Mixtures

Lecture No: 5

Assistant Professor
Dr Ali Taha Yassen
College of Dentistry
University of Basrah

Objectives

At the end of this lecture we will understand the following points.

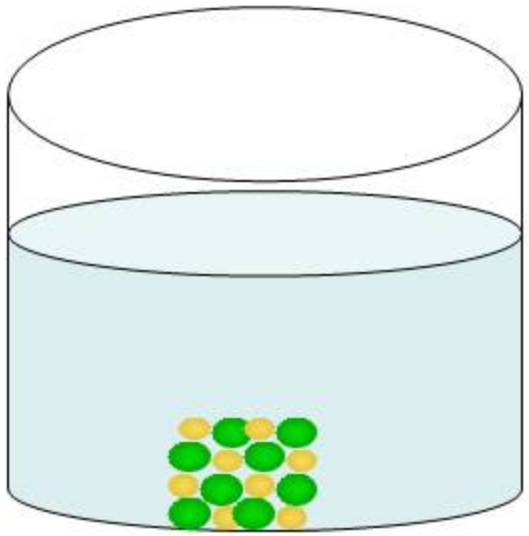
- **Mixtures types**
- **Rate of Solution Formation**
- **Solubility**

Mixtures

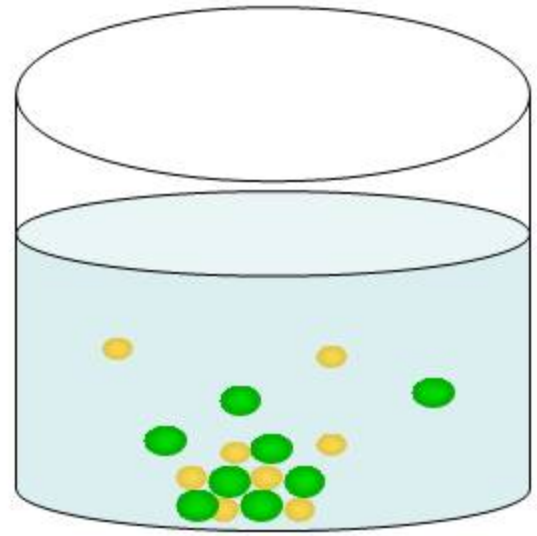
- Mixture – two or more substances put to gether but they do not react with each other
- Types: solutions, colloids, suspensions

Salt Solution

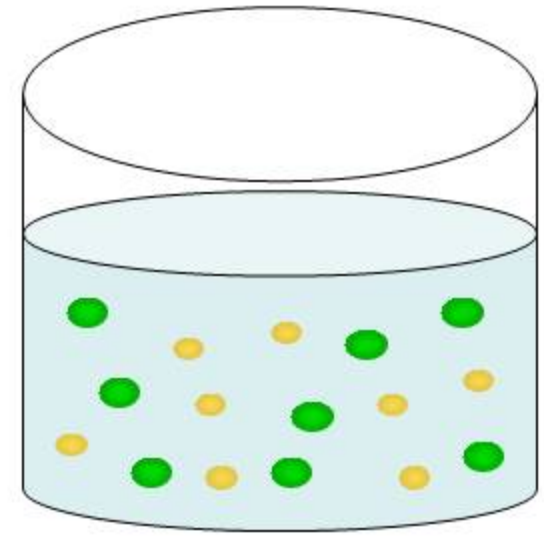
NaCl in H_2O



Salt crystal in water



Na and Cl begin to disperse



Na and Cl evenly dispersed

Solutions

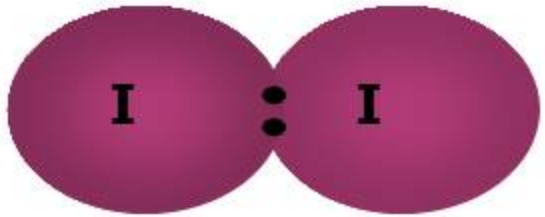
- A solution is a mixture of one substance dispersed uniformly in another substance
  - Solute – substance that is dispersed
  - Solvent – substance that contains the solute and present in a greater amount than the solute
- Solute and solvent do **not** react with each other so they can be mixed in various proportions

