

Name of the Student: _____

Max. Marks : 15 Marks

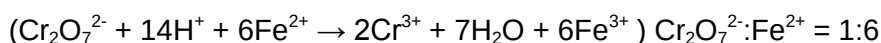
Time : 15 Minutes

Mark Schemes

Q1.

(a) moles of $\text{Cr}_2\text{O}_7^{2-}$ per titration = $21.3 \times 0.0150 / 1000 = \underline{3.195 \times 10^{-4}}$

1



If 1:6 ratio incorrect cannot score M2 or M3

1

moles of $\text{Fe}^{2+} = 6 \times 3.195 \times 10^{-4} = 1.917 \times 10^{-3}$

Process mark for M1 $\times 6$ (also score M2)

1

original moles in $250 \text{ cm}^3 = 1.917 \times 10^{-3} \times 10 = 1.917 \times 10^{-2}$

Process mark for M3 $\times 10$

1

mass of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O} = 1.917 \times 10^{-2} \times 277.9 = 5.33 \text{ (g)}$

Mark for answer to M4 $\times 277.9$

(allow 5.30 to 5.40)

*Answer **must** be to at least 3 sig figs*

Note that an answer of 0.888 scores M1, M4 and M5 (ratio 1:1 used)

1

- (b) (Impurity is a) reducing agent / reacts with dichromate / impurity is a version of FeSO_4 with fewer than 7 waters (not fully hydrated)

Allow a reducing agent or compound that that converts Fe^{3+} into Fe^{2+}

1

Such that for a given mass, the impurity would react with more dichromate than a similar mass of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$

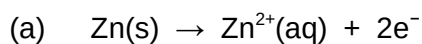
OR for equal masses of the impurity and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, the impurity would react with more dichromate.

Must compare mass of impurity with mass of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$

1

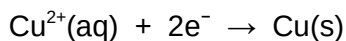
[7]

Q2.



*If equations reversed, allow **M1** only.*

1



Ignore state symbols.

1

(b) Moles of copper(II) reacted = $(100 / 1000) \times 0.5 = 0.05$

1

Moles of zinc reacted = 0.05

1

Mass of zinc lost = $0.05 \times 65.4 = 3.27 \text{ g}$

*Correct final answer without working scores **M3** only.*

1

(c) Allow cell to discharge until $[\text{Cu}^{2+}]$ is 0.5

Alternative: Allow cell to discharge completely.

1

Confirmed by colorimetric measurement or other suitable method

Solution colourless or use of chemical test to determine absence of copper(II)

1

Weigh the Zn electrode before and after the experiment

Weigh Zn electrodes before and after and halve the mass change.

1

[8]