NAME_____

1. (5). 10.59 g of KBr is dissolved in enough water to make 250 mL of solution. What is the molarity of the solution?

$\frac{10.59}{119} = 0.0890$ moles

$\frac{0.0890}{0.250} = 0.356\ M$

2. (5). What is the pH of a 0.146 M solution of KOH?

13.16

3. (20). Fill in the blanks by writing one of the following words or phrases in each blank.

a. One way to accomplish desalination of sea water is by reverse osmosis.

b. Acid + base gives water + salt.

c. Carbon-containing compounds burn with the release of CO_2, heat, and water.

d. The conjugate base of HSO_4^- is SO_4^{2-}.

e. Basic solutions have pH values > 7.0.

f. A buffer solution includes a weak acid and its conjugate acid

g. Sodium chloride has extremely high melting and boiling points because of strong interionic attraction

h. The volume of a sample of an ideal gas at constant pressure is directly proportional to its absolute T.

i. The boiling point of any liquid is the temperature at which its partial pressure equals the external pressure.

4. (6). Copper(II) chloride reacts with aluminum metal to give aluminum(III) chloride and metallic copper. Write the complete and the net ionic equation for the reaction.

$3\ CuCl_2 + 2\ Al \rightarrow 2\ AlCl_3 + 3\ Cu$

$3\ Cu^{2+} + 2\ Al \rightarrow 3\ Cu + 2\ Al^{3+}$

NAME_____

5. (3). True or false. (Circle your choice). The boiling point of water is decreased by the addition of common table salt (NaCl).

6. (3). Consider a mixture of blood and an aqueous salt (NaCl) solution. If the concentration of the salt solution is less than the isotonic concentration (0.15 M), the blood cells will _____burst; _____shrink due to osmosis.

7. (5). What happens when a strong acid like HBr, a covalently bonded gas, is dissolved in water? (A simple equation will do).

$$HBr + H_2O \rightarrow H_3O^+ + Br^-$$

8. (5). What is the hydrogen ion concentration in a solution whose pH is 3.50?

$$3.16 \times 10^{-4}$$

9. (5). What is the pH of a buffer system that contains 0.200 M hydrocyanic acid (HCN) and 0.150 M sodium cyanide (NaCN)? The pKa of hydrocyanic acid is 9.31.

H-H eqn.

$$pH = 9.31 + \log \frac{0.150}{0.200} = 9.21$$

10. (5). How many milliliters of 0.50 M NaOH solution are required to titrate (exactly neutralize) 40.0 mL of a 0.10 M solution of hydrochloric acid (HCl)?

$$V = \frac{(40)(0.10)}{0.50} = 8.0 \text{ mL}$$

NAME_____

11. (5). If a 2.760 g sample of a gas maintains a pressure of 450 mm Hg when contained in a 2.0 L flask at 20 deg C, what is the molecular weight of the gas?

$PV = nRT$

$MWT = 56\ g/mol$

12. (5). A sample of gas has a volume of 250 mL at 0.500 atm pressure and 50 deg C. What would the volume be if the pressure is increased to 1.25 atm at 100 deg C?

$V = 115\ mL$

13. (5). How many grams of NaOH are contained in 50 mL of a 1.50 M solution?

$\#moles = (0.050)(1.50) = 0.075\ moles$

$0.075\ moles \times \frac{40\ g}{mol} = 3.00\ g.$

14. (5). Hydrogen and oxygen react according to the equation, $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$. How many liters of oxygen are required to react with 5.20 L hydrogen at STP?

2.60 L.

15. (5). Write the equation for the reaction of formate ion ($HCOO^-$), a weak Brønsted base, with water. Is the resulting solution acidic or basic?

$$HCO_2^- + H_2O \rightleftharpoons HCO_2H + OH^-$$

Rx produces XS OH^- ion.

16. (5). If 15.0 g of CO2 gas has a volume of 0.30 L at 310 K, what is its pressure in mm Hg?

$$PV = nRT$$

$$P = \frac{nRT}{V} = \left(\frac{15}{44}\right)\left(\frac{62.4 \times 310}{0.3}\right) \text{ mm Hg}$$

17. (6). Write the equation for the reaction between hydrocyanic acid (HCN) and fluoride ion (F^-). The pKa's are 3.46 (HF) and 9.31 (HCN). Does the reaction as written favor the left-hand side (LHS)_____ or the right-hand side (RHS)__X__?

$$HCN + F^- \rightleftharpoons CN^- + HF$$

9.31 3.46

WA WB SB SA

18. (6). Answer these questions based on the general heating curve – shown below -- for a molecular compound such as water.

    a. The solid and liquid phases are in equilibrium between points B and C.

    b. The pure liquid phase exists between points C and D.

    c. The heat of vaporization is given by the difference in heat (ΔH) between points E and D.