**CHEMISTRY**

**PAPER 2**

**MARKING SCHEME**

**QUESTION ONE:**

a) J Alkaline earth metals🗸 ½

 D Noble gas elements🗸 ½

b) (i) J3B2🗸 1

 (ii) J3B2(s) + 6H2O (l) 3J (OH) 2 (aq) + 2BH3 (g) 🗸 1

c) E is more reactive than F🗸 ½, across the period there is an increase nuclear charge due to increase in the number of protons🗸 ½, thus E has a weaker nuclear charge than H🗸 ½ and can easy lose its valence electron than H🗸 ½ OR This is because of the increase in nuclear charge from E atom to F atom, which makes it easier to remove an electron from E atom to F atom.

d) See grid (Period 4) 🗸 1

 Reason: It consists of 10 more transition metal elements🗸 1

e) Fe3+🗸 ½

 Fe Fe3+ + 3e-🗸 ½

**QUESTION TWO**

a) – Add lead (II) oxide🗸 ½ till in excess🗸 ½

* Filter to obtain lead (II) nitrate as filterate🗸 ½
* Mix filterate with sulphuric acid🗸 1
* Filter to obtain lead (II) sulphate precipitate🗸 ½

b) - Add methyl benzene, iodine dissolves🗸 ½

 - Filter and crystallisefilterateto obtain iodine🗸 ½

 - Heat residue 🗸½ Ammonium chloride sublimes🗸 ½

- Add water to residue, sodium chloride dissolves🗸 ½

- Filter and crystallisefilterate🗸 ½

c) i) 2NaHCO3(s) Na2CO3(s) + CO2(g) + H2O(l)

RFM NaHCO3 = 84 Moles NaCO3 Mass

Moles 8.4/84🗸 ½ 0.1/2 = 0.05🗸 ½ 0.05 x 106🗸 1

= 0.1 🗸 ½ RFM= 106 = 5.3g🗸 ½

1. Moles CO2 ==0.1/2 = 0.05🗸 ½

0.05 X 22.4🗸 1

= 1.12dm3🗸 ½

 d) I i) Solution V – Pb(NO3)2

 ii) White precipitate T – Pb(OH)2

II. PbO(s) + 2HNO3(aq) Pb(NO3)2(aq)  + H2O(l)

 III. Pb2+(aq) + 2OH(aq) Pb(OH)2(aq)

**QUESTION THREE**

1. i) C H

 Percentage 85.7 14.3

 RAM 12 1

 Moles 7.14 14.3 🗸 1

 Mole ratio 1 2

E.F = CH2

 (12 + 2) n = 56 🗸1

 N = 4., M.F = C4H8

ii) C-C-C-C=C OR C-C=C- C

b) 2 correctly drawn isomers (branching or positional)

 Each isomer 🗸 1

 Name🗸 ½

ci) Potassium chromate (VI) turns from orange to green

ii) Butan – 1 -ol or Butan – 2-ol

di) Brown bromine is decolorized

 ii) CH3CHCHCH3 + Br2 CH3CHBrCHBrCH3

 **OR**CH3CH2CHCH2  +Br2 CH3CH2CHBrCH2Br

iii) 2,3–dibromobutane or 1,2 – dibromobutane

(Tied to d (ii))

Iv) Addition

 **QUESTION FOUR:**

 a) W Concentrated sulphuric (VI) acid 🗸1

 X Hydrogen🗸 1

 Y Water🗸 1

b) NaCl (s) + H2SO4(l) NaHSO4 (aq) + HCl (g) 🗸 1

 c) MnO2(s) oxidizes HCl (g) to chlorine🗸 1

 W reacts with NaCl(s) to form HCl(g) 🗸 1

d) i) Fe (s) + HCl2 (g) FeCl2 (s) 🗸 1

 ii) FeCl2 (aq) + 2NaOH (aq) Fe(OH)2 (s) + 2NaCl(aq) 🗸 1

5. a) Labeling of axes 🗸 ½ for both

 Plotting 🗸 2 marks

 Smooth Curves🗸 2 marks

 Scale🗸 ½(graph should cover at least ½ of the grid.

1. 18 +1

c) - **Heat** the distilled water to 45 oC 🗸½

 -Add solid Q while stirring until no more can dissolve🗸1

 - Filter🗸 ½ the mixture to remove undissolved salt

d) Heat the solution mixture above 80 oC .Salt Q will crystallize while P will remain in solution .Filter the mixture to obtain the crystals of Q,wash with hot water and dry them between pieces of filter papers.

 **QUESTION SIX:**

 a) i) Al2O3(s) +2 NaOH(aq) + 3H2O 2Na Al(OH)4(aq ) ✓ 1

 ii) Iron (III) oxide ✓ 1

 iii) R: Filtration ✓ 1

 C: Electrolysis ✓ 1

 iv) Q = It

 = 88 x 8 x 60 x 60

 = 2534400 C ✓ ½ mk

 Al3+ (l) + 3e- Al(s) ✓ 1

 27g Al 3 x 96500C ✓ ½

 X 2 534 400 C

 X$=\frac{27x2534400}{3x96500}$ ✓ ½

 =236.3689 g ✓ ½

 v) By adding a seed / seeding ✓ 1

 By bubbing CO2 into the NaAl(OH)4 ✓ 1

 vi) 2Al (OH)3(s) Al2O3(s) + 3H2O(l) ✓ 1

 b) i) Strongly alkaline solutions / liquids dissolve the protective layer of aluminium

oxide ✓ 1

 ii) - Low density ✓1

 -Less reactive / inert (Any one)

 -More resistant to corrosion

 **QUESTION SEVEN:**

 (a) (i) -The blue colour of the solution fades ✓ ½ the coloured copper (II) ions are
 discharged ✓½

 - Red-brown solid in deposited ✓ ½ because copper (II) ions are
 discharged to form copper ✓½

 (ii) T=380C-230C=150C ✓½

 H=25🞩4.2🞩15 ✓1

 = 3670.8 J ✓½

 (iii) Mg (s) + Cu2+ (aq) Mg2+ (aq) + Cu(s) ✓1

 (iv) Moles of Cu =✓ ½

 =0.05 mol ✓ ½

 Molar heat of displacement of Cu $=\frac{3670.8}{0.05}$ ✓ ½

 = 73416 J

 = -73.416 kJ/mol ✓ ½

 b) (i) Heat of combustion of hydrogen ✓ 1

 Heat of formation of water/steam ✓ 1

 C2H6 (g) +$ \frac{7}{2}$O2 (g)

 Energy H = -1560 kJmol-1 ✓ ½

 2CO2 (g) +3H2O (g)

 Reaction path

 Labeling both axes ✓ ½

 Relative levels of reactants and products ✓1

 Arrow and H ✓ ½

iii) Using energy cycle or elimination method leads to:

 Hf= 2H2 + 3H3 - H1

 = 2(-394) + 3(-286)-(-1560) ✓1

 = -86 kJ mol-1 ✓1 (wrong or omitted sign or units penalize ½ mk)