

F4 C5

Chemical bond

- Ionic bond (transfer electrons)
- Covalent bond (sharing electrons)

Ionic bond(metal+non-metal)

Ionic compound

- high melting point (ionic bond is strong->need large amount of heat energy to overcome these strong forces between the ions)
- usually soluble in water 水不是完全neutral的所以可以 (polarisation of the water molecules cause water to have positive and negative ends)
- not soluble in organic solvents
- conduct electricity in molten and aqueous solution (ions are free to move)
- do not conduct electricity in solid state (ions are not free to move)

Atom:

Loses electrons=form positive ion

Gain electrons=form negative ion

force attraction between positive and negative ions=ionic bond/electrostatic force

Example 1:

Formation of sodium chloride(NaCl):

-formation of positive ions,Na⁺

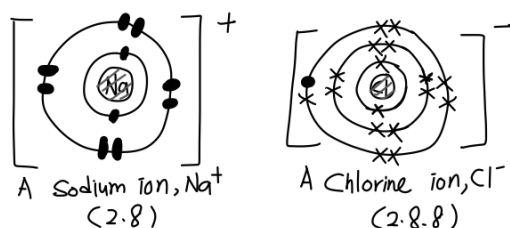
- 1.Sodium atoms with electron arrangement 2.8.1,are not stable.
- 2.A sodium atom loss a valence electron to form a sodium ion,Na⁺ with stable electron arrangement ,2.8 .
3. $\text{Na} \rightarrow \text{Na}^+ + \text{e}^-$

-formation of negative ion,Cl⁻

- 1.Chlorine atoms with electron arrangement 2.8.7, are not stable.
- 2.A chlorine atom gain an electron to form a chlorine ion,Cl⁻ with stable electron arrangement ,2.8.8 .
3. $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$

-formation of ionic bond

- 1.The attraction force that holds the oppositely charged ions is called ionic bond
- 2.Sodium ion ,Na⁺ and chlorine ion ,Cl⁻ are arranged in a crystal lattice structure in solid sodium chloride,NaCl.
- 3.



Example 2:

MgCl₂

-formation of Mg²⁺

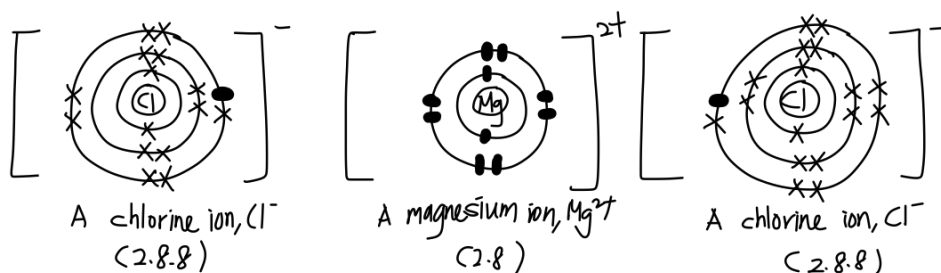
- 1.Magnesium atoms with electron arrangement ,2.8.2 are not stable
- 2.Magnesium atoms loses 2 valence electrons to form magnesium ion,Mg²⁺ with stable electron arrangement 2.8 .
3. $\text{Mg} \rightarrow \text{Mg}^{2+} + 2\text{e}^-$

-formation of Cl-

1. Chlorine atoms with electron arrangement ,2.8.7 are not stable
2. Chlorine atoms gain 1 electron to form chlorine ion, Cl⁻ with stable electron arrangement 2.8.8 .
3. $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$

-formation of ionic bond

1. The attraction force that holds the oppositely charged ions is called ionic bond.
2. Magnesium ions, Mg²⁺ and chlorine ions, Cl⁻ are arranged in a crystal lattice structure in solid magnesium chloride, MgCl₂.
- 3.



Covalent bond(non-metal+non-metal)

- single covalent bond(one pair of electron shared)
- double covalent bond(two pairs of electron shared)
- triple covalent bond(three pairs of electron shared)

Covalent compound

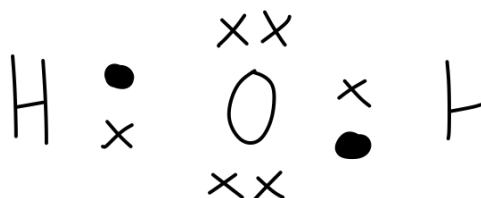
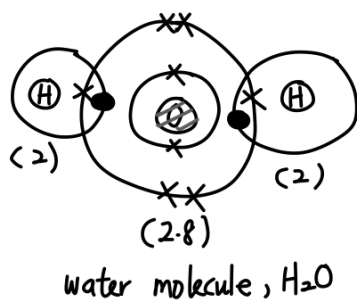
- low melting point (attraction force between molecules are weak—>need small amount of heat energy to overcome these weak forces)
- soluble in organic solvent(most) bond in both covalent substances and organic solvents are similar in nature
- do not conduct electricity in any state(do not contain ions ,only neutral molecules)

Example 1:

Water molecules, H₂O

1. Electron arrangement of hydrogen atoms are 1 ,electron arrangement of oxygen atoms are 2.6 .
2. Oxygen atoms need 2 more electrons to achieve a stable octet electron arrangement ,hydrogen atoms need 1 more electron to achieve a stable duplex electron arrangement.
3. An oxygen atoms and 2 hydrogen atoms share 2 pairs of electrons to form molecule, H₂O.
4. Each hydrogen atom contributes 1 electron and each oxygen atom contributes 2 electrons to form 2 single covalent bonds.
- 5.

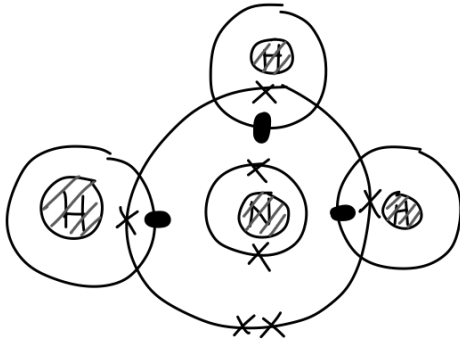
Lewis structure:



Example 2:

Ammonium molecule, NH_3

1. A nitrogen atom with electron arrangement, 2.5, a hydrogen atom with electron arrangement, 1.
2. A nitrogen atom needs 3 more electrons to achieve a stable octet electron arrangement, a hydrogen atom needs 1 more electron to achieve a stable duplet electron arrangement.
3. A nitrogen atom and 3 hydrogen atoms share 3 pairs of electrons to form a molecule, NH_3 .
4. Each nitrogen atom contributes 3 electrons and each hydrogen atom contributes 1 electron to form 3 single covalent bonds.
- 5.

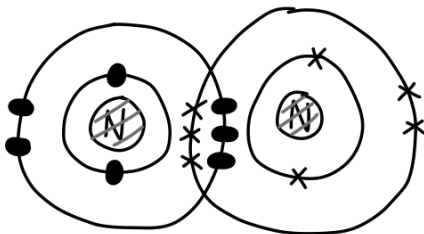


An ammonia molecule, NH_3

Example 3:

Nitrogen molecule, N_2

1. Nitrogen atom has electron arrangement, 2.5.
2. It needs 3 more electrons to achieve a stable octet electron arrangement.
3. 2 nitrogen atoms share electrons to form a molecule, N_2 .
4. Each nitrogen atom contributes 3 electrons to form a triple covalent bond.
- 5.



A nitrogen molecule, N_2