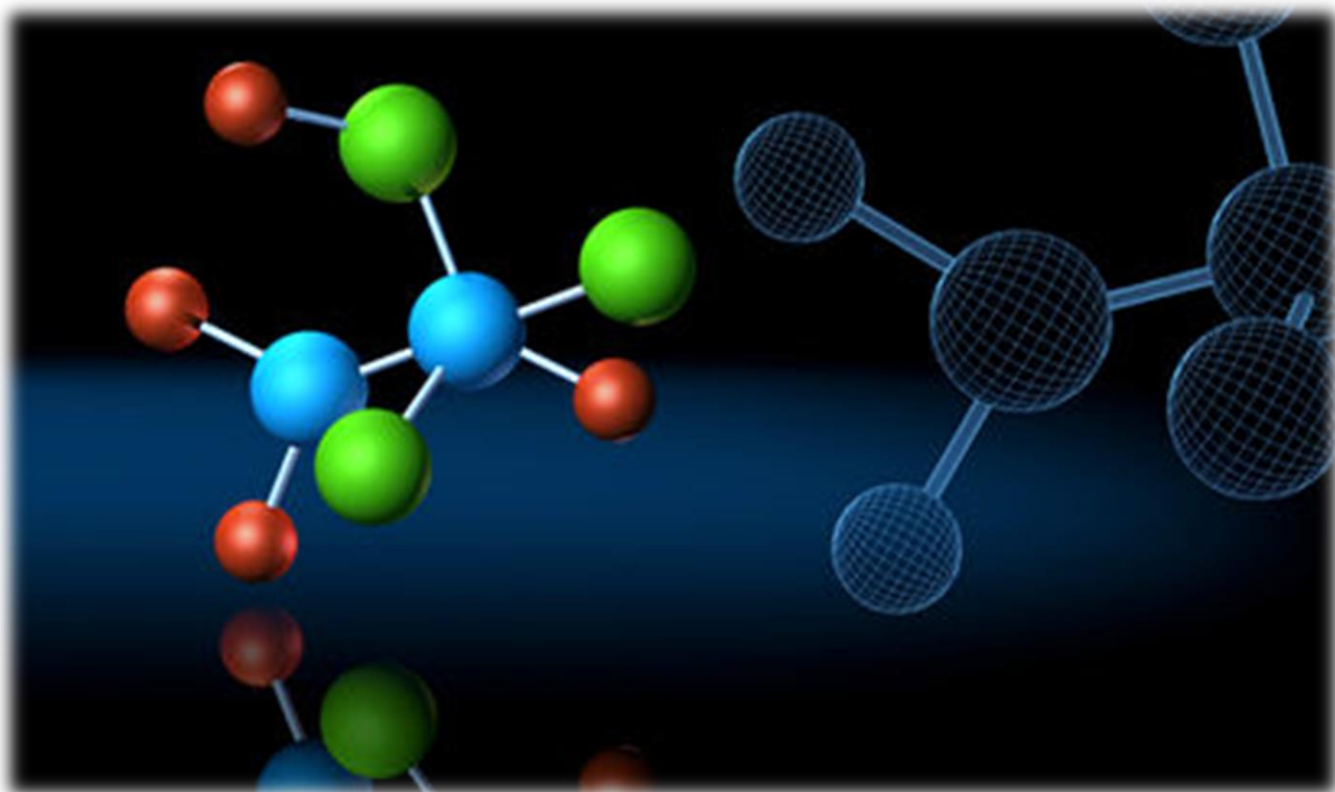


Chapter 5 : Chemical Bond



Formation of Compound and The Uses of Compound

Compounds and Chemical Bonds

- ❖ Compounds are formed when two or more elements are combined.
- ❖ There are two types of chemical bond which chemically combines two elements.
- ❖ Ionic bond is a type of bond which atoms of both element transfer electron and form a positively charged ion and negatively charged ion. This causes the cation to be attracted to the anion and result in a bond also known as electrostatic force.
- ❖ Covalent bond is a type of bond which atoms of both element shares electron and form a molecule. The bond between the atoms are very strong.

Uses of Compound in our Daily Life

- ❖ Compounds are very important in our daily life. It is widely used in a few sectors such as Medical Sector, Industrial Sector, Agricultural sector and more.
- ❖ Compounds like Sodium Chloride and Monosodium Glutamate are a type of ionic compound that is known informally as flavor enhancers or flavorings. It enhance the taste of food.
- ❖ Compound like Hydrogen Peroxide is a type of covalent compound that helps in healing injuries and wounds by releasing oxygen during its decomposition process.
- ❖ Compounds like Water and Alcohols are solvents used in daily life to remove stains or to act as a cleaning agent.

Chapter 5 : Chemical Bond

Stability of Group 18 elements

Valence Electrons of Group 18 Elements

- ❖ The valence electron of Group 18 elements already achieved duplet or octet configuration which means that they no longer need to interact with other elements by sharing or transferring electron.

2

HELIUM

2.X.X.X.8

NEON
ARGON
KRYPTON
XENON
RADON

- ❖ They exist as monoatomic gases and does not form any bond with any other elements.

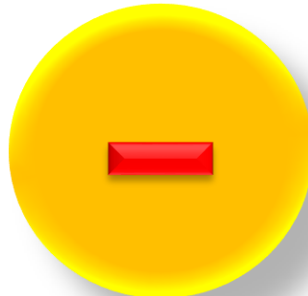
Formation of Ionic Bond

Ionic Bonds are bonds that are formed between metal and non-metal elements.



