \quad \quad 96500 \text{ C} = 1\text{F}$$

$$\therefore \frac{64 \times 386}{0.128} = \frac{193000 \times 1\text{F}}{96500} = 2\text{F}$$

$$= 193,000 \text{ C} \quad \quad \therefore X^{2+} \quad \text{or } \frac{1}{2} X = +2$$



In the equation above, identify with a reason the oxidizing agent and the reducing agent. (2 marks)

O.A is ZnO $\checkmark$ R.A is NH_3 $\checkmark$ Accept names
 $\checkmark$ the O.S of Zn decreases from +2 to 0 while that of Nitrogen increases from -3 to 0. $\checkmark$

10. The grid below represents part of the Periodic Table. Study it and answer the questions that follow:

					D					
					E	F		I		
A						G				
B	C									

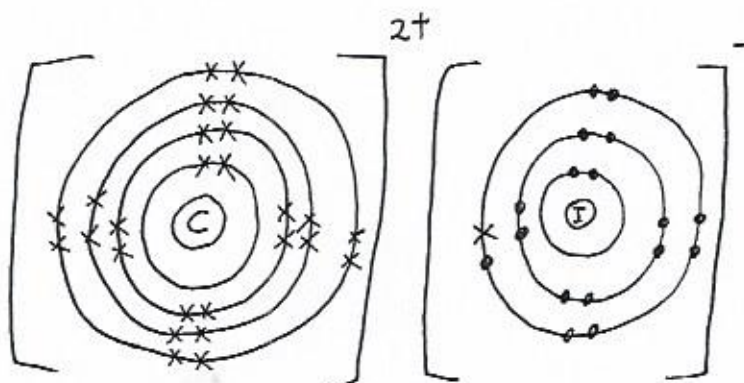
a. Compare the reactivities of elements A and B with chlorine. (2 marks)

B reacts faster with chlorine than A ✓
 - A has larger atomic radius than B hence weaker nuclear attraction
 - A has lower ionisation than B ✓
 - A is higher in reactivity series / more electropositive than B. ✓

b. State two uses of element I. (1 mark)

- Manufacture of hydrochloric acid ✓
 - Manufacture of bleaching agents, chloroform, pesticides, fungicides ✓
 - As a disinfectant in small amounts ✓

c. Using dots and crosses to represent electrons, show bonding in a compound formed when C and I react. (1 mark)



nucleus must be shown ✓

11. Describe how you can prepare Barium sulphate salt starting with Barium Oxide. (3 marks)

Add excess BaO to dilute nitric acid in a beaker. Stir.

Filter to get rid of unreacted BaO. To the filtrate add excess

sodium sulphate solution. Filter to obtain Barium sulphate

as residue. Wash the residue and dry between

filter papers. Award to a Maximum of 3 marks.

