

R.C.E.A JOINT EXAMINATIONS

Marking Scheme.

233/1 CHEMISTRY -Paper 1 **(Theory)** **TIME - 2 hours**

Name Index Number...../.....

Signature Date/...../.....

INSTRUCTIONS TO CANDIDATES

- a) Write your name and index number in the spaces provided
- b) Sign and write the date of examination in the spaces provided
- c) Answer ALL questions in the spaces provided
- d) Mathematical table and electronic calculators may be used.
- e) ALL working MUST be shown clearly where necessary
- f) *This paper consists of printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing*

FOR EXAMINERS USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORES
1 – 27	80	

TURN OVER

1. Identify the following laboratory apparatus and give the use of each.

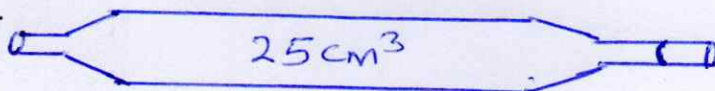
a).



Name Thistle funnel ($\frac{1}{2}$ mrk)

Use To deliver liquids or solutions into a container. (1mrk)

b).



Name Pipette. ($\frac{1}{2}$ mk)

Use Measure accurate volumes of solutions. (1 mk)

2. Sodium and aluminium are metals in the same period of the periodic table.

a). Compare the size of atomic radii of sodium and aluminium. Give a reason. (1mrk)

Atomic radius of sodium atom is larger than that of aluminium since sodium has one valence electron and less strong nuclear attraction.

b). Which of the two elements is a better conductor of electricity? Explain. (1mrk)

Aluminium. It has more delocalised electrons than sodium.

c). State one use of aluminium. (1mrk)

In making - cooking pans.
- electric overhead cables.
- aeroplane body parts.

3. Starting with copper metal, describe how to prepare solid copper carbonate. (3mrks)

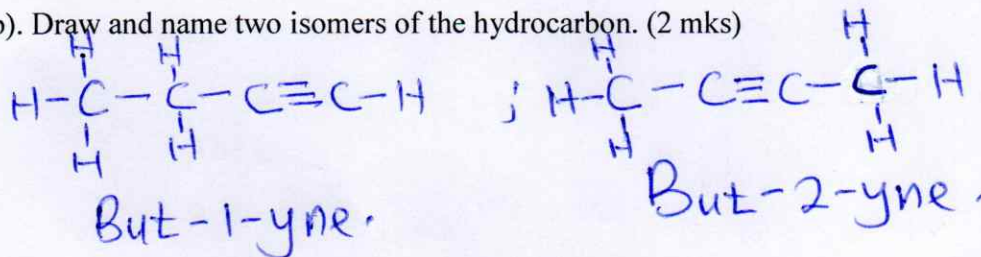
Add warm dilute nitric acid to copper metal to form copper(II) nitrate solution. Filter to get the solution. Add sodium carbonate solution to the filtrate to precipitate copper carbonate. Filter the solution to obtain copper carbonate as residue, wash with distilled water and dry between filter papers.

4. A hydrocarbon has molecular mass of 54. It has four carbon atoms. (C=12, H=1)

a). Name the homologous series to which the hydrocarbon belongs. (1mrk)

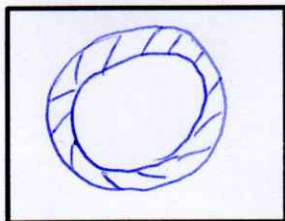
Alkyne.

b). Draw and name two isomers of the hydrocarbon. (2 mks)

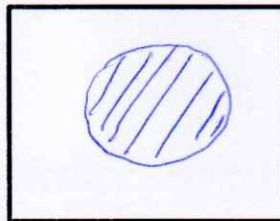


5. Two papers A and B were placed in different levels of a non-luminous flame. Paper A was placed at the lowest part of the flame while B was placed at the tip.

a). Indicate below the observation made on each paper. (2mks)