Solutions

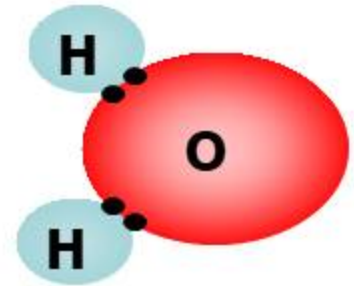
- Solutes and solvents may be gases, liquids, or solids
- Solution has the same state as the solvent
  - Air – gas in a gas
  - Carbonated drink – gas in a liquid
  - Salt water – solid in a liquid
  - Tooth filling (Hg in Ag) – liquid in a solid
  - Steel (carbon in iron – solid in a solid

Solutions

- Characteristics of solutions
  - Small, single particles that go through a filter and a semipermeable membrane
  - Particles are uniformly dispersed so solution is homogeneous and transparent
  - Particles do not settle out of a solution

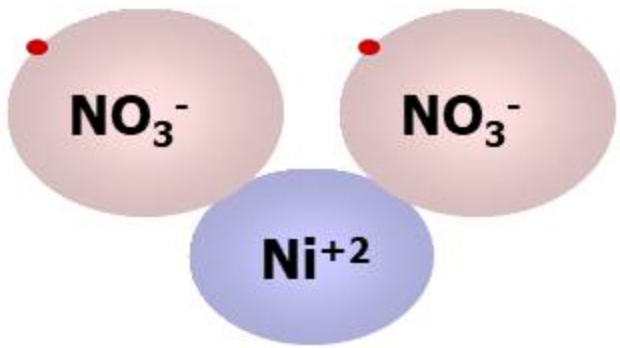


Nonpolar

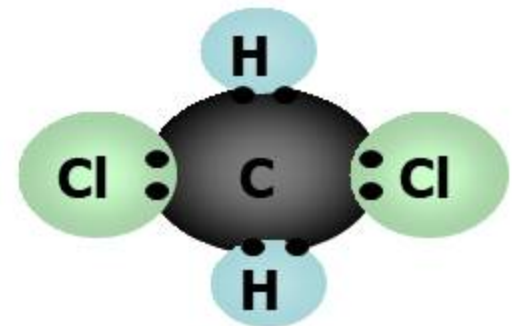


Polar

Polar or Nonpolar?

