

## Chemguide – questions

### SHAPES OF MOLECULES AND IONS (single bonds only)

You will need a copy of the Periodic Table.

- This question is about the shape of the molecule  $\text{SiCl}_4$ .
  - How many electrons are there in the outer level of a silicon atom?
  - How many electrons are there in the outer level after it has bonded with the four chlorine atoms?
  - How many pairs of electrons is this?
  - How many of the electron pairs are bond pairs and how many lone pairs?
  - Draw a diagram to show the shape of a molecule of  $\text{SiCl}_4$ .
- The molecules  $\text{BF}_3$  and  $\text{NF}_3$  have similar formulae, but completely different shapes. Draw diagrams to show the shapes of the two molecules, and explain carefully why they are different.
- In the molecules  $\text{CH}_4$ ,  $\text{NH}_3$  and  $\text{H}_2\text{O}$ , the bond angles are as follows:

H-C-H	H-N-H	H-O-H
$109.5^\circ$	$107^\circ$	$104.5^\circ$

All of these molecules have four pairs of electrons arranged around the central atom in a tetrahedral arrangement. Explain why the bond angles are different.

- Work out the shapes, including the bond angles, of the following:
  - the ion  $\text{PH}_4^+$
  - the molecule  $\text{PF}_5$
  - the ion  $\text{PF}_6^-$
  - the molecule  $\text{XeF}_4$
- (Hard question. Don't spend time on this unless you are confident that you have got the previous questions right.)

Work out the shape of the molecule  $\text{BrF}_3$ .