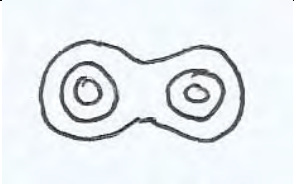
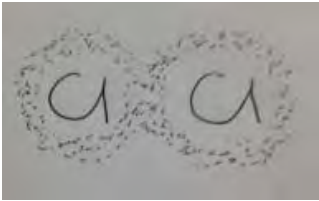


Question Number	Acceptable Answers	Reject	Mark
1(a)	 <p>Drawing must have at least 1 circle around each chlorine atom</p> <p>OR</p>  <p>Random dots to indicate electron density around both chlorine atoms and a concentrated area between the atoms</p>		1

Question Number	Acceptable Answers	Reject	Mark
1(b)	<p>(Electrostatic) attraction between oppositely charged ions</p> <p>IGNORE comments on the formation of ions</p>		1

	<p>evolved is stated then it must have the correct sign or charge, although it is not necessary to name or give a sign for the electrode, ie chlorine at the electrode with a positive sign and hydrogen at the electrode with a negative sign.</p> <p>Use of other ionic compounds can only score MP2</p>		
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Question Number	Acceptable Answers	Reject	Mark
1(d)(i)	<p>Correct dot and cross diagram with charge</p> <p>Example</p> <pre> XX [] - XX Cl X• [] XX </pre> <p>ALLOW all dots or all crosses</p> <p>IGNORE any sodium dot and cross diagram</p>		1

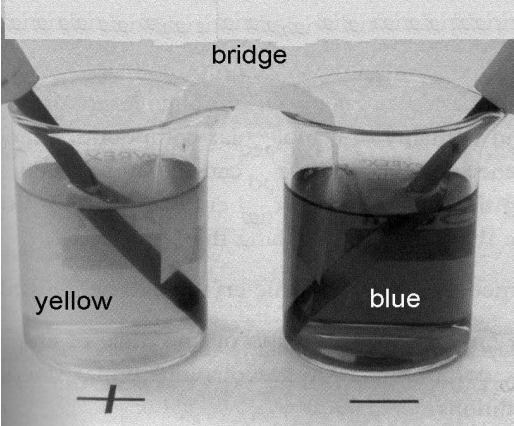
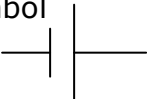
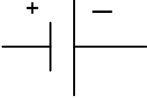
Question Number	Acceptable Answers	Reject	Mark
1(d)(ii)	(Isoelectronic example) $S^{2-}/S^{-2}/P^{3-}/P^{-3}$	$Si^{4+}/K^{+}/Ca^{2+}/Ar$	1

Question Number	Acceptable Answers	Reject	Mark
11(e)	<p>Marking point 1 Sodium conducts when solid (and liquid/molten) (1)</p> <p>Marking point 2 Sodium chloride conducts when molten (and in solution but not as a solid) (1)</p> <p>Marking point 3 Charge carriers in sodium are (delocalised) electrons but ions in sodium chloride</p> <p>OR</p> <p>Conductivity in sodium due to the movement of (delocalised) electrons but the movement of ions in sodium chloride (1)</p>	Sodium in solution/dissolved	3

Question Number	Acceptable Answers	Reject	Mark
2 (a)	<p>(i) Structure Lattice /close-packed (1)</p> <p>(or a diagram with at least 3 rows)</p> <p>positive ions or cations (allow metal ions) (1)</p> <p>delocalized electrons / sea of electrons (1)</p> <p>(ii) Bond (Electrostatic) attraction between positive ions / cations (allow metal ions) and delocalized electrons / sea of electrons (1)</p>	layers protons 'free' electrons	4

Question Number	Acceptable Answers	Reject	Mark
2 (b)	<p>Any three from</p> <ol style="list-style-type: none"> 1. Magnesium ion / Mg^{2+} (allow magnesium) has a larger charge (density) than the sodium ion (allow sodium) / Na^+ some comparison of the ions is required (1) 2. magnesium ions / Mg^{2+} smaller than sodium ions (1) 3. Magnesium / Mg^{2+} contributes two / more electrons (per atom) to the "sea" of electrons (1) 4. magnesium ions / Mg^{2+} have greater attraction for the delocalized "sea" of electrons (1) <p>Ignore reference to number of outer electrons in Mg / Na Any references to the bonding being ionic, covalent or intermolecular (max 2)</p> <p>Reverse argument can gain full marks</p>	<p>Just Mg^{2+} and Na^+</p> <p>More bonds</p>	3