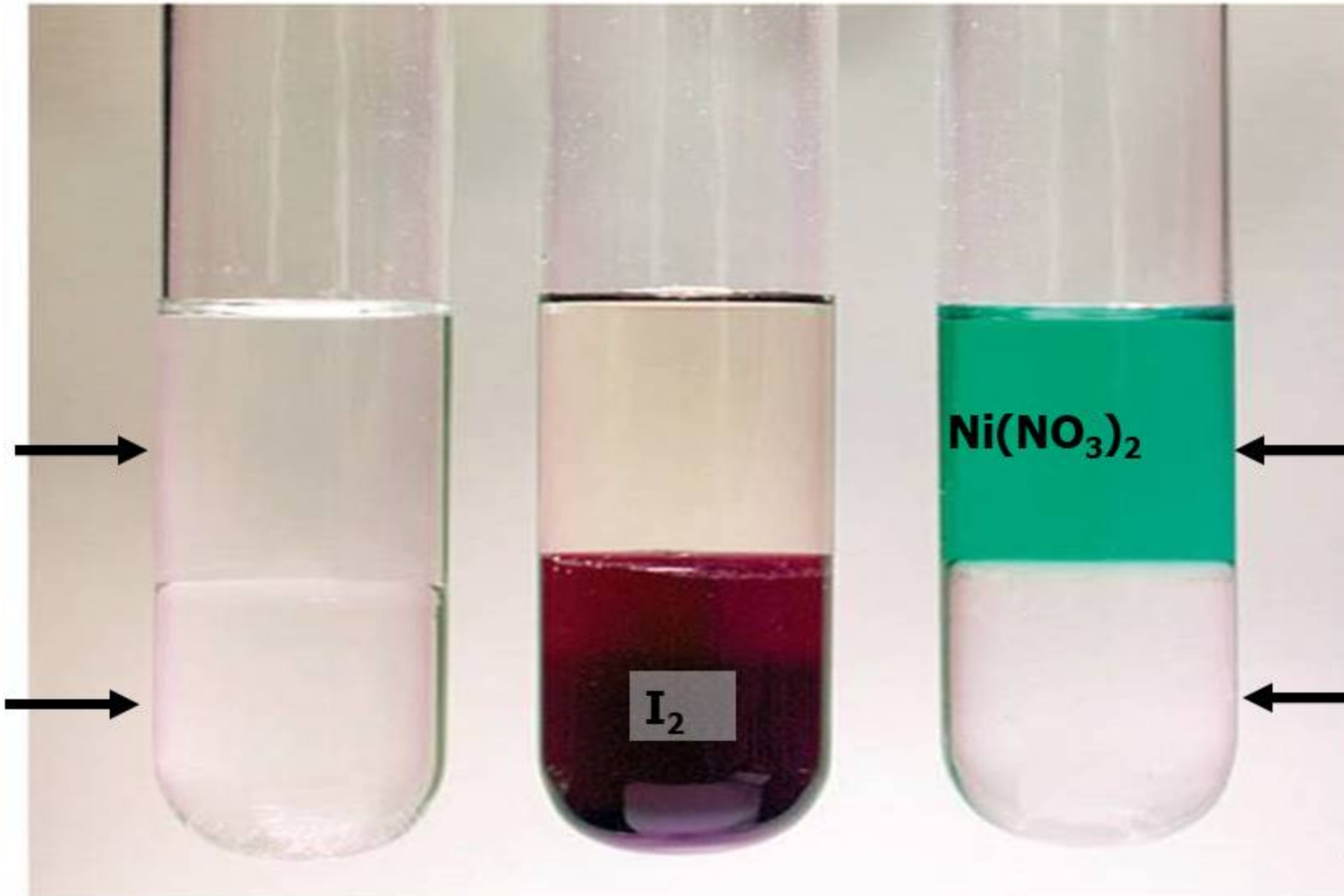


Polar



Nonpolar

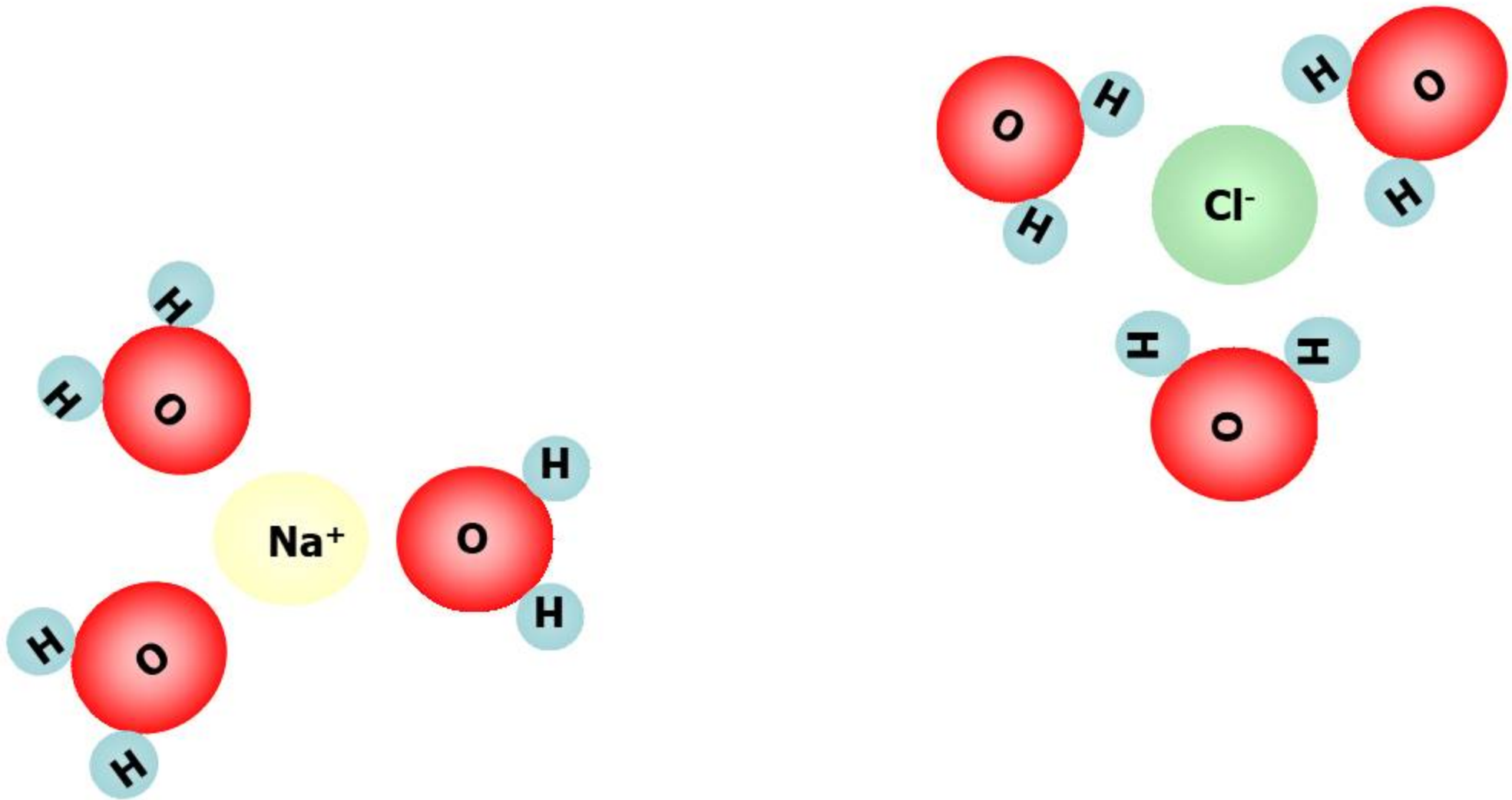
Nonpolar Solvent vs Polar Solvent



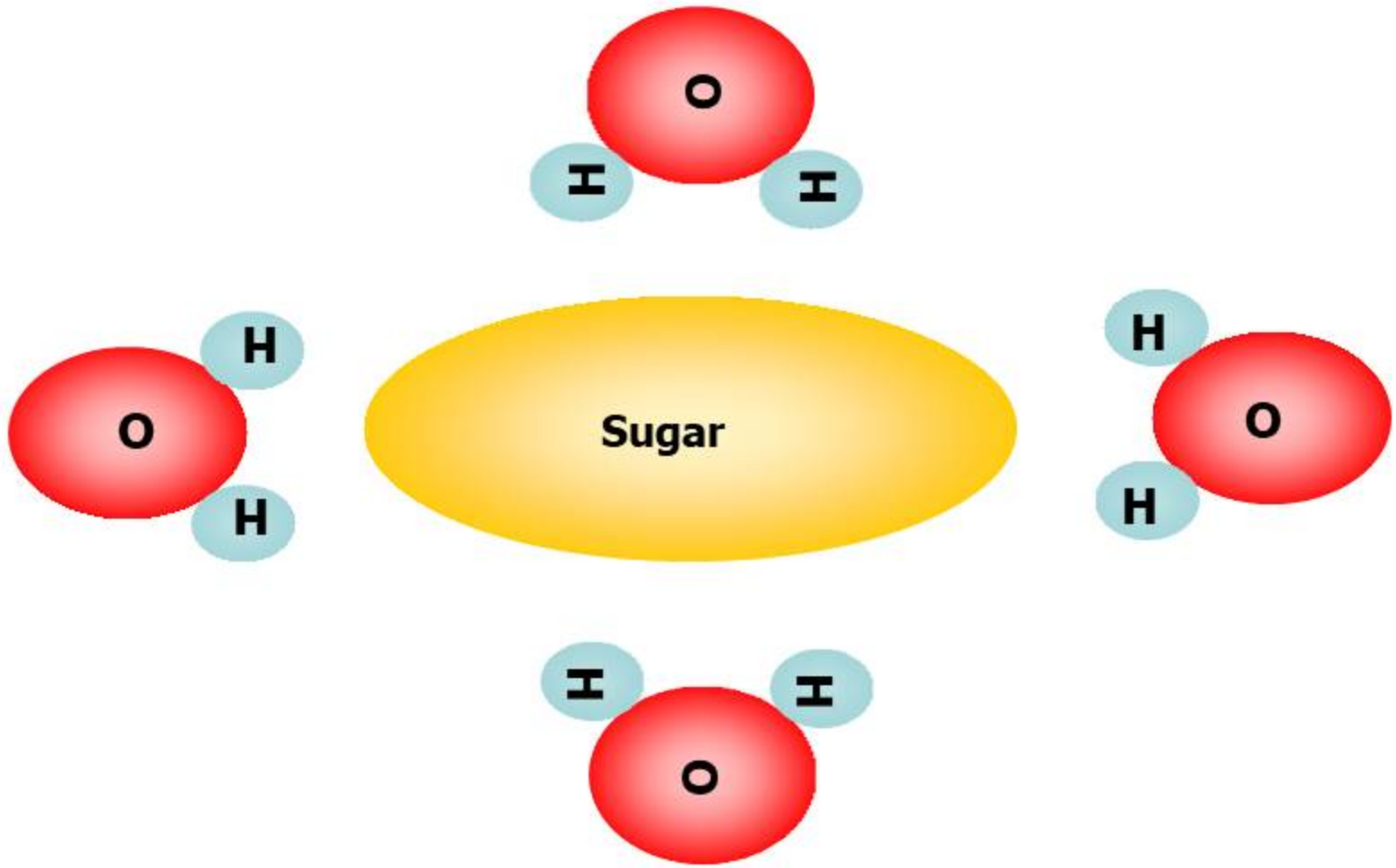
Solutions

- Likes dissolve likes
  - Polar solvents attract polar solutes
  - Polar solvents like water do not attract nonpolar solutes like iodine
  - Nonpolar solvents like carbon tetrachloiride attract nonpolar solutes