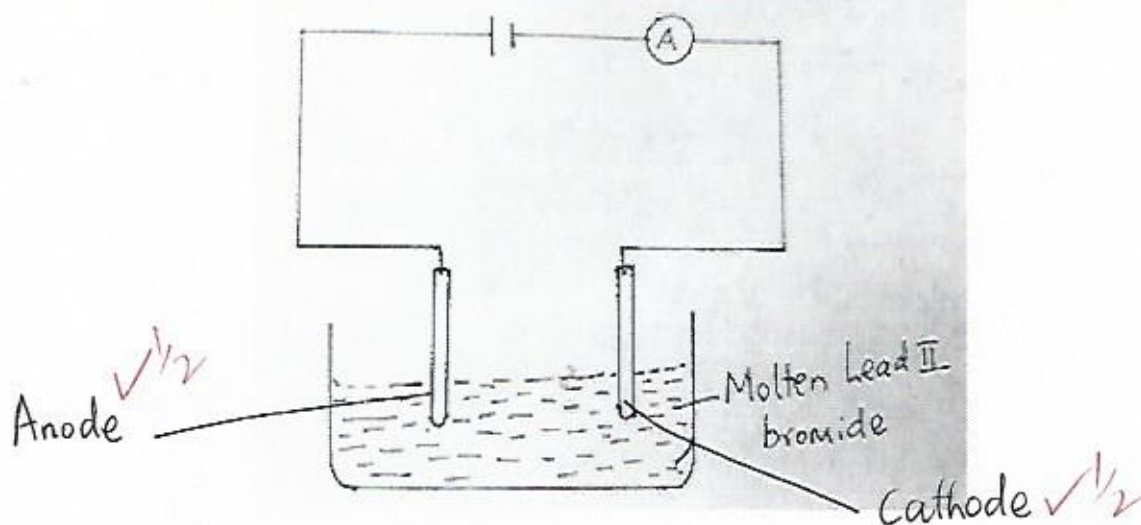
accept any soluble sulphate

12. Name the process by which:

a. Crystals of calcium chloride changes into solution when exposed in air overnight. . . *Deliquescence* ✓ (1 mark)

b. The volume of concentrated sulphuric (VI) acid increases when left in an open beaker overnight. *Hygroscopy* ✓ (1 mark)

13. Study the diagram below for the electrolysis of molten Lead (II) bromide.

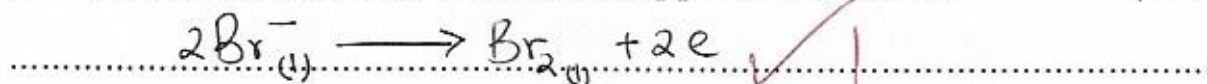


a. Label the electrodes .

(1 mark)

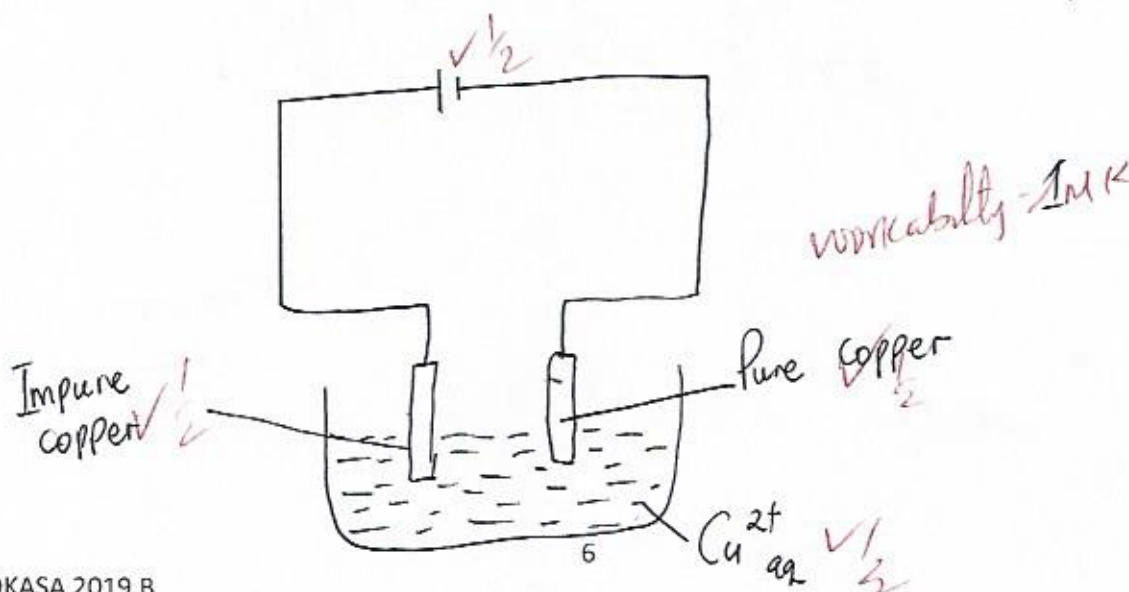
b. Write an equation for the reaction taking place at the anode.