Metal elements

- Metal elements donates electron to become positive ion(cation).
- This is because they need to achieve octet configuration to be stable.



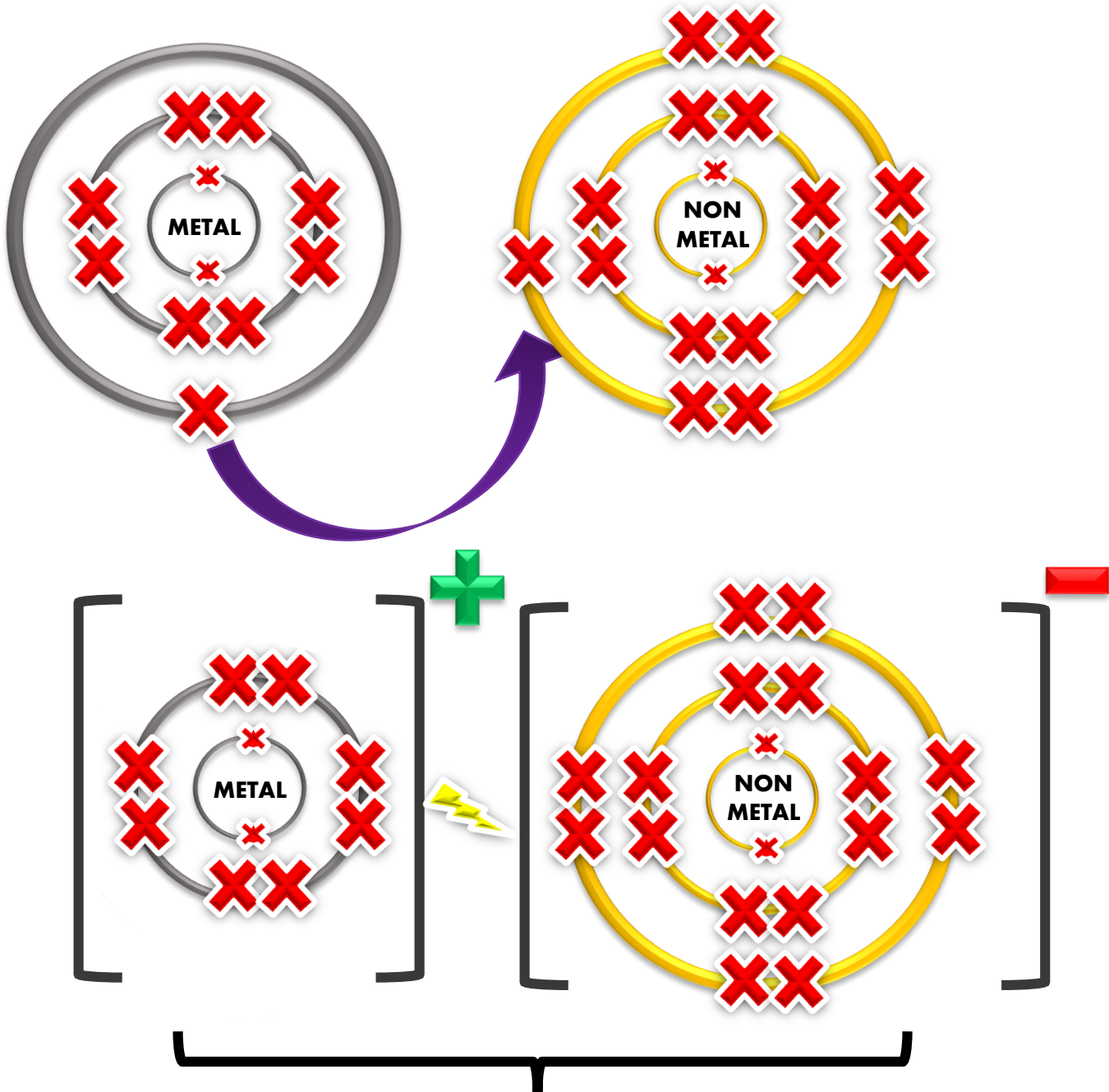
Non-Metal elements

- Non-metal elements gain electron to become negative ion(anion).
- This is because they need to achieve duplet or octet configuration to be stable.

Chapter 5 : Chemical Bond

Formation of Ionic Bond

Ionic Bonds are electrostatic force between two ions which are positive ion and negative ion.

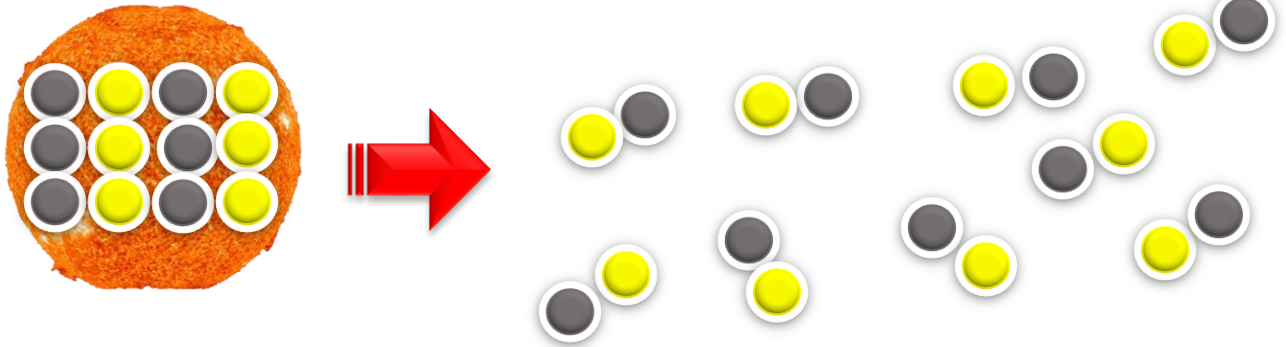


Electrostatic Force

Chapter 5 : Chemical Bond

Formation of Ionic Bond

Ionic Bonds are strong bonds which consumes a lot of heat energy to break the bond between them.

