Molecular Solids

Non-metals forming molecules

I_2 S_2 HCl

Particles: molecules	Bonding: weak intermolecular

Molecules are held together by weak intermolecular bonding. Within the Molecules, the atoms are held together by strong covalent bonds.

Conductivity	Melting point	Solubility	Hardness
no	Low	No – non-polar Yes - polar	soft

Metallic Solids

Elements that are metals

Al Fe Cu

Particles: atoms	Bonding: metallic

Metal atoms are held together in a 3–D lattice by non-directional metallic bonding in which valence electrons are attracted to the nuclei of neighbouring atoms.

Conductivity	Melting point	Solubility	Hardness
yes	high	no	Yes but malleable

Ionic Solids

Non-metals and metals together forming a ionic compound

KI NaCl $CuSO_4$

Particles: ions	Bonding: electrostatic / ionic

Ions held together by strong directional electrostatic forces (ionic bonding) between +ve (cations) and –ve (anions) ions in a 3-dimensional lattice

Conductivity	Melting point	Solubility	Hardness
No–solid Yes-liquid or aqueous	Very high	yes	Hard but brittle

Covalent Network Solids

Carbon and silicon dioxide

C - graphite C - diamond SiO_2

Particles: atoms	Bonding: covalent

Diamond and SiO_2 are 3-dimensional covalent network structures where atoms are held together by strong covalent bonds in all planes. **Graphite** is a covalent network structure that is in 2 dimensional sheets. Between the layers are free moving valence electrons

Conductivity	Melting point	Solubility	Hardness
Yes - Graphite No - Diamond/SiO_2	Very high	no	Hard – diamond Soft -graphite