Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_

**Review Chemistry Unit 12: Solution Chemistry**

1. A solution consists of a\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dissolved in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. A solution is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mixture. (which means \_\_\_\_\_\_\_ throughout)

Is this type of mixture a pure substance, a compound, both, or neither? (***circle one***)

1. Classify the following materials as: **solution** (**SO**) or **colloid** (**C**) or **Suspensions** (**SP**)

 \_\_\_\_ a. smoky air \_\_\_\_ g. salt water (NaCl + H2O)

 \_\_\_\_ b. sugar water (C12H22O11 + H2O) \_\_\_\_ h. milk

 \_\_\_\_ c. vinegar (HC2H3O2 + H2O) \_\_\_\_ i. soda with bubbles

 \_\_\_\_ d. mayonnaise \_\_\_\_ j. oil-based paint

 \_\_\_\_ e. Italian salad dressing \_\_\_\_ k. fog

 \_\_\_\_ f. cereal \_\_\_\_ l. ethanol in water (C2H5OH + H2O)

1. There is a relatively large amount of solute dissolved in a concentrated **/** dilute solution. (***circle one***)

There is much more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in a dilute solution.

1. Molarity is the ratio of \_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_ per \_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_.

A 3.0 molar solution (3.0 *M*) has \_\_\_\_\_ mole(s) of solute in every \_\_\_\_\_ liter(s) of solution.

1. To dilute a solution, you can add more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which will change the molarity of the

solution, but will not change the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of solute.

1. Complete the phrase that describes the types of substances that will generally dissolve in each other:

\_\_\_\_\_\_\_ dissolves \_\_\_\_\_\_\_.

 Therefore, polar solvents (like water) can dissolve \_\_\_\_\_\_\_\_\_\_\_ solutes (like alcohols, sugars,

 ionic compounds, etc.).

 But nonpolar solutes (like fats, oils, hydrocarbons, etc.) will dissolve in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ solvents.

1. A solution is formed by adding methanol, CH3OH, to water. Identify each of the following intermolecular attractions as breaking or forming in the solution process: (*circle answers*)

breaking / forming methanol – methanol

breaking / forming water – water

breaking / forming methanol – water

1. In general, the stronger the intermolecular attractions between solute and solvent molecules,

 the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the solubility.

1. In general, the \_\_\_\_\_\_\_\_\_\_\_\_\_ the intermolecular attractions between solute and solute molecules,

 the lower the solubility.

1. A tincture of iodine can be used as a disinfectant. This solution is can be made by mixing:

2 g of solid iodine (I2)

3 g of sodium iodide (NaI)

55 g of liquid ethanol (C2H5OH)

40 g of water (H2O)

The solvent in this mixture is best identified as \_\_\_\_because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 A. I2

B. NaI

C. C2H5OH

D. H2O

1. Three factors that typically cause a solid to dissolve faster in a liquid are:

increase / decrease \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

increase / decrease \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

increase / decrease \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Gases dissolve faster in liquids at \_\_\_\_\_\_\_\_\_\_\_ temperatures and at higher \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. ***Label*** each solution as saturated, unsaturated, or supersaturated based on the addition of solute:









1. A solution that contains less solute than can be dissolved at that temperature is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. If solute crystals are added to a saturated solution, the crystals will…

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. If the addition of a seed crystal causes dissolved solute to crystallize, the original solution was

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**For # 18-22**, consider the graph of solubility curves below.



18. Which substance has the lowest solubility at 20oC?

 \_\_\_\_\_\_\_\_\_\_

19. If 40 g of KCl is dissolved in 100 g of water

 at 80oC, then the solution is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

20. If 80 g of KNO3 is dissolved in 100 g of water

 at 40oC, then the solution is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

21. If 80 g of KNO3 is dissolved in 100 g of water

 at 50oC, then the solution is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

22. How many grams of NH4Cl can dissolve in 100 g

 of water at 70oC? \_\_\_\_\_\_\_ g

23. Which of the following usually makes a substance dissolve faster in a solvent?

|  |  |
| --- | --- |
| a. | agitating the solution |
| b. | increasing the particle size of the solute |
| c. | lowering the temperature |
| d. | decreasing the number of particles |

24. Which of the following pairs of factors affects the solubility of a particular substance?

|  |  |
| --- | --- |
| a. | temperature and the nature of solute and solvent |
| b. | temperature and degree of mixing |
| c. | particle size and degree of mixing |
| d. | particle size and temperature |

25. Which of the following substances is less soluble in hot water than in cold water?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | CO | c. | NaNO |
| b. | NaCl | d. | KBr |

 26. What does NOT change when a solution is diluted by the addition of solvent?

|  |  |  |  |
| --- | --- | --- | --- |
| a. | volume of solvent | c. | number of moles of solute |
| b. | mass of solvent | d. | molarity of solution |



27. Circle the letter of ***each*** sentence that is TRUE about

 the **saturated solution** pictured here:

 A. The total amount of dissolved solute remains constant.

 B. The total mass of undissolved crystals remains constant.

 C. When the rate of solvation equals the rate of crystallization,

 a state of dynamic equilibrium exists.

 D. If more solute were added to the container,

***m* = mol**

 **kg solvent**

 the total amount of dissolved solute would increase.

**For #28-34**, you may use the following formulas:

M1V1 = M2V2

mol

L

*M* =

1. What is the molarity of a solution that contains 9.50 moles of solute in 3.00 L of solution?
2. How many moles of solute are in 3.20 L of a 1.50 *M* solution of sodium chloride?
3. How many moles of solute are in 40.0 g of water in a 0.615 *molal* solution? (Molality problem)
4. How many liters of a 0.510 *M* solution are contain 0.242 moles of solute?
5. What mass of glucose (C6H12O6, 180.18 g/mol) is needed to make 5.00 mL of a 0.200 *M* solution?
6. How many mL of a 0.150 *M* NaBr solution are needed to make 100 mL of 0.0500 *M* NaBr?
7. If 20.0 mL of 12.1 *M* HCl is used to make a 5.00 L aqueous solution, what is the molarity of the dilute solution? (*hint*: choose mL or L, not both)

**KEY for Calculations #28-34**

28. 3.17 *M*

29. 4.80 mol

30. 0.0246 mol

31. 0.475 L

32. 0.180 g

33. 33.3 mL

34. 0.0484 *M*