

Question	Marking Guidance	Mark	Comments
3(a)	<p><u>Enthalpy change</u>/heat energy change when <u>one mole</u> of <u>gaseous atoms</u></p> <p>Form (one mole of) gaseous negative ions (with a single charge)</p>	<p>1</p> <p>1</p>	<p>Allow explanation with an equation that includes state symbols</p> <p>If ionisation/ionisation energy implied, CE=0 for both marks</p> <p>Ignore conditions</p>
3(b)	<p>Fluorine (atom) is smaller than chlorine/shielding is less/ outer electrons closer to nucleus</p> <p>(Bond pair of) electrons attracted more strongly <u>to the nucleus/protons</u></p>	<p>1</p> <p>1</p>	<p>Fluorine molecules/ions/charge density CE=0 for both marks</p>
3(c)	<p>Fluoride (ions) smaller (than chloride) / have larger charge density</p> <p>So (negative charge) attracts ($\delta+$ hydrogen on) water more strongly</p>	<p>1</p> <p>1</p>	<p>Any reference to electronegativity CE=0</p> <p>Allow H on water, do not allow O on water</p> <p>Allow F⁻ hydrogen bonds to water, chloride ion does not</p> <p>Mark independently</p>

3(d)(i)	$\Delta H(\text{solution}) = LE + \Sigma(\text{hydration enthalpies})$ / correct cycle $LE = -20 - (-464 + -506)$ $= (+) 950 \text{ kJ mol}^{-1}$	<p>1</p> <p>1</p> <p>1</p>	<p>AgF₂ or other wrong formula CE = 0</p> <p>Ignore state symbols in cycle</p> <p>Ignore no units, penalise M3 for wrong units</p> <p>-950 scores max 1 mark out of 3</p> <p>990 loses M3 but M1 and M2 may be correct</p> <p>808 is transfer error (AE) scores 2 marks</p> <p>848 max 1 if M1 correct</p> <p>1456 CE=0 (results from AgF₂)</p>
3(d)(ii)	There is an increase in the number of particles / more disorder / less order	1	<p>Allow incorrect formulae and numbers provided number increases</p> <p>Do not penalise reference to atoms/molecules</p> <p>Ignore incorrect reference to liquid rather than solution</p>
3(d)(iii)	<p>Entropy change is positive/entropy increases and enthalpy change negative/exothermic</p> <p>So ΔG is (always) negative</p>	<p>1</p> <p>1</p>	