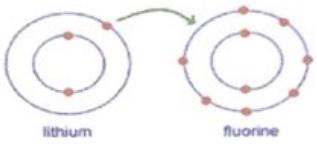
Chemical Bonding:

Atoms tend to arrange themselves in the most stable patterns possible, which means that they have a tendency to complete or fill their outermost electron orbits. The force that holds atoms together in collections known as molecules is referred to as a chemical bond. There are two main types and some secondary types of chemical bonds:

1- Ionic bonds :

- Electrons are transferred from one atom to another creating ions
- Cations are attracted to anions (positives and negatives attract)
- Metal + nonmetal
  - Metals form cations
  - Nonmetals form anions



lithium fluoride

2-Covalent bonds . Formed by a shared pair of electrons between two atoms

- Make up molecules (which make up molecular substances)
- Between nonmetals

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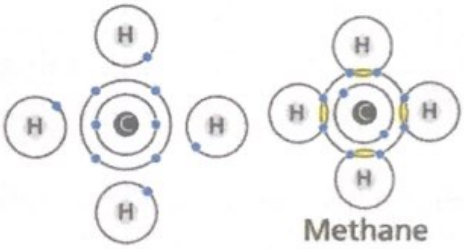


Methane

3- Polar Covalent Bonding

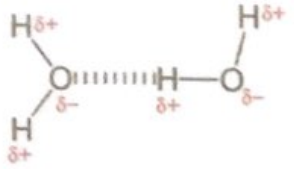
Covalent bonds can be either be Polar or Non-Polar in nature. In Polar Covalent chemical bonding, electrons are shared unequally since the more electronegative atom pulls the electron pair closer to itself and away from the less electronegative atom. Water is an example of such a polar molecule.

A difference in charge arises in different areas of the atom due to the uneven spacing of the electrons between the atoms. One end of the molecule tends to be partially positively charged and the other end tends to be partially negatively charged.

4-Hydrogen bonds

Compared to ionic and covalent bonding, Hydrogen bonding is a weaker form of chemical bonding. It **is a type of polar covalent bonding** between oxygen and hydrogen wherein the hydrogen develops a partial positive charge. This implies that the electrons are pulled closer to the more electronegative oxygen atom.

This creates a tendency for the hydrogen to be attracted towards the negative charges of any neighboring atom. This type of chemical bonding is called a hydrogen bond and is responsible for many of the properties exhibited by water.



Characteristics of Ionic and Covalent Compounds

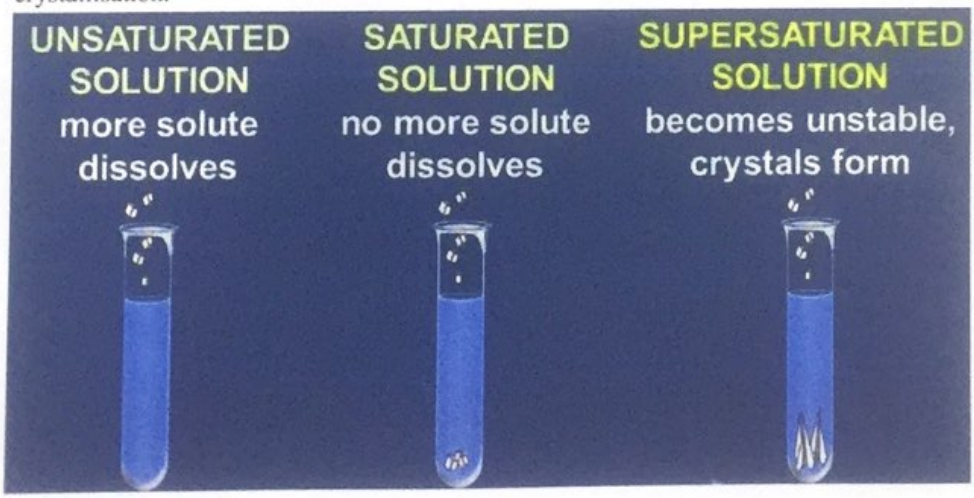
Ionic Compounds	Covalent Compounds
Contain positive and negative ions (Na^+Cl^-)	Exist as neutral molecules ($C_6H_{12}O_6$)
Solids suchs as table salt ($NaCl_{(s)}$)	Solids, liquids,or gases ($C_6H_{12}O_{6(s)}$, $H_2O_{(l)}$, $CO_{2(g)}$)
High melting and boiling points	Lower melting and boiling points (i.e., often exist as a liquid or gas at room temperature)
Strong force of attraction between particles	Relatively weak force of attraction between molecules
Separate into charged particles in water to give a solution that conducts electricity $NaCl_{(s)} \xrightarrow{H_2O} Na^+_{(aq)} + Cl^-_{(aq)}$	Remain as same molecule in water and will not conduct electricity $C_6H_{12}O_{6(s)} \xrightarrow{H_2O} C_6H_{12}O_{6(aq)}$