(1 mark)



c. Draw a well labeled diagram for a set-up that can be used to purify impure copper.

(3 marks)



14. i. What do you understand by the term greenhouse effect?

(1 mark)

- refers to the rise in atmospheric temperatures due to trapping of solar radiation (w.t.t.e.)

ii. State two ways in which carbon (IV) oxide is released into the environment

(1 mark)

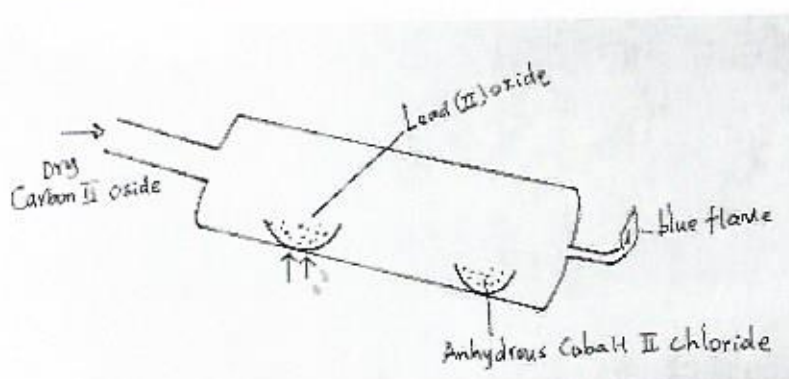
Burning of fossil fuels/organic matter $\checkmark \frac{1}{2}$

Respiration $\checkmark \frac{1}{2}$

Weathering of carbonate rocks. $\checkmark \frac{1}{2}$

any 2 @ $\frac{1}{2}$ mk.

15. Study the diagram below and use it to answer the questions that follow.

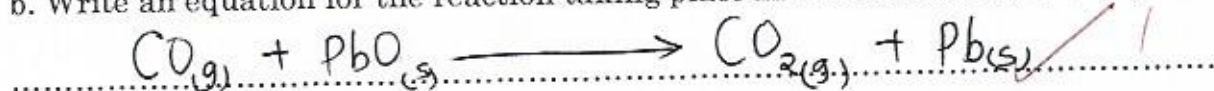


a. State what is observed on the anhydrous cobalt (II) chloride.

(1 mark)

- remains blue $\checkmark$

b. Write an equation for the reaction taking place in the combustion tube. (1 mark)



c. State one industrial use of carbon (II) oxide.

(1 mark)

- Extraction of less reactive metals from their oxides $\checkmark$

16. i. State Graham's Law of diffusion.

(1 mark)

Under the same conditions of temperature and pressure, the rate of diffusion of a gas is inversely proportional to the square root of its density. $\checkmark$

ii. 200 cm³ of oxygen gas took 90 seconds to diffuse through a porous plug. Determine the time taken by 300 cm³ of Sulphur (IV) oxide to diffuse through the same plug under the same conditions. (O = 16, S = 32) (3 marks)

$$R_{O_2} = \frac{200}{90} = 2.222 \text{ cm}^3/\text{s}$$

$$R_{SO_2} = \frac{300}{t} = x \text{ cm}^3/\text{s}$$

$$\frac{R_{O_2}}{R_{SO_2}} = \frac{\sqrt{64}}{\sqrt{32}}$$

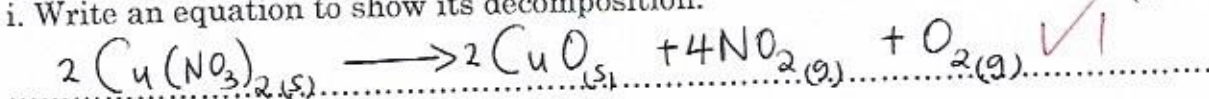
$$\frac{2.222}{x} = \frac{\sqrt{64}}{\sqrt{32}}$$

$$x = 1.5713$$

$$t = \frac{300}{1.5713} = 190.92 \text{ s}$$

17. Copper (II) nitrate was heated carefully and the gases produced passed over water. A colourless gas is collected over water.

