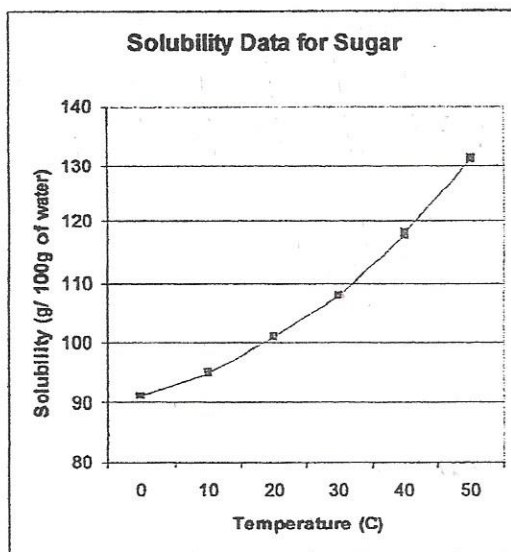1. How does a homogenous mixture differ from a heterogeneous mixture?

   *same throughout*   *different throughout*

2. What are the two types of heterogeneous mixtures and how do they differ?

   *1) suspension - large particles settle*
   *2) colloid - smaller particles don't settle, make it cloudy*

3. What is the name of a stable homogenous mixture?

   *solution*

4. For each below identify as a suspension, colloid, or solution.
   a) sugar water *solution*
   b) oil and water *suspension*
   c) milk *colloid*
   d) Kool-Aid *solution*
   e) Low pulp orange juice *colloid*

5. In solutions the substance that dissolves is called the *solute* while the dissolving medium is called the *solvent*.

6. A solution where water is the solvent is called *aqueous* and if alcohol is the solvent it is called a *tincture*.

7. Identify the solute and solvent for each below
   a) salt water  *solute = salt  solvent = water*
   b) oxygen in water  *solute = oxygen  solvent = water*
   c) oxygen in air  *solute = oxygen  solvent = nitrogen*

8. Define the following
   a) miscible  *does dissolve*
   b) immiscible  *does not dissolve*
   c) saturated  *as much solute dissolved as possible*
   d) unsaturated  *more solute can still dissolve*
   e) supersaturated  *more solute dissolved than is supposed to*
   f) effervescence  *gas comes out of solution as bubbles*

**Use the following graph to answer # 9 and 10.**

**Solubility Data for Sugar**

Solubility (g/ 100g of water) vs Temperature (C)

140
130
120
110
100
90
80

0   10   20   30   40   50
Temperature (C)

9. Which of the following statements is/are correct?

   I. The solute is most likely a gas  *false*

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II. At 30°C, the solubility is about 54g / 50g of water

III. Based on the sugar's solubility, sugar molecules are polar

    a. I only
    b. I and II
    c. II and III
    d. All are correct

10. A sugar solution is made by dissolving 100g of sugar in 100g of water at 30°C. Which statement is correct?
    a) The solution is supersaturated
    b) The solution is saturated
    c) The solution is unsaturated    *(under curve)*
    d) The solution is dilute

11. List all factors (3) that increase the <u>rate</u> at which a solid solute dissolves in a liquid.
*stirring, heating, crushing*

12. How does temperature affect the solubility of a solid in a liquid?
*increases it*

13. How does temperature affect the solubility of a gas in a liquid?
*decreases it*

14. Pressure affects the solubility of ___*gases*___ - the higher the pressure the *greater* the solubility.

15. What is meant by the phrase "like dissolves like"? *polar dissolves in polar non-polar dissolves in non-polar*

16. Substance A dissolves in water, but not in carbon tetrachloride. Which of the following is true?
    a) A is non-polar and carbon tetrachloride is polar
    b) A is polar and carbon tetrachloride is polar
    c) A is non-polar and carbon tetrachloride is non-polar
    d) A is polar and carbon tetrachloride is non-polar

17. Solutions that conduct electricity are called ___*electrolytes*___

18. List the three equations for measuring concentrations of solutions

$$M = \frac{\text{moles solute}}{\text{L solution}} \qquad M = \frac{\text{moles solute}}{\text{kg solvent}} \qquad \frac{\text{mass solute}}{\text{mass solution}} \times 100$$

*Molarity*      *molality*      %

19. A solution is mixed by adding 5.75g of $NiCl_2$ to water to form 500mL of solution. Calculate the concentration in <u>molarity</u>.