Question Number	Acceptable Answers	Reject	Mark
2 (c)	The delocalized electrons / sea of electrons (1) Flow (allow move / free to move) (1) (When a potential difference/voltage is applied) 'Carry the current' is not sufficient for the mark	'free' electrons	2

Question Number	Acceptable Answers	Reject	Mark
3(a)	<p>First mark: Diagram showing U-tube OR filter paper on a microscope slide OR electrodes in a beaker OR other feasible set-up such as</p>  <p>but a + and a – sign must be shown somewhere on the diagram by signs or words, positive and negative.</p> <p>NOTES If set-up in the picture above is used, in addition to the + and – signs a bridge between the two beakers must also be shown. External circuits do not have to be complete (e.g. wires can be shown attached to a slide, provided the + and – labels included).</p> <p>If the words cathode and/or anode are included, for the first mark to be awarded the cathode must be shown as –ve and/or the anode as +ve</p> <p>If a battery symbol</p>  <p>shown, IGNORE any incorrect polarities, that is</p>  <p>IGNORE any electrode materials EXCEPT Cu^{2+} and/or CrO_4^{2-} (1)</p>		4

	<p>Second mark: Description to include the idea that the ions move/ions are mobile/ions migrate MUST BE IN WORDS</p> <p>ALLOW if description focuses on the movement of one of the ions to the oppositely-charged electrode (1)</p> <p>Third mark: Yellow ion/yellow (colour)/CrO_4^{2-} moves towards the/+ve (electrode)/anode (1)</p> <p>Fourth mark: Blue ion/blue (colour)/Cu^{2+} moves towards cathode /-ve (electrode) (1)</p> <p>Mark CQ on candidate's cathode and anode signs for the 3rd and 4th marks</p>	<p>Just ions are attracted to the electrodes of opposite charge</p>	
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Question Number	Acceptable Answers	Reject	Mark
3(b)(i)	(Forces of attraction between) oppositely-charged ions/positive and negative ions/cations and anions IGNORE comments about electron transfer	Just ionic bonds/ Just "electrostatic forces of attraction"	1

Question Number	Acceptable Answers	Reject	Mark
3(b)(ii)	<p>First mark: Ions of the same charge (repel)/positive ions (repel)/negative ions (repel) (1)</p> <p>Second mark: Nuclei (of the ions repel) ALLOW 'protons' (in the ions repel) OR Electron clouds OR electrons (in the ions repel) (1)</p>	<p>"Magnetic repulsion" negates first mark</p> <p>"Electrons repel nuclei"</p>	2

Question Number	Acceptable Answers	Reject	Mark
3(c)(i)	$\text{Mg}^{2+}(\text{g})$ (1) $\text{O}^{2-}(\text{g})$ (1) Penalise missing /incorrect state symbols once only Max 1 if include "2e ⁻ "		2

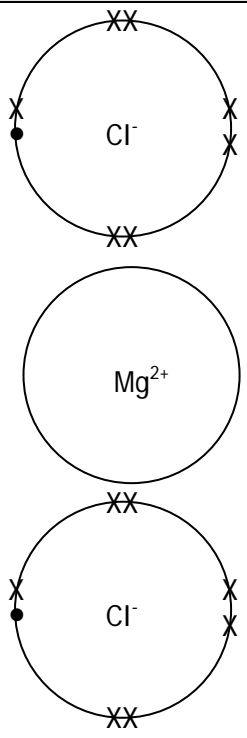
Question Number	Acceptable Answers	Reject	Mark
3(c)(ii)	<p>(A is enthalpy change of) formation (of MgO) (1) ALLOW just "ΔH_f" ALLOW (enthalpy change of) combustion of magnesium</p> <p>(C is) (sum of) first plus second ionization energies (of Mg) / $\text{IE}_1 + \text{IE}_2$ (for Mg) (1)</p> <p>ALLOW "first and second ionization energies (of Mg)"</p> <p>IGNORE references to "standard"</p>	<p>"(enthalpy change of) reaction"</p> <p>Just "ionization energy"/ "second ionization energy" (of Mg)</p>	2

Question Number	Acceptable Answers	Reject	Mark
3(c)(iii)	<p>(F =) A - B - C - D - E NOTE: These letters may be in any order, but the signs MUST be correct</p> <p>ALLOW answers when the enthalpy changes are identified correctly in words or symbols in lieu of the letters</p>		1

