

3 Fluorine and iodine are elements in Group 7 of the Periodic Table.

3 (a) Explain why iodine has a higher melting point than fluorine.

.....

 (Extra space)..... (2 marks)

3 (b) (i) Draw the shape of the NHF_2 molecule and the shape of the BF_3 molecule. Include any lone pairs of electrons that influence the shape. In each case name the shape.

Shape of NHF_2

Shape of BF_3

Name of shape of NHF_2

Name of shape of BF_3 (4 marks)

3 (b) (ii) Suggest a value for the F-N-F bond angle in NHF_2

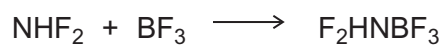
..... (1 mark)

3 (c) State the strongest type of intermolecular force in a sample of NHF_2

..... (1 mark)



3 (d) A molecule of NHF_2 reacts with a molecule of BF_3 as shown in the following equation.



State the type of bond formed between the N atom and the B atom in F_2HNBF_3
Explain how this bond is formed.

Name of type of bond

How bond is formed

.....

.....

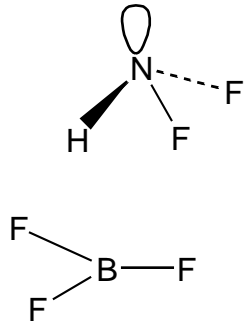
(2 marks)

10

Turn over for the next question

Turn over ►



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	1	Stronger VdW intermolecular forces = M2 If stated VdW between atoms lose M2
	<u>Stronger / more van der Waals forces / vdw / London / temporarily induced dipole / dispersion forces <u>between molecules</u></u>	1	
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 Lone pair / both electrons/ 2 electrons <u>on N(HF₂)</u> donated (to BF ₃)	1 1	If covalent mark on If ionic / metallic CE = 0 Direction of donation needed here
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