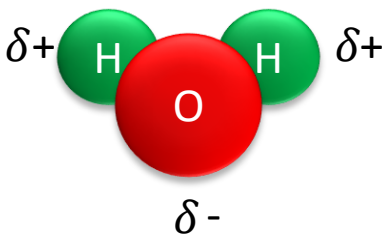


Ionic Bonds are soluble in water because of the polarity in water.

Polarity of Water

Polarity

- ❖ Polarity is the electronegativity and electropositivity in a molecule such as water.
- ❖ The molecule of water contains one oxygen molecule and two hydrogen molecules.
- ❖ The oxygen atom contain some negative charge while the hydrogen atom contains some positive charge.



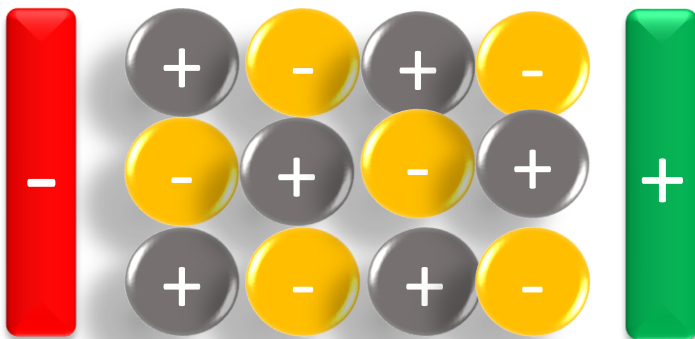
- ❖ This causes the oxygen which is electronegative to attract positively charged ion while the hydrogen to attract negatively charged ion.
- ❖ This is why the polarity of water molecules makes water a universal solvent.

Chapter 5 : Chemical Bond

Formation of Ionic Bond

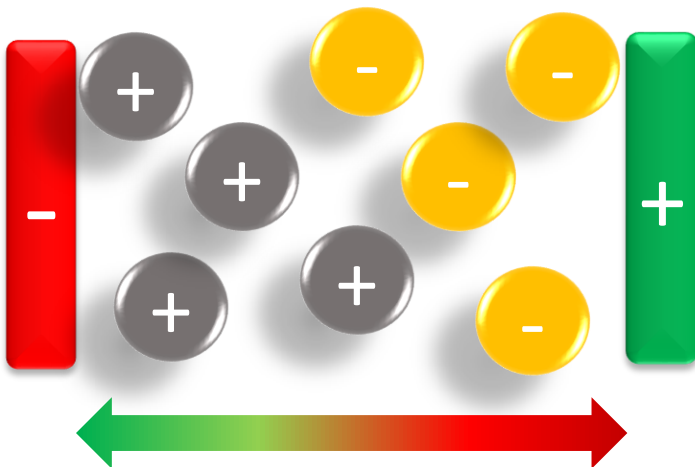
Ionic Bonds can conduct electricity in molten and aqueous state.

Solid Form



- ❖ The ions are tied by strong electrostatic force in solid and cannot move freely to conduct electricity.

Molten or Aqueous Form



- ❖ The ions are not tied by electrostatic force and can move freely to conduct electricity.
- ❖ This is because electrostatic forces are overcome by heat energy when ionic compound is heated.

Chapter 5 : Chemical Bond

Formation of Ionic Bond

Ionic Bond

- Formed when electron are transferred.
- Is an electrostatic force.

Ionic Compounds and Their Uses

Ionic compounds such as sodium chloride and monosodium glutamate are used as flavorings in food.

Ionic compound such as lithium iodide are used in manufacture of batteries for phones.