Methods of Expressing Concentrations

A **solution** is a homogeneous mixture created by dissolving one or more solutes in a solvent. The chemical present in a smaller amount, **the solute**, is soluble in the **solvent** (the chemical present in a larger amount). **Solutions** with accurately known concentrations can be referred to as **standard (stock) solutions**. These solutions are bought directly from the manufacturer or formed by **dissolving the desired amount of solute into a volumetric flask of a specific volume.**
Stock solutions are frequently diluted to solutions of lesser concentration for experimental use in the laboratory

In the amount of solute present in the solution, we can classify them into the following types.

- **Unsaturated Solution:** An unsaturated is one that can dissolve more solute at a definite temperature. It means that we can still add more solute to the solvent.
- **Saturated Solution:** A solution is be saturated when we can't add any more solute to the solvent. This means that the solution can't dissolve any more solute at a definite temperature.
- **Supersaturated Solution**: A supersaturated solution is one where the solute is present in an excess amount. This solute is dissolved forcefully by raising the temperature or pressure of the solution. These generally crystal out in the bottom by the method called crystallisation.

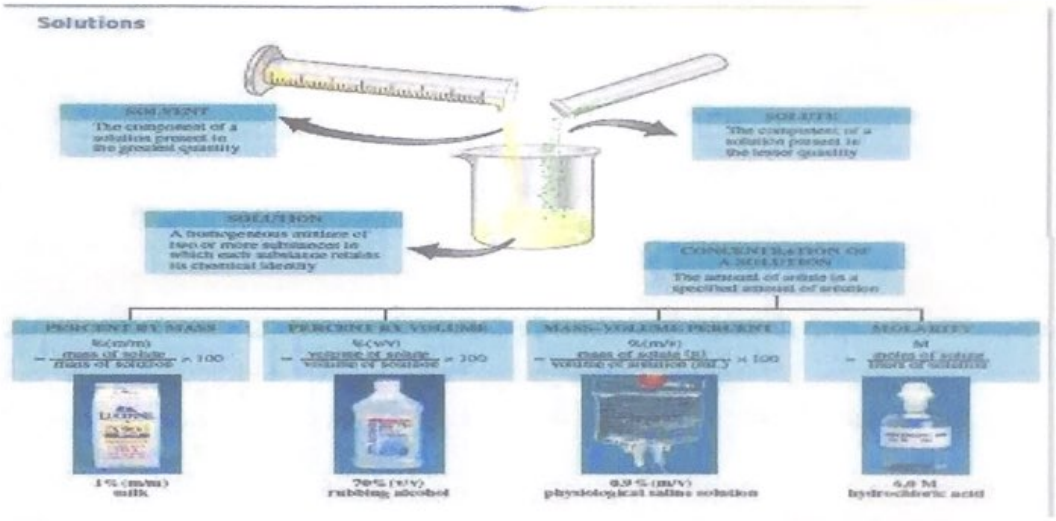


On the Basis of Amount of Solvent Added

- **Concentrated Solution**: A concentrated solution has large amounts of solute in the given solvent. Examples include orange juice, dark color tea.
- **Dilute Solution**: A dilute solution has a small amount of solute in a large amount of solvent. Examples include Salt solution, light color tea

Concentration

Is a general term that expresses the quantity of solute contained in a given amount of solution.



1) Percent Concentration

There are three different ways of representing percent concentration:

1. Percent by mass (or mass–mass percent) or (W/W)
2. Percent by volume (or volume–volume percent) (V/V)
3. Mass–volume percent(W/V)