Paper A

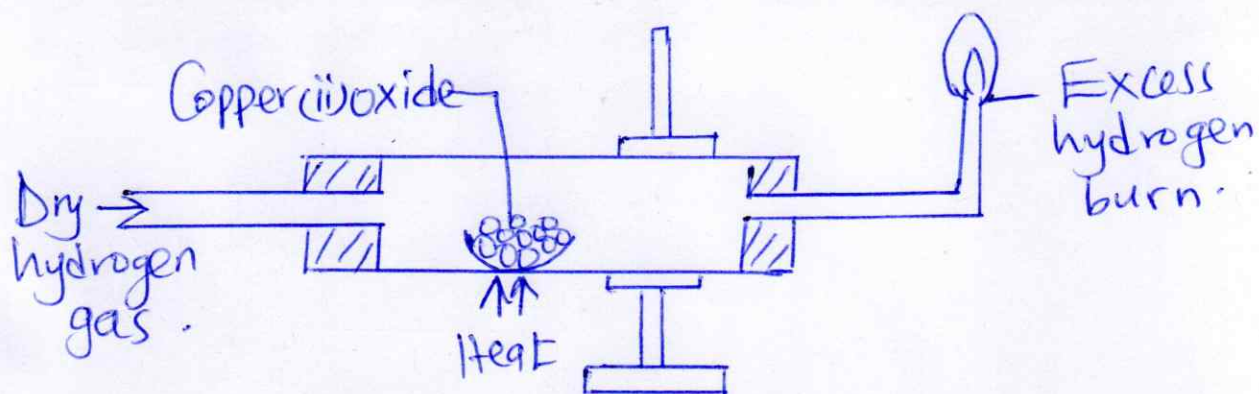


Paper B

b). Explain your observation in A. (1mk)

The lower part has unburnt section representing the part of the flame occupied by unburnt gases.

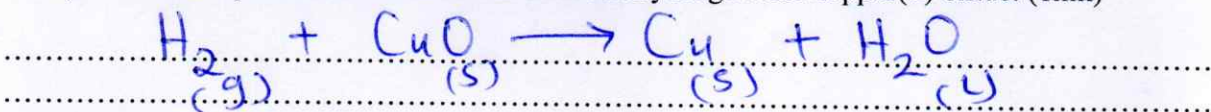
6. The effect of hydrogen gas on heated copper (ii) oxide was investigated in the diagram below.



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

Black solid turn to brown.

b) Write an equation for the reaction between hydrogen and copper(ii) oxide. (1mk)



c) What is the product formed when hydrogen gas burns. (1mk)

Water.

7. a) State Graham's Law of diffusion. (1mk)

The rate of diffusion of a fixed volume of gas is inversely proportional to the square root of its density; temperature and pressure being constant.

(C=12, N=14, O=16) (3mks)

$150 \text{ cm}^3 \rightarrow ?$

$$\underline{150 \times 30} = 4500$$

100

$$\Rightarrow \text{M.M. of } \text{CO}_2 = 12 + 16 \times 2 = 44$$

$$NO_2 = 14 + 32 = 46$$

$$\Rightarrow \frac{45}{\text{Time } \text{NO}_2} = \frac{\sqrt{44}}{\sqrt{46}}$$

$$\underline{45} - 6.63$$

TNO₂ 6.78

$$\overline{I_{No}} = \underline{305.1}$$

6.63

$$= 46.02 \text{ sec}$$

Solution	A	B	C	D	E
pH	3	6	12	7	10

A and B ($\frac{1}{2}$ MK each)

A and C

B and C

A and E

B and E

Any 1 pair - (1mk)

It is a reaction between an acid and a base; they undergo a neutralisation process. (1mk)

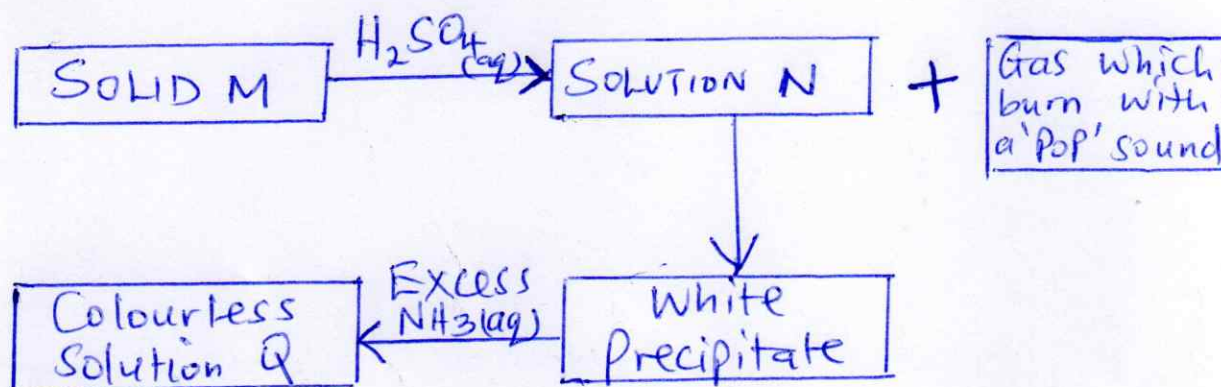
a) Name compound P and Solution Q. (1mk)