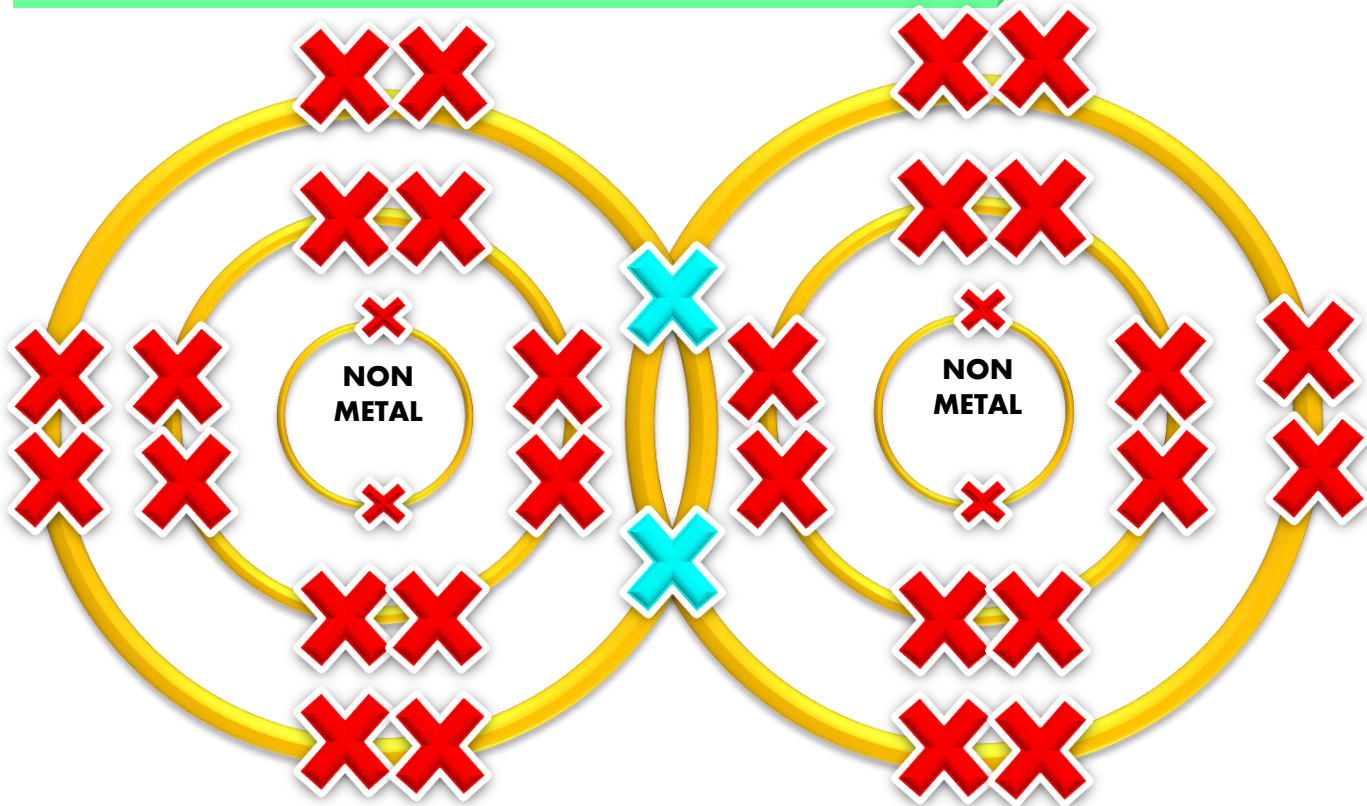
Ionic compound such as ammonium nitrate contains high percentage of nitrogen which is used in fertilisers.

Ionic compound such as sodium bicarbonate is used in antacids to neutralize the hydrochloric acid in stomach.

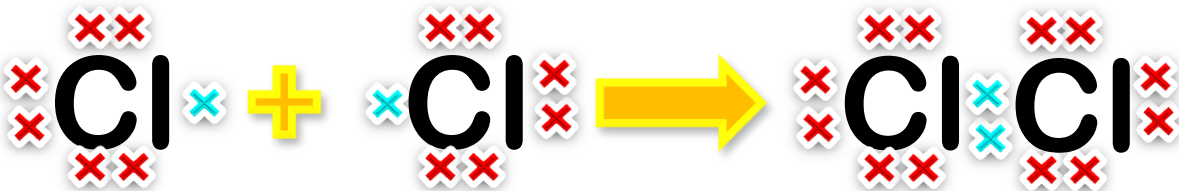
Chapter 5 : Chemical Bond

Formation of Covalent Bond

Covalent bond are formed when two or more atoms share electrons with each other.



Lewis Structure

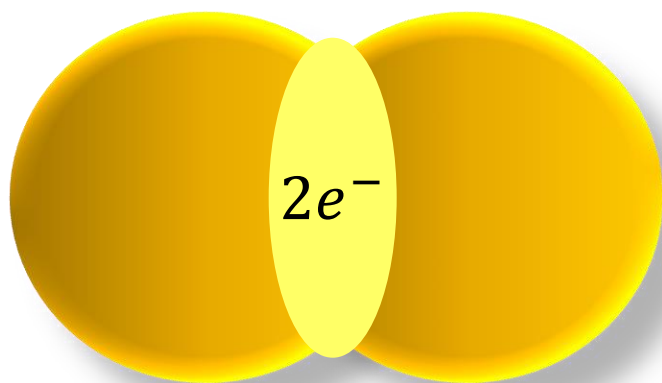


- ❖ Lewis Structure is the structure that only shows the valence electron of the atoms.
- ❖ The red cross represents the valence electron that is not included in the sharing of electrons.
- ❖ The blue cross represents the valence electron that is included in the sharing of electrons.

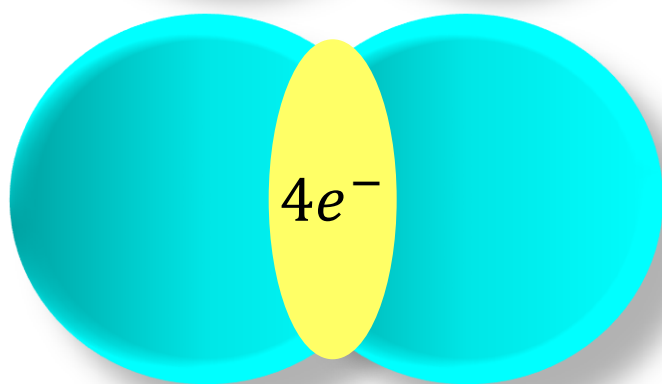
Chapter 5 : Chemical Bond

Formation of Covalent Bond

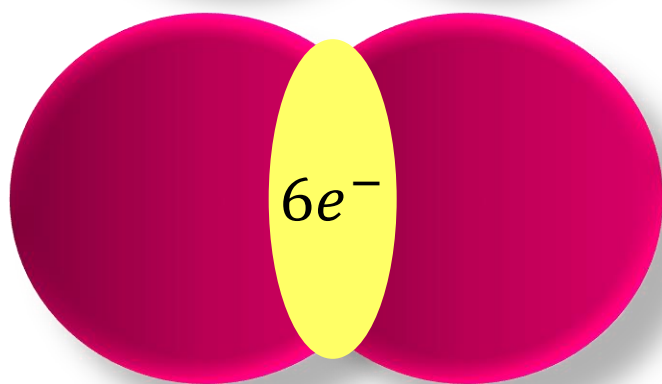
Covalent bond are divided into 3 types which are single bond, double bond and triple bond.