i. Write an equation to show its decomposition. (1 mark)



ii. If 9.4g of the solid was heated, determine the volume of the gas collected at R.T.P. (3 marks)

(Cu = 64, N = 14, O = 16, molar gas volume at R.T.P = 24 dm³)

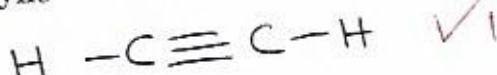
$$\text{Moles of Cu}(\text{NO}_3)_2 = \frac{9.4}{188} = 0.05 \text{ moles}$$

$$\text{Moles of O}_2 = \frac{1}{2} \times 0.05 = 0.025 \text{ moles}$$

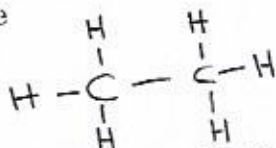
$$\text{Volume of O}_2 = 0.025 \times 24 = 0.6 \text{ dm}^3 = 600 \text{ cm}^3$$

18. a. Draw the structural formula of the following:

i. Ethyne (1 mark)



ii. Ethane (1 mark)



b. Describe an experiment to distinguish between the compounds in (a) above. (2 marks)

Burn them separately.

- Ethyne burns with yellow sooty flame, ethane with pale blue flame

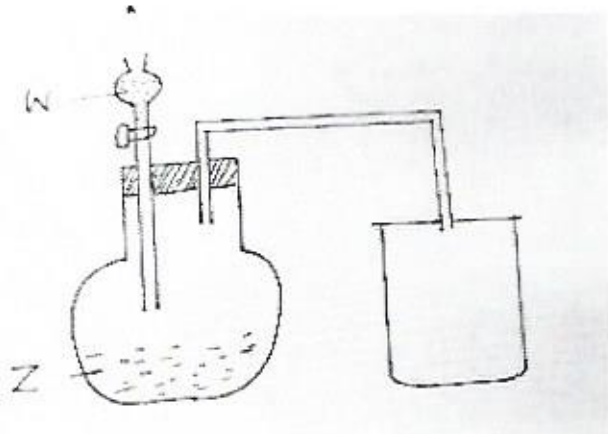
Accept use of:

- bromine water

- acidified KMnO₄

original colour and final colour must be mentioned for ethyne

19. Study the diagram below for the preparation and collection of nitrogen (IV) oxide in the laboratory and use it to answer the questions that follow.



i. Name substances W and Z. (2 marks)

W. Concentrated Sulphuric acid ✓ 1 Z. Copper turnings ✓ 1

ii. Give a reason why the gas is collected as shown. (1 mark)

It is denser than air. ✓ 1

20. State and explain the observations made when moist blue litmus paper is dropped into a jar containing chlorine gas. (2 marks)

- the blue litmus paper turns red ✓ 1/2 then it is bleached. ✓ 1/2
- chlorine dissolves in water to form an acidic mixture. ✓ 1/2
the paper is bleached by Chloric I and turned. ✓ 1/2

21. a. Given the reaction;



Identify the acid in the backward reaction and give a reason for your answer.

H_2O , ✓ 1 ✓ 1 (2 marks)

It donates a proton to NH_3 to form NH_4^+ (aq). ✓ 1

b. State two advantages of hard water. (1 mark)

1. Provides calcium essential for bones. ✓ 1/2
2. Can be used in brewing. ✓ 1/2 any 2 @ 1/2 mark
3. Doesn't dissolve lead from lead pipes. ✓ 1/2

22. i. Define the term solubility.

the maximum mass of solute required to saturate 100g of solvent at a given temperature. (1 mark)
 reject any given temperature

ii. Use the information below to calculate the solubility of sodium nitrate.

