

## Solutions



## Solutions: Basic Definitions

- \_\_\_\_\_ – substance that is being dissolved
- \_\_\_\_\_ – substance that dissolves the solute
- \_\_\_\_\_ – a mixture of substances that has a uniform composition; a homogeneous mixture

## Solutions: Basic Definitions

- \_\_\_\_\_ – when a substance will dissolve in another substance (salt & water)
- \_\_\_\_\_ – when a substance will not dissolve in another substance (sand & water)

## Solutions: Basic Definitions

- \_\_\_\_\_ – when two liquids are soluble in each other (alcohol & water)
- \_\_\_\_\_ – when two liquids are not soluble in each other (oil & water)
- \_\_\_\_\_ – dissolved in water

## Solutions: Basic Definitions

- **solution** - If the amount of solute dissolved is less than the maximum that could be dissolved
- **solution** - solution which holds the maximum amount of solute per amount of the solution under the given conditions
- **solution** - solutions that contain more solute than the usual maximum amount and are unstable.

## Increasing the Rate of Solution

1. Agitation
2. Increasing Temperature
3. Increasing Surface Area

## Solubility of a gas

- **Two main factors that affect the solubility of a gas in a liquid**

1.
2.

## Henry's Law

- The solubility of a gas is directly proportional to the pressure

$$S_1 = S_2 \\ P_1 \quad P_2$$

S = solubility (g/L)

P = pressure

### Example

- If 0.85 g of a gas at 4.0 atm of pressure dissolves in 1.0 L of water at 25°C, how much will dissolve in 1.0 L of water at 1.0 atm of pressure at the same temperature?

### Another Example

- The solubility of a gas is 2.0 g/L at 50.0 kPa. How much gas will dissolve in 1.5 L at 10.0 kPa?

### % Composition of Hydrated Salts

- Barium Chloride is found as a hydrated salt,  $\text{BaCl}_2 \cdot x\text{H}_2\text{O}$ . A student carefully heats 2.50 g of the salt to a constant mass of 2.13 g. Find  $x$ .

### Molarity

Molarity = moles of solute/liter of solution

$M = \text{mol/L}$

### Molarity Examples

- Calculate the molarity of a solution made by dissolving 23.4 g of sodium sulfate in 125 ml of solution

### Molarity Examples

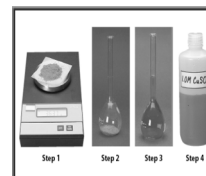
- Calculate the molarity of a solution made by dissolving 5.00 g of  $C_6H_{12}O_6$  in enough water to make 100.0 ml of solution

### Molarity Examples

- How many grams of  $Na_2SO_4$  are required to make 0.350 L of a 0.500 M solution of  $Na_2SO_4$ ?

### Making Solutions

- Assuming you're making an aqueous solution, you need to know only three things when working quantitatively:
  1. the concentration
  2. the amount of solute
  3. the total volume of solution needed.



### Preparing 1 L of an NaCl Solution

- How would you prepare 1.0 L of a 0.15M sodium chloride solution?

### Dilution Equation

- $M_1V_1 = M_2V_2$
- $M_1$  = initial molarity
- $V_1$  = initial volume
- $M_2$  = final molarity
- $V_2$  = final volume
- The units for  $V_1$  &  $V_2$  do not matter as long as they are the same
- $M_1$  &  $M_2$  MUST be in molarity

### Dilution Problems

- Suppose we want to make 250 ml of a 0.10 M solution of  $\text{CuSO}_4$  and we have a stock solution of 1.0 M  $\text{CuSO}_4$ . How would we prepare the solution?

### More Dilution Problems

- How many ml of 3.0 M  $\text{H}_2\text{SO}_4$  are required to make 450 ml of a 1.0 M solution? How would you make it?

### Calculating Ion Concentrations

- 0.10 M NaOH
- What are the concentration of sodium ions and hydroxide ions?

### Calculating Ion Concentrations

- $7.5 \times 10^{-4}$  M  $\text{Ca}(\text{OH})_2$   
Calculate the concentrations of the ions present