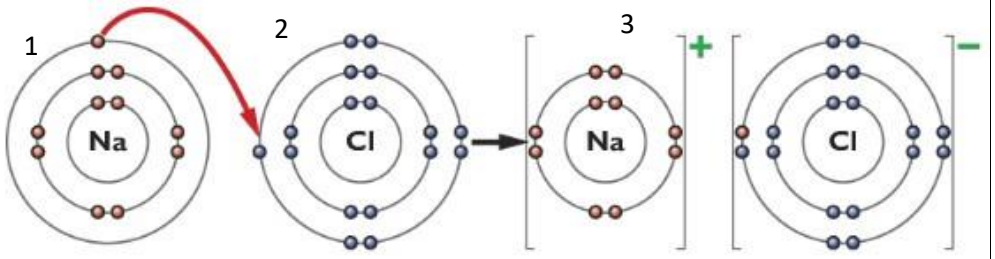
Science: Structure and Bonding

1. Key Words

Key Word	Definition
Ion	Charged particle
Electrostatic attraction	Attraction between ions of opposite charge
Intermolecular forces	Forces that pull molecules together
Ionic bonding	Bonding that occurs between a metal and non-metal elements, where electrons are lost or gained from the outer shell of the atom
Covalent bonding	Bonding that occurs between non-metal elements, where electrons are shared on the outer shell of the atoms
Metallic bonding	Bonding that occurs in metal elements and alloys
Delocalised electron	Electron that can move freely in the element

2. Ionic Bonding

Metal atoms lose electrons to become positive ions
Non-metal atoms gain electrons to become negative ions



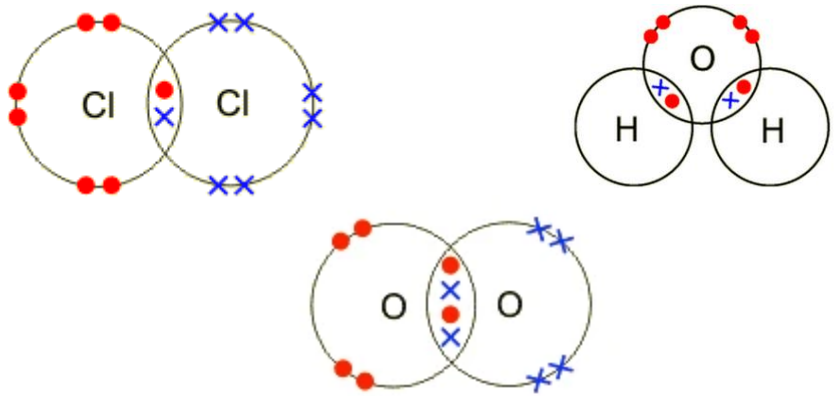
1	Sodium loses an electron from its outer shell to become Na^+
2	Chlorine gains an electron to its outer shell to become Cl^-
3	The oppositely charged ions are pulled together by an electrostatic attraction

3. Giant Ionic Lattice

Properties	Reason
High melting and boiling points point	Atoms are arranged in a large lattice structure with appositely charged ions next to each other. This means a lot of energy is needed to overcome the forces of attraction
Do no conduct electricity as a solid	Ions are fixed in position and not able to move
Conducts electricity as a liquid or in solution	Ions can move freely and carry a charge

4. Covalent Bonding

In a covalent bond the electrons on the outer shell are shared to make up full and stable outer shell.
Covalent bonds are very strong and take atom of energy to break



1	Chlorine gas - Cl_2	2	Water – H_2O	3	Oxygen – O_2

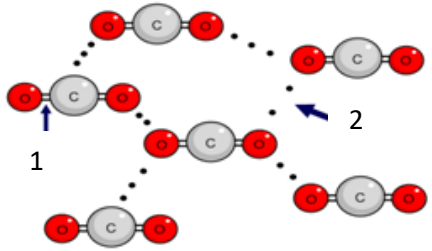
Chlorine and water have single bonds as they share **ONE** pair of electrons

Oxygen has a double bond as it shares **TWO** pairs of electrons

Science: Structure and Bonding

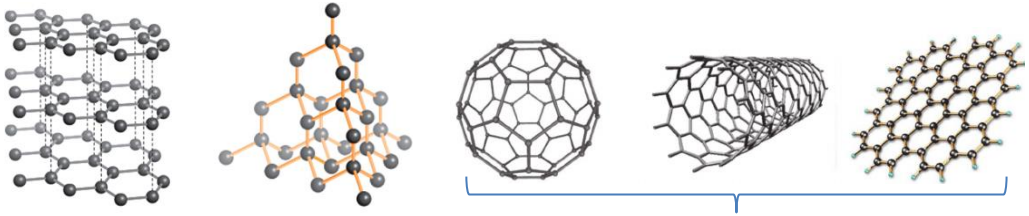
5. Small covalent molecules

Properties	Gases, Low boiling and melting points, Low density



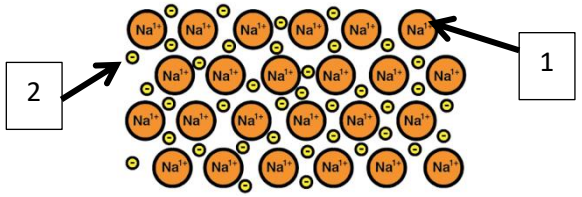
1	Strong covalent bonds that require a lot of energy to break
2	Weak intermolecular forces that do not required much energy to break

6. Allotropes of carbon

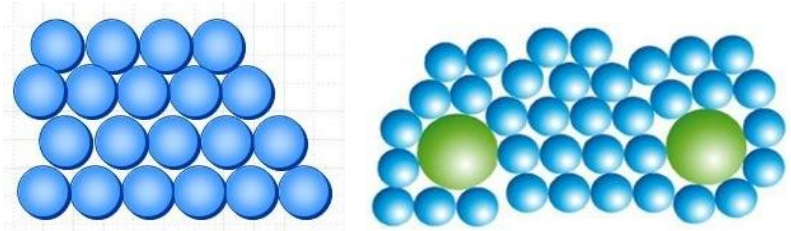


Property	1	2	3
Name	Graphite	Diamond	Graphene or fullerene
Number of bonds per carbon	3	4	3
Melting point	High	Very high	High
Hardness	Soft	Very hard	Flexible and strong
Delocalised electrons	yes	No	Yes
Conduct electricity	Yes	No	Yes
Uses	Pencils, electrodes	Drill bits and gems	Electronics and nanotubes

7. Metallic Bonding



1	Positive metal ions
2	Delocalised electrons



3	Pure Metal	Metal can be easily shaped as the layers can easily slide over each other
4	Alloy	Atoms of the different metals are different sizes so the particles are not arranged in layers. This makes the metal harder as the atoms cannot slide over each other

8. Polymers

A polymer is a long chain of repeated molecular structures

Hydrocarbons (molecules containing hydrogen and carbon) form long chain polymers from small units called monomers.

Polyethene is an example of a polymer made from the monomer ethene.