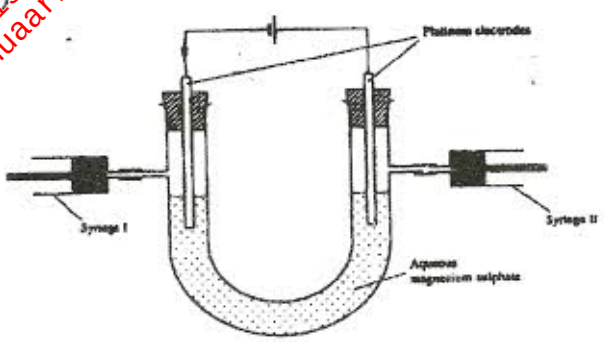
K.C.S.E. 2006 CHEMISTRY PAPER 233/2 MARKING SCHEME

1. (a) A substance that allows the passage of an electric current and is decomposed by it. (1 mark)

(b) (i) Molten calcium chloride: Conducts by movement of ions. (1 mark)
(ii) Graphite: Conducts by movement of delocalised electrons. (1 mark)

(c) (i)



(1 mark)

(ii) Syringe 1: The H^+ ions migrate to the negatively charged electrode (cathode) where they get discharged to form hydrogen gas. (1 mark)

(d) The amount of water used to produce O_2 and H_2 gases is **MORE** than that produced at the anode. (2marks)

(e) Quantity of electricity $15 \times 0.72 \times 60$
$= 648$ coulombs

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

Faradays of electricity $\frac{648}{96500} = 0.006715$ F

Moles of oxygen produced $= 0.006715$
$= \frac{0.006715}{4} = 0.0016787$

Volume of oxygen $= 0.0016787 \times 24000$
$= 40.2888\ cm^3$
$= 40.29 cm^3$ (4marks)

2. (a) (i) The blue colour of solution fades. Brown solid is deposited because the coloured copper ions are discharged to form copper. (3marks)

(ii) Heat change
$25 \times 4.2 \times 18 = 1890$ Joules (2marks)

(iii) Moles of Mg used $= \frac{0.15}{24} = 0.00625$

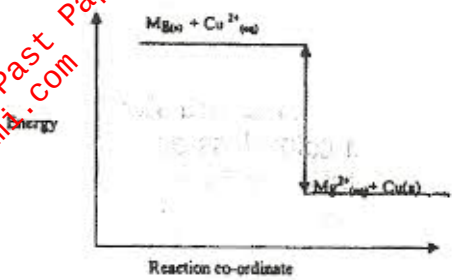
$0.00625 = 1890$ Joules

$\therefore 1$ mole $= \frac{1890}{0.00625}$

$= -302.4$ KJ mo^{-1} (2marks)

(iv) $Mg_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Mg^{2+}_{(aq)} + Cu_{(s)}$ (1) (1 mark)

(v)



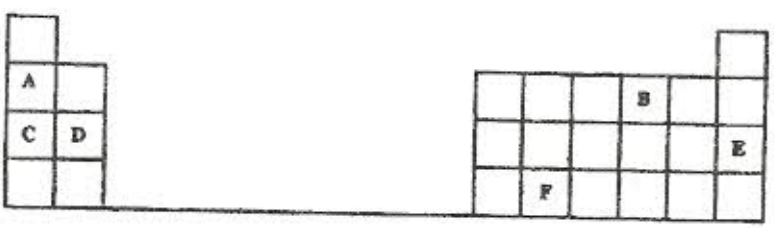
(2marks)

(b) Zinc is higher than copper in the reactivity series of zinc is more reactive than copper or Zinc will disolve in the solution leading to weakening of the container or Redox reaction will take place. (2marks)

3. (a) Isotopes are atoms with same atomic number (protons) but different mass numbers while allotropes are different forms/structure of an element in the same physical state. (2marks)

(b) (i) E Atomic radius decreases across a period / E has the highest nuclear attraction / E has the highest no. of protons. (2marks)

(ii)



(1 mark)

(iii) Used in Advertising Sign Lamps / Light / fluorescent lamps Weather / metrological / arch welding. (1 mark)

(iv) $2CNO_{3\,(s)} \longrightarrow 2CNO_{2(s)} + O_{2(g)}$

$2NaNo_{3(s)}\ (s) \xrightarrow{Heat} 2NaNo_{2(s)} + O_{2(g)}$ (1 mark)

(c) Moles of chlorine used $= {}^{3}/_{24} = 0.125$

$\therefore$ Mass of Cl_2 in product formed $= 0.125 \times 71^{(1/2)} = 8.875$

Moles of D $= 0.125$

Mass of D 11.875 - 8.875 $= 3g$

$= {}^{3}/_{0.125}$

$\therefore$ R.A.M. of D $= 24$ (3marks)

4. (a) (i) $2PbS_{(s)} + 3O_{2(g)} \longrightarrow 2PbO_{(s)} + 2SO_{2(g)}$ (1 mark)

(ii) To avoid poisoning of the catalyst. (1 mark)

(iii) SO_3 is absorbed in 98% conc. Sulphuric acid to make Oleum or SO_2 + $H_2SO_4 \longrightarrow H_2S_2O_{7(l)}$ (1 mark)

(iv) $SO_{2(g)1/2}$ and $SO_{3(g)(1/2)}$ (1 mark)

(v) They form acid rain which corrodes buildings / toxic - kills/causes respiratory problems. (1 mark)

(vi) To minimize costs. (1 mark)

(b) (i)

Substance	Observations
Iron filings	- Effervescence starts and stops immediately. - Bubbles of a colourless gas with a pungent smell. - A brown solution is formed. (1 mark)
Crystal of white sugar	- Black spongy solid. (1 mark)