  - Nonpolar solvents do not polar solutes

Polar Water Dissolves Polar Ions



Water Dissolves Polar Covalent Molecules



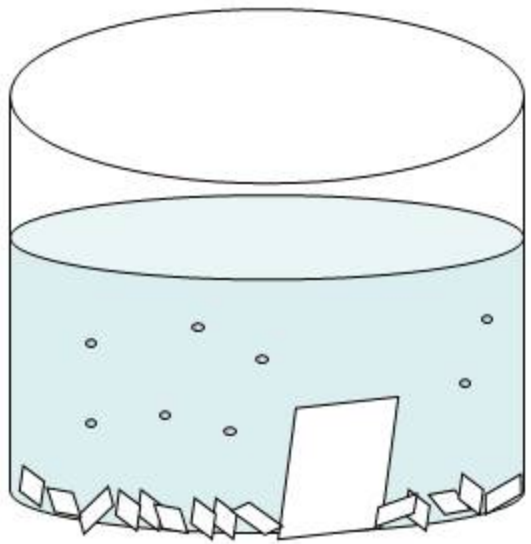
Water, the Universal Solvent

- Water, a polar molecule, separates polar solutes
  - Ionic solutes
  - Polar covalent solutes

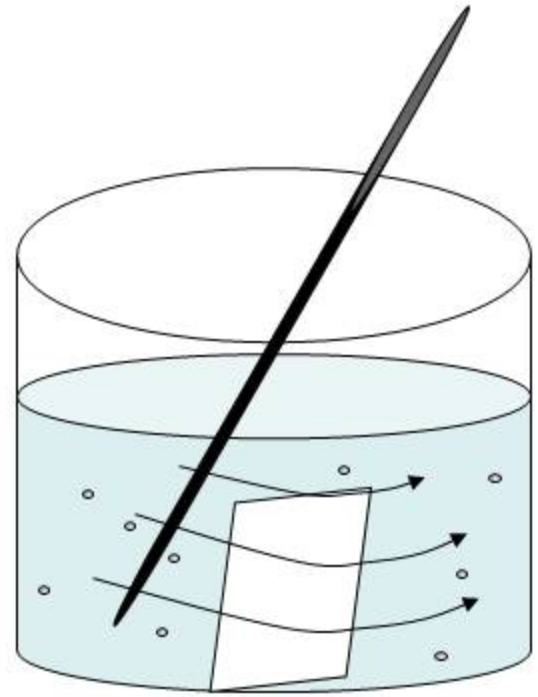
Water, the Universal Solvent

- Water, a polar molecule, separates polar solutes
- Electrolyte – an ionic solution with water – conducts electricity
  - Strong electrolyte – all ions are separated; so, conducts electricity strongly
  - Weak electrolyte – only some ions are separated; so, conducts electricity weakly
- Nonelectrolyte – polar covalent molecule in water; no ions so no conduction of electricity

