CHEMISTRY 233/2
MARKING SCHEME

1. (a) (i) K **√1mk**

(ii) J or C **√1mk**

(iii) Group 4 , period i.e. below S in the grid

(iv) J and U are in the same period and <u>across the period the nuclear charge</u> increases hence <u>nuclear</u>

<u>charge</u> of U is greater than that of J hence it pulls the outermost electron more strongly reducing the radius.

(v) **Y** – is better conductor because it has more delocalized electrons. ***OR*** Y- has 3 delocalized

electrons while A how one delocalized electron.

(vi) The B.p of the elements increases **√1mk** down the group. This is because the intermolecular forces of attraction increase **√1mk** down the group with increase in the size of the molecules.

(b) (i) **V** and **G√1mk** because they are in the same group or loses 2 electrons / some number of electrons in the outer energy levels.

(ii) **X, √½mk** because its ionic radius is bigger tendency to donate its electron is high. **√½mk**

(iii) E, **√½mk** because its ionic radius is bigger than atomic radius so its tendency to donate its electron is high. **√½mk**

2. (a) Fractional distillation **√1mk**

(b) (i) Cracking – is the braking of long-chain alkane molecules into shorter alkanes and an alkene by

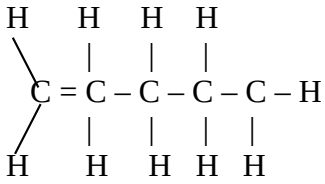
heating or use of catalyst. **√1mk**

(ii) - Heat or temperature 400°C – 700°C **Any two correct for√1mk each**

- Silica /SiO_2 or Catalyst – silica /SiO_2
- Aluminium oxide Al_2O_3

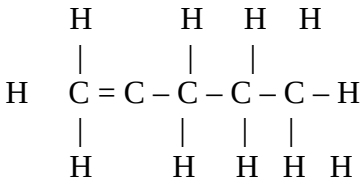
(iii) $C_{10}H_{22(l)} \rightarrow C_5H_{12} + C_5H_{10(g)}$ **√1mk**

(iv)



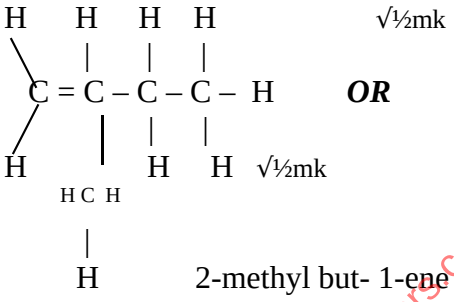
√½mk

Pent-1-ene √½mk



√½mk

Pent-2-ene √½mk

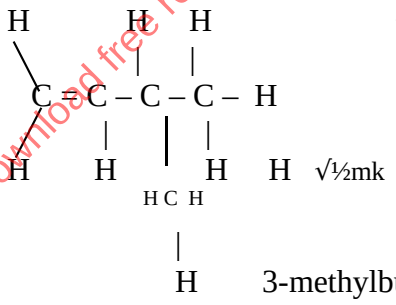


√½mk

OR

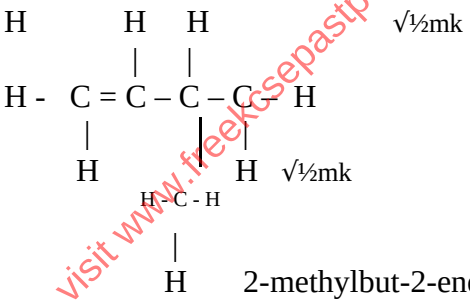
√½mk

2-methyl but- 1-ene



√½mk

3-methylbut-1-ene



√½mk

2-methylbut-2-ene

Any two; drawing ½mk
naming ½mk

(v) Shake a sample with;
Bromine C_5H_{12} does not decolourise, C_5H_{10} decolourise ***OR***. – Acidified Potassium chromate (VI) with C_5H_{12} the orange colour does not change but with C_5H_{10} the orange colour changes to green ***OR*** Burn a sample of C_5H_{12} burns with a non-luminous flame; while C_5H_{10} burns with luminous

(c) (i) Soapy √1mk Detergent √1mk

(ii) Soapless detergent √1mk because it is non-biodegradable √1mk hence pollutes the Environment.

