Structure and Bonding

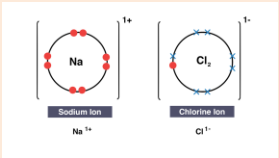
Ionic Bonding

Metal + Non-Metal

Strong electrostatic attraction between ions in all directions.

Formed by the TRANSFER of electrons

Dot and cross Diagram:



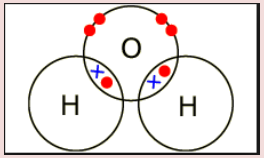
Covalent Bonding

Non-Metals only

Strong bonds between atoms

Formed by the SHARING of electrons

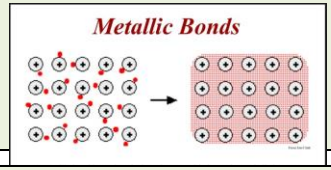
Dot and cross diagram:



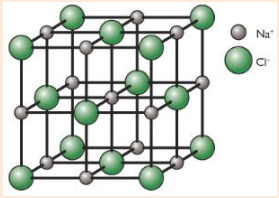
Metallic Bonding

Metals only

Strong electrostatic attraction between positive ions in a 'sea' of delocalised electrons



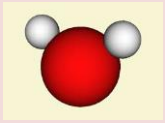
STRUCTURE
Giant Ionic Lattice



Giant lattice of opposite charged ions

Examples: sodium chloride

STRUCTURE
Small Molecule



Strong bonds hold the molecule together BUT weak intermolecular forces

Examples: Water, Ammonia

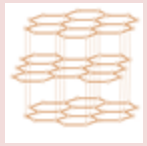
STRUCTURE
Large Molecule

Strong bonds hold the molecule together BUT strong intermolecular forces.

Examples: Polymers (plastics)

STRUCTURE
Giant Structures

Graphite



Diamond

Strong bonds hold the giant structures together.

Fullerene

STRUCTURE
Giant Metallic Lattice

Strong electrostatic attractions between ions in a sea of delocalised electrons

STRONG BONDS.

PROPERTIES

Conductivity

Conducts as LIQUID and in SOLUTION (ions are mobile)

Does not conduct as SOLID (ions are fixed)

High Melting Point

Strong electrostatic forces between ions require high energy (heat) to separate.

PROPERTIES

Conductivity

Does not conduct because there are no ions or delocalised electrons.

Low Melting Point

Weak intermolecular forces between molecules require little energy (heat) to separate)

PROPERTIES

Conductivity

Does not conduct because there are no ions or delocalised electrons.

High Melting Point

Strong intermolecular forces between molecules require more energy (heat) to separate

PROPERTIES

Conductivity

Does not conduct because there are no ions or delocalised electrons.

EXCEPTION: Graphite and FULLERENES conduct.

High Melting Point

Strong covalent bonds in between atoms require more energy (heat) to separate

PROPERTIES

Conductivity

Conducts in LIQUID and SOLID because it has DELOCALISED ELECTRONS that can CARRY CHARGE.

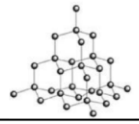
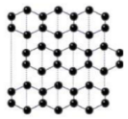
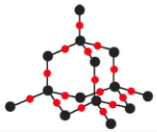
Malleable/Ductile

Metals are arranged in LAYERS that can SLIDE.

High Melting Point

Strong metallic bonds require high energy (heat) to separate.

Extra Notes for Giant Covalent Structures

Substance	Diagram	Description	Properties
Diamond		Each carbon is covalently bonded to four other carbons	Very hard, very high melting point, due to strong covalent bonds. Does not conduct electricity – no free electrons/ions.
Graphite		Each carbon is covalently bonded to 3 other carbons, there are weak (non covalent) bonds between the layers.	High melting point, conductor of electricity due to **delocalised electrons which can carry a charge.** Slippery as layers can slide over each other
Silica		Every silicon atom is bonded to 2 oxygen atoms and vice versa	High melting point

Extra Notes for Metallic Bonding

Alloys

Alloys are mixtures of **2 or more elements, one of which is a metal.** Examples of alloys include brass and steel. Metals are alloyed so that the regular structure of metals is changed and the layers of ions can no longer slide over one another; therefore making it much stronger.