

- M1.** (a) $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$ 1
- $\text{MgO} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$
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/Mr
 Mol $\text{H}_2 = \text{mol Mg}$ (Mark consequentially to equation) 2
- (c) $\text{MgCl}_2 + 2\text{NaOH} \rightarrow \text{Mg(OH)}_2 + 2\text{NaCl}$ Species 1
- Balanced 1
Allow an ionic equation
- $\text{Mg(OH)}_2 \rightarrow \text{MgO} + \text{H}_2\text{O}$ 1
- (d) ***Allow 2 significant figures in these calculations and ignore additional figures***
- EITHER
- Mol MgO obtained stage 2 = mass MgO/MrMgO 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

$$= 0.159 - 0.0528 = 0.106 \text{ Allow } 0.11$$

Mark consequentially to moles of magnesium oxide determined above

OR

$$\text{Mass MgO formed from Mg} = 0.0528 \times M_r \text{ MgO} \{ \text{or } 40.(3) \} \quad (1)$$

$$= 2.13 \text{ g}$$

Allow 2.1 (1)

Allow method mark if formula of magnesium oxide or M_r incorrect

$$\text{Mass original MgO} = \text{total mass MgO} - \text{mass formed from Mg} \quad (1)$$

$$= 6.41 - 2.13 = 4.28 \text{ g} \quad \text{Allow } 4.3 \quad (1)$$

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.

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

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

mark for volume conversion fully correct

$$= 3.79 \times 10^{-3} \text{ (mol)} \quad (1)$$

range 3.79×10^{-3} to 3.8×10^{-3}

$$M_r = m/n = .304 / 3.79 \times 10^{-3} = 80.1 \quad (1)$$

*range 80 – 80.3
min 2 s.f. conseq*

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

M3.D

[1]

M4.D

[1]