3. (a) (i) Name – Aluminium hydroxide √½

Formula: $Al(OH)_{3(s)}$ √½ (1mk)

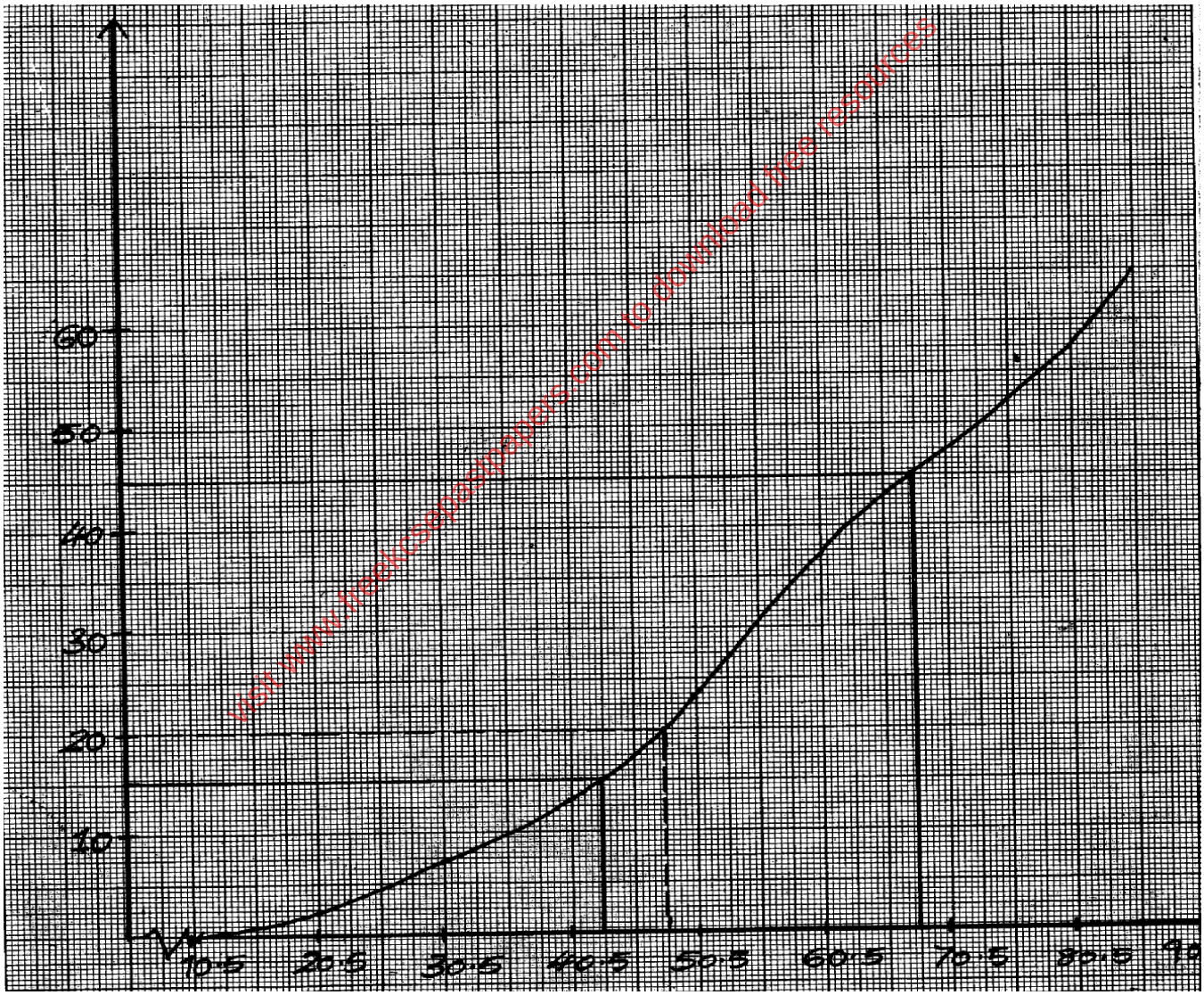
(ii) Name: Sodium aluminate / tetrahydroxo aluminate √1

Formular: $NaAl(OH)_{4(aq)}$ /$[Al(OH)_4]^-_{(aq)}$ √1 (2mks)

(b) Amphoterism

(c) $Al(OH)_{3(s)} + OH^-_{(aq)} \rightarrow [Al(OH)_4]^-_{(aq)}$ (1mk)

d) i)



(ii) I . 33/100g of H_2O (must be on the graph)

