Structure and Bonding Summary

1, Five Types of Structure

Monotomic	Simple Molecular	Giant Covalent	Giant Ionic	Metallic
Elements: Group 0	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 e.g. CO_2	Elements: C diamond, graphite Compounds: SiO_2	Compounds: metal with non-metal e.g. NaCl	Elements: metals e.g. Cu
Individual atoms with very weak forces between them	Molecules comprising of atoms covalently bonded together and weak forces between the molecules	Lattice structure in which all atoms are joined to others by covalent bonds	Lattice structure of positive and negatively charged ions electrostatically attracted together to form ionic bonds	Lattice structure of metal ions with delocalised outer shell electrons free to move through the structure
Very low bpt and mpt Very weak forces between atoms	Low bpt and mpt 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 bpt and mpt Need to break many strong covalent bonds	High bpt and mpt Strong electrostatic attraction between positive and negative ions	High bpt and mpt Strong electrostatic attraction between positive metal ions and delocalised negative electrons
Do not conduct No charged particles that can move – atoms are neutral	Do not conduct No charged particles that can move – molecules are neutral	Do not conduct No charged particles that can move – electrons are NOT delocalized EXCEPT graphite due to delocalised electrons which move between layers and conduct charge throughout the structure	Conduct when molten or dissolved in water as ions can move and conduct charge. Do not conduct as solids as ions cannot move.	Conduct Outer shell electrons are delocalised and can conduct charge throughout the structure.

2, Three types of bond

Covalent	Ionic	Metallic
Shared pair of electrons between atoms.	Electrostatic attraction between positive and negative ions.	Attraction between lattice of positive metal ions and delocalised outer shell electrons.
The shorter the bond, the stronger the bond. Double bonds are stronger than single bonds, while triple bonds are stronger than double bonds.	The smaller the ions and the greater the charge on the ions, the stronger the attraction between the ions. This is due to a greater charge density within the structure.	The smaller the metal ions, the greater the charge on the ions, and the more delocalised outer shell electrons there are, the stronger the attraction between the ions and electrons (usually). This is due to a greater charge density within the structure

(adapted from Chemsheets)