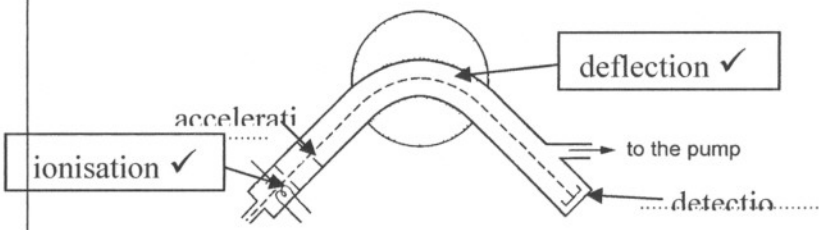
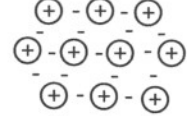
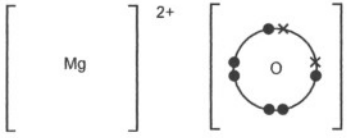


Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit () = words which are not essential to gain credit <u> </u> = (underlining) key words which must be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument																
Question	Expected Answers	Marks															
1 (a) (i) (ii) (iii) (iv)	 <table border="1"> <tr> <td></td> <td>protons</td> <td>neutrons</td> <td>electrons</td> <td></td> </tr> <tr> <td>²⁵Mg</td> <td>12</td> <td>13</td> <td>12</td> <td>✓</td> </tr> <tr> <td>²⁶Mg</td> <td>12</td> <td>14</td> <td>12</td> <td>✓</td> </tr> </table> <p>$1s^2 2s^2 2p^6 3s^2$ ✓</p> <p>$24 \times 78.60/100 + 25 \times 10.11/100 + 26 \times 11.29/100$ ✓ = 24.33 ✓ (calc value: 24.3269. This scores one mark) 24.32 with no working, award 1 mark only. 24.3 with no working, no marks (Periodic Table value)</p>		protons	neutrons	electrons		²⁵ Mg	12	13	12	✓	²⁶ Mg	12	14	12	✓	 [2] [2] [1] [2]
	protons	neutrons	electrons														
²⁵ Mg	12	13	12	✓													
²⁶ Mg	12	14	12	✓													
(b) (i) (ii)	 <p>positive ions ✓ electrons ✓ (must be labelled) If Mg²⁺ shown then must be correct: Mg⁺ not worthy electrons move ✓</p>	 [2] [1]															
(c) (i) (ii)	<p>Oxidation state goes from 0 in O₂ ✓ → -2 in MgO ✓</p>  <p>or with Mg full shell. correct dot and cross ✓; correct charges ✓</p>	 [2] [2]															
(d) (i) (ii)	<p>MgO has reacted with CO₂ ✓</p> <p>Solid dissolves / disappears ✓ Fizzing / bubbles ✓</p> <p>$MgO + 2HCl \longrightarrow MgCl_2 + H_2O$ ✓ $MgCO_3 + 2HCl \longrightarrow MgCl_2 + CO_2 + H_2O$ ✓ both reactions form magnesium chloride/MgCl₂ ✓</p>	 [1] [2] [3]															
		Total: 20															

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Question	Expected Answers	Marks								
2 (a) (i)	mark vertically: <table style="margin-left: auto; margin-right: auto;"> <tr> <td>H₂O</td> <td>NH₃</td> </tr> <tr> <td>2</td> <td>3</td> </tr> <tr> <td>2</td> <td>1</td> </tr> <tr> <td>✓</td> <td>✓</td> </tr> </table>	H ₂ O	NH ₃	2	3	2	1	✓	✓	[2]
H ₂ O	NH ₃									
2	3									
2	1									
✓	✓									
(ii)	3D Diagram required or diagram with name labelled bond angle required NH ₃ pyramidal molecule shown ✓ 107 ° ✓ (106-108°) SO ₂ non-linear molecule shown ✓ 110 - 130 ° ✓	[4]								
(b) (i)	oxygen/ nitrogen is more electronegative/ molecule has atoms with different electronegativities /oxygen/more electronegative atom ... attracts bonded electron pair more ✓	[1]								
(ii)	H bonding from N of 1 NH ₃ molecule to H of another NH ₃ molecule with a H ^{δ+} shown and a N ^{δ-} shown ✓ with lone pair involved in bond ✓ 2nd mark is available from water molecule(s)	[2]								
(c)	ice is less dense than water ✓ hydrogen bonds hold H ₂ O molecules apart in ice / hydrogen bonds cause an open lattice structure ✓	[2]								
(d) (i)	ratio N : H : S : O = $\frac{24.12}{14} : \frac{6.94}{1} : \frac{27.61}{32.1} : \frac{41.33}{16} : \checkmark$ = 2 : 8 : 1 : 3 Empirical formula = N ₂ H ₈ SO ₃ ✓ N ₂ H ₄ SO ₃ is worth 1 mark from consistent use of at nos.	[2]								
(ii)	H ₂ O + 2NH ₃ + SO ₂ → (NH ₄) ₂ SO ₃ ✓ (Award mark for N ₂ H ₈ SO ₃)	[1]								
		Total: 14								

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Question	Expected Answers	Marks
3 (a) (i)	goes yellow/orange/brown ✓	[1]
(ii)	$\text{Cl}_2 + 2\text{Br}^- \longrightarrow \text{Br}_2 + 2\text{Cl}^-$ ✓ ✓ <i>OR</i> $\text{Cl}_2 + 2\text{KBr} \longrightarrow \text{Br}_2 + 2\text{KCl}$ 1 mark for species. 1 mark for balancing	[2]
(iii)	An electron is being gained ✓ Cl atoms are smaller/less shells (ora) ✓ In Cl, attraction for electrons is greater ✓	[3]
(b) (i)	Amount of substance that has the same number of particles as there are atoms in 12 g of ^{12}C / 6×10^{23} / Avogadro's Number ✓	[1]
(ii)	moles = $\frac{0.275 \times 120}{1000} = 0.0330$ mol ✓	[1]
(iii)	moles $\text{Cl}_2 = \frac{0.0330}{2} = 0.0165$ mol ✓ volume $\text{Cl}_2 = 0.0165 \times 24000 = 396 \text{ cm}^3$ ✓ / 0.396 dm^3 792 cm^3 worth 1 mark (no molar ratio) 1584 cm^3 worth 1 mark (x 2) units needed.	[2]
(iv)	bleach / disinfectant /sterilising /killing germs ✓	[1]
(c)	NaClO_3 ✓	[1]
		Total: 12

