CONCEPT: SOLUTIONS: SOLUBILTY AND INTERMOLECULAR FORCES

- Recall, solubility is a _____ property that deals with the ability of a solute to become dissolved (miscible) in a solvent.
  - **Solution:** A _____ mixture that is created when a solvent dissolves a solute.
    - A _____ mixture is created when a solvent cannot dissolve a solute.

EXAMPLE: The following table represents the solubilities of a few nonpolar gases in water at 25 ºC under a total pressure of 1.0 atm. Based on the information provided what is the most likely solubility value of F_2?

Solubility in Water			
Compound	N_2	O_2	F_2
Solubility (mM)	0.6	1.2	?

a) 0.01 b) 0.25 c) 1.3 d) 4.2

Theory of Likes Dissolve Likes

- Compounds with the same _____ and/or _____ will dissolve into each other to form a solution.

Types of Intermolecular Forces		
Type of Force	**Major Force Of**	**Polarity**
Ion-Dipole	_____ compounds	_____
Hydrogen Bonding	Compounds containing ___ directly bonded to **F**, **O** or **N**	_____
Dipole-Dipole	_____ covalent compounds	_____
London Dispersion (van der Waals)	_____ covalent compounds	_____

EXAMPLE: Identify the intermolecular forces present in both the solute and solvent, and predict whether a solution will form between the two: 50 g $AsCl_5$ placed into 250 g H_2O.

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PRACTICE: Indicate the most important type of intermolecular attraction responsible for solvation in the following solution:

Methanol, CH_3OH, dissolved in ethanol, CH_3CH_2OH

a) Ion-Dipole b) Dipole-Dipole c) Hydrogen Bonding d) Dispersion Forces e) Ionic Bonding

PRACTICE: Which of the following solutes will most readily dissolve in H_2O?

a) $HOCH_2CH_2CH_2OH$ b) $CH_3CH_2CH_2CH_3$ c) $CH_3CH_2CH_2OH$ d) CCl_4 e) $HOCH_2CH_2OH$

PRACTICE: Two pure chemical substance are likely to mix and form a solution if:

a) The formation of the solution causes an increase in energy.

b) One substance is polar and the other is nonpolar.

c) The formation of the solution causes an increase in randomness.

d) Strong intermolecular attraction between the solute molecules.

PRACTICE: Which of the following statements is/are true?

I. The hydrocarbon methane (CH_4) will dissolve completely in acetone (CH_3COCH_3).

II. Ammonia (NH_3) will form a heterogeneous mixture with carbon tetrachloride (CCl_4).

III. Pentane (C_5H_{12}) will form a homogeneous mixture with carbon tetrabromide (CBr_4).

IV. Methanethiol (CH_3SH) is miscible in fluoromethane (CH_3F).

a) I only b) II and III c) II, III, IV d) III and IV e) None of the above