Calcium Carbonate

b) State the observation made when excess gas Z is bubbled through Calcium hydroxide solution. Explain the observation. (2mks)

The white precipitate dissolve to form a colourless solution.
- There is formation of Calcium hydrogen carbonate which is solution.

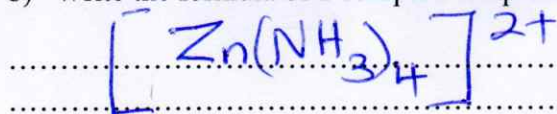
10. The Scheme below shows some reaction sequence starting with Solid M.



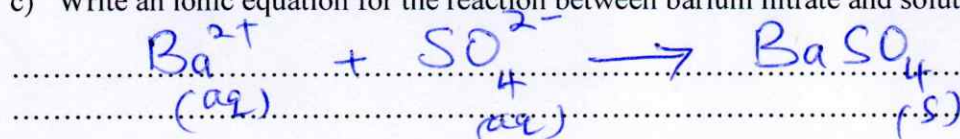
a) Name solid M. (1mk)

Zinc metal / granules.

b) Write the formula of a complex ion present in solution Q. (1mk)



c) Write an ionic equation for the reaction between barium nitrate and solution N. (1mk)



11. An element X has atomic number 3, relative atomic mass of 6.94 and consists of two isotopes with mass numbers of 6 and 7.

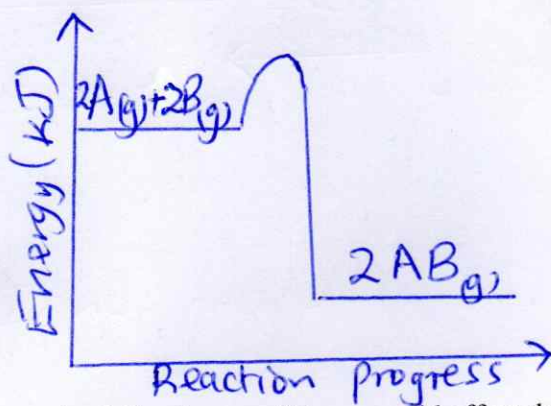
a) What is the mass number of the most abundant isotope of X? (1mk)

7

b) Calculate the relative abundance of each of the isotopes. (3mks)

Let %age abundance of 7 be x .
 $(7 \times x) + 6(100 - x) = 6.94$
 $7x + 600 - 6x = 6.94$
 $x = 94$
 $\therefore$ %age abundance of 7 = 94%
 $6 = 100 - 94 = 6\%$

12. The figure below is an energy level diagram for the reaction between A and B gases.



a) Explain how the following conditions would affect the yield of AB.

(i) Increase in Pressure. (1½ mks)

Yield increase ✓
 - Increase in pressure favours forward reaction which result in formation of a gas with few molecules. ✓

(ii) Decrease in temperature. (1½ mks)

Decrease the yield ✓
 - A rise in temperature shift equilibrium to the left resulting in formation of gases with greater volume. ✓

13. An element X has atomic number of 11 while element Y has atomic number of 8.

a) Write electronic arrangement of

(i) The atom of X ($\frac{1}{2}$ mk)

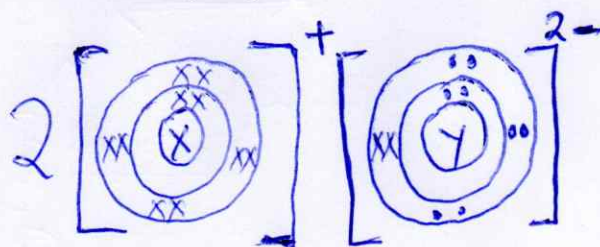
2.8.1

(ii) The ion of Y. ($\frac{1}{2}$ mk)

