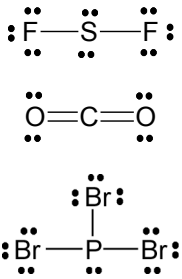
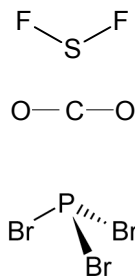
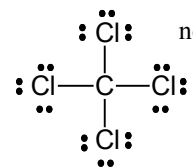
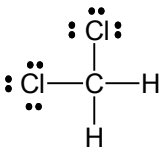
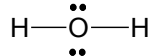
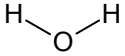
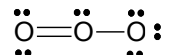
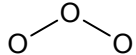


## Assessment Schedule – 2006

## Chemistry: Describe the nature of structure and bonding in different substances (90308)

## Evidence Statement

Practice Statement						
Q	Evidence			Achievement	Achievement with Merit	Achievement with Excellence
1	(a) 	(b) 	(c)  bent or V-shape  linear or straight  trigonal or triangular pyramid	Lewis structure and shape (name and diagram) correct for two molecules  <b>OR</b>  All Lewis structures correct.	All answers correct.	
2	(a) <ul style="list-style-type: none"><li>• ion</li><li>• molecule</li><li>• atom</li><li>• ion.</li></ul>	(b) <ul style="list-style-type: none"><li>• ionic bond or electrostatic or attractive force between ions</li><li>• van der Waals force or intermolecular force</li><li>• covalent bond</li><li>• ionic bond or electrostatic or attractive force between ions.</li></ul>		Three rows correct  <b>OR</b>  All particles correct.	All answers correct.	
3(a)	<p>CCl<sub>4</sub>  non-polar molecule</p> <p>The molecule is tetrahedral, due to 4 electron repulsions around the central C atom. The C–Cl bond is polar, due to the difference in electronegativity of C and Cl. As these polar bonds are symmetrical about the C atom in CCl<sub>4</sub>, the effect of them is cancelled, so the molecule is non-polar.</p>			<p>Polarity of both molecules correct.</p> <p><b>OR</b></p> <p>Lewis diagrams of both molecules correct</p> <p><b>OR</b></p> <p>One Lewis diagram and its explanation identifies correct polarity with justification.</p>	<p>Both Lewis diagrams correct and differing polarity of bonds recognised with justification of polarity that is related to shape or symmetry or electronegativity</p> <p><b>OR</b></p> <p>Full explanation for both molecules.</p>	<p>Full explanation for both molecules that includes concept of electronegativity differences and acknowledges shape and symmetry.</p>

3(b)	<p>CH<sub>2</sub>Cl<sub>2</sub>        polar molecule</p> <p>The molecule is tetrahedral due to 4 electron repulsions around the central C atom.  The C–Cl bond is polar due to the difference in electronegativity of C and Cl, and C–H bond is almost non-polar or different polarity to C-Cl.  Although the bond arrangement around the C atom in CH<sub>2</sub>Cl<sub>2</sub> is symmetrical, the differing polarities of the C–H and C–Cl bonds means the effect of the polar bonds is not cancelled, so the molecule is polar.</p>			
4	<p>    </p> <p>There are 4 electron repulsions around the central O atom which leads to a tetrahedral shape. This forms a bond angle of 109°.</p> <p>    </p> <p>There are 3 electron repulsions around the central O atom which leads to a trigonal planar shape. This forms a bond angle of 120°.</p>	<p>Lewis diagrams for both molecules correct</p> <p><b>OR</b></p> <p>Lewis diagram and one bond angle or explanation of repulsion derived correctly.</p>	<p>Lewis diagrams for both molecules correct and shape or bond angle or explanation or repulsion correctly derived for one molecule</p> <p><b>OR</b></p> <p>Shapes and bond angles derived correctly for both molecules.</p>	<p>Lewis diagrams, shapes and bond angles derived correctly for both molecules.</p>

5(a)	Sodium chloride consists of a 3-D lattice of $\text{Na}^+$ and $\text{Cl}^-$ ions. Although charged particles are present, they are held in position by strong ionic bonds. When the solid is melted the ions become free moving, and the free moving charge means the liquid will conduct electricity.	Particle and force correctly identified for two examples.  <b>OR</b>	Properties for three substances are explained.  <b>OR</b>	Properties for the three substances are correctly and clearly explained with reference to structure and bonding.
(b)	Potassium chloride consists of a 3-D lattice of $\text{K}^+$ and $\text{Cl}^-$ ions. The ions are held in position by strong ionic bonds. The molecules of a non-polar solvent are not attracted towards the ions and so KCl is insoluble.  KCl is soluble in water as the polar water molecules are attracted towards the ions, and the attraction is sufficient to pull the ions from the lattice.	Properties of one substance explained in detail with reference to structure and bonding.	Properties for two substances are correctly and clearly explained with reference to structure and bonding.	
(c)	Copper consists of Cu atoms held together in a 3-D lattice by metallic bonding, in which valence electrons are attracted to the nuclei of neighbouring atoms. As this is a non-directional force, layers of atoms can slide over each other without breaking the metallic bond and disrupting the structure and breaking the metal.			
6(a)	Either melting or boiling point of chloride decreases across the period.	Trend correct and recognition of ionic and molecular chlorides	Trend correct and recognition of ionic and molecular chlorides	Trend correct with full comparison of the ionic and molecular substances.
(b)	NaCl and $\text{MgCl}_2$ both have high melting and boiling points. These are ionic substances. They consist of a 3-D lattice of positive metal ions and $\text{Cl}^-$ ions and the ions are held together by strong ionic bonds. As a lot of energy is required to overcome these strong forces and separate the ions, the substances have high melting and boiling points. $\text{PCl}_3$ and $\text{SCl}_2$ both have low melting and boiling points. These are molecular substances. They consist of molecules and the molecules are attracted to each other by weak intermolecular or van der Waals forces. As not much energy is required to overcome these weak forces and separate the molecules, the substances have low melting and boiling points.	<b>OR</b>  Trend correct and explanation of ionic or molecular chlorides clearly linked to mp and bp by identifying particle, force and strength of force.	either ionic or molecular chlorides clearly linked to mp and bp by identifying particle, force and strength of force.	Reference to all four substances are included.

**Judgement Statement****Chemistry: Describe the nature of structure and bonding in different substances (90308)**

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
FOUR questions answered correctly. Minimum of $4 \times A$	FOUR questions answered correctly at Merit level (or better). Minimum $4 \times M$	FIVE questions answered correctly, including at least THREE at Merit level and at least TWO at Excellence level.  Minimum $2 \times E + 3 \times M$