MARKING SCHEME

233/2

Chemistry FORM 3

Paper 2

Question 1

a) E and H

b) Alkali metals

c) Giant covalent structure. 1mk. C is a non metal and react by sharing electrons. 1mk

d) G is more reactive than B.(1mk). G has a bigger atomic radius than B hence its outermost e’s experience less nuclear attraction thus easily lost than B.(1mk)

e) i) Mg(s) + Cl2(g) MgCl2(s) (1mk)

or B(s) + E2(g) BE2(s)

ii) from balanced equation

1 mole of B reacts with 1mole of E

1.3g of B reacts with 1.21dm3 E

? 22.4dm3

$\frac{1.3 x 22.4}{1.21} (1mk)$ = 24.066g ( 1mk) penalize ½ mk for missing /wrong units

2

2+

B

-

E

iii)

f) used in bulb filament/

street lights

Question 2

a) i) Hydrocarbons

ii) fractional distillation.

iii

$HC≡C-CH\_{3}$

vi $CH\_{3}CH=C-CH\_{3}$

CH3

v 2,2-dimethylpropane

b) i Heat to 7000c or heat to 4000c in presence of a catalyst Al2O3

ii Ethane or $CH\_{3}CH\_{3}$

iii Bubble the gases separately in acidified potassium manganate (VII) purple/K2Cr2O7(1mk) ethenedecolourises KMnO7/H+(1mk) but ethane does not/orange K2Cr2O7/H+ turns green.

iv polyethene reject polythene

v manufacture of margarine or hardening of oil to fats.

vi $H\_{2}C-CH\_{2}$

Cl Cl

1,2-dichloroethane

**Question 3**

**i NH3 (g)+ H2O(l) + CO2(g) NH4HCO3(aq) 1mk**

ii **NH4HCO3(aq) + NaCl(aq) NH4Cl(aq) + NaHCO3 (s) 1mk**

 (b)

I Process I

**Filtration**

 II. Process II

**Heating**

**III NaHCO3 (s) Na2CO3(s)+ H2O(l/g) + CO2(g)**

 **(c) i) Na2CO3 (s)+ H2SO4 (aq) Na2SO4(aq) + H2O(l)+ CO2(g) 1mk**

**Mole ratio Na2CO3: H2SO4 = 1 : 1**

**Mole H2SO4 (aq)/ Na2CO3 = 0.5 x 40 √**½ **= 0.02√**½**moles**

 **1000**

**ii) Molar mass Na2CO3 = 106g√**½

**Method 1**

**Mass of Na2CO3= 0.02 moles x 106 g√**½ **= 2.12g**

**% purity of Na2CO3 = 2.12g x 100 √**½ **= 98.6047 %√**½ **2.15 g**

**Method 2**

**Moles of Na2CO3 in impure = 2.15 g √**½**=0.0203 moles**

 **106**

**% purity of Na2CO3 = 0.02 moles x 100 √**½ **= 98.5221 %√**½ **0.0203 moles**

**d) Making glass**

**Softening hard water**

**Making soapy and soapless detergents**

**Manufacture of sodium hydroxide**

e) Method 1.

**Add excess calcium oxide to dilute nitric/hydrochloric acid√ /water. Stir. Filter.**

**Add sodium carbonate√ (any soluble carbonate) to the filtrate.**

**Filter√** ½  **to obtain calcium carbonate as residue√** ½**.**

**Wash with distilled water. Dry between filter papers.**

Method 2.

**Add excess calcium oxide to water. Stir. Filter.**

**Bubble carbon(IV)oxide√ to the filtrate.**

**Filter√** ½  **to obtain calcium carbonate as residue√** ½**.**

**Wash with distilled water. Dry between filter papers.**

**Question 4**

a) **Filter√**½ **air through electrostatic precipitation to remove dust/smoke.**

**Pass it through concentrated NaOH√**½**/KOH to remove CO2 gas**

**Cool to -25oC √**½**to remove water vapour.**

**Cool to -200oC to liquefy√**½ **Argon, oxygen and nitrogen.**

**Remove helium and neon which do not liquefy.**

**Perform fractional distillation√**1 **of liquid mixture**

**Nitrogen is collected 1stat -196oC √**1**.**

**b) i) Nitrogen(II)oxide / NO**

 **ii) NH4NO3(s) N2O(g) + 2H2O (l)**

 **iii) use as fertilizer/ or explosive**

**c) Pb(NO3)2(aq) + 2NH4Cl (aq) PbCl2(s) + 2NH4NO3(aq) 1mk**

**Rfm of NH4Cl =14+4+35.5=53.5 (½mk)**

Rfm of **PbCl2 = 207 + 71= 278 ½mk**

Moles of **PbCl2 =**$\frac{5.56}{278}=0.02$ **½mk**

**Mole ratio 2: 1**

**Moles of NH4Cl= 2x 0.02= 0.04 ½mk**

Mass of **NH4Cl = 0.04 x 53.5=2.14g 1 mk**

**Or** $\frac{2 x 53.5 x 5.56}{278}=2.14g$

Dry H2 gas

Conc H2SO4 acid/ Anhyd.CaO in a U-tube

Method of gas collection 1mk

Drying agent 1mk

Workability 1mk

**Question 5**

a)

b) i) Dropping funnel 1mk

 ii) 2H2(g) + O2(g) 2H2O(g/l) 1mk

c) Zn(s) + H2SO4(aq) ZnSO4 (aq) + H2(g) 1mk

mole ratio 1: 1

1.2 lit 3.27g or moles H2= $\frac{1.2}{24}=0.05$ 1mk

24lit ? Moles ratio 1:1 Zn= 0.05 1mk

 Mass of Zn=$\frac{3.27}{0.05}=65.4$ 1mk

$$\frac{24 x 3.27}{1.2}=65.4$$

d) Hardening of oil to fats

 Man. Of HCl

 Haber process

 Oxy-hydrogen flame

e) Introduce a burning splint (1mk) at the mouth of the jar , the gas burns with a pop sound (1mk)

**Question 6**

**a)**

Solvent front

I G

II A1

b) Heat√ the mixture.

Ammonium chloride sublimes√½ into vapour and deposits as a sublimate on cooler parts .

Calcium chloride remains√½ at bottom of heating tube.

c) i) **Fractional distillation. √**

ii) **Put both liquids in a separating funnel.Shake and let it settle for the layers to separate.**$√$

 **Open the tap to remove the lower layer of the denser liquid√½.**

 **Close tap to leave the less dense layer√½.**

d) i V1 and V3

 ii **Add petrol√ to the mixture**

 **Filter as residue V2√**½ **and V4 as filtrate**

 **Fractional distill√**½ **the filtrate.// Evaporate to obtain V4 as residue.**

7. a) **To remove any magnesium oxide layer on it √.**

(b) **White solid ash√.**

(c) **Oxygen combined with magnesium to form magnesium oxide**

**d) 2Mg(s) + O2(g) 2MgO(s) √**

(e)

 **Blue litmus paper remain blue√½**

 **Red litmus paper turn blue√½**

 **Magnesium hydroxide solution is alkaline√.**

**// MgO (s) + H2O(l) Mg(OH)2(aq)**

**f)** mass of oxygen = 4.0-2.4=1.6g ½mk

 moles of oxygen= $\frac{1.6}{32}=0.05$ ½mk

 1 mol------24000cm3

 0.05mol------?

 0.05 x 24000 (1mk)= 1200dm3(1mk)