

Name of the Student: _____

Max. Marks : 17 Marks

Time : 17 Minutes

Mark Schemes

Q1.

(a) More shells

OR

more energy levels.

*Allow Ca has 4 shells and Mg has 3 shells**Do not accept more outer shells**Ignore shielding**Ignore subshells/orbitals/more electrons*

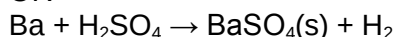
1

(b) $\text{Mg(s)} + \text{H}_2\text{O(g)} \rightarrow \text{MgO(s)} + \text{H}_2\text{(g)}$ *State symbols required**Allow multiples*

1

(c) **M1** (Ba is more reactive) because outer/valence electrons further from nucleus/less attracted to the nucleus/lost more easily**M2** Insoluble barium sulfate (is formed)

OR

**M3** Barium sulfate prevents further reaction (with sulfuric acid)

OR

Barium gets coated with barium sulfate (so no more barium reacts)

3

(d) **M1** $P = 100\,000\text{ Pa}$ and $V = 348 \times 10^{-6}\text{ m}^3$

$$\text{M2 } n = \frac{PV}{RT} \text{ Or } \frac{100\,000 \times 348 \times 10^{-6}}{8.31 \times 298}$$

$$\text{M3 } n = 0.01405\text{ mol}$$

$$\text{M4 } n \text{ metal nitrate} = 0.01405 \times \frac{2}{5} = 5.62 \times 10^{-3}\text{ mol}$$

$$\text{M4 } = \text{M3} \times \frac{2}{5}$$

$$\text{M5 } M_r \text{ metal nitrate} = \frac{0.832}{5.62 \times 10^{-3}} = 148(.0)$$

$$\text{M5 } = 0.832 \div \text{M4}$$

$$\text{M6 } A_r \text{ of metal} = 148.0 - (2 \times 14 + 2 \times 48) = 24(.0) = \text{Mg}$$

$$\text{M6 } = \text{M5} - 124 \text{ and identity of a metal with } 2+ \text{ oxidation state}$$

6

- (e) **M1** $\text{Na} + \text{Al} + 2 \text{H}_2 \rightarrow \text{NaAlH}_4$
M2 contains oppositely charged ions/ Na^+ and AlH_4^- ions
M3 strong attraction between (oppositely charged) ions
3
- (f) $3 \text{NaOH} + \text{H}_3\text{PO}_4 \rightarrow \text{Na}_3\text{PO}_4 + 3 \text{H}_2\text{O}$
Allow multiples and ignore state symbols
1
- (g) $\text{Li}^+ + \text{CoO}_2 + \text{e}^- \rightarrow \text{Li}^+(\text{CoO}_2)^-$
Allow Li(CoO₂) as product
1
- (h) The electrode reactions can be reversed (by applying a reverse potential)
Allow reaction is reversible (by applying a reverse potential)
1
- [17]