



STRUCTURE TYPES

	Monatomic	Simple molecular	Giant covalent	Ionic	Metallic
Substances	Group 0 elements	Elements: H ₂ O ₂ N ₂ F ₂ Cl ₂ Br ₂ I ₂ S ₈ P ₄ Compounds: non-metal with non-metal	<i>sometimes incorrectly called macromolecular</i> Elements: Si, diamond, graphite, graphene Compounds: SiO ₂	Compounds: metal with non-metal	Elements: metals
What the structure is	Individual atoms with very weak forces between them.	Lots of individual molecules with weak forces between the molecules. (the atoms within molecules are joined by covalent bonds)	Lattice structure in which all atoms are joined together in a giant network by covalent bonds.	Lattice structure of positive and negative ions. The ions are held together by the strong attraction between the + and - ions (this +/- attraction is known as ionic bonding, although it is just an electrostatic attractive force).	Lattice structure of metal atoms where the outer shell electrons from each atom are delocalised. There is a strong attraction between the positive nucleus of the atoms and the cloud of negative delocalised electrons (this is known as metallic bonding)
Bonding	none	covalent (within molecules)	covalent	ionic	metallic
Solid					
Liquid					
Gas					
Formula (molecular)		Gives number of atoms of each type in one molecule: e.g. glucose C ₆ H ₁₂ O ₆ each molecule contains 6C, 12H and 6O atoms			
Formula (empirical)	Just the symbol e.g. Ar	Gives ratio of atoms in substance e.g. glucose CH ₂ O ratio of C:H:O atoms is 1:2:1	Gives ratio of atoms in substance e.g. SiO ₂ ratio of Si:O atoms is 1:2	Gives ratio of ions in substance: e.g. MgCl ₂ ratio of Mg ²⁺ :Cl ⁻ ions is 1:2	Just the symbol e.g. Fe
Melting and boiling points	VERY LOW Very weak forces between atoms	LOW Weak forces between the molecules (Note – the atoms within the molecules are held together by strong covalent bonds, but these DO NOT break when molecules melt/boil)	VERY HIGH Need to break many strong covalent bonds	HIGH Strong electrostatic attraction between positive and negative ions	HIGH Strong electrostatic attraction between positive metal ions and delocalised negative electron
	Higher melting / boiling points occur when: the heavier the atoms, the stronger the forces between the atoms	Higher melting / boiling points occur when: the stronger the intermolecular forces	Higher melting / boiling points occur when: the stronger the covalent bonds	Higher melting / boiling points occur when: the smaller the ions and the higher the charge on the ions, the stronger the attraction between the positive and negative ions	Higher melting / boiling points occur when: the smaller the ions, the higher the charge on the ions, and/or the more delocalised electrons, the stronger the metallic bonding
Conductivity	Do not conduct contain no mobile ions or electrons	Do not conduct contain no mobile ions or electrons	<i>Diamond, Si, SiO₂</i> Do not conduct contain no mobile ions or electrons <i>Graphite, graphene</i> Conduct as delocalised electrons carry charge through structure	<i>Solids</i> Do not conduct as ions are not mobile <i>Liquids and solutions</i> Conduct mobile ions carry charge through structure	<i>Conduct</i> as delocalised electrons carry charge through structure
Solubility (aq)	Insoluble	Insoluble (usually)	Insoluble	Soluble (usually)	Insoluble