Mass of evaporating dish = 15.10g

Mass of evaporating dish and salt = 20.10g

Mass of evaporating dish and solution = 40.10g

(2 marks)

Mass of salt = $20.10 - 15.10 = 5.0$ g

Mass of solution = $40.10 - 15.10 = 25$ g

Mass of solvent = $25\text{g} - 5\text{g} = 20$ g

$$\frac{20 = 5}{100\text{g solvent}} \times \frac{100}{20} = 25\text{g}/100\text{g of solvent}$$

23. 100 cm³ of 2M copper (II) sulphate at 20 °C is reacted with 3 grams of magnesium ribbon. The temperature of the resulting solution was found to be 26 °C. (density of solution is 1 g/cm³, $c = 4.2\text{kJ/Kg/K}$, $M_g = 24$)

i. Determine the molar enthalpy change for the reaction.

(3 marks)

$$\Delta H = M.C.\Delta T$$

$$= 0.1 \times 4.2 \times 6$$

$$= 2.52\text{kJ}$$

$$0.125\text{ moles} = 2.52\text{kJ}$$

$$\therefore 1 \times 2.52 = 0.125$$

$$= -20.16\text{ kJmol}^{-1}$$

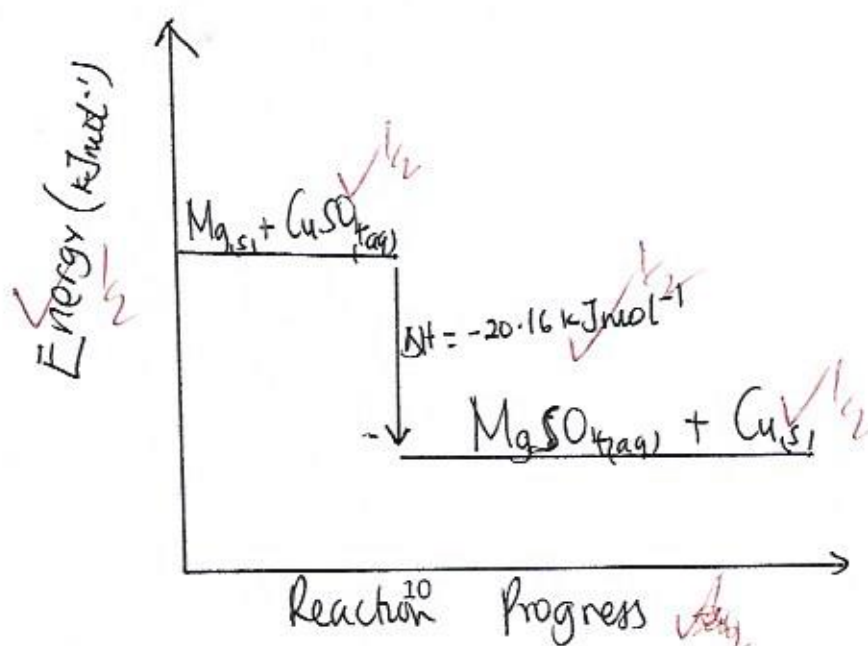
$$\text{Moles of Mg} = \frac{3}{24} = 0.125\text{ moles}$$

$$\text{Moles of CuSO}_4 = 2 \times \frac{100}{1000} = 0.2\text{ moles}$$

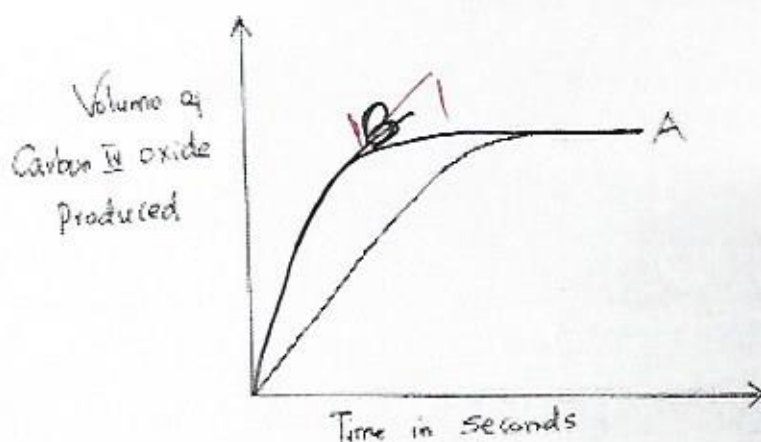
Penalise -1 mark for wrong/missing unit or sign.

ii. Draw an energy level diagram for representing the reaction

(2 marks)



24. Curves A below was obtained when marble chips were reacted with dilute hydrochloric acid and carbon (IV) oxide produced.