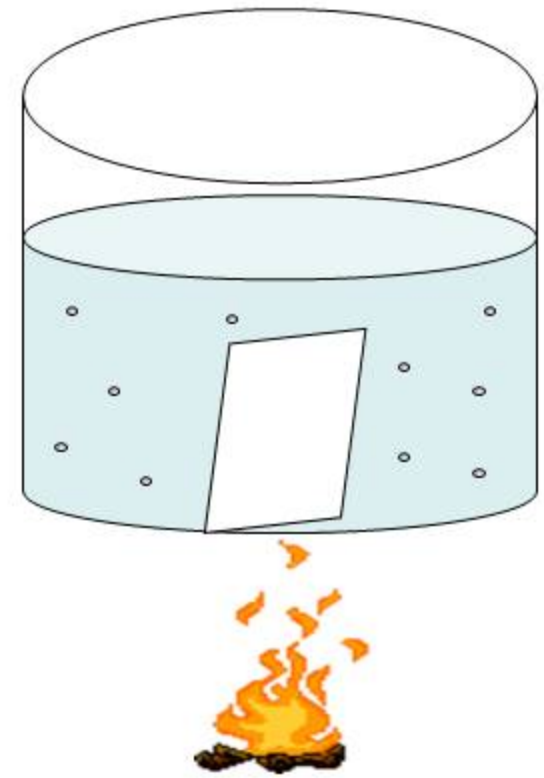
Rate of Solution Formation



Crush



Stir



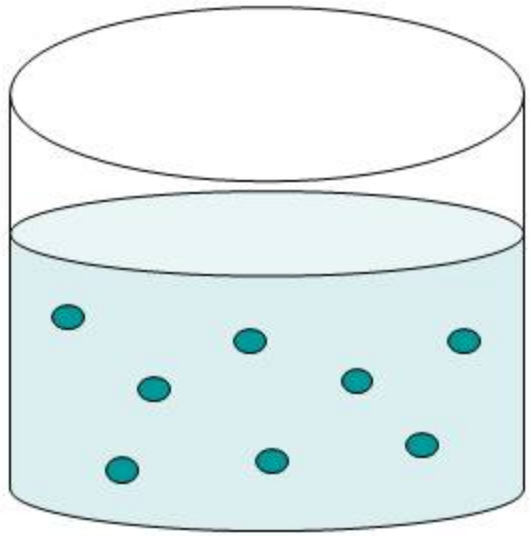
Heat

Increasing the rate of formation!

Rate of Solution formation

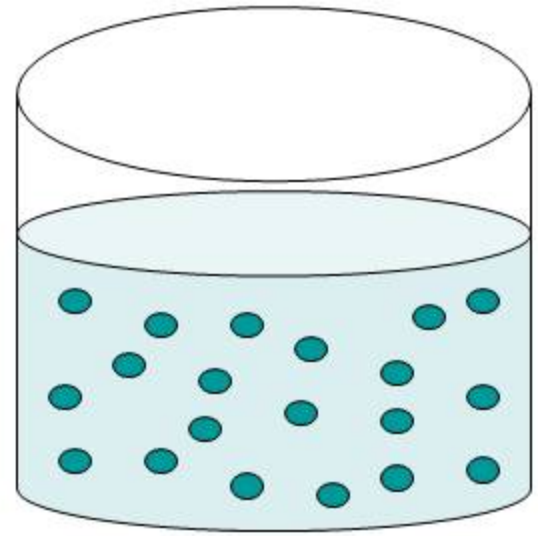
- Rate of solution formation – how fast solution is formed
  - Some molecules go into solution faster than others
  - Rate of formation is increased by crushing, stirring, or heating

