CEKENAS END OF TERM I EXAM-2022

FORM FOUR EXAM

Kenya Certificate of Secondary Education (K.C.S.E)

MARKING SCHEME

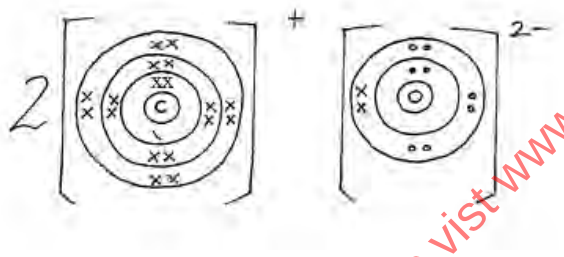
CHEMISTRY 233/2

PAPER 2

1. a) i) A- 2.8

B – 2.8.8

ii)



b) Shown on the grid between (B and D)

c) i) A is less reactive✓1 than C, C has a larger atomic radius✓1 hence loses its outermost electrons more easily.

ii) B has a smaller✓1 atomic radius than A since B has stronger nucleus✓1 charge.

ii) Oxide of G has a higher melting point than oxide of D ✓1 since G oxide is ionic and has strong ionic bonds✓½ whereas oxide of D has a molecular structure with weak vanderwaal forces✓½ between molecules.

d) Covalent bond✓1

E and D share valence electrons✓1 to form covalent bond.

e) E forms ion by gaining electrons ✓1. There exist repulsive forces ✓1 between the incoming electron and the existing electrons in E making the outer energy level bulge outward.

2. a) A – Brine/ concentrated sodium chloride. Reject sodium chloride

B – Carbon (iv) oxide

b) i) $NH_{3(g)} + H_2O_{(l)} + CO_{2(g)} \longrightarrow NH_4HCO_{3(aq)}$ ✓1

$NH_4HCO_{3(aq)} + NaCl_{(aq)} \longrightarrow NH_4Cl_{(aq)} + NaHCO_{3(s)}$ ✓1

iii) $Ca(OH)_{2(s)} + 2NH_4Cl_{(aq)} \longrightarrow CaCl_{2(aq)} + 2H_2O_{(l)} + 2NH_{3(aq)}$ ✓1

(award ½mk for correct equation without symbols)

c) i) Calcium chloride✓1

ii) I- Drying agent for gases/ as a drying agent✓1 in the desiccators

II – In extraction of sodium from molten sodium chloride✓½. It lowers the melting point✓½ of NaCl from 801^0c to above 600^0c

d) i) Glass manufacturing industry

ii) Paper industry

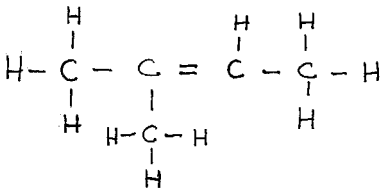
e) i) Efflorescence✓1

ii) –Decrease in mass✓½

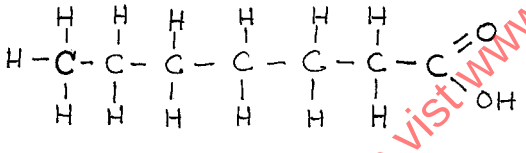
- Loss of crystalline nature✓½

3a)

i)



ii)



b) Heat the two substances separate and determine their boiling point✓1. Hexanol has a higher boiling point than methanol. ✓1