Single Bond



Double Bond

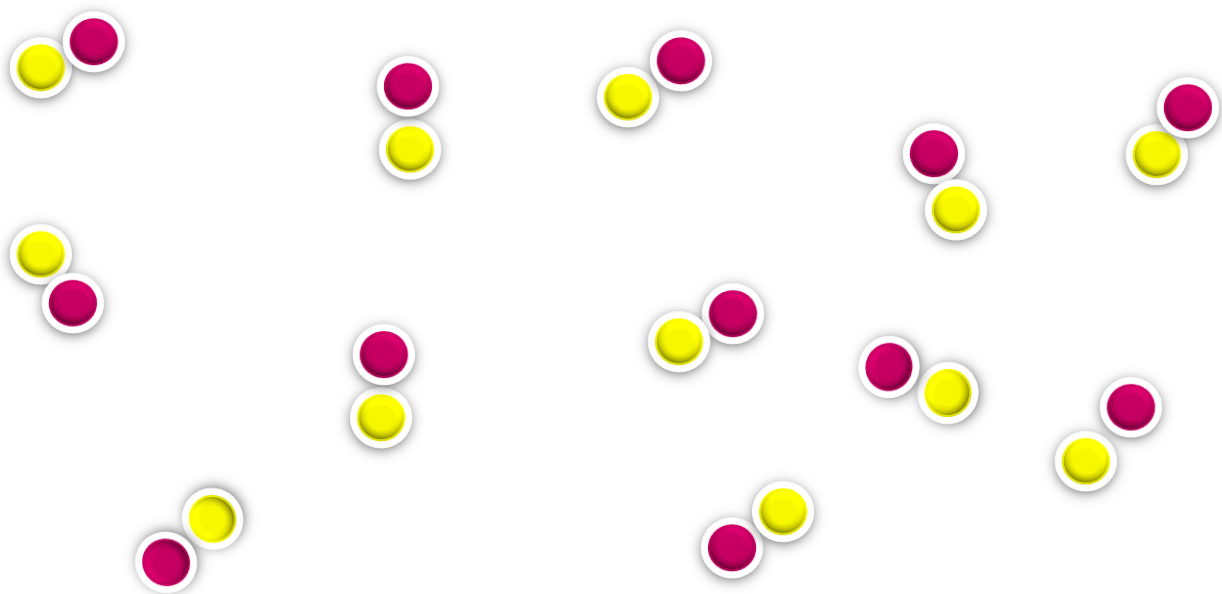


Triple Bond

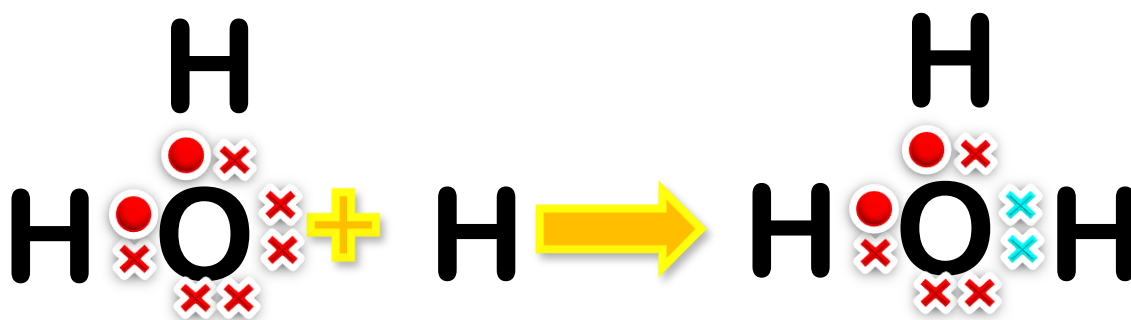
Chapter 5 : Chemical Bond

Formation of Covalent Bond

Covalent bond forms a molecule.



Dative bond is a type of covalent bond that only one atom of all the atoms contribute the electrons to share.