II. 25°C √1

III. Solubility of X at 30°C = $^{19g}/_{100g}$ of water mass of crystals deposited 50-19 = 31g √½ (1mk)

4. (a) (i) Water

(ii) 6.5; √1 presence of Carbonic acid

i.e $CO_2 + H_2O \rightarrow H_2CO_3$

(iii) $2\ Na_2O_{2(s)} + 2H_2O_{(l)} \rightarrow 4NaOH_{(aq)} + 2O_{2(s)}$ √1

(b) (i) to lower the melting point of sodium chloride √1

(ii) sodium react with air and water vigorously/sodium would react with moist air √1

(c) (i) If CO_2 is bubbled in lime water for a few minutes white ppt. is formed. No white ppt. forms when CO is bubbled into lime water.

(ii) – Extraction of metals √1

(d) CO_2 is highly soluble√½ in sodium hydroxide to form Na_2CO_3 √½soluble in water to form Carbonic acid. √ (2mks)

5. (a) (i) A – Concentrated hydrochloric acid√1

B – water √ 1mk

(ii) Calcium oxide / CaO√ (1mk)

(iii) To absorb unreacted /excess chlorine √

(iv) $2KMnO_{4(s)} + 16HCl_{(aq)} \rightarrow 2KCl_{(aq)} + 2MnCl_{(aq)} + 8H_2O_{(l)} + 5Cl_{2(g)}$ √1

(v) Solid C sublimes √ hence collects on a cooler place away fromheating.

(vi)

Elements present	Al	Cl
Mass/volume	0.675	1800cm^3
R.A.M/M.G.V	27	24000
No. of moles	$\frac{0.675}{27}$ √½ = 0.0025 √½	$\frac{1800}{24100}$ = 0.075
Mole ratio	$\frac{0.025}{0.025}$ = 1 √½	$\frac{0.075}{0.025}$ = 3

EF = $AlCl_3$ √½

$(AlCl_3)n = 267$ √½

$(27 + 35.5 \times 3)n = 267$

$n = \frac{267}{133.5} = 2$ √½

M.F = $(AlCl_3)_2 = Al_2Cl_6$ √½

(b) (i) $6NaOH_{(aq)} + 3Cl_{2(g)} \rightarrow NaClO_{3(aq)} + 5NaCl_{(aq)} + 3H_2O_{(l)}$

(ii) Bleaching agent in paper pulp√1 // Used as herbicides √1

(c) Sulphur (IV) oxide bleaches by reduction√½ and removal of oxygen from the dye hence temporary √½ while chlorine bleaches by oxidation√½/adding oxygen to the dye hence permanent. √½

6. A. (i) (a) Carbon (IV) oxide or CO_2 or
Carbon (IV) oxide (CO_2) √1 (Any)

(b) $KOH_{(aq)} + CO_{2(g)} \longrightarrow KHCO_{3(aq)}$ √1

Wrong balanced = 0

State symbols wrong or missing ½ mark

(ii) Oxygen gas or $O_{2(g)}$ or oxygen (O_2) gas √1

(iii) Nitrogen gas or $N_{2(g)}$ or nitrogen (N_2) gas. √1

B. (i) Moles of nitrogen = $\frac{1.54}{14}$ √½ = 0.11 √½

Moles of oxygen = $\frac{3.53}{16}$ √½ = 0.22 √½

(ii)

	N	O
Mole ratio	$\frac{0.11}{0.11}$ = 1 √½	$\frac{0.22}{0.11}$ = 2 √½

Simplest formula NO_2 √1

(iii) Compound has low melting and boiling points √1 because it has a weak Van der wall forces √1

7. (a) copper oxide / CuO √1mk

(b) $CuSO_{4(aq)} + Na_2CO_{3(aq)} \longrightarrow CuCO_{3(s)} + Na_2SO_{4(aq)}$ √1mk

(c) (i) Sodium sulphate / Na_2SO_4 √1mk

(ii) Copper carbonate √1mk

(d) $CuO_{(s)} + H_2SO_{4(aq)} \longrightarrow CuSO_{4(aq)} + H_2O_{(l)}$ √1

(e) $Cu^{2+}{}_{(aq)} + CO_3^{2-}{}_{(aq)} \longrightarrow CuCO_{3(s)}$ √1mk5

(f) $CuCO_{3(s)} \xrightarrow{heat} CuO_{(s)} + CO_{2(g)}$ √1mk

(g) Filtrate √ ½

Beaker √ ½

Water bath√ ½

Tripond stand √ ½

Workability √1mk