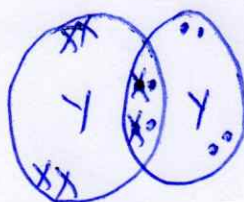
2.8

b) Draw dot (.) and cross (x) diagram to show bonding in;

(i) Compound of X and Y. (1mk)



(ii) Molecule of Y. (1mk)



14. Explain how you would obtain a pure sample of lead(ii) chloride from a mixture of lead chloride, sodium chloride and silver chloride. (3mks)

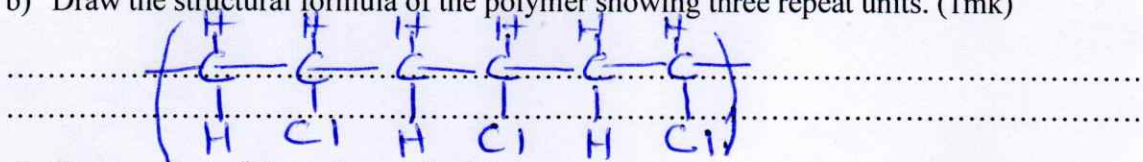
- Add Cold water to the mixture. Sodium Chloride dissolve and is filtered out as filtrate.
- Add warm/hot water to the remaining mixture, lead(ii) chloride dissolve and is filtered out leaving Silver Chloride as residue. The filtrate is heated to saturate, the left to cool and to form crystals.

15. Vinyl chloride can undergo polymerization to form a polymer called polyvinyl chloride. If the monomer has the following condensed structure CH_2CHCl :-

a) Give the IUPAC name of the monomer. (1mk)

Chloroethene

b) Draw the structural formula of the polymer showing three repeat units. (1mk)



c) State one use of the polymer. (1mk)

making plastic pipes, gutters, protective clothing, hose pipes, car dashboards, floor tiles.
(any 1 - 1mk)

16. Diamond and graphite are allotropes of carbon. In terms of structure and bonding, explain why:-

a) Graphite is slippery. (1½mks)

- hexagonal layers of carbon bonded together are held by weak van der Waals forces of attraction, these forces allow slide over each other when under pressure.

b) Diamond is used for cutting glass. (1mk)

All carbon atoms are bonded by strong covalent bonds to form giant atomic structure which is very hard.

c) Explain why graphite conduct electric current. (1mk)

- Three electrons are used in forming covalent bonds between carbon atoms leaving one which remains as delocalised electron.

17. Study the reduction half-cell equations below and use to answer the questions that follows.

	E(volts)
$\text{Ag}^+_{(\text{aq})} + \text{e}^- \longrightarrow \text{Ag}_{(\text{s})}$	+0.80
$\text{Zn}^{2+}_{(\text{aq})} + 2\text{e}^- \longrightarrow \text{Zn}_{(\text{s})}$	-0.70
$\text{Mg}^{2+}_{(\text{aq})} + 2\text{e}^- \longrightarrow \text{Mg}_{(\text{s})}$	-2.37

- a) Give two half-cells that would make the cell with the largest e.m.f. (1mk)

Ag / Ag^+ half cell and $\text{Mg}^{2+} / \text{Mg}$ half cell.

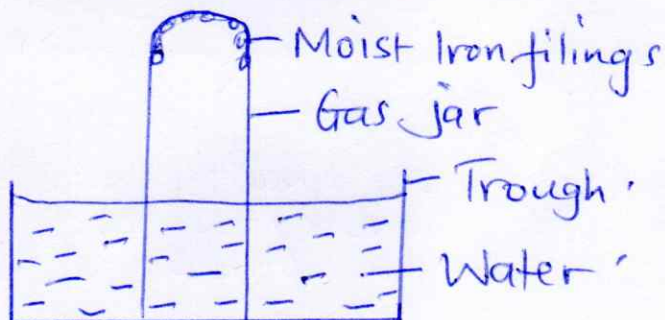
- b) Calculate the e.m.f of the cell you have chosen in (a) above. (1mk).