Coordinate Bond

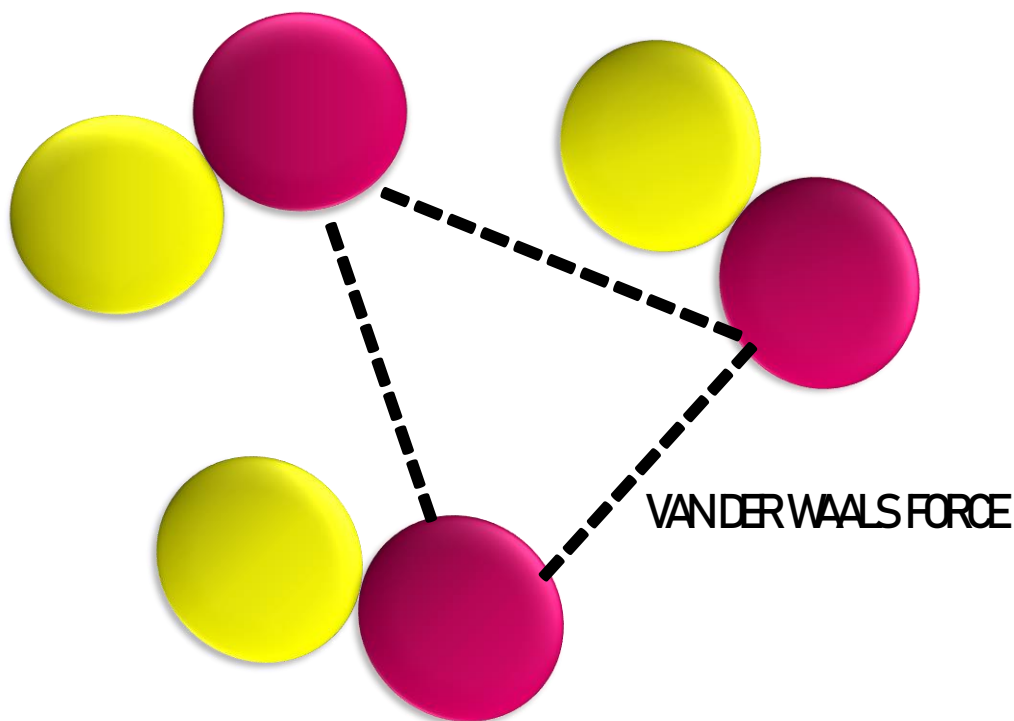
❖ Coordinate bond is also known as Dative bond.

Chapter 5 : Chemical Bond

Formation of Covalent Bond

Covalent bond is not soluble in water but soluble in organic solvents because the molecules do not carry charges.

Covalent bond needs little heat energy to break the van Der Waals force between the molecules.



Van Der Waals Force

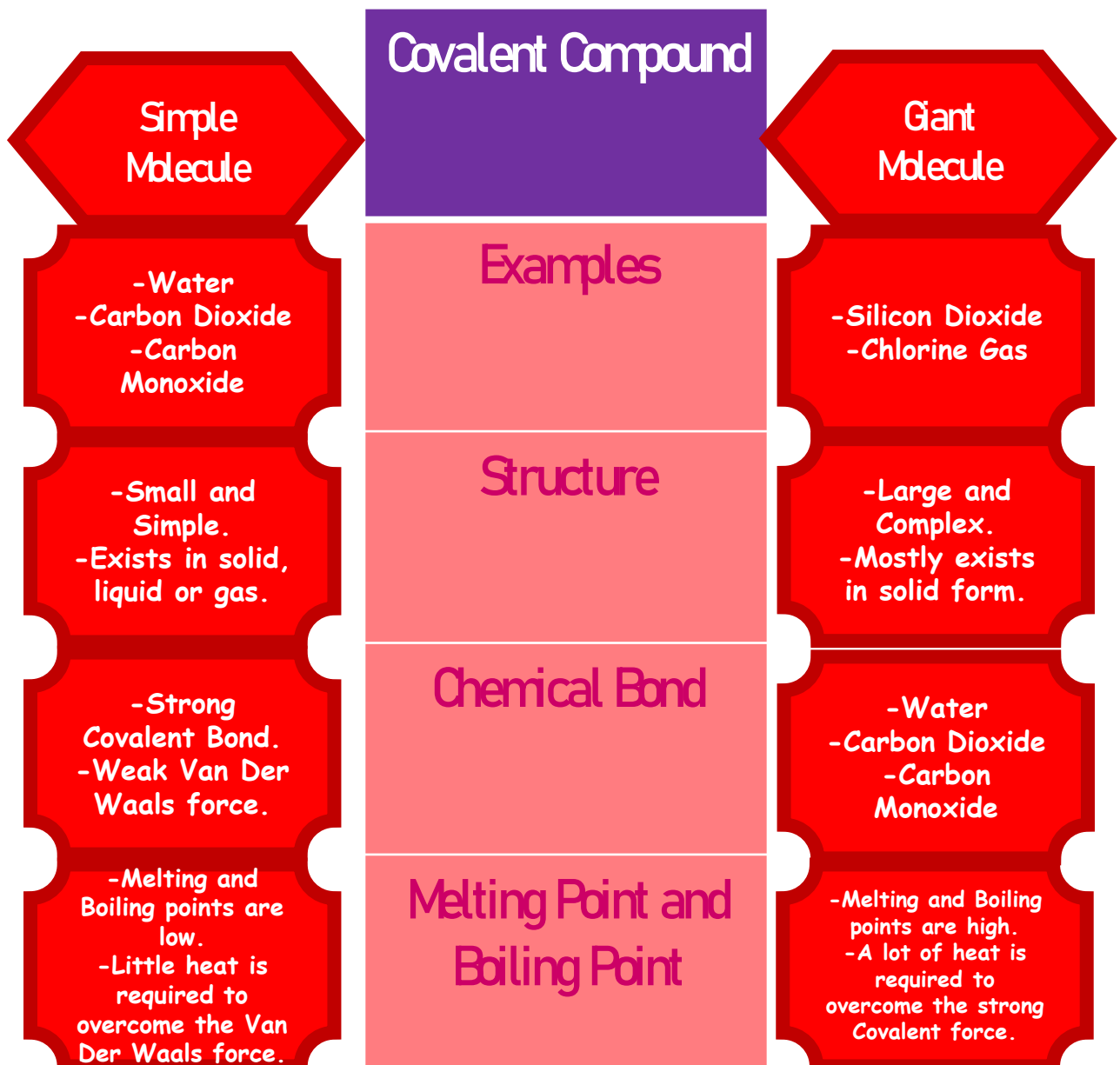
- ❖ Van Der Waals force exists between smaller molecules of Covalent compound.
- ❖ It is very weak and consume little amount of heat to be broken.

