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) $Mg(s) + H_2O(g) \rightarrow MgO(s) + H_2(g)$

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
$Ba + H_2SO_4 \rightarrow BaSO_4(s) + H_2$
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 Pa and V = 348×10^{-6} m^3

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

M3 n = 0.01405 mol

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

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

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

M5 = 0.832 ÷ M4

M6 A_r of metal = 148.0 - (2 × 14 +2 × 48) = 24(.0) = Mg

M6 = M5 - 124 ***and*** *identity of a metal with 2+ oxidation state*

6

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(e) **M1** $Na + Al + 2\ H_2 \rightarrow NaAlH_4$

M2 contains oppositely charged ions/ Na^+ and AlH_4^- ions

M3 strong <u>attraction</u> between (oppositely charged) ions

3

(f) $3\ NaOH + H_3PO_4 \rightarrow Na_3PO_4 + 3\ H_2O$

Allow multiples and ignore state symbols

1

(g) $Li^+ + CoO_2 + e^- \rightarrow Li^+(CoO_2)^-$

Allow $Li(CoO_2)$ 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]

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