$+0.80 - (-2.37) = +3.17 \text{ volts}$

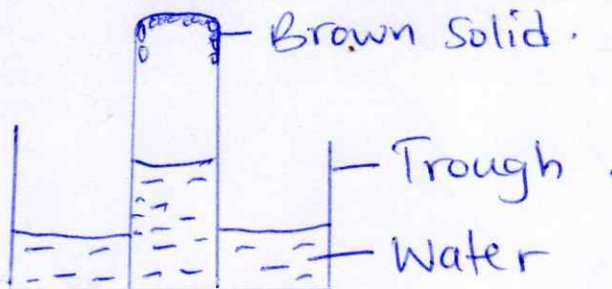
- c) Give the cell representation of the cell in (a) above. (1mk)

$\text{Mg}_{(\text{s})} / \text{Mg}^{2+}_{(\text{aq})} // \text{Ag}^+_{(\text{aq})} / \text{Ag}_{(\text{s})} ; E = +3.17 \text{ V}$

18. The diagram below was used to study some properties of air.



- a) Draw another set-up to show the level of water in the gas jar after 24 hours. (1mk)



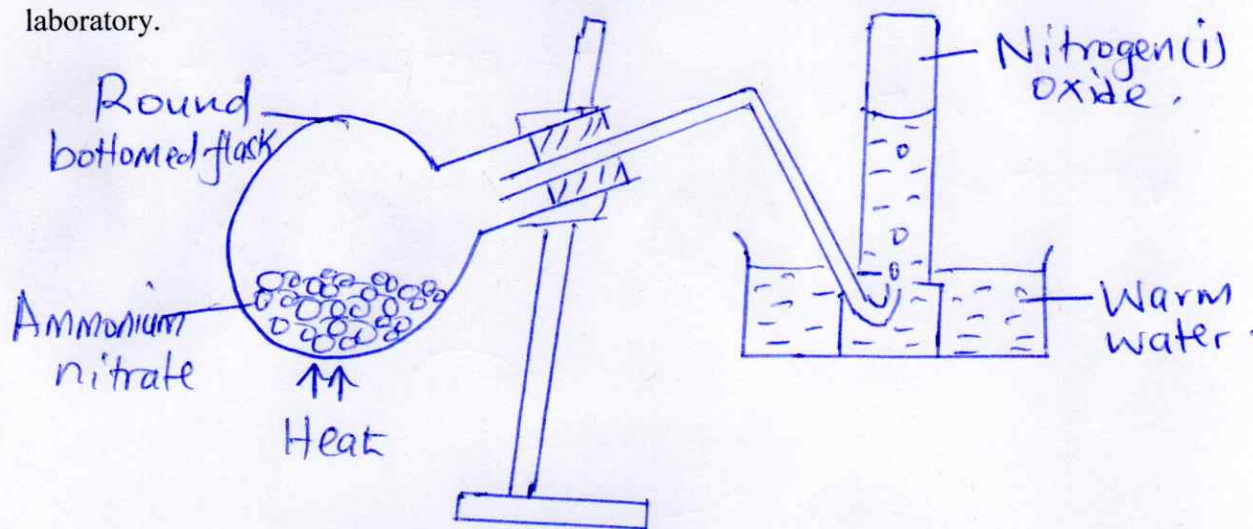
b) State and explain one observation on moist iron after 24 hours. (1mk)

They turn from grey to brown. Iron reacts with oxygen and moisture in air to form rust which is brown.

d) Give the chemical name for the compound that form when iron is exposed to moist air for 24 hours. (1mk)

hydrated Iron (III) oxide.

