

Chapter 1.C

- Solubility
- Concentrations
- Dissolving Processes
- Acids and Bases
- Molecular Substances

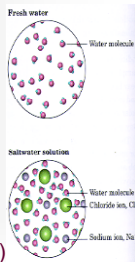


Solutions

A solution is a homogeneous mixture of two or more substances in a single physical state.

Properties:

- particles in solution are very small (usually atoms, molecules or ions)
- particles are evenly distributed (every sample will have the same concentration as every other sample)
- particles will not separate out



Solutions

2 parts to a solution:

- 1) solute - substance that dissolves
- 2) solvent - substance doing dissolving.

4 types of solutions

- 1) alloys - solid solutions
- 2) gas solutions
- 3) liquid solutions
- 4) aqueous solutions - water is solvent



Solubility & Saturation

Solubility - The amount of a solute that will dissolve in a specific solvent.

Saturated - A solution is saturated if it contains as much solute as it possibly can.

Unsaturated - A solution that has less than the maximum amount of solute that can be dissolved.

Supersaturated - A solution that contains more than it should (highly unstable)

Concentrations

Chemists often need to specify precisely how concentrated or dilute a solution is. The concentration is the amount of solute in a given amount of solution.

Ways of expressing concentration

1) Percent or pph (parts per hundred)

$$\text{pph} = \frac{\text{mass of solute}}{\text{mass of solution}} \times 100$$

Tells the number of molecules of solute per 100 molecules of solution

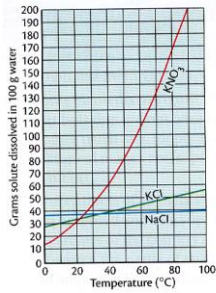
Concentrations

2) ppm - parts per million - number of solute molecules per 1 million molecules of solution molecules.

3) ppb - parts per billion - number of solute molecules per 1 billion molecules of solution molecules.

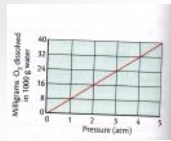
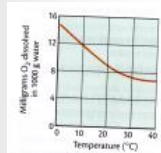
Effects on Solubility

Solubility can be affected by the temperature of the solvent
 A point on the curve is saturated.
 Below the curve indicates an unsaturated solution
 Above is a supersaturated solution



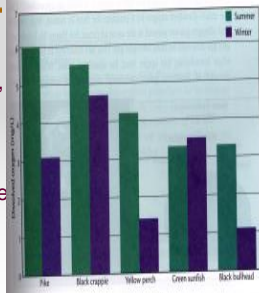
Dissolved Oxygen

The amount of dissolved oxygen within water depends on two things: temperature and pressure.
 The higher the temperature, the lower the amount of dissolved oxygen
 The higher the pressure, the higher the dissolved oxygen.



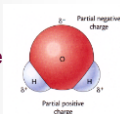
Dissolved Oxygen and Life

What happens to the amount of dissolved oxygen required by waterlife in the winter, compared to the summer?
 What explanation can be used to explain the lower oxygen use?



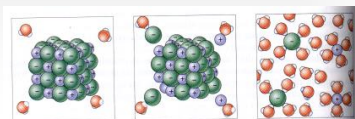
Dissolving

Water is not an ionic compound. However, it does have partial positive negative sides to the molecules. A water molecule is called polar.



When water dissolves an ionic compound, the solid is taken apart into ions by the water molecules.

The ions are attracted to the opposite charges of the polar molecule water



Pollutants

- Molecular compounds – organic molecules that dissolve in water can be hazardous or helpful. These molecules can be polar or nonpolar. “Like dissolves like”
- Dissolved Gases – too little or too much oxygen can be harmful
- Heavy Metals – Lead and Mercury can lower immunity and cause brain damage

pH

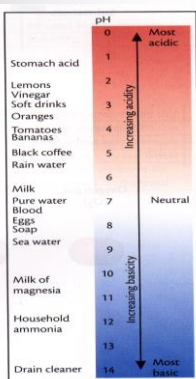
The pH scale measures the amount of acid or base in a solution.

A pH of 0 is very acidic. A

pH of 14 is very basic.

A pH of 7 is neutral.

Acids and Bases - Acids burn skin, bases dissolve skin. pHs between 5 and 9 are considered “safe”.



Molecular Substances

Substances that dissolve, but do not form charged ions.

These substances can be polar (like ionic compounds) or nonpolar. Nonpolar molecules do not have charged ends like polar molecules.

Polar and nonpolar molecules are determined by what they dissolve in.

“like dissolves like”

Properties of Acids and Bases

- Taste - acids have a sour or tart taste, while bases taste bitter
- Touch- acids will give a sharp sting on an open sore, while bases will feel slippery.
- Reactivity - metals react vigorously with acids, bases are unaffected

Properties of Acids and Bases

- Conductors - acids and bases are both good conductors of electricity.
- Indicators - an indicator is a substance that has a different color in an acid than in a base.
- Neutralization - when acids and bases are mixed, they retain none of the properties of either an acid or base.

Solvents Lab

- In this lab, we will be testing the solubility of several solutes in three solvents. Limits on materials are for the entire lab!

• Solid solutes

(limit 1 g per lab group)

NaCl (s)
urea (s)
CuSO₄ (s)
NH₄Cl (s)
sucrose (s)
naphthalene (s)

Liquid solutes

(limit 5 mL per lab group)

hexanes (l)
ethanol (l)
water (l)
lamp oil (l)

- Solvents (limit 100 mL total volume per lab group per lab)
water (l) ethanol (l) lamp oil (l)

Solvents Lab

- Waste containers for this lab are tricky. Follow this hierarchy:
- 1. If mixture has hexanes in it, put it in HEXANES WASTE.
- 2. If mixture has lamp oil in it, put it in LAMP OIL WASTE.
- 3. If mixture has ethanol or water in it, put it in ETHANOL/WATER WASTE.
