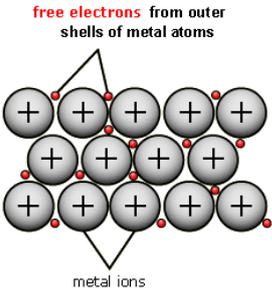
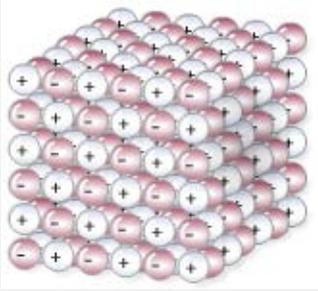
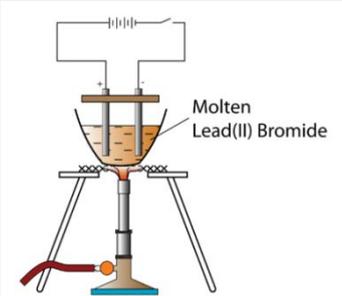




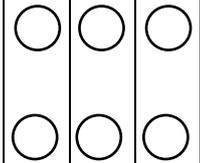
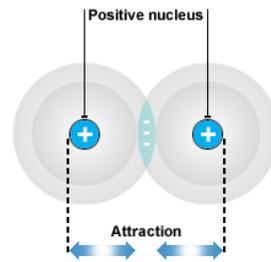
Lesmahagow High School
National 5 Chemistry: Unit 1
Key Area - Bonding



Learning Statement	Red	Amber	Green
There are 3 types of bonding: <ul style="list-style-type: none">○ Metallic○ Ionic○ Covalent.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Metallic Bonding <ul style="list-style-type: none">○ Occurs in metals.○ Results from an electrostatic attraction between positively charged metal ions and a sea of delocalised (free) electrons.○ Metallic bonds are strong.○ Most metals are solids. Mercury is the only liquid metal.○ As electrons can move from metal ion to metal ion, metals conduct electricity. <div style="text-align: right;"><p style="font-size: small; text-align: center;">free electrons from outer shells of metal atoms metal ions</p></div>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ionic Bonding <ul style="list-style-type: none">○ Ionic bonds are the electrostatic forces of attraction between positive ions and negative ions.○ Ionic bonds are strong.○ Ionic compounds have a lattice structure.○ Ionic compounds dissolve in water. When they dissolve in water the lattice breaks up.○ Ionic compounds conduct electricity as a melt or a solution as the ions are free to move. As solids they do not conduct as the ions are not free to move.○ Ionic compounds have high melting and boiling points. This means they are solids at room temperature.○ The colour of an ionic compound comes from the ions present. <i>A list of ions colours can be found on page 6 of the data booklet.</i> <div style="text-align: right;"></div>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When an ionic compound is dissolved in water a solution called an electrolyte is formed. Electrolytes conduct electricity as the ions are free to move.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Solutions of ionic compounds can be broken down using a process called electrolysis . Electrolysis is the breaking down of compound using electricity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
			

Covalent Bonding

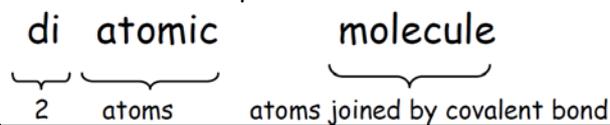
- A covalent bond is a shared pair of electrons between atoms.
- Atoms share electrons to gain a full, stable outer shell of electrons.
- The atoms are held together in a covalent bond by the electrostatic attraction between the positively charged nuclei of each atom and the negatively charged electrons.
- Covalent substances do not conduct electricity. *The exception to this rule is carbon in form of graphite.*
- Most covalent substances do not dissolve in water. However, there are substances they do dissolve in e.g. acetone (nail varnish remover).
- Covalent molecules tend to be liquids or gases at room temperature as they have low melting and boiling points.



A **molecule** is a group of atoms held together by covalent bonds.



A **diatomic molecule** is one which is made up of two atoms.



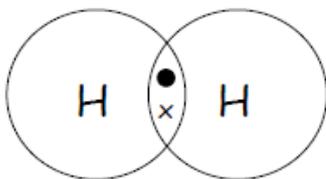
Several elements exist as diatomic molecules.

