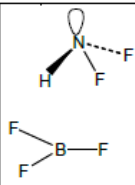
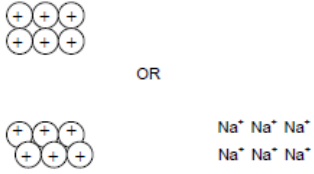


CHERRY HILL TUITION AQA CHEMISTRY AS PAPER 3 MARK SCHEME

2(c)	4.20 g $\text{Ca}(\text{NO}_3)_2$	1													
	<table style="border: none;"> <tr> <td>$\text{Ca}(\text{NO}_3)_2$</td> <td>H_2O</td> </tr> <tr> <td><u>4.20</u></td> <td><u>1.84</u></td> </tr> <tr> <td>164(.1)</td> <td>18</td> </tr> <tr> <td>0.0256</td> <td>0.102</td> </tr> <tr> <td>1</td> <td>: 3.98</td> </tr> <tr> <td>$x = 4$</td> <td></td> </tr> </table>	$\text{Ca}(\text{NO}_3)_2$	H_2O	<u>4.20</u>	<u>1.84</u>	164(.1)	18	0.0256	0.102	1	: 3.98	$x = 4$		1	Mark is for dividing by the correct M_r values M2 and M3 dependent on correct M1 M2 can be awarded here instead
	$\text{Ca}(\text{NO}_3)_2$	H_2O													
	<u>4.20</u>	<u>1.84</u>													
	164(.1)	18													
0.0256	0.102														
1	: 3.98														
$x = 4$															
		1	If $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ seen with working then award 3 marks Credit alternative method which gives $x = 4$												

Question	Marking Guidance	Mark	Comments
3(a)	Iodine has more electrons / iodine is bigger (atom or molecule) / iodine has bigger M_r / bigger surface area <u>Stronger / more</u> van der Waals forces / vdw / London / temporarily induced dipole / dispersion forces <u>between molecules</u>	1	
		1	Stronger VdW intermolecular forces = M2 If stated VdW between atoms lose M2
3(b)(i)	 <p>NHF₂ shape - pyramidal / trigonal pyramid BF₃ shape - <u>trigonal planar</u></p>	1	Mark is for 3 bp and 1 lp attached to N (irrespective of shape)
		1	Mark is for 3 bp and 0 lp attached to B (irrespective of shape)
		1	Accept tetrahedral / triangular pyramid
		1	Not triangular or triangular planar
3(b)(ii)	107°	1	Allow 106-108°
3(c)	Hydrogen bonds	1	Allow H-Bonds Not just Hydrogen Apply list principle eg Hydrogen bonding and dipole-dipole = 0
3(d)	Coordinate / dative covalent / dative	1	If covalent mark on If ionic / metallic CE = 0
	Lone pair / both electrons / 2 electrons <u>on N(HF₂)</u> donated (to BF ₃)	1	Direction of donation needed here

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Question	Marking Guidance	Mark	Comments
4(a)(i)	Metallic	1	Allow body centred cubic
4(a)(ii)		1	One mark for regular arrangement of particles. Can have a space between them Do not allow hexagonal arrangement
		1	One mark for + in each Ignore electrons If it looks like ionic bonding then CE = 0/2
4(b)(i)	Ionic	1	CE = 0 for 4(b)(i) and 4(b)(ii) if not ionic
4(b)(ii)	Strong (electrostatic) attraction	1	Any mention of IMF or molecules / metallic / covalent in 4(b)(ii) then CE 0/2
	Between <u>oppositely</u> charged ions / particles	1	Or + and – ions
4(c)	Iodide / I ⁻ bigger (ion) (so less attraction to the Na ⁺ ion)	1	Need comparison Do not allow iodine is a bigger atom Ignore I ⁻ has one more e- shell CE = 0 if IMF / covalent / metallic mentioned