Solubility



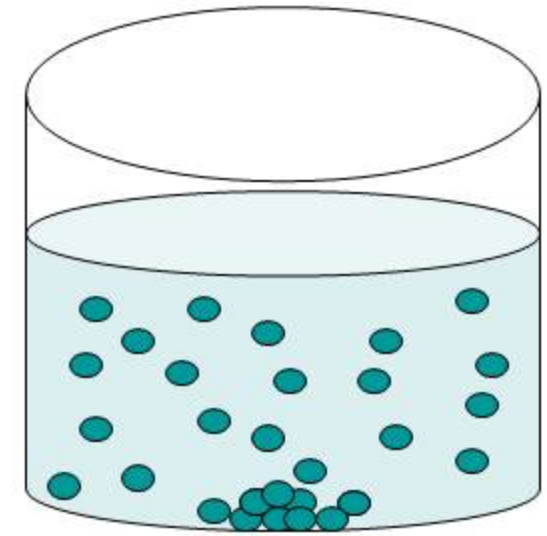
Solvent can dissolve more solute

Unsaturated



Solvent holding all the solute it can possibly hold

Saturated



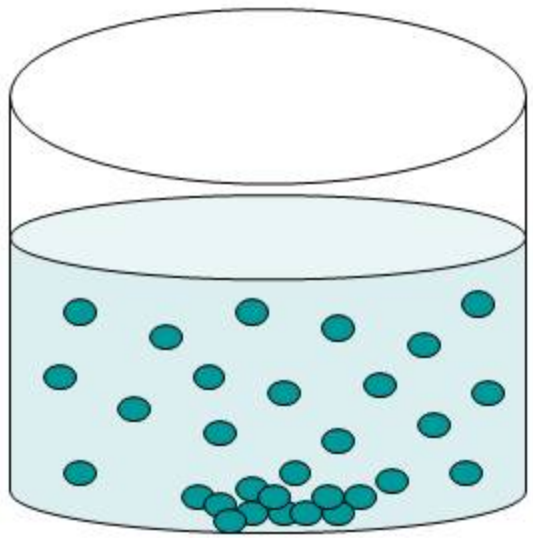
Solvent can not dissolve all the solute

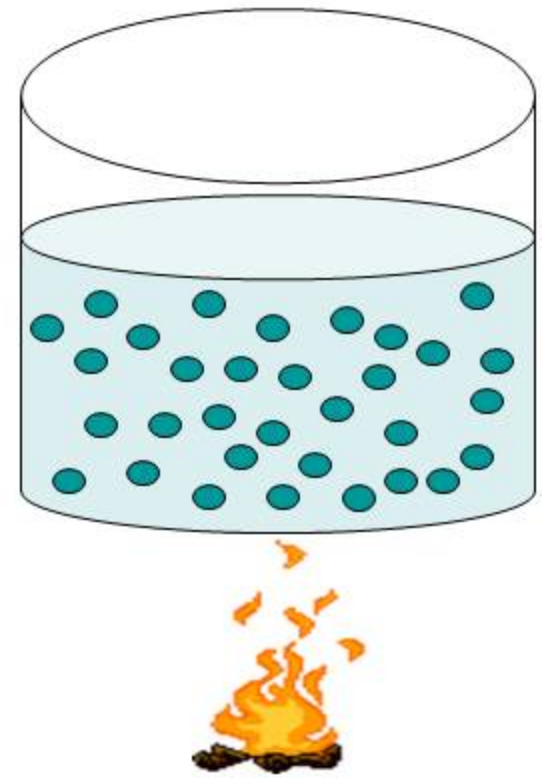
Super Saturated

Solubility

- Solubility – the amount of solute that can dissolve in a solvent
  - A given amount in grams of a solute can dissolve in 100g. of a specific solvent at a given temperature
  - Saturated solution – contains the maximum amount of solute possible
  - Unsaturated solution – has less that the maximum amount of solute

Solubility





Solubility

- Temperature usually causes more solid solute to dissolve in water
- Gases are less soluble in water at a higher temperature
- Not all ionic compounds dissolve in water

The End
Thank You All