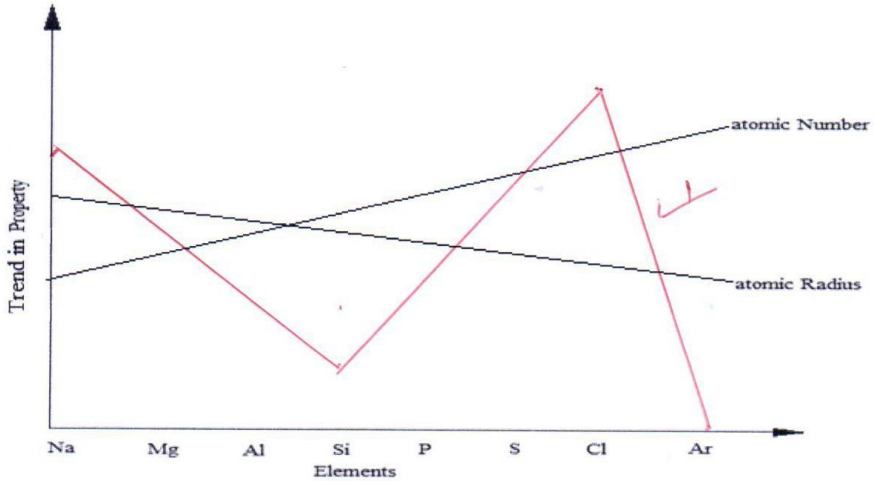
KAPSABET BOYS TRIAL 1 2025 MARKING SCHEME

CHEMISTRY PAPER 2 MS

1. a) i) Atomic number increases ; number of protons increase

ii) Atomic radius decreases / reduces; due to the additional protons // increase in nuclear charge hence energy levels are pulled closer to the nuclear

b)



c) i) 2.8

ii) 2.8.4

d) i) P/Phosphorous ; cut off air// Prevent reaction with air// smoulders when exposed to air

ii) Manufacture of aluminium sheets //aircraft parts// Aluminium foil// Reject manufacture of Iron sheets.

e) White fumes are formed. The Chloride of phosphorous hydrolyses in air to form hydrogen chloride

2. a). i) - Is water that boils above boiling point.

- It is achieved by raising pressure of water

ii) - To melt the sulphur.

- Boiling water is at 100°C while sulphur melts at 113°C

iii) Monoclinic sulphur (stable at temperatures above 96°C)

iv) Plastic sulphur

b) i) Electrode that serves only as a source or sink for electrons without playing a chemical role in the electrode reaction

ii) To increase the surface area for dissolving of the gas.

iii) I. The pH lowers as $SO_{2(g)}$ formed dissolves in water forming H_2SO_3 which is acidic

II pH lowers as concentration of H^+ increases due to deposition of cu^{2+} leaving H^+ ions in solution

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iv) I. $4OH^-_{(aq)} \longrightarrow 2H_2O_{(l)} + O_{2(g)} + 4e^-$

II. $4H^+_{(aq)} + 4e^- \longrightarrow 2H_{2(g)}$

3. a. (i) It is the energy released or absorbed when one mole of a compound is formed from its constituent elements in their standard states

(ii) ΔH^θ

$2C_{(s)} + 3H_{2(g)} \longrightarrow C_2H_{6(g)}$

$\Delta H_1 = 2(-394)$ $\Delta H_2 = 3(-286)$ $\Delta H_3 = -1560 kJmole^{-1}$

$2CO_{2(g)} + 3H_2O_{(g)}$

$Hf^\theta + \Delta H_3 = 2\Delta H_1 + 3\Delta H\theta_2$

$\Delta Hf^\theta = [2(-394) + 3(-286) - (1560)] = -86 kJ/mole$

I a) ΔH_1 Enthalpy of lattice for NaCl(s) (1mark)

b) ΔH_2 Enthalpy of hydration of $Na^+_{(g)}$ (1mark)

II.

$NaCl_{(s)} + {}_{(aq)} \xrightarrow{\Delta H_1 = +776 kJ/mole} Na^+_{(g)} + Cl^-_{(g)}$

