Review Sheet: Unit 10 Name Key

Fill in the blanks using the most appropriate word or phrase.

1. A solution is a homogeneous mixture of two or more substances.

2. Every solution is composed of a solute, which is normally present in the smaller amount and is the substance that is dissolved, and a solvent, which is normally present in the greater amount and is the substance that does the dissolving.

3. A carbonated drink is an example of a gas solute dissolved in a liquid solvent; the final phase is that of a liquid. Air is an example of a gaseous solution.

4. Liquids, such as antifreeze and water, which dissolve in one another are said to be miscible, while liquids that do not dissolve in one another, such as salad oil and vinegar, are said to be immiscible.

5. Brass, a mixture of copper and zinc, is an example of a solid solution known as a(n) alloy.

6. Because the particles in a solution are so small (molecules, atoms, or ions), filtration cannot be used to separate the components nor do the components settle upon standing.

7. Suspensions contain particles too large to be true solutions, and upon standing, separate. They are actually heterogeneous mixtures and (can, can not) be separated by filtration. They also exhibit the Tyndall Effect which is the scattering of a beam of light. Colloids also exhibit the Tyndall Effect, but do not separate upon standing.

8. The rate of solution expresses how quickly a solute dissolves in a solvent.

9. Henry's Law: The mass of a gas dissolved in a given volume of liquid is directly proportional to the pressure of the gas.

10. For most solutes to be dissolved in liquid solvents:
    -- as temperature increases the rate of solution increases
    -- as surface area increases, the rate of solution increases
    -- stirring or agitating the mixture increases the rate of solution.

11. Electrolytes are substances that conduct an electric current when dissolved. Nonelectrolytes are substances that do not conduct an electric current when dissolved.

12. A solution is concentrated if it contains a relatively large amount of solute compared to the amount of solvent. A solution is dilute if it contains a relatively small amount of solute.

13. Solubility is a measure of how much solute can dissolve in a given amount of solvent at a given temperature.

14. Colligative properties depend only on the concentration of the solution. These properties include vapor pressure depression, freezing point depression, and boiling point elevation.

Define each of the following words.

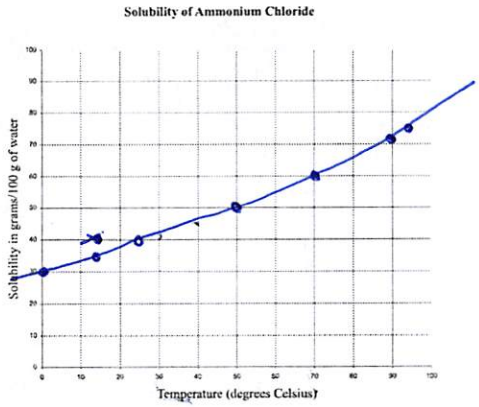
1. aqueous: dissolved in water
2. tincture: dissolved in alcohol
3. emulsion: a mixture of 2 or more liquids that are normally immiscible
4. colligative properties: properties that depend on the concentration of the solution
5. "like dissolves like": polar solvents dissolve only polar solutes. The same is true for nonpolar solutes and solvents.

Answer each of the following questions completely.

1. Explain how a solution can be both dilute and saturated. Saturated means all solute that can dissolve has dissolved. Dilute only means a little solute dissolves
2. Why do we put antifreeze in car radiators in the summer as well as in the winter? To raise the boiling pt. & lower the freezing pt.
3. What will happen when a crystal of solute is added to an unsaturated solution?
   It dissolves
4. What will happen when a crystal of solute is added to a supersaturated solution? All solute particles crystallize out of solution
5. Normally, if the temperature is increased, the solubility of a solid solute increases. (For gaseous solutes, however, increasing the temperature decreases solubility.)

Use the following data to construct a solubility curve for NH_4Cl.

Grams of NH_4Cl per 100 g of H_2O	Temperature (°C)
30	0
35	15
40	25
50	50
60	70
71	90
74	95



Use your graph to answer the following questions.

1. What is the solubility of ammonium chloride at 40 °C? ~47 g
2. If 54 g of NH_4Cl are dissolved at 68 °C, the solution is unsaturated
3. If 54 g of NH_4Cl are dissolved at 30 °C, how many grams don't dissolve?
   54g − 42g = (12g)

Answer each of the following questions about molarity. Show all work on the problems.

1. Describe, IN DETAIL, how to make one liter of a 1 M NaCl solution.
   Dissolve 1 mole of NaCl into 1 L of water.

2. What is the molarity of a solution that contains 15.0 g NaCl in 1.25 L of solution?

$$n = 15.0\text{g} \left| \frac{1\text{mol}}{58.44\text{g}} \right. = .25667\text{mol}$$

$$M = \frac{n}{V}$$

$$M = \frac{.25667\text{mol}}{1.25\text{L}} = \boxed{.205 \frac{\text{mol}}{\text{L}}}$$

3. A solution of HCl is 0.200M. What mass of acid is dissolved in 250 mL of solution?

$$n = M \cdot V = \left(.200 \frac{\text{mol}}{\text{L}}\right)(.250\text{L}) = .0500\text{mol} \left| \frac{36.46\text{g}}{1\text{mol}} \right. = \boxed{1.82\text{g}}$$

$$V = 250\text{mL} = .250\text{L}$$

4. A solution of Na_2CO_3 contains 65.0 g of solute dissolved in water to make a 3.00 M solution. What is the volume of the solution, in liters?

$$V = \frac{n}{M} = \frac{.61327\text{mol}}{3.00\text{mol/L}} = \boxed{.204\text{L}}$$

$$n = 65.0\text{g} \left| \frac{1\text{mol}}{105.99\text{g}} \right. = .61327\text{mol}$$

for #2 - 58.44g is the molar mass of NaCl.
for #3 - 36.46g is the molar mass of HCl.
for #4 - 105.99g is the molar mass of Na_2CO_3.

