

Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Mark Schemes

Q1.

(a) **M1** Amount of $\text{S}_2\text{O}_3^{2-} = \frac{9.00 \times 0.0800}{1000} = 7.20 \times 10^{-4} \text{ mol}$

1

(From equations $\text{mol S}_2\text{O}_3^{2-} = \text{mol Cu}^{2+}$)

M2 Amount of Cu^{2+} in $25 \text{ cm}^3 = 7.20 \times 10^{-4} \text{ mol}$

M2 = answer to **M1** (1:1 ratio)

1

M3 Amount of Cu^{2+} in $250 \text{ cm}^3 = 7.20 \times 10^{-4} \times 10 = 7.20 \times 10^{-3} \text{ mol}$

M3 = **M2** $\times 10$

1

M4 Mass of copper = $7.20 \times 10^{-3} \text{ mol} \times 63.5 = 0.457 \text{ g}$

M4 = **M3** $\times 63.5$

1

M5 mass = 0.985 g

M5 converting 985 mg to g

1

% Cu = $0.457 \times \frac{100}{0.985} = 46.4 \%$

M6**M6** is for the answer to **3 sf**

Allow **% Cu** = $457 \times \frac{100}{985} = 46.4 \%$ for **M5** and **M6**

Allow $(\text{M4} \times 1000) / 985 \times 100$ for **M5** and **M6**

1

(b) Use more of the alloy

1

Use a lower concentration of the thiosulfate solution/lower mass of $\text{Na}_2\text{S}_2\text{O}_3$ to make solution

1

(c) Oxidizing agent

Allow electron acceptor

1

(d) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9$ Do not allow $[\text{Ar}]3d^9$

1

(e) Full (3)d (sub)shell or (3)d¹⁰

1

No (d-d) transitions possible/ cannot absorb visible/white light

M2 is dependent on **M1**

Ignore reflects visible/white light

1

(f) **M1**: $n = (5.00/253.8) = 0.0197 \text{ mol}$

Allow 254

If 126.9 or 127 used lose **M1** only

1

M2: $T = 458 \text{ K}$ and $P = 100\,000 \text{ Pa}$

1

M3 $V = \frac{nRT}{P} \text{ or } \frac{0.0197 \times 8.31 \times 458}{100\,000} \text{ or } 7.50 \times 10^{-4} \text{ (m}^3\text{)}$

M3 If rearrangement incorrect can only score **M1** and **M2**

1

M4: $V = 750 \text{ (cm}^3\text{)}$

M4: Allow **M3** $\times 10^6$

M4: Allow 749

1

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Q2.

- (a) Repeating pattern/trends (of physical or chemical properties/reactions)

Allow named property

Penalise groups

1

- (b) Bromine/Br

Not Br₂

Accept Kr or Krypton

1

- (c) Potassium /K

*If Na or Rb lose **M1** but allow access to **M2** and **M3***

If other incorrect elements 0/3

1

Smallest number of protons/smallest nuclear charge

1

Similar shielding / same number of shells (as other elements in period 4)

Allow same shielding

1

- (d) Amphoteric

1

- (e) $\text{As}_2\text{O}_3 + 6 \text{Zn} + 12 \text{HNO}_3 \rightarrow 2 \text{AsH}_3 + 6 \text{Zn}(\text{NO}_3)_2 + 3 \text{H}_2\text{O}$

Accept multiples

1

[7]