Chapter 5 : Chemical Bond

Formation of Covalent Bond

Covalent bond does not conduct electricity because it does not carry any charges.

Structure of Covalent Compounds



Chapter 5 : Chemical Bond

Covalent Compounds and Their Uses

Covalent compound like water is universal solvent.

Covalent compound like paracetamol is used to treat fevers and irritations.

Covalent compounds like bromoethane and chloropicrin are used as pesticides.

Covalent compounds like pigment and turpentine solvent are used in paint.

Chapter 5 : Chemical Bond

Formation of Hydrogen Bond

Hydrogen bonds are attraction forces between hydrogen atom, H with an atom of high electronegativity.

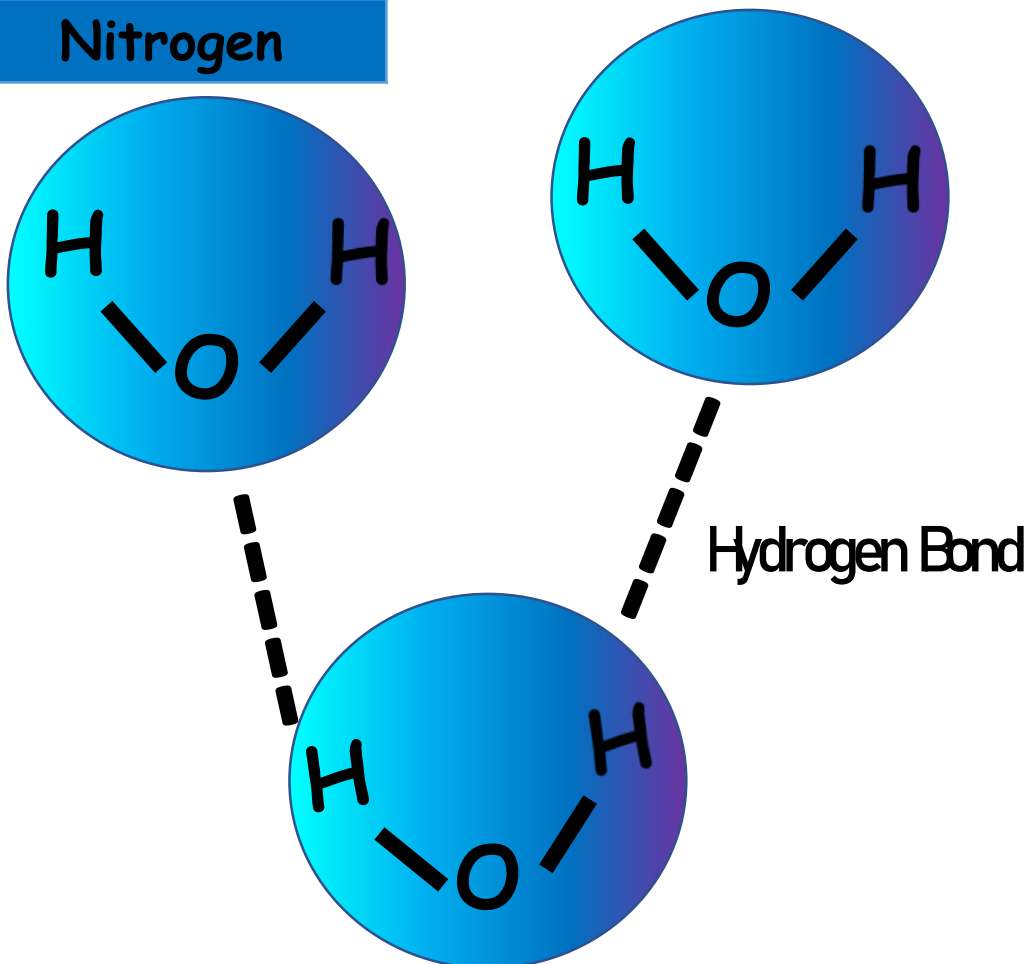
Atoms with High Electronegativity

- ❖ Electronegativity is the tendency of an atom to accept electrons easily.
- ❖ Atoms with high electronegativity are as follows :

Oxygen

Fluorine

Nitrogen



Chapter 5 : Chemical Bond

Hydrogen Bond and Its Role in Daily Life

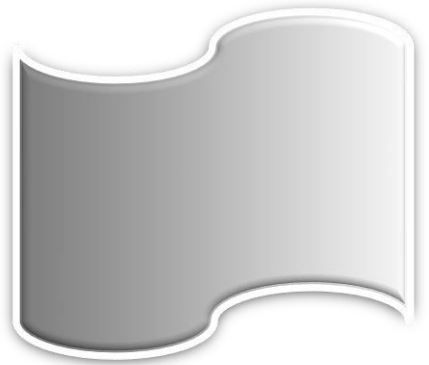
Hair and Protein Molecules

- ❖ When hair is in contact with water, the protein molecules in hair will form hydrogen bond with the water molecules and causes it to stick together.
- ❖ The water molecules not only stick to one protein molecules but also stick with other protein molecules. This causes it to appear as a clump and stick together.



