**FORM 4**

**CHEMISTRY PAPER TWO**

**TERM 2 SEPTEMBER 2022**

**MARKING SCHEME**

1 (ai) H H CH3 H

H C C = C C H 1mrk

 H H

(ii) H H H H H H O

H C C C C C C C 1mrk

 H H H H H H OH

 Accept open structural formula.

 CH3 may or may not be open.

 OH may or may not be open.

(b) i) Ethane/ C2 H6 H H

 H C C H 1mrk

 H H

(ii) C3 H6 Cl2 H H H

 H C C C H

 H CL Cl

(iii) 1) Water/ steam/ conc. H2 SO4 1mrk

 2) Acidified KMnO4 /KMnO4/Acidified K2 Cr2 O7 Any 1mrk

(ii) 2CH3 CH2 CH2 OH + 2Na 2CH3 CH2 CH2 ONa + H2 1 mrk

 *Ignore missing or wrong state symbols.*

 *Penalize fully if not balanced.*

(c) i) Oxidation 1mrk

 ii) Decarboxylation 1mrk

(d) Cleansing agent has polar end ½ and non – polar end ½ Non – polar end attracts ½ Grease while polar end attracts water molecules ½ This lower the surface tension of water/ emulsification of grease ½

2(a) i) D has a lower melting point than F ½ because F has more valence electrons ½ and smaller atomic radius hence stronger metallic bonds which require a lot of energy to break.

ii) G has a larger atomic radius than N. N has more protons than G/ N has a greater nuclear attraction than G./ N has a more effective nuclear charge than G.

iii) D 1mrk; Has the largest atomic radius / thus loses it’s outermost electrons most readily.

iv) Oxide of L is acidic ½ while that of C is basic/alkaline1/2 Oxide of L dissolves in water to form H+ ions ½ while that of C dissolves in water to form OH- ions ½

(b) i) M 1mrk

 ii) L 1mrk

(c) In SiCl4 molecules are joined together by weak van der waals forces ½ . Forming a simple molecular structure while in Mg Cl2 ions are linked by strong ionic bonds / electrostatic forces of attraction ½ forming giant ionic structure ½

3 (a) i) Heat change that occurs when one mole of a substances is formed from its constituent elements ( in their normal State) 1mrk

 Or

Heat absorbed or evolved when one mole of a substance is formed from its constituent elements in their normal states.

ii) I) C(s) + 2H2(g) ΔHf CH4(g) ½

 +O2(g) + O2(g)  +2O2(g)

ΔH2 1/2 ΔH1

1/2 C O2(g) + 2H2 O(l)  ½

Equation for CH4 formation ½

Equation for CO2 and H2O combustion 1mrk

Equation for CH4 combustion 1/2mrk Total= 2mrks

II) Δhf  = ΔH2 – ΔH1

 = -393+ 2(-286) + 890

 =-75kJMol-1

 *Penalize ½for wrong or missing units.*

(b) i) Plotting

 9 correct plots 1

 8 correct plots ½

< 8 correct plots 0

Scale

 Horizontal scale – ½

Vertical scale ½

Line Extrapolation ½

 Inverted ½

ii) I) Value read from graph = ½

 II) Acid volume from graph ½

Base volume = 50cm3 acid volume from graph ½

iii) ΔT value (Final Temp from graph -250C) ½

(c) NH3 is a weak base hence some of the heat evolved is used to completely ionize NH3(aq)

4 (a) measure of how much of the reactants are consumed or how much products are formed per unit time.

(b)



(c) i) Reaction in which rate of forward reaction is equal to the rate of reverse/ backward reaction. 1mrk

ii)

(d) i) Crush(1mrk) the seeds using a mortal and pestle, add suitable solvent such as propanone / acetone/ ethanol/ propanol ½ and continue crushing. The liquid is filtered / decanted/sieved ½ in an evaporating dish. The dish is placed out into the sun to allow the solvent to evaporate leaving the oil behind. ½

ii) The liquid left after evaporation is placed on apiece of paper. If it leaves a translucent mark then it approves it is oil.

5 (a) i) Ag/Ag+(aq) and Zn(s)/Zn2+(aq) Or1mrk

 Zn/Zn2+(aq) // Ag+(aq)/Ag(s) 1mrk

 Or

 Zn and Ag half cells.

ii)



iii) Zn(s)/Zn2+(aq)//Ag+(aq)/Ag(s) 1mrk

iv) Completes the circuit 1mrk

 Maintains charge balance 1mrk

Replenishes the used ions in the two half cells

(b) i)



 Workability ½

I Q = It

 = 4 x 30 x 60 ½

 = 7200C ½ *Penalize if missing units.*

II) 2.34g 7200C

 65g ?

 = 65g x 7200C ½

 2.34g

 =200 000C ½

6 i) MnO2(s)+ 4HCl(aq) MnCl2(aq) + Cl2(g) + 2H2 O(l) 1mrk

ii) KMnO4(s)/ Pb O2(s) CaOCl2(s)

iii) By passing Cl2(g) through a U – tube containing anhydrous CaCl2

Drying agent 1mrk

 Suitable Apparatus 1mrk

By passing Cl2(q) through concentrated H2 SO4 in a flask or bulling tube.

 Or



(b) i) Aluminum chloride/Al Cl3

ii) 2Al(s) + 3Cl(s) 2AlCl3(g)/ Al2 Cl6(g)

iii) Mol Al used = 0.84 = 0.0311 1 mrk

 27

 Mol of Cl2 = 0.0311x 3 = 0.047 1 mrk

 2

Volume of Cl2 = 0.047 x 24 = 1.12 dm3

Or

0.84 x 3 x 24 = 1.12dm3 3mks

27

This part is consequential to part iii)

If more raha not used give a maximum of 2mrks

iv) Prevent moisture from entering its apparatus by absorbing it/ prevent hydrolysis of AlCl2

To react with excess Cl2 / preventing environmental pollution by Cl2.

7 (a) i) Magnetite/ Siderite 1 mrk

ii) Carbon (ii) oxide 1mrk

 iii) React with coke/charcoal / carbon to form carbon (iv) Oxide

 Rise the temperature at the bottom of the finance to about 200K (1650C)

(b) A; C(s)+O2 (g) CO2(g) 1mrk

 B; Fe2 O3(s) + 3CO(g) 2Fe(s) + CO2(s) 1mrk

 C; CaCo3(s) CaO(s) + CO2(g) 1mrk

(c) Decompose to quick lime (calcium oxide) which react to remove impurities and produce more carbon (iv) oxide gas.

(d) CaO + Si O2(s) Ca Si O3(s) 1mrk

All Equations must be balanced and with correct state symbols

 CaO + Al2 O3(s)  Ca Al2 O4(s) 1mrk

(e) Carbon (iv) Oxide gas causes global warming if allowed to escape. 1mrk

 Carbon (iv) Oxide is highly poisonous/ toxic that can kill.