c) i) I – Substitution

II – Chloroethane

ii) <u>Condition</u>

Warming✓½

Concentrated sulphuric (vi) acid✓

<u>Reagent</u>

Propanoic acid ✓1

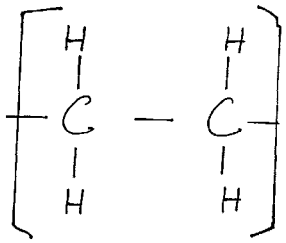
iii) CH_3CH_2ONa✓½ – Sodium Ethoxide✓½

iv) Hydrogen ✓1

Nickel catalyst✓½

Temperature 150^0c – 250^0c✓½

v) I



✓½

Polyethene✓½

II – Polythene bags✓1

4.*i*) $MnO_{2(s)} + 4HCl_{(l)} \rightarrow MnCl_2 + Cl_{2(g)} + 2H_2O_{(l)}$ ✓1

ii) $KMnO_{4(s)} / PbO_{2(s)}$ ✓1

iii) By passing it through concentrated sulphuric (vi) acid. ✓1

b) i) Aluminium chloride ✓1

ii) $2Al_{(s)} + 3Cl_{2(g)} \rightarrow 2AlCl_{3(s)}$ ✓1

iii) $2Al_{(s)} + 3Cl_{2(g)} \rightarrow 2AlCl_{3(s)}$ ✓1

$\frac{0.84g}{27} = 0.03111moles$ ✓½

$Cl_{2(g)} volume used = 0.03111x3 = 0.09333moles$ ✓½

Volume of chlorine = 0.09333 x 24000✓1

= 2240cm³

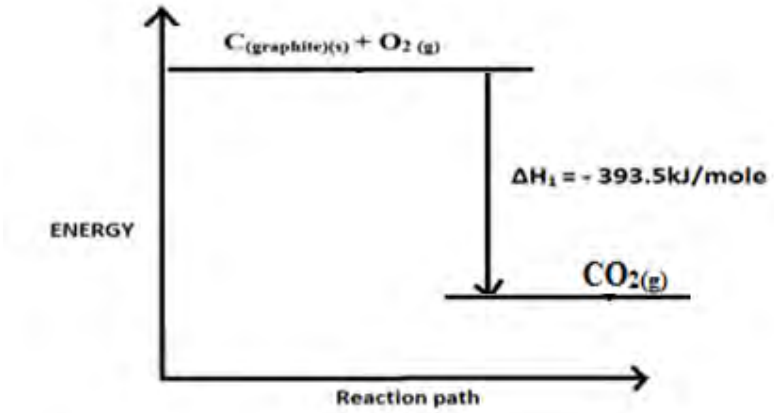
iv) – Calcium oxide prevents any moisture from outside since the $AlCl_3$ is deliquescent hence keeps combustion tube dry. ✓1

- Calcium oxide reacts with moisture forms calcium hydroxide that prevents chlorine from escaping to the atmosphere. ✓1

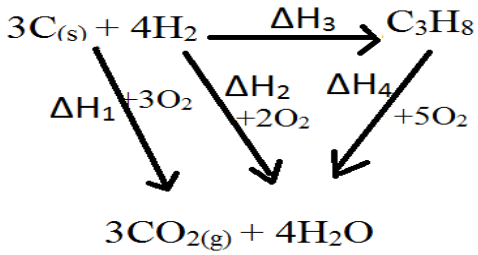
5.a) i) Energy or enthalpy change that occurs when a compound reacts completely with oxygen at standard conditions. ✓1

ii) I - Molar enthalpy of formation of propane. ✓1

II –



iii)



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

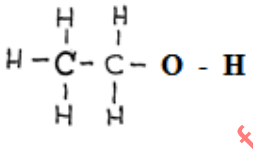
$3(-393.5) + 4(-285.8) = --103.7kJ/mole + \Delta H_4$ ✓½

$-1180.5 + -1143.2 = -103.7 + \Delta H_4$ ✓½

$-2323.7 + 103.7 = \Delta H_4$ ✓½

$\Delta H_4 = -2220kJ/mole$ ✓½

b)



