

Name Answers!!! Date _____ Period _____

Solutions Worksheet #1

Chemistry; Coleman

Part One: On the line at the left, write the letter of the definition that best matches each term.

- e 1. solution a. capable of being dissolved
- c 2. solute b. solution with water as the solvent
- f 3. solvent c. substance that is dissolved in a solution
- a 4. soluble d. solid solution containing two or more metals
- b 5. aqueous solution e. homogeneous mixture of two or more substances in a single physical state
- d 6. alloy f. substance that does the dissolving in a solution

Part Two: Answer each of the following questions in the space provided.

7. Describe the properties of a solution.

Homogeneous mixture that stays mixed indefinitely and that never separates.

8. Give two examples of solutions in every-day life and indicate what is the solute and what is the solvent each. **Answers Vary...**

Salt Water: Salt is solute; Water is solvent

Atmosphere: Nitrogen gas is solvent; all other gases are solutes

9. What does "like dissolve like" mean?

Polar solvents dissolve polar solutes and non-polar solvents dissolve non-polar solutes.

10. Why don't oil and vinegar mix? You should discuss this in terms of what happens at a molecular level.

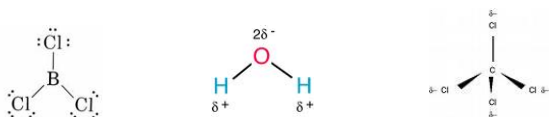
Because water molecules are more attracted to other water molecules than to oil molecules.

11. Indicate the solvent that will be best at dissolving the given solute in each of the following problems (remember that polarity of a molecule is based on shape as well as electronegativity difference between the bonds in the molecule):

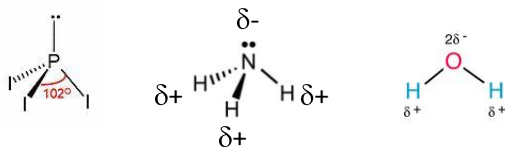
- a) Solute: lithium hydroxide. Solvents: carbon disulfide, CH_2Cl_2
Lithium hydroxide is an IONIC compound and therefore POLAR. It needs a polar solvent to dissolve it. Carbon disulfide is non-polar so it won't dissolve LiOH. CH_2Cl_2 is polar so it WILL dissolve CS_2 .



- b) Solute: boron trichloride. Solvents: carbon tetrachloride, water.
Boron trichloride is NON-POLAR and therefore needs a non-polar solvent. Carbon tetrachloride is non-polar but water is polar. So Carbon tetrachloride is the best solvent.



- c) Solute: phosphorus triiodide. Solvents: ammonia, water.
 Phosphorus triiodide is NON-POLAR and therefore needs a non-polar solvent. Both water and ammonia are polar, so neither one will dissolve PI_3 .



12. Indicate the solute(s) and the solvent in each of the following solutions:

- a) 50 g of solid NaOH in 150 ml of liquid ethanol.

NaOH = Solute; Ethanol = Solvent

- b) Laughing gas, which is 40% nitrous oxide gas and 60% oxygen gas.

Nitrous Oxide = solute; Oxygen gas = solvent

- c) A steel composition containing 0.95 % carbon, 0.1 % silicon, 0.015 % phosphorus, 0.4 % molybdenum, with the remainder percent by weight being iron.

Iron = solvent; all other substances = solutes

13. Name 3 ways to *increase* the *speed* with which a solute dissolves.

Increase the temperature; stir or shake the solution, or crush the solute into smaller pieces

14. Name three things that will change the solubility of a solute into a solvent.

Changing the temperature of the solvent; intermolecular forces, or increasing the pressure (this only works on gases)

15. How does increasing the temperature of a solid affect its solubility? What about for a gas?

Increasing the heat increases the solubility of *any* solute.

Part Three: Read the instruction and answer the questions.

In chemistry, the concentration of a solution is often measured as **Molar Concentration** or **Molarity**, abbreviated M. The **Molarity** of a solution is an indication of the number of moles of a solute in a certain volume of solution. It is calculated as follows:

$$\text{Molarity (M)} = \frac{\text{moles of solute}}{\text{Volume of solution (in liters)}}$$

Calculate the molar concentration (Molarity, M) of each of the following solutions:

16. 2.3 moles of sodium chloride in 0.45 liters of solution.

$$M = \frac{2.3 \text{ moles}}{0.45L} = 5.1M$$

17. 1.2 moles of calcium carbonate in 1.22 liters of solution.

$$M = \frac{1.2 \text{ moles}}{1.22L} = 0.98M$$

18. 0.09 moles of sodium sulfate in 12 mL of solution.

$$M = \frac{0.09 \text{ moles}}{0.012L} = 7.5M$$

19. 0.75 moles of lithium fluoride in 65 mL of solution.

$$M = \frac{0.75 \text{ moles}}{0.065L} = 11.5M$$

20. 120 grams of calcium nitrite in 240 mL of solution.

$$120 \text{ g of calcium nitrate} = 0.73 \text{ moles}$$

$$M = \frac{0.73 \text{ moles}}{0.24L} = 3.0M$$