Question	Marking Guidance	Mark	Comments
5(a)	$\text{Li(g)} \rightarrow \text{Li}^{\text{+}}(\text{g}) + \text{e}^{\text{-}}(\text{g})$ $\text{Li(g)} - \text{e}^{\text{-}}(\text{g}) \rightarrow \text{Li}^{\text{+}}(\text{g})$ $\text{Li(g)} + \text{e}^{\text{-}}(\text{g}) \rightarrow \text{Li}^{\text{+}}(\text{g}) + 2\text{e}^{\text{-}}$	1	One mark for balanced equation with state symbols Charge and state on electron need not be shown

Question	Marking Guidance	Mark	Comments
6 (a)(i)	M1 (could be scored by a correct mathematical expression which <u>must</u> have <u>all</u> ΔH_f symbols and the Σ or SUM) M1 $\Delta H_f = \Sigma \Delta H_f(\text{products}) - \Sigma \Delta H_f(\text{reactants})$ OR a <u>correct cycle of balanced equations with 1C, 3H₂ and 1O₂</u>	3	Correct answer gains full marks Credit 1 mark ONLY for + 49 (kJ mol ⁻¹) For other incorrect or incomplete answers, proceed as follows <ul style="list-style-type: none"> check for an arithmetic error (AE), which is either a transposition error or an incorrect multiplication; this would score 2 marks (M1 and M2) If no AE, check for a correct method; this requires either correct cycle of balanced equations with 1C, 3H₂ and 1O₂ OR a clear statement of M1 which could be in words and scores <u>only M1</u>
	M2 $\Delta H_f = -201 + (-242) - (-394)$ $\Delta H_f = -201 - 242 + 394$ $\Delta H_f = -443 + 394$ (This also scores M1)		
	M3 = - 49 (kJ mol ⁻¹) (Award 1 mark ONLY for + 49)		
(a)(ii)	It is an element / elemental OR By definition	1	Ignore reference to "standard state"

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(b)	<p>M1 (The yield) increases / goes up / gets more</p> <p>M2 There are <u>more moles / molecules</u> (of gas) on the left / of reactants <i>OR</i> <u>fewer moles / molecules</u> (of gas) on the right / products <i>OR</i> there are <u>4 moles / molecules</u> (of gas) on the left and <u>2 moles / molecules</u> on the right. <i>OR</i> (equilibrium) shifts / moves <u>to the side with less moles / molecules</u></p> <p>M3: Can only score M3 if M2 is correct The (position of) <u>equilibrium shifts / moves</u> (from left to right) to <u>oppose the increase in pressure</u></p>	3	<p>If M1 is given as "decreases" / "no effect" / "no change" then CE= 0 for clip, but mark on only M2 and M3 from a blank M1</p> <p>Ignore "volumes", "particles" "atoms" and "species" for M2</p> <p>For M3, <u>not</u> simply "to oppose the change" For M3 credit the <u>equilibrium shifts / moves</u> (to right) to <u>lower / decrease the pressure</u> (There must be a <u>specific</u> reference to the change that is opposed)</p>
(c)	<p>M1 Yield increases / goes up</p> <p>M2 The (forward) reaction / to the right is <u>endothermic</u> OR <u>takes in / absorbs heat</u> <i>OR</i> The reverse reaction / to the left is <u>exothermic</u> OR <u>gives out / releases heat</u></p> <p>Can only score M3 if M2 is correct</p> <p>M3 The (position of) <u>equilibrium shifts / moves</u> (from left to right) to <u>oppose the increase in temperature</u> (QoL)</p>	3	<p>If M1 is given as "decrease" / "no effect" / "no change" then CE= 0 for clip, but mark on only M2 and M3 from a blank M1</p> <p>For M3, <u>not</u> simply "to oppose the change" For M3, credit the (position of) <u>equilibrium shifts / moves</u> (QoL) to <u>absorb the heat</u>, OR to <u>cool the reaction</u> OR to <u>lower the temperature</u> (There must be a <u>specific</u> reference to the change that is opposed)</p>