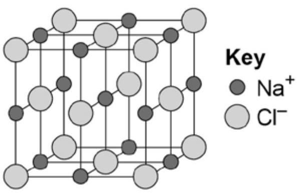
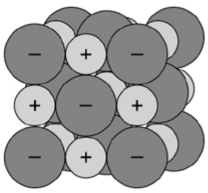
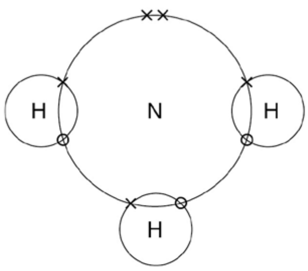
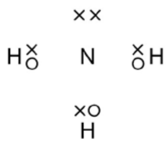
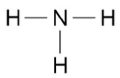
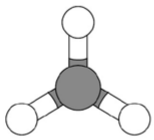
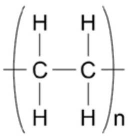
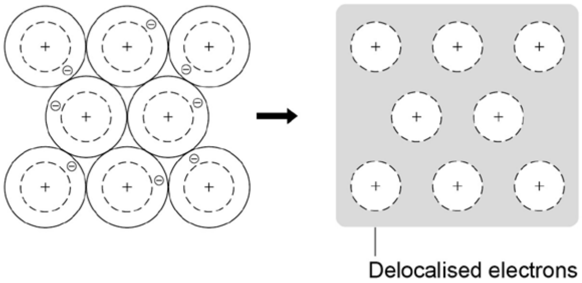
C2 Bonding, Structure & Properties of Matter

Can you…?	☺	😐	☹
2.1.1 Chemical bonds			
State the three types of strong chemical bonds.			
For each bond, state what it is, where it occurs and the particles involved.			
2.1.2 Ionic bonding			
Describe the formation of an ionic bond in terms of electron transfer.			
Represent the electron transfer during the formation of an ionic compound using dot and cross diagrams. For example. 			
Work out the charge on the ions of elements in group 1, 2, 6 and 7.			
Draw dot and cross diagrams for ionic compounds formed by elements in groups 1 and 2 with elements in group 6 and 7.			
2.1.3 Ionic compounds			
Describe the structure of a giant ionic lattice, with references to the forces holding it together.			
Recognise ionic structures represented in the following forms, for example sodium chloride.  			
Describe the limitations of using dot and cross diagrams to represent a giant ionic structure.			
Describe the limitations of using ball and stick diagrams to represent a giant ionic structure.			
Describe the limitations of using 2D diagrams to represent a giant ionic structure.			
Describe the limitations of using 3D diagrams to represent a giant ionic structure.			
Work out the empirical formula of an ionic compound from given information.			
2.1.4 Covalent bonding			
Describe a covalent bond in terms of electron sharing.			
Recall that some covalent substances consist of small molecules, some have very large molecules, such as polymers, and some have giant covalent structures such as diamond and silicon dioxide.			
Recognise common substances that consist of small molecules from their chemical formula.			
Recognise the covalent bonds in molecules and giants structures in the following forms.			

C2 Bonding, Structure & Properties of Matter

Can you…?	☺	😐	☹
For ammonia (NH_3)  and/or  and/or  and/or  Polymers can be represent in the form:  poly(ethene) where n is a large number.			
Draw dot and cross diagrams for the molecules of hydrogen, chlorine, oxygen, nitrogen, hydrogen chloride, water, ammonia and methane.			
Represent the covalent bonds in small molecules, in the repeating units of polymers and in part of giant covalent structures, using a line to represent a single bond.			
Describe the limitations of using dot and cross diagrams to represent molecules or giant structures.			
Describe the limitations of using ball and stick diagrams to represent molecules or giant structures.			
Describe the limitations of using 2D diagrams to represent molecules or giant structures.			
Describe the limitations of using 3D diagrams to represent molecules or giant structures.			
Work out the molecular formula of a substance from a given model or diagram in these forms, showing the atoms and bonds in the molecule.			
2.1.5 Metallic bonding			
Describe the structure of a metallic lattice, with reference to positive ions and electrons.			
Describe metallic bonding with reference to electrons.			
Recognise metallic substances in the following forms.			

C2 Bonding, Structure & Properties of Matter

Can you…?	☺	😐	☹
			
2.2.1 The three states of matter			
Describe the particle model.			
Describe the three states of matter using the particle model.			
Explain changes in state using the particle model.			
Explain what determines the melting and boiling point of different substances, with reference to forces, particles, bonding and structure.			
Predict the states of substances at different temperatures given appropriate data.			
Explain the different temperatures at which changes of state occur in terms of energy transfers and the types of bonding present.			
Recognise that atoms themselves do not have the bulk properties of materials.			
Explain the limitations of the particle theory in relation to changes of state .			
2.2.2 State symbols			
State the four state symbols and what they mean.			
Use state symbols in chemical equations.			
2.2.3 Properties of ionic compounds			
Describe the structure of a giant ionic lattice with reference to ions and electrostatic forces.			
Recall that ionic compounds have high melting and boiling points.			
Recall that ionic compounds don’t conduct electricity when solid, but do when melted or dissolved.			
Explain the properties of ionic compounds in terms of their structure and bonding.			
2.2.4 Properties of small molecules			
Recall that substances which consist of small molecules are usually gases or liquids and have relatively low melting points and boiling points.			
Describe what happens when these substances melt or boil, with reference to the intermolecular forces present.			
Describe how these forces change as the size of the molecules increase, and the effect this has on the melting and boiling points of substances.			