Question Number	Acceptable Answers	Reject	Mark
3(d)(i)	<p>First mark: Mg²⁺ AND O²⁻ higher charge / Mg²⁺ AND O²⁻ higher charge density (than Mg⁺ and O⁻) NOTE: both ions needed (1)</p> <p>Second mark: Mg²⁺ smaller (than Mg⁺) (1)</p> <p>IGNORE comparisons of the relative sizes of O⁻ with O²⁻ even if INCORRECT</p> <p>IGNORE any references to polarization (of ions) and/or covalent character</p>	Any mention of 'intermolecular forces' scores (0) overall for this question	2

Question Number	Acceptable Answers	Reject	Mark
3(d)(ii)	<p>(Lattice energy of Mg²⁺O²⁻ is) more exothermic/more negative</p> <p>ALLOW greater/increased/higher/ more/larger/bigger</p> <p>IGNORE "stronger lattice"</p>	"energy required " OR Lower/less/ smaller	1

Question Number	Acceptable Answers	Reject	Mark
4 (a)	(1s ² 2s ²) 2p ⁶ 3s ² 3p ⁵ (ignore repetition of 1s ² 2s ²) <i>ALLOW</i> subscripts, correct use of p_x , p_y and p_z orbitals or normal font for electrons	2 8 7	1

Question Number	Acceptable Answers	Reject	Mark
4 (b) (i)	 <p>Correct number of outer electrons (ignore whether dots and / or crosses) drawn and also ratio of magnesium : chloride ions is 1:2 (1)</p> <p>Correct formulae and charges of the ions shown somewhere (1)</p> <p>NOTE: Diagram for Mg²⁺ showing the outermost shell with 8e⁻ (dots and/or crosses) and/or Cl⁻ shown with a 2 in front or 2 as a subscript would also score both marks</p> <p>Mark the two points independently</p>	Covalent bonding (0)	2

Incorrect numbers of electrons in inner shells if drawn for first mark

"Mg²⁺" and/or "Cl⁻" for second mark

Question Number	Acceptable Answers	Reject	Mark
4 (b) (ii)	<p>4 shared pairs of electrons around the carbon labelled C (1)</p> <p>ALL outer electrons, including lone pairs, are correctly shown on each of the four chlorine atoms labelled Cl (1)</p> <p><i>ALLOW</i> versions without circles</p> <p><i>IGNORE</i> lines between the shared electrons</p> <p>Mark two points independently</p>	Ionic bonding (0)	2

Question Number	Acceptable Answers	Reject	Mark
4 (b) (iii)	<p>(Comparison of) charges: O^{2-} ions whereas Cl^{-} ions</p> <p>OR</p> <p>Statement to the effect that oxide ion has a greater (negative) charge / greater charge density than the chloride ion (1)</p> <p>(so the force of) attraction between ions is stronger in MgO (than $MgCl_2$) / stronger ionic bonding in MgO (than $MgCl_2$) (1)</p> <p>More energy is required to separate the ions in MgO (than $MgCl_2$) / more energy is required to break (ionic) bonds in MgO (than $MgCl_2$) / (1)</p> <p>Mark the above three points independently</p> <p><i>NOTE ALTERNATIVE ANSWER WITH A MAXIMUM OF TWO MARKS:-</i></p> <p>O^{2-} (ions) smaller (than Cl^{-} ions) (1)</p> <p>so (force of) attraction between ions is stronger in MgO (than $MgCl_2$) / stronger ionic bonding in MgO (than $MgCl_2$) (1)</p> <p>Ignore <i>ANY</i> references to polarization of ions / covalent character / degree of covalency.</p> <p>Mark the above two points independently</p>	<p>Use of term chlorine and/or oxygen "atoms" or "molecules" (0) f answer overall</p> <p>"More bonds need to be broken"</p> <p>(0) f answer overall if mentions "intermolecular forces"</p>	3

Question Number	Acceptable Answers	Reject	Mark
4 (c)	<p>First Mark:</p> <p><i>EITHER</i> Magnesium reacts with chlorine to form only magnesium chloride/ magnesium reacts with chlorine to form only one product / magnesium reacts with hydrochloric acid to form hydrogen (as well as magnesium chloride) / magnesium reacts with hydrochloric acid to form more than one product / magnesium reacts with hydrochloric acid to form a waste product</p> <p><i>OR</i></p> <p>Both equations $\text{Mg} + \text{Cl}_2 \rightarrow \text{MgCl}_2$ and $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$ <i>IGNORE</i> state symbols, even if incorrect (1)</p> <p>Second Mark:</p> <p><i>EITHER</i> The reaction with chlorine has an atom economy which is higher /100% ALLOW "high" <i>OR</i> Any mention of numbers comparing 100 % v. 97.9% (1)</p> <p><i>IGNORE</i> any comments about yield</p> <p>Mark the two points independently</p>		2