**Name of the Student**:_____
**Max. Marks : 17 Marks** **Time : 17 Minutes**

Mark Schemes

Q1.

(a) Co-ordinate / dative / dative covalent / dative co-ordinate
*Do not allow covalent alone*
**1**

(b) (lone) pair of electrons on oxygen/O
*If co-ordination to $O^{2-}$, CE=0*
**1**

forms co-ordinate bond with Fe / donates electron pair to Fe
*'Pair of electrons on O donated to Fe scores M1 and M2*
**1**

(c) 180° / 180 / 90
*Allow any angle between 85 and 95*
*Do not allow 120 or any other incorrect angle*
*Ignore units eg °C*
**1**

(d) (i) 3 : 5 / 5 $FeC_2O_4$ reacts with 3 $MnO_4^-$
*Can be equation showing correct ratio*
**1**

(ii) **M1** Moles of $MnO_4^-$ per titration = 22.35 × 0.0193/1000 = $4.31 \times 10^{-4}$
Method marks for each of the next steps (no arithmetic error allowed for M2):
*Allow $4.3 \times 10^{-4}$ ( 2 sig figs)*
*Allow other ratios as follows:*
*eg from given ratio of 7/3*
**1**

**M2** moles of $FeC_2O_4$= ratio from (d)(i) used correctly × $4.31 \times 10^{-4}$
***M2*** *= 7/3 × $4.31 \times 10^{-4}$ = $1.006 \times 10^{-3}$*
**1**

**M3** moles of $FeC_2O_4$ in 250 $cm^3$ = M2 ans × 10
***M3*** *= $1.006 \times 10^{-3} \times 10 = 1.006 \times 10^{-2}$*
**1**

**M4** Mass of $FeC_2O_4.2H_2O$ = M3 ans × 179.8
***M4*** *= $1.006 \times 10^{-2} \times 179.8 = 1.81$ g*
**1**

**M5** % of $FeC_2O_4.2H_2O$ = (M4 ans/1.381) × 100

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***M5*** *= 1.81 × 100/1.381 = 131 % (130 to 132)*

**1**

(OR for M4 max moles of $FeC_2O_4.2H_2O$ = 1.381/179.8 (= $7.68 \times 10^{-3}$)
for M5 % of $FeC_2O_4.2H_2O$ = (M3 ans/above M4ans) × 100)
eg using correct ratio 5/3:
Moles of $FeC_2O_4 = 5/3 \times 4.31 \times 10^{-4} = 7.19 \times 10^{-4}$
Moles of $FeC_2O_4$ in 250 $cm^3 = 7.19 \times 10^{-4} \times 10 = 7.19 \times 10^{-3}$
Mass of $FeC_2O_4.2H_2O = 7.19 \times 10^{-3} \times 179.8 = 1.29$ g
% of $FeC_2O_4.2H_2O$ = 1.29 × 100/1.381 = 93.4 (allow 92.4 to 94.4)
Note correct answer ( 92.4 to 94.4) scores 5 marks

*Allow consequentially on candidate's ratio*

*eg* ***M2*** *= 5/2 × 4.31 × $10^{-4}$ = 1.078 × $10^{-3}$*

***M3*** *= 1.0078 × $10^{-3}$ × 10 = 1.078 × $10^{-2}$*

***M4*** *= 1.078 × $10^{-2}$ × 179.8 = 1.94 g*

***M5*** *= 1.94 × 100/1.381 = 140 % (139 to 141)*

*Other ratios give the following final % values*

*1:1 gives 56.1% (55.6 to 56.6)*

*5:1 gives 281% (278 to 284)*

*5:4 gives 70.2% (69.2 to 71.2)*

**[10]**

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Q2.

(a) (i) Flask with side arm

**1**

Buchner funnel and horizontal filter paper

*Allow Hirsch funnel and horizontal filter paper.*

*Do not allow standard Y-shaped funnel.*

*If there is not a clear air-tight seal (labelled or drawn) between the funnel and the flask maximum 1 mark.*

**1**

(ii) $M_r$ $KMnO_4$ = 158(.0)

**1**

Mass = 0.225 × 158 / 3 = 11.9 (g)

*Lose M2 if no working shown.*

*Allow consequential mark on an incorrect $M_r$ for $KMnO_4$*

**1**

Precision mark: three significant figures

*Allow if mass incorrect.*

**1**

(iii) (Unpleasant) taste

*Ignore smell.*

**1**

(b) Difficult to see meniscus / line on graduated flask

*Do not allow reference to over filling.*

**1**

**[7]**

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