19. The diagram below represents a set up of apparatus used to prepare nitrogen(i) oxide in the laboratory.



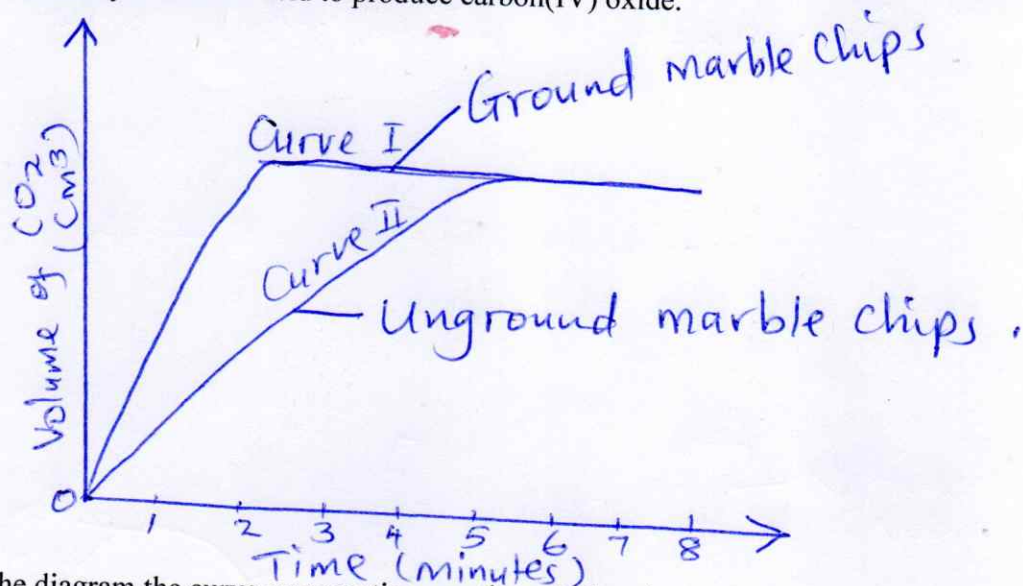
a) Complete the diagram to show how the gas can be collected. (2mks)

marking points - Heat
- Collection.

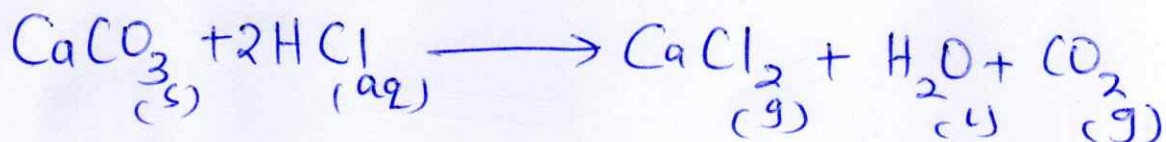
b) State one precaution that should be made in the experiment above. Give a reason. (1mk)

The delivery tube for collection should be withdrawn from water before heating is stopped. To prevent sucking back.

20. The diagram below is a sketchy graph plotted when marble chips (calcium carbonate) is reacted with dilute hydrochloric acid to produce carbon(IV) oxide.



- a) Label on the diagram the curve representing reaction of dilute hydrochloric acid with;-
- Ground marble chips. (½ mk)
 - Unground marble chip (½ mk)
- b) Write a chemical equation for the reaction in part (a) above. (1mk)



21. Study the ionic equation below and answer the questions that follow



Using oxidation numbers explain which of the substances undergoes :-

Oxidation (1½ mks)

Iodide (I⁻) ion; its oxidation number increase from -1 to 0.

Reduction (1½ mks)

Cl₂; its oxidation number reduce from 0 to -1.

22. The mass of a radioisotope fell to 3g in 45 seconds. If its half-life is 15 seconds' calculate the original mass (3 mrks)

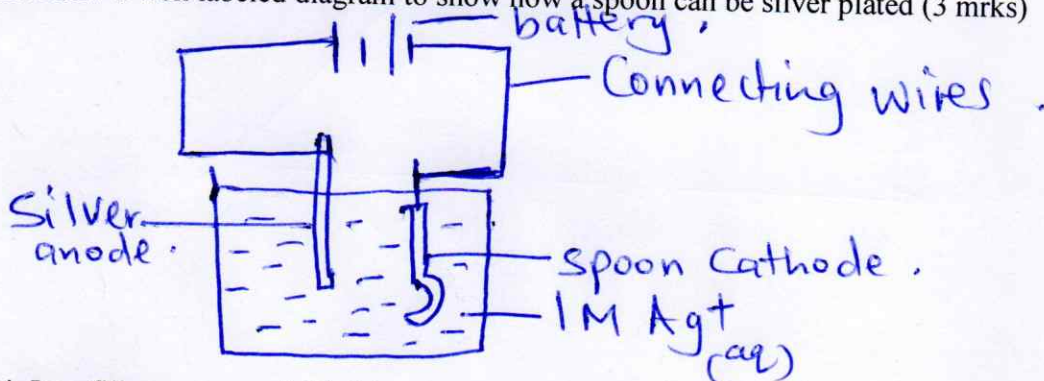
$\frac{45}{15} = 3 \text{ half-lives}$

3g $\xrightarrow[1/2]{1^{\text{st}}}$ 6g $\xrightarrow[1/2]{2^{\text{nd}}}$ 12g $\xrightarrow[1/2]{3^{\text{rd}}}$ 24g