$1(C-C) = -346kJ$

$5(C-H) = -2070kJ$ ✓1

$1(C-O) = -360kJ$

$= -2776kJ$

1 x -346kJ

5x -414 = - 2070kJ

1 x -360 = - 360Kj

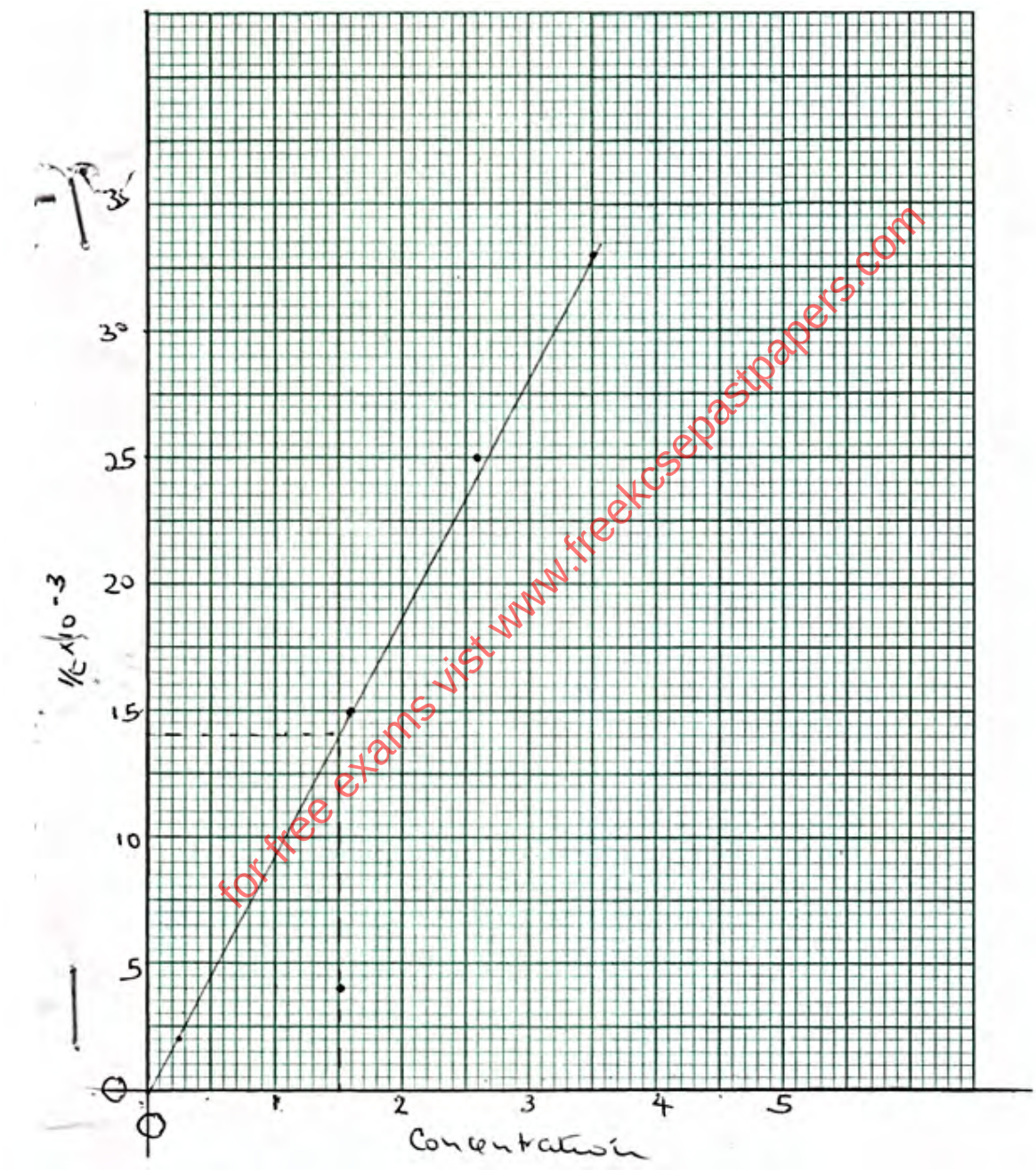
- 2776kJ + (O – H) = -3239 ✓1

O – H = -463kJ ✓1

6. a) i)

Acid concentration	0.25M	1.5M	1.6M	2.6M	3.5M
Time in sec	500	250	67.5	40	30
$\frac{1}{time(s^{-1})}$	0.002	0.004	0.015	0.025	0.033

ii)



- Labelling – ✓½
- Scale – ✓½
- Plots – ✓1

- Line -✓1

NB: Straight line passing through the origin.

ii) 0.014✓ correct showing ✓½

Correct reading ✓½

iv) The rate of reaction increases with increase in concentration ✓1/ increased concentration increases the number of reacting particles and number of effective collisions✓1.

v) – Increased temperature (warm the mixture) ✓1

- Presence of a catalyst/ add crystals of $CuSO_4$

vi) $Zn_{(s)} + H_2SO_{4(aq)} \rightarrow ZnSO_{4(aq)} + H_{2(g)}$ ✓½

1: 1 1: 1✓½

65.4g of Zinc produce 22400cm³ of H_2 at STP✓½

0.26G of Zinc produces cm³ of H_2 at STP

$= \frac{0.26g \times 22400cm^3}{65.45}$ ✓1

= 89.05cm³✓½

7. a) Mixture of soluble and insoluble salt

b) i) Lead carbonate (Reject formula)

ii) Carbon (iv) oxide (Reject formula)

c) $PbCl_2$

d) Zn^{2+}, SO^{2-}_4 (Reject names)

e) $Ba^{2+}_{(aq)} + SO^{2-}_{4(aq)} \rightarrow BaSO_{4(s)}$ (Penalise ½for wrong state symbol)

f) $PbCO_3$ and $ZnSO_4$ (accept names tied to the two for 1mk)

g) i) $Zn(OH)_{2(s)} + 2OH^-_{(aq)} \rightarrow [Zn(OH)_4]^{2-}_{aq}$

(Reject fully if not balanced, penalise ½mk for wrong state symbols)

ii) Tetramine Zinc (ii) ions

h) Add excess lead (ii) oxide to dilute nitric (v) acid✓½.

Filter✓½ the unreacted lead (ii) oxide;

Add sodium sulphate✓½/ K_2SO_4/ H_2SO_4 to the filtrate

Filter✓½ to obtain lead (ii) sulphate as the residue

Wash the residue✓½ with distilled water

Dry the residue between filter paper✓½