13.2, 13.3, and 13.4

I. 13.2 – Saturated Solutions and Solubility | PART #2

Define **Saturated** –

The amount of solute needed to form a saturated solution in a given quantity of solvent is known as the _____ of that solute.

Define **Solubility** –

The Theorem of Solubility –

| |
| |

- For example, the solubility of NaCl in water at 0 degrees Celsius is 35.7 grams per 100 mL of water. This is the maximum amount of NaCl that can be dissolved in water to give a stable equilibrium solution at that temperature.

Define **Unsaturated** –

Define **Supersaturated** –

II. 13.3 – Factors Affecting Solubility

Solute–Solvent Interactions –

Solute–solvent interactions affect solubility in the sense that…

- Polar liquids tend to dissolve in _____ solvents.
- Nonpolar liquids tend to dissolve in _____ solvents.

This is where the saying, "like–dissolves–like" comes into play.

If you were to mix liquids and they were to mix in all proportions, you would say they are _____.

Define **Miscible** –

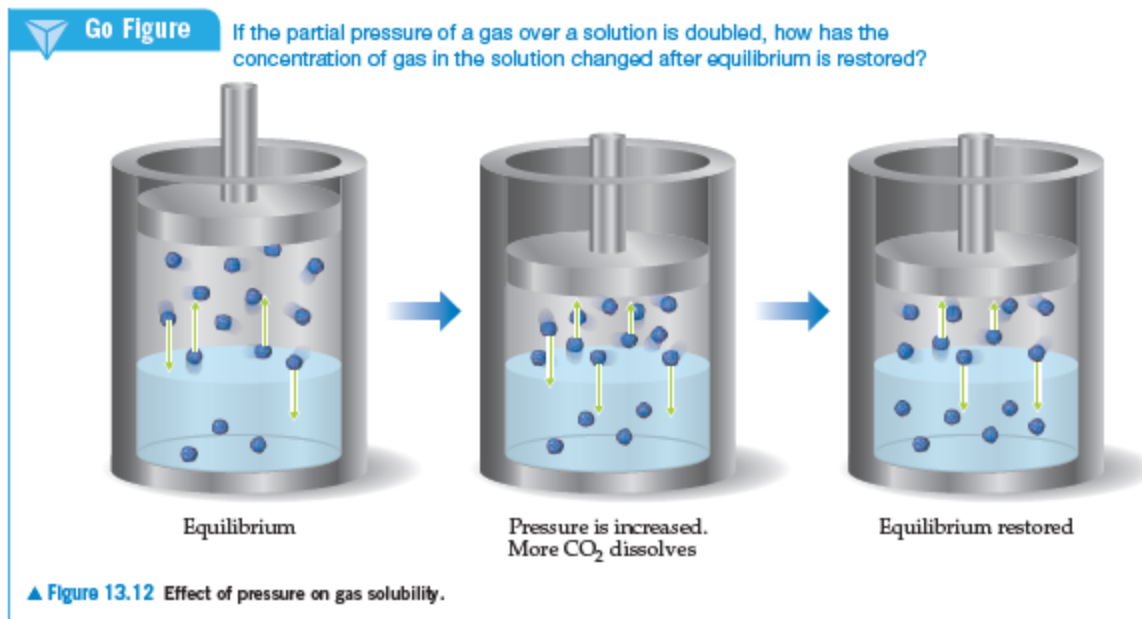If they don't, whereas those that do not dissolve in one another, they are
_____.

Define **Immiscible** –

1. Predict whether each of the following substances is more likely to dissolve in the nonpolar solvent carbon tetrachloride (CCl_4) or in water: C_7H_{16}, Na_2SO_4, HCl, and I_2.

Pressure Effects –

The "Theorem" of Pressure Effects on a Gas's Solubility –

Thus, we can formulate the general understanding that…

Go Figure If the partial pressure of a gas over a solution is doubled, how has the concentration of gas in the solution changed after equilibrium is restored?

Equilibrium

Pressure is increased.
More CO_2 dissolves

Equilibrium restored

▲ **Figure 13.12** Effect of pressure on gas solubility.

- I increased the pressure; I essentially pushed more gas to be forced into the solvent. More gas becomes dissolved in solution because I increased the pressure.

The relationship between pressure and solubility is expressed by
_____ _____.

- _____ -

- _____ -

  ○

- _____ -

2. Calculate the concentration of CO_2 in a soft drink that is bottled with a partial pressure of CO_2 of 4.0 atm over the liquid at 25 degrees Celsius. The Henry's law constant for CO_2 in water at this temperature is 3.4E–2 mol/L–atm.

Temperature Effects –

- The solubility of most solid solutes in water _____ as the solution temperature _____.
  - Of course, there are exceptions to this rule.

- The solubility of gases in water _____ with _____ temperature.

Therefore, for temperature effects, the solubility of solid and gaseous solutes are inverse.

III. 13.4 – Expressing Solution Concentration | PART #1

Calculation of Mass–Related Concentrations: ppm –

3. (a) A solution is made by dissolving 13.5 g of glucose into 0.100 kg of water. What is the mass percentage of solute in this solution? (b) Then, a 2.5 g sample of groundwater was found to contain 5.4 micrograms of zinc ions. What is the concentration of the zinc ions in parts per million?

Calculation of Molality: $m -$

4. A solution is made by dissolving 4.35 g of glucose in 25.0 mL of water at 25 degrees Celsius. Calculate the molality of glucose in the solution. Water has a density of 1.00 g/mL.