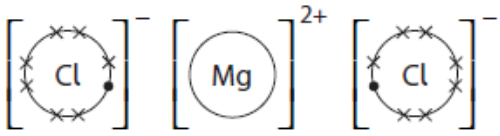
Metallic Bonding - Questions by Topic

Q1.

Question number	Answer	Mark
	The only correct answer is C (ions and delocalised electrons) ***A*** *is incorrect because this is ionic bonding* ***B*** *is incorrect because atoms do not attract delocalised electrons* ***D*** *is incorrect because this is covalent bonding*	**(1)**

Q2.

Question number	Answer	Additional guidance	Mark
(a)	• dot-and-cross diagram, including charges	Example of diagram:  Allow no electrons or 8 electrons on outer shell of Mg Allow any combination of dots or crosses for electrons Ignore missing square brackets	1

Question number	Answer	Additional guidance	Mark
(b)	An explanation that makes reference to the following points: • identification of charge carriers: magnesium - electrons **and** magnesium chloride - ions **(1)** • magnesium conducts electricity when solid because delocalised electrons can flow through **(1)** • magnesium chloride does not conduct when solid because the ions cannot move **and** it does conduct electricity when molten or dissolved in water as the ions can move. **(1)**		**3**

Question number	Answer	Additional guidance	Mark
(c)(i)	• correct balanced ionic equation with state symbols	Examples of equation: $MgO(s) + 2H^+(aq) \rightarrow Mg^{2+}(aq) + H_2O(l)$ or $MgO(s) + 2H_3O^+(aq) \rightarrow Mg^{2+}(aq) + 2H_2O(l)$	1

Question number	Answer	Additional guidance	Mark
(c)(ii)	• calculation of moles of MgO (1) • calculation of moles of HCl (1) • calculation of volume of HCl (1)	Example of calculation: moles MgO = $\frac{2.45}{40.3}$ = 0.060794 moles HCl = 2 × 0.060794 = 0.121588 volume HCl = 0.121588 × $\frac{1000}{2.00}$ = 60.794 cm^3 Ignore SF except 1 SF Allow use of A_r(Mg) = 24 (61.25 cm^3) Correct answer with no working scores full marks	3

Question number	Answer	Additional guidance	Mark
(d)	Either • calculation of moles of $MgCO_3$ (1) • calculation of mass of $MgCl_2$ (1) or • use of both molar masses (1) • calculation of mass of $MgCl_2$ (1)	Example of calculation: moles $MgCO_3$ = $\frac{2.25}{84.3}$ = 0.02669 mass $MgCl_2$ = 0.02669 × 95.3 = 2.5436 (g) or 84.3 g $MgCO_3$ makes 95.3 g $MgCl_2$ so 2.25 g $MgCO_3$ makes $\frac{95.3}{84.3}$ × 2.25 = 2.5436 (g) $MgCl_2$ Ignore SF except 1 SF Allow use of A_r(Mg) = 24 (2.5446 g) Correct answer with no working scores full marks	2

Question number	Answer	Additional guidance	Mark
(e)	An explanation that makes reference to the following points: • (in the reaction with magnesium oxide) there are fewer waste products/no carbon dioxide is released/water is the only waste product (1) • so the molar mass of all products is lower/the denominator of the equation for atom economy is lower (1) or • 1 mol of magnesium compound produces 1 mol of magnesium chloride (1) • but the M_r of magnesium carbonate is greater than the M_r of magnesium oxide/carbon dioxide is an additional waste product from magnesium carbonate. (1)	Ignore calculations Allow reverse arguments	2