Paper and Cellulose Molecules

- ❖ When our hands are dry, water molecules are absent and no hydrogen is formed. Thus, it is harder to turn the pages.
- ❖ To overcome this problem, wetting our hands can help. This is because by wetting our hands, water molecules on our hands will form hydrogen bond with the cellulose molecules on the paper. This will make it easier to turn the pages.



Hydrogen Bond and Its Effects

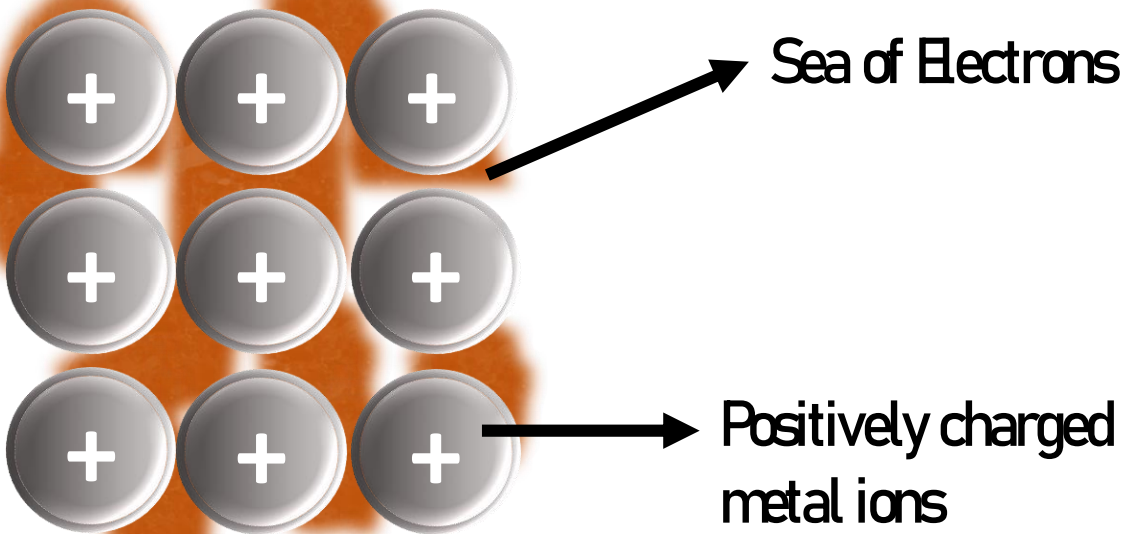
Ethanol Molecules

- ❖ Ethanol molecules not only have strong covalent bond and Van Der Waals force but also have strong Hydrogen Bond which is harder to be overcome.
- ❖ The hydrogen bond requires high heat energy.
- ❖ In addition to the heat energy required to break the Van Der Waals force, the ethanol molecules have very high melting and boiling point.
- ❖ Ethanol is also soluble in water even though it is a covalent molecule. This is because of the hydrogen bond formed when Ethanol is in contact with hydrogen atoms in the water.

Chapter 5 : Chemical Bond

The Conductivity of Electricity of Metals

Metal atoms are arranged closely packed and orderly. This causes the valence electron of metal to be easily donated and delocalised although in solid state



Delocalised Electrons

- ❖ Delocalised electrons are electrons that moves freely and is not owned by any atom nor ion.

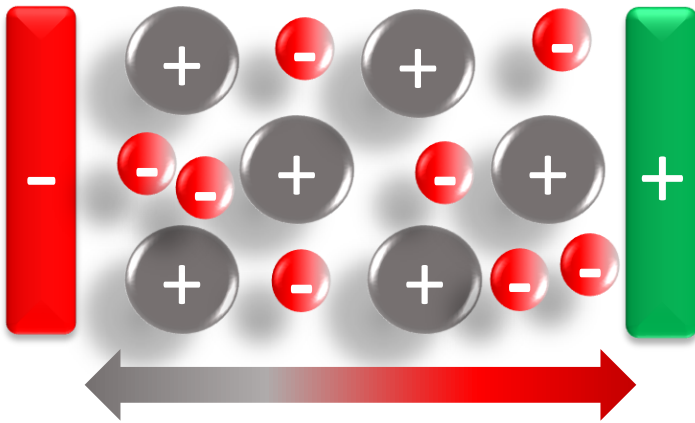
Sea of Electrons

- ❖ Sea of electron is formed when the valence shells of metal atoms overlap, resulting in electron delocalization.

Chapter 5 : Chemical Bond

Metallic Bond and The Conductivity of Electricity

The electrostatic force between the positively charged metal ions and the sea of electron forms a metallic bond.



Chapter 5 : Chemical Bond

Chemical Bond

Ionic Bond

**Covalent
Bond**

**Dative
Bond**

**Hydrogen
Bond**

**Metallic
Bond**

Chapter 4 : Periodic Table of Elements

Arrangement in the Periodic Table of Elements

Groups in the Periodic Table of Elements

- ❖ Groups are known as the vertical bars down the periodic table.
- ❖ Groups are based on the valence electron of the element.
- ❖ There are 18 groups which the groups are based on the valence electron such that
 - if it is 2 or lesser than 2, the group of electron = valence electron and
 - if it is more than 2 and smaller than 8, the group of electron = valence electron + 10

GROUP	NAME
1	ALKALI METALS
2	ALKALINE EARTH METALS
3-12	TRANSITION METALS
17	HALOGENS
18	NOBLE GASES

Periods in the Periodic Table of Elements

- ❖ Periods are known as the horizontal bars across the periodic table.
- ❖ Periods are based on the number of shells of the element.
- ❖ There are 7 periods.