$\Delta H_4 = ?$ $\Delta H_2 = -402$ $\Delta H_3 = -307 kJ/mole$

$Na^+_{(aq)} + Cl^-_{(aq}$

III $\Delta H_4 = \Delta H_1 + \Delta H_2 + \Delta H_3$

$\Delta H_4 = +776 + (-402 + -371) = +3$ kJ/mole

IV (i) - Colour of solution changes from blue to colourless

- A brown solid was deposited , etc

(ii) $\Delta H = m \times c \times \Delta T$

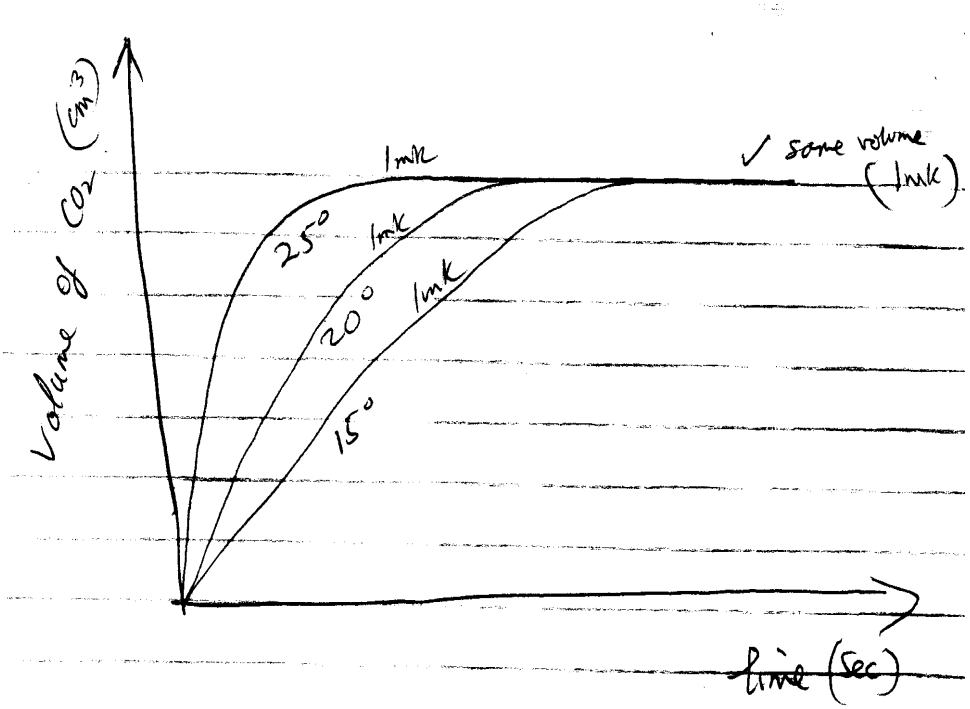
$\Delta H = \frac{100.0}{1000.0} cm^3 \times 1.0 \times 4200 \times (30.0 - 20.5) K$

$\Delta H = -3990 J$

(iii) Number of moles = $\frac{0.1 \times 100.0}{1000.0}$ = 0.01 m0les

(iv) $\Delta H_{molar} = \frac{1 \times 399}{0.01}$ = -399 kJ/mole

4. a) i)



ii) Total volume of gas evolved is equal when excess acid was reacted with same mass of calcium carbonate – graph levels off in the end.
(1mark)

The gradient of graph for 25^0C in greater showing greater rate of reaction at higher temperature. Increase in temperature increases the kinetic energy of particles causing more frequent and effective collisions w.t.t.e
(1mark)

b) i) Hydrochloric acid <u>completely dissociated</u> in water producing a large amount of H+ whereas ethanoic acid only <u>partially dissociates</u> in water releasing few H^+ ions. In ethanoic acid solution there are <u>few H^+ available for displacement</u>. W.t.t.e.
(3marks)

ii) Temperature, pressure, surface area, catalyst, etc
for any one – 1mark

c) i) left/ backward

$A_{(g)} + B_{(g)} \rightleftharpoons D_{(l)} + E_{(g)} + heat$

Increase in temperature means heat ↑ which is a product in this case. Equilibrium shift backwards to get rid of excess heat.

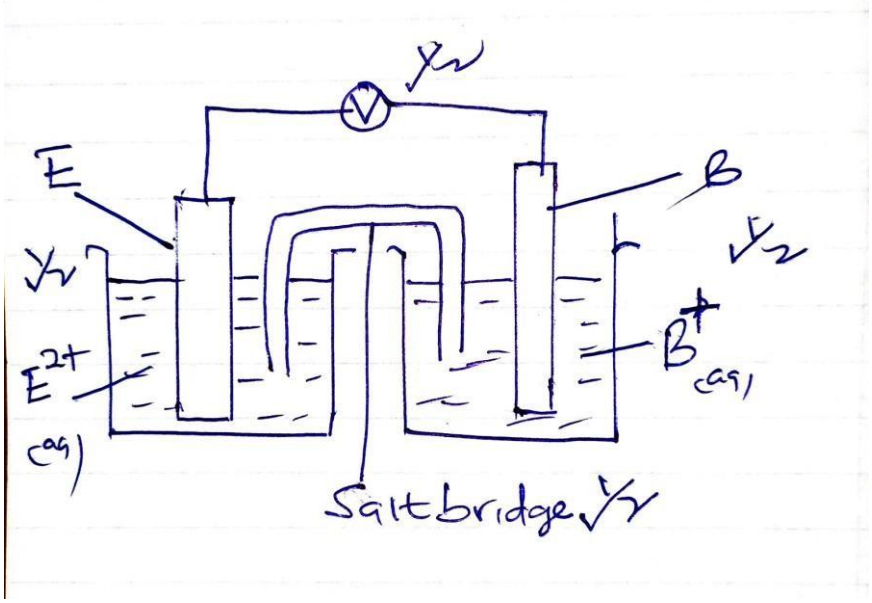
ii) Right / forward
The products formed occupy a smaller volume compared to reactants.