C2 Bonding, Structure & Properties of Matter

Can you…?	☺	😐	☹
Recall that these substances don't conduct electricity.			
Explain the properties of small molecules in terms of their structure and bonding.			
Use ideas about the strength of intermolecular forces and covalent bonds to explain the bulk properties of molecular substances.			
2.2.5 Polymers			
Recall that polymers have very large molecules, and that the atoms in the polymer molecules are linked to other atoms by strong covalent bonds			
State the relative strength of the intermolecular forces between polymer molecules, and the effect this has on their state at room temperature.			
Recognise polymers from diagrams showing their structure and bonding.			
2.2.6 Giant covalent structures			
Recall that substances that consist of giant covalent structures are solids with very high melting points.			
Recall that all of the atoms in these structures are linked to other atoms by strong covalent bonds.			
Explain the properties of giant covalent structures in terms of their structure and bonding.			
Describe what happens when these substances melt or boil, with reference to the covalent bonds present.			
Recall that diamond and graphite (which are forms of carbon) and silicon dioxide (silica) are examples of giant covalent structures.			
Recognise giant covalent structures from diagrams showing their bonding and structure.			
2.2.7 Properties of metals and alloys			
Recall that metals have giant structures of atoms with strong metallic bonds.			
Recall that these strong metallic bonds mean that most metals have high melting and boiling points.			
Describe the arrangements of atoms in pure metals.			
Explain the properties of metals in terms of their structure and bonding.			
State what an alloy is and describe how the atoms are arranged.			
Explain the properties of alloys (when compared to pure metals) in terms of their structure and bonding.			
2.2.8 Metals as conductors			
Recall that metals are good conductors of electricity.			
Recall that metals are good conductors of thermal energy.			

C2 Bonding, Structure & Properties of Matter

Can you...?	☺	😐	☹
Explain these properties of metals in terms of their structure and bonding.			
2.3.1 Diamond			
Describe the structure of diamond.			
Recall that diamond is very hard and has a very high melting point.			
Recall that diamond doesn't conduct electricity.			
Explain these properties in terms of its structure and bonding.			
2.3.2 Graphite			
Describe the structure of graphite.			
Recall that graphite is soft and slippery.			
Recall that graphite has a high melting point.			
Recall that graphite conducts electricity.			
Explain these properties in terms of its structure and bonding.			
2.3.3 Graphene and fullerenes			
Describe the structure of graphene.			
Recall that its properties make it useful in electronics and composites.			
Explain the properties of graphene in terms of its structure and bonding.			
Describe the structure of fullerenes.			
Recall that the first fullerene to be discovered was Buckminsterfullerene (C_{60}) which has a spherical shape.			
Recall that carbon nanotubes are cylindrical fullerenes with very high length to diameter ratios.			
Recall that their properties make them useful for nanotechnology, electronics and materials.			
Recognise graphene and fullerenes from diagrams and descriptions of their bonding and structure			
Give examples of the uses of fullerenes, including carbon nanotubes.			
2.1 Sizes of particles and their properties (Chemistry only)			
Recall that nanoscience refers to structures that are 1–100 nm in size, of the order of a few hundred atoms. Nanoparticles, are smaller than fine particles ($PM_{2.5}$), which have diameters between 100 and 2500 nm (1×10^{-7} m and 2.5×10^{-6} m). Coarse particles (PM_{10}) have diameters between 1×10^{-5} m and 2.5×10^{-6} m. Coarse particles are often referred to as dust.			
Recall that as the side of cube decreases by a factor of 10 the surface area to volume ratio increases by a factor of 10.			

C2 Bonding, Structure & Properties of Matter

Can you…?	☺	😐	☹
Explain why nanoparticles may have properties different from those for the same materials in bulk			
Recall that these properties may also mean that smaller quantities are needed to be effective than for materials with normal particle sizes.			
Compare ‘nano’ dimensions to typical dimensions of atoms and molecules.			
2.2 Uses of nanoparticles (Chemistry only)			
Recall that nanoparticles have many applications in medicine, in electronics, in cosmetics and sun creams, as deodorants, and as catalysts. New applications for nanoparticulate materials are an important area of research.			
Consider advantages and disadvantages of the applications of these nanoparticulate materials			
Evaluate the use of nanoparticles for a specified purpose when given appropriate information			
Explain that there are possible risks associated with the use of nanoparticles.			