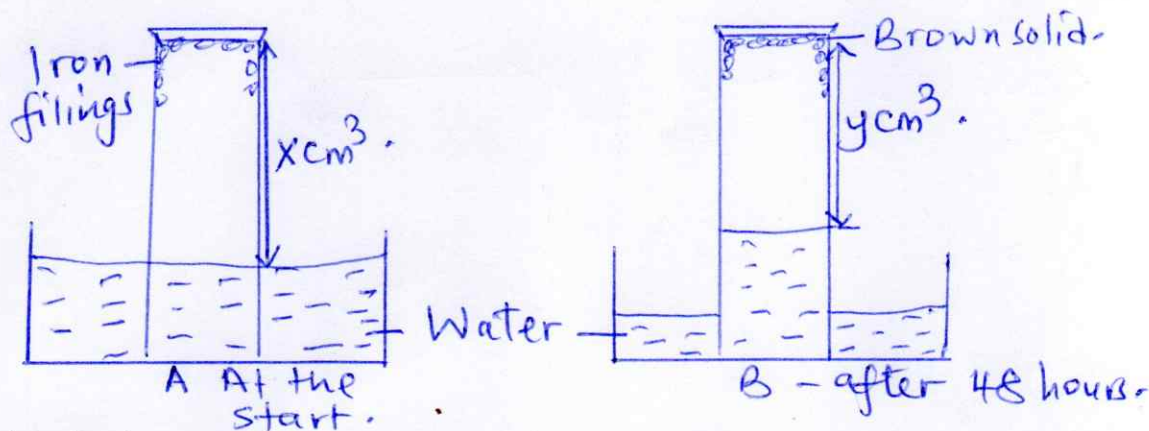
24g

Alternative method,
 $3 = \left(\frac{1}{2}\right)^3 \times \text{Original amt}$
 $3 = \frac{1}{8} \times 0.9; 3 \times 8 = 24\text{g}$

23. Draw a well labeled diagram to show how a spoon can be silver plated (3 mrks)



24. Iron filings were sprinkled in wet measuring cylinder and the set-up arranged as shown below.



a) Explain the observation made after 48 hours of the set-up (1 mrks)

→ Level of water rise in the measuring cylinder to occupy the space left by oxygen that reacted with iron filings.

b) Using level X and Y show how you can work out the percentage of active air (2 mrks)

$$\frac{(X - Y)}{X} \times 100 = \text{percentage of active air}$$

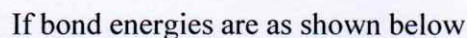
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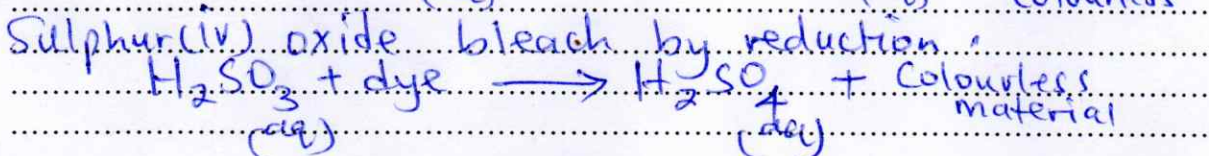
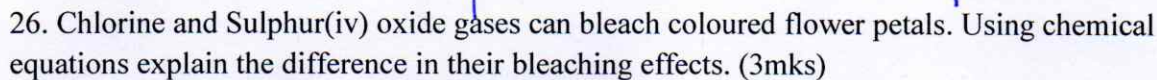
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Work out the enthalpy change for the reaction above.



27. Study the diagram below.

The diagram above represent the three concentric pipes for extraction of sulphur by Frasch process.

a) State with reasons the substances passed through pipes B and C

B: Substance passed Hot Compressed air (½mk)

Reason To melt sulphur and force it out (1mk)

C: Substance passed Super heated water under high pressure (½mk)

Reason To melt sulphur and maintain its liquid state (1mk)