1. (a)X+-2(3)=-1
X=+6-1
X=+5

(b) (i) I A(s). can easily lose electrons/ most electropositive/most negative electrode potential.
IIC. Has electrode potential of 0.00V

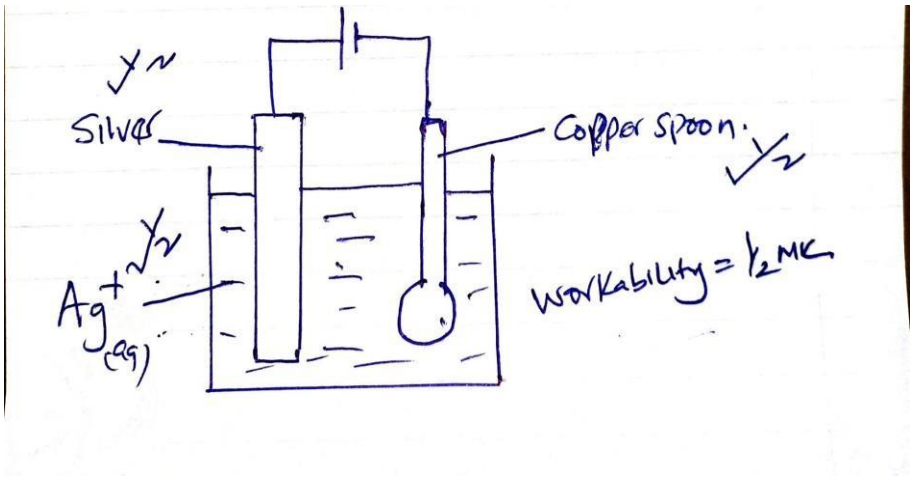
(ii) $E_{(s)} + 2B^{+} \longrightarrow 2B_{(s)} + E^{2+}$ E= +0.96V

(iii) Reaction cannot take place. A is more reactive than E/ E cannot displace A.



(iv)

C*(i)*



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C(ii) 0.5× 18× 60=540C
96500C=108g
(108×540)÷ 96500= 0.644g

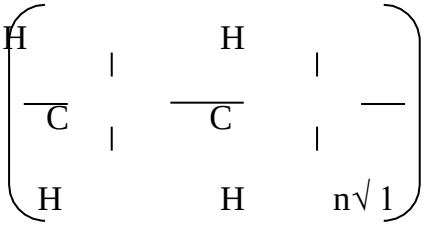
6. (a) (i) $Al_2O_3.2H_2O$√1 // $Al_2O_3.H_20$
(ii) (a) Iron (iii) Oxide√1
(b) Concentrated Sodium√1 Hydroxide // (NaOH)
(iii) By bubbling carbon (iv) oxide gas through the filtrate to precipitate Aluminum hydroxide which is the filtered off. √½
(iv) To lower M.p of Al_2O_3 from 2015^0C√1 to 800^0C; which is economical√1 during electrolysis // to avoid Aluminium from vaporizing if electrolysis is carried out at 2015^0C.

(b) (i) Because the carbon anode is attacked√1 by oxygen liberated at high temperature hence the anode gradually burns√1 away.
(ii) $4Al^{3+}_{(l)} + 12e^- \longrightarrow 4Al_{(s)}$ √1
OR $4Al^{3+}_{(l)} + 3e^- \longrightarrow Al_{(s)}$

(c) (i) It is light, √1 hard, strong and resistant to corrosion.
(ii) - making cooking vessels. √1
- Making overhead cables. √1
- As a reducing agent in thermite process. (any 2x1 = 2mks)

7.(a) (i) Cracking√ 1
(ii) When the gas is burnt in air√ 1 it burns with a pale blue flame. √ 1
OR
Does not decolourize √ 1purple acidified potassium manganate (VII). √ 1

(iii) I. A. Ethane√ 1
II. B 1- Chloroethane√ 1
(iv)



(v) (i) Combustion√ 1
(ii) Dehydration√ 1
(vi) Conc. H_2SO_4√ 1
Temperature of 170^0C. √ 1
(b) (i) Pent-2-ene√ 1
(ii) Prop-1-yne