Hydrogen	Nitrogen	Oxygen	Fluorine	Chlorine	Bromine	Iodine	Astatine
H_2	N_2	O_2	F_2	Cl_2	Br_2	I_2	At_2

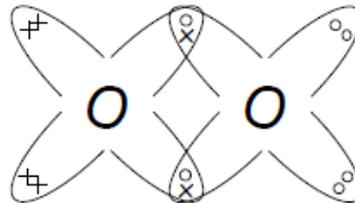


Diagrams can be drawn to show how the outer electrons in atoms are shared to form a covalent bond.

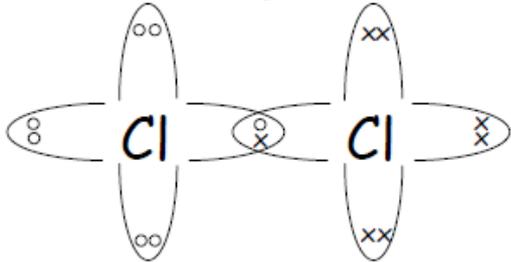
Hydrogen H_2 molecule



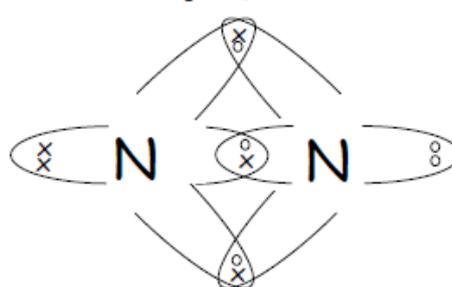
Oxygen O_2 molecule



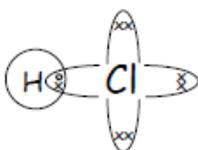
Chlorine Cl_2 molecule



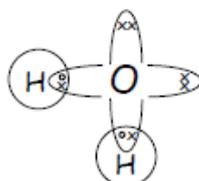
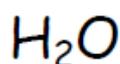
Nitrogen N_2 molecule



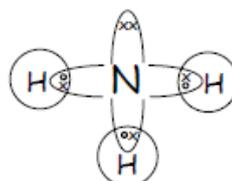
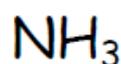
Hydrogen chloride



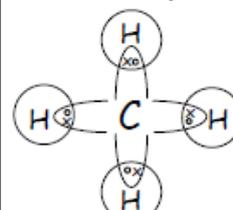
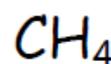
Water



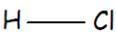
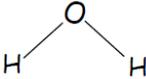
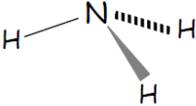
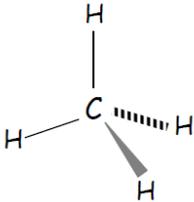
Ammonia



Methane



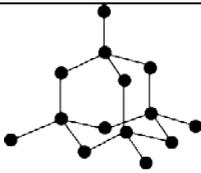
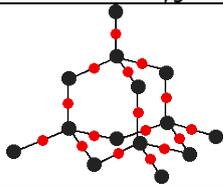
Shapes of Molecules

Linear	Bent	Pyramidal	Tetrahedral
			
HCl	H ₂ O	NH ₃	CH ₄
Also with same shape: HF HBr HI	Also with same shape: H ₂ S H ₂ Se	Also with same shape: PH ₃ NCl ₃ PCl ₃	Also with same shape: CCl ₄ CF ₄ SiH ₄

Covalent substances can also exist as giant networks. We call these **covalent networks**.

Examples of covalent networks are: **diamond (carbon)** and **sand (silicon dioxide)**.

They only contain strong covalent bonds and therefore are solids and have extremely high melting and boiling points.

Name	Diamond	Sand
Elements present	Carbon	Silicon and oxygen
Structure		
Melting point (°C)	3550	1610
Boiling point (°C)	4827	2230

Bonding Summary

State at Room Temp	Solid	Liquid	Gas
Type of Bonding	Ionic or Covalent	Covalent	Covalent

Type of Bonding	Conduction as a Solid	Conduction as a Liquid	Conduction as a Solution
Metallic (Metals only)	✓	✓	metals do <u>not</u>  dissolve in water
Covalent (Non-metals only)	✗	✗	✗
Ionic (Metals + Non-metals)	✗	✓	✓