(ii) I Heating is required for conc. H_2SO_4 to react.
Some SO_2 is formed/ produced. (1 mark)
II Formation of Carbon by dehydration of sugar. (1 mark)

(c) $(NH_4)SO_4$- Ammonium Sulphate.
$2CaSO_4 + Ca(H_2PO_4)_2$ Calcium Superphosphate. (1 mark)

(d) It is insoluble in water hence cannot be washed easily. (1 mark)

5. (a) Hydrocarbon. (1 mark)
(b) (i) Fractional distillation. (1 mark)
(ii) Fuel solvent / source of H_2 gas. (1 mark)

(c) (i) L = calcium cabide, CaC_2 (1 mark)
(ii) Phosphoric acid / Aluminium oxide / H_2SO_4 (1 mark)

(iii) H - C ≡ C - H (1 mark)

(iv) Hydrolysis or hydration or oxidation. (1 mark)

(v) I
- Making rain coats.
- Plastic water pipes.
- Electrical insulation.
- Floor tiles. (1 mark)

II Hardening of oils to form fats / margarine manufacture. (1 mark)

(d) (i) $CH_3COOH_{(aq)} + NaOH_{(aq)} \longrightarrow CH_3CO - ONa_{(aq)} + H_2O_{(l)}$ (1 mark)

(ii) HCL is fully dissociated while ethanoic acid dissociates partially.
∴ Ethanoic acid is weak while HCL is strong. (2marks)

6. (a) (i) Calcium silicate / Calcium aluminate. (1 mark)
(ii) Magnetite, Fe_3O_4

Siderite, $FeCO_3$ / Iron pyrites / iron lemonite.
Accept both the name and or a correct formula
(iii) Carbon dioxide, CO_2 / Carbon (iv) Oxide (1 mark)

(b) Air reacts with carbon (coke) to form carbon dioxide (CO_2). Carbon dioxide reacts with coke to form carbon monoxide. The carbon monoxide reacts with Fe_2O_3 to form iron. (3marks)

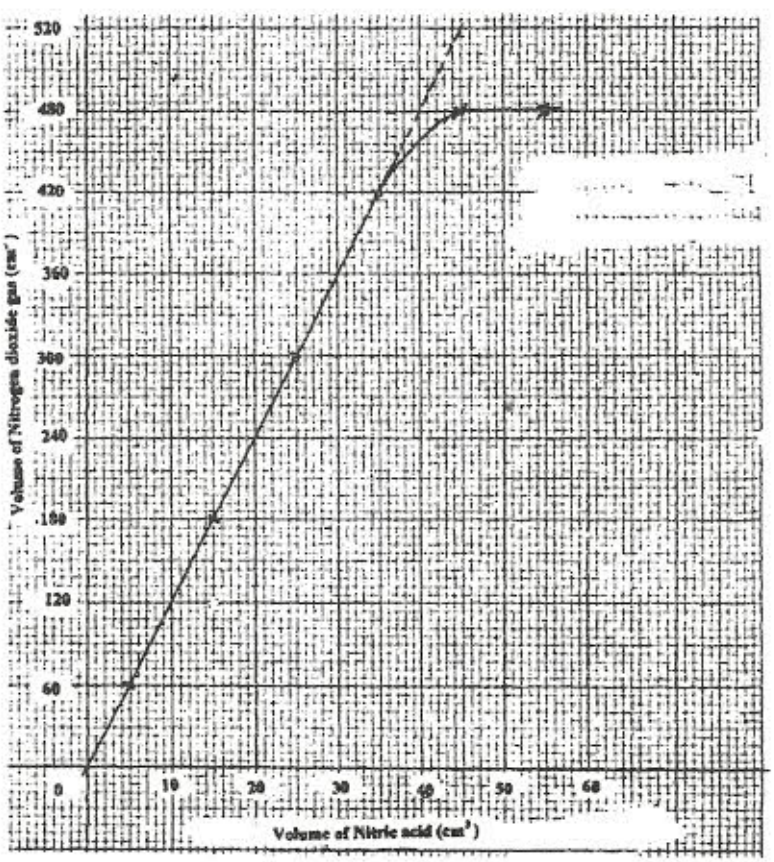
(c) To produce calcium oxide which reacts with silica to form slag. (1 mark)

(d) Cast iron is impure. (1 mark)

(e) Manufacture of
- Rails
- Drainage pipes.
- Engine blocks / utensils/ nails/ cutlery/ surgical instruments/ bridges/ cars/iron sheets etc. (2marks)

14. (a) Nitric acid is a strong oxidising acid. It oxidises hydrogen gas to water. (1 mark)

(b) Increase Molecules acquire the necessary activation energy. This increases the frequency of collisions hence the rate of reaction. (2marks)



(d) (i) 360cm³ (Correct value read from graph) (1 mark)
(ii) 40cm³ (Correct value read from graph) (1 mark)

(e) (i) Moles of lead $= \frac{2.07}{2.07}$

$\therefore$ 1 moles of lead $= \frac{40}{0.01}$

$= 4000cm$ (2marks)

(ii) $\frac{480}{0.01} = 48000cm^3$ (1 mark)

(f) (i) Moles of nitric acid $= \frac{4000}{1000}$

That react with 1 mole of lead $= 4$ (1 mark)

(ii) Moles of nitrogen dioxide $= \frac{48000}{24000}$

$= 2$ (1 mark)

(g) $Pb_{(s)} + 4HNO_{3(aq)} \longrightarrow Pb(NO_3)_{2(aq)} + 2H_2O_{(l)} + 2NO_{2(g)}$ (1 mark)