20. What mass of KOH is dissolved in 20mL of a 2.0M solution?
*Moles = M×L    2.0M × .020L = .04mol    .04mol × $\frac{56.11g}{1mol}$ = 2.2g KOH*

21. What is the % concentration of a solution formed by dissolving 35g of ethanol in 300g of water?
*$\frac{35g}{335g}$ × 100 = 10.4%*

22. What mass of water must be added to 2.0g of LiOH in order to form a 5.0% solution?
*5.0% = $\frac{\text{mass solute}}{\text{mass solution}}$ × 100    .05 = $\frac{\text{mass solute}}{\text{mass solution}}$*
*mass solution = $\frac{2.0g}{0.05g}$ = 40g    mass H2O = 40g solution − 2g solute = 38g water*

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23. A student wants to make a 0.250 M solution of $AgNO_3$. If they start with 15.5g of silver nitrate, what will be the volume of the solution?

$15.5g\, AgNO_3 \times \dfrac{1mol}{169.88g} = .091mol$    $L = \dfrac{moles}{M} = \dfrac{.091mol}{.250M} = \boxed{.364L}$

24. What mass of calcium sulfate is dissolved in 55.0mL of a 5.0M solution?

$moles = M \times L = 5.0M \times .055L = .275mol\, CaSO_4$

$.275mol\, CaSO_4 \times \dfrac{136.136g}{1mol} = \boxed{37.4\,g\, CaSO_4}$

25. A solution of NaOH has a concentration of 2.5M and is formed when 35.7g NaOH is dissolved. What is the volume of the solution?

$35.7g \times \dfrac{1mol}{40g} = .8925mol\, NaOH$    $L = \dfrac{moles}{M} = \dfrac{.8925mol}{2.5M} = \boxed{.357L}$

26. The Dead Sea is the saltiest sea in the world. It contains 332g of NaCl per 1000ml (1000g) of water.
1.0L   1.0kg
What is the concentration in M, m, and %?

$332g\, NaCl \times \dfrac{1mol}{58.44g} = 5.68mol\, NaCl$    $\%\, Comp = \dfrac{332g}{1332g} \times 100 = \boxed{25\%}$

$M = \dfrac{moles}{L} = \dfrac{5.68mol}{1.0L} = \boxed{5.68M}$    $m = \dfrac{moles}{kg\, solv.} = \dfrac{5.68mol}{1.0kg} = \boxed{5.68m}$

27. Calculate the % composition of a solution that contains 45g of HCl dissolved in 200g of water.

$\%\, Comp = \dfrac{mass\, solute}{mass\, solution} \times 100 = \dfrac{45g}{245g} \times 100 = \boxed{18.4\%}$

28. How many grams of water must be used to dissolve 50g of NaCl to form a 30% solution?

$mass\, solution = \dfrac{mass\, solute}{\%\, mass} = \dfrac{50g}{.30} = 167g\, solution$    $\dfrac{167g\, solution}{-50g\, solute}$    $\boxed{117g\, Solvent}$

29. What is the molality of a solution that contains 75g of $NaNO_3$ dissolved in 500g of water?

$M = \dfrac{moles\, solute}{kg\, solvent} = \dfrac{.88mol}{.500kg} = \boxed{1.8m}$

30. How many grams of MgO must be dissolved in 500g of water to form a 0.50 m solution?

$M = \dfrac{Moles\, solute}{kg\, Solvent}$    $moles\, solute = M \times kg\, solvent$
$= (.50m)(.500kg)$
$= .25mol\, MgO$

$.25mol\, MgO \times \dfrac{40.31g\, MgO}{1mol} = \boxed{10.1g\, MgO}$

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