Review Sheet: Unit 11 Name_____

Name these Acids:

HI hydroiodic H_2SO_3 sulfurous

HNO_3 nitric H_3PO_4 phosphoric

Write formulas for these acids:

hydrofluoric acid: HF phosphorous acid: H_3PO_3

Name these bases and salts:

KOH potassium hydroxide $MgSO_4$ magnesium sulfate

Calculate:

1. the pH of a 1.4×10^{-2} M NaOH solution

$[OH^-] = 1.4 \times 10^{-2} M$

$pOH = -\log[OH^-]$

$pOH = -\log 1.4 \times 10^{-2} = 1.85$

$pH + pOH = 14$

$pH + 1.85 = 14$

$pH = 12.15$

2. the $[H^+]$ of a solution with pH = 3.2

$[H^+] = 10^{-pH} = 10^{-3.2} = 6.31 \times 10^{-4} M$ or $.000631 M$

3. the $[OH^-]$ of a solution with a $[H^+]$ of 9.3×10^{-4} M

$pH = -\log[H^+]$

$pH = -\log 9.3 \times 10^{-4}$

$pH = 1.00$

$pH + pOH = 14$

$1.00 + pOH = 14$

$pOH = 13.00$

$[OH^-] = 10^{-pOH} = 10^{-13.00}$

$= 1.00 \times 10^{-13} M$

$M_A V_A = M_B V_B$

4. In a titration, 25.0 mL of a 0.20 M NaOH solution is used to neutralize 10.0 mL of HCl.

a. Write the equation for this neutralization reaction:

$NaOH + HCl \rightarrow NaCl + H_2O$

b. Calculate the molarity of the acid:

$M_A = ?$ $M_B = .20M$ $V_A = 10.0mL = .0100L$ $V_B = 25.0mL = .0250L$

$(M_A)(.0100L) = (.20M)(.0250L)$

$(M_A)(.0100L) = .00500 M \cdot L$

$M_A = \frac{.00500 M \cdot L}{.0100L} = .50M$

5. In a titration, 24.2 mL of 0.120 M $Mg(OH)_2$ were required to neutralize 33.1 mL of H_3PO_4.

a. Write the equation for this neutralization reaction:

$Mg(OH)_2 + H_3PO_4 \rightarrow Mg_3(PO_4)_2 + H_2O$

b. What is the molarity of the acid?

6. What is the word equation for the neutralization of a strong acid and strong base? acid + base → salt + water

7. In a neutral solution, moles of H^+ equal the moles of OH^-.

8. A pH of 7 indicates that a solution is neutral; a ph <7 would mean the solution is acidic; and a pH >7 is a(n) basic solution.

9. Contrast a strong acid with a weak acid:

strong acid - dissociates 100% into ions

weak acid - dissociates 5% into ions

$M_A V_A = M_B V_B$

$M_A = ? = 3M_A$ (because of H_3PO_4)

$V_A = 33.1mL = .0331L$

$M_B = (.120M)2 = .240M$

$V_B = 24.2mL = .0242L$

$(3M_A)(.0331L) = (.240M)(.0242L)$

$(3M_A)(.0331L) = .005805 M \cdot L$

$3M_A = \frac{.005805 M \cdot L}{.0331L}$

$3M_A = .175M$

$M_A = \frac{.175M}{3} = .0583M$

Define:

1. titration- see your notes!
2. electrolyte- solution that conducts electricity
3. ~~end point-~~
4. salt- a metal ion + a nonmetal ion bonded together
5. Arrhenius definition of an acid and a base- acid → gives off H^+ in solution
   base → gives off OH^- in solution
6. ~~operational definition~~

Fill in the blanks:

1. Acids have a sour taste, react with metals to produce hydrogen gas, turn indicators different colors according to pH, and are electrolytes because their water solutions conduct electricity. On the other hand, bases have a bitter taste, feel slippery, turn indicators different colors according to pH, and are electrolytes because their water solutions conduct electricity.
2. Most cleaning products are (acidic, (basic)) while most foods are ((acidic), basic).
3. Bases turn litmus blue, phenolphthalein red, and cabbage juice green. Acids turn litmus red, phenolphthalein clear, and cabbage juice purple.

Brønsted-Lowry Acids/Bases Review-

1. What is a Brønsted-Lowry acid? What is a Brønsted-Lowry base? What is a conjugate acid? What is a conjugate base?

acid- donates an H^+

base - accepts an H^+

conjugate acid - what base becomes after getting the extra H^+

conjugate base - what the acid becomes after losing an H^+

2. Identify the Brønsted-Lowry acid (B-L acid), Brønsted-Lowry base (B-L base), conjugate acid (CA) and conjugate base (CB) in the following reactions.

a. $NH_4^+ (aq) + H_2O (l) \rightarrow NH_3 (aq) + H_3O^+ (aq)$

B-L acid B-L base CB CA

b. $HSO_4^- (aq) + H_2O (l) \rightarrow H_2SO_4 (aq) + OH^- (aq)$

B-L base B-L acid CA CB

c. $H_2CO_3 (aq) + H_2O \rightarrow HCO_3^- (aq) + H_3O^+ (aq)$

B-L acid B-L base CB CA