- a. On the same graph, sketch a curve that would be obtained if powdered calcium carbonate was used and labeled as B (1 mark)
 b. Explain the difference in the two curves. (2 marks)

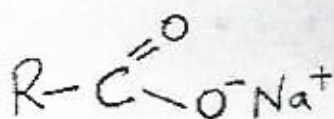
Powdered CaCO_3 has a larger surface area. The larger the S.A the higher the rate of reaction.

25. Give two uses of zinc metal. (2 marks)

1. to galvanize iron ✓
 2. make brass ✓
 3. Make outer casing in dry cells ✓

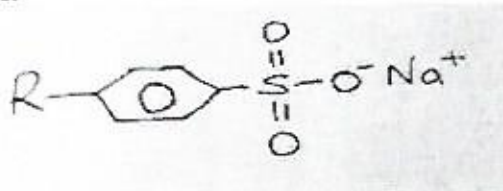
26. a. Identify the substances represented below;

- i. (1 mark)



Soap / soapy detergents ✓

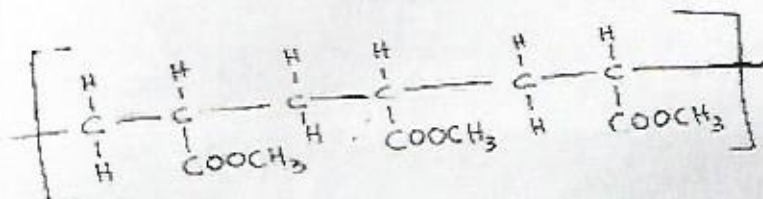
- ii. (1 mark)



Soapless detergent ✓

b. Name the polymer shown below.

(1 mark)



Perspex
/Methyl methacrylate

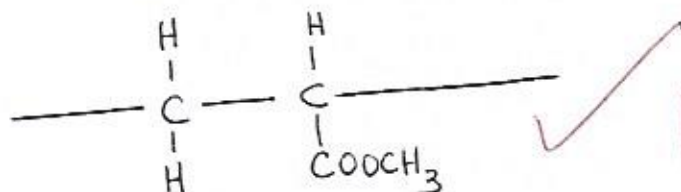
c. If the polymer in (b) above has a molar mass of 8600, how many monomers are present in it?

(2 marks)

$$\text{No of Monomers} = \frac{\text{MM of Polymer}}{\text{MM of Monomer}} = \frac{8600}{(4 \times 12 + 20 + 8 \times 1)} = \frac{8600}{76} = 113.15 \approx 113$$

d. Draw a repeating unit of the polymer.

(1 mark)



27. i. The activity of a radioactive isotope decreased from 1024 counts per second to 128 counts per second in 75 days. Determine the half-life of the isotope.

(2 marks)

$$1024 \xrightarrow{1} 512 \xrightarrow{2} 256 \xrightarrow{3} 128$$

Alt: $128 = 1024 \left(\frac{1}{2}\right)^n$ where $n = \frac{75}{t_{1/2}}$

$n = 3$

$\therefore \frac{75}{3} = 25 \text{ days}$

No of $t_{1/2} = \frac{75}{3} = 25 \text{ days}$

iii. State two dangers associated with radioactivity.

(2 marks)

- Environmental pollution
- Can be used as weapons of mass destruction
- Causes gene mutation (are carcinogenic)

any 2 @ 1mk

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