**Bonding and Periodicity – Homework 4**

**1.** (a) What is a covalent bond?

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(1)

(b) Draw diagrams to show the shapes of the following molecules and in each case show the value of the bond angle on the diagram.

BeCl2 BF3

CCl4 SF6

(8)

(c) Explain why the shape of NF3 is not the same as the shape of BF3.

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(3)

(Total 12 marks)

**2.** (a) The shape of the molecule BCl3 and that of the unstable molecule CCl2 are shown below.



(i) Why is each bond angle exactly 120° in BCl3?

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(ii) Predict the bond angle in CCl2 and explain why this angle is different from that in BCl3

*Predicted bond angle* ...................................................................................

*Explanation* ..................................................................................................

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(5)

(b) Give the name which describes the shape of molecules having bond angles of 109° 28'.  
Give an example of one such molecule.

*Name of shape ..*......................................................................................................

*Example.........*..........................................................................................................

(2)

(c) The shape of the XeF4 molecule is shown below.



(i) State the bond angle in XeF4

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(ii) Suggest why the lone pairs of electrons are opposite each other in this molecule.

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(iii) Name the shape of this molecule, given that the shape describes the positions of the Xe and F atoms only.

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(4)

(d) Draw a sketch of the NF3 molecule. Indicate in your sketch any lone pairs of electrons on nitrogen.

(2)

(Total 13 marks)

**3.** Phosphorus and nitrogen are in Group V of the Periodic Table and both elements form hydrides. Phosphine, PH3, reacts to form phosphonium ions, , in a similar way to that by which ammonia, NH3, forms ammonium ions, 

(a) Give the name of the type of bond formed when phosphine reacts with an H+ ion. Explain how this bond is formed.

*Type of bond .............................................................................................................*

*Explanation .............................................................................................................*

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(3)

(b) Draw the shapes, including any lone pairs of electrons, of a phosphine molecule and of a phosphonium ion.  
Give the name of the shape of the phosphine molecule and state the bond angle found in the phosphonium ion.

PH3 

*Shape of PH3* ……………………… *Bond angle in * …………......

(4)

(Total 7 marks)

**................. Out of 32 (Grade )**