M1. (a) $Mg + 2HCl \rightarrow MgCl_2 + H_2$

1

$MgO + 2HCl \rightarrow MgCl_2 + H_2O$

Allow ionic equations

1

(b) Hydrogen collection

Using a gas syringe or measuring cylinder/ graduated vessel over water

Allow if shown in a diagram

1

Measurements (i) P 1
(ii) T 1
(iii) V 1

Use ideal gas equation to calculate mol hydrogen or mass/*M*r

Mol H_2 = mol Mg (Mark consequentially to equation)

2

(c) $MgCl_2 + 2NaOH \rightarrow Mg(OH)_2 + 2NaCl$ Species

1

Balanced

1

Allow an ionic equation

$Mg(OH)_2 \rightarrow MgO + H_2O$

1

(d) ***Allow 2 significant figures in these calculations and ignore additional figures***

EITHER

Mol MgO obtained stage 2 = mass MgO/*M*rMgO

1

= 6.41/ 40.(3) = 0.159 *Allow 0.16*

Allow method mark if formula of magnesium oxide or M_r incorrect

1

Moles of Mg = moles of H_2 hence

Mol original MgO = mol MgO from stage 2 - mol H_2

1

= 0.159 – 0.0528 = 0.106 *Allow 0.11*

Mark consequentially to moles of magnesium oxide determined above

OR

Mass MgO formed from Mg = 0.0528 × M_r MgO {or 40.(3)} **(1)**

= 2.13 g

Allow 2.1 ***(1)***

Allow method mark if formula of magnesium oxide or Mr incorrect

Mass original MgO = total mass MgO - mass formed from Mg **(1)**

= 6.41 – 2.13 = 4.28 g *Allow 4.3* **(1)**

Mark consequentially mass of magnesium oxide determined above

NB

As there is an error in part (d), the mass of sample should have been 6.25 NOT 2.65, award full marks to any candidate who has crossed out their correct first answer.

1

[15]

M2. *Ideal gas equation*: pV = nRT **(1)**

Calculation: n = pV/RT = $\frac{103000 \times 127 \times 10^{-6}}{(8.31 \times 415)}$ **(1)**

mark for volume conversion fully correct

= 3.79 × 10^{-3} (mol) **(1)**

range 3.79 × 10^{-3} to 3.8 × 10^{-3}

M_r = m/n = .304/3.79 × 10^{-3} = 80.1 **(1)**

range 80 – 80.3
min 2 s.f. conseq

If 'V' wrong lose M2; 'p' wrong lose M3; 'inverted' lose M3 and M4

[5]

M3.D

[1]

M4.D

[1]