Northern Arizona University **Quiz #4**
CHM 151, General Chemistry I Dr. Brandon Cruickshank
Section 6, Fall 2008 October 2, 2008

Name (PRINT) _____

1. Write the balanced molecular equation for the following acid-base reaction. [3 pts]

$$HNO_2\,(aq) + LiOH\,(aq) \rightarrow$$

molecular equation: $\mathbf{HNO_2(aq) + LiOH(aq) \rightarrow H_2O(l) + LiNO_2(aq)}$

2. The balanced **net ionic equation** for the complete neutralization of HCl by KOH in aqueous solution is: [3 pts]

a) $HCl\,(aq) + OH^-\,(aq) \rightarrow H_2O\,(l) + Cl^-\,(aq)$
b) $H^+\,(aq) + Cl^-\,(aq) + K^+\,(aq) + OH^-\,(aq) \rightarrow H_2O\,(l) + KCl\,(s)$
c) $HCl\,(aq) + KOH\,(aq) \rightarrow H_2O\,(l) + KCl\,(aq)$
d) $\mathbf{H^+\,(aq) + OH^-\,(aq) \rightarrow H_2O\,(l)}$
e) $H^+\,(aq) + KOH\,(aq) \rightarrow H_2O\,(l) + K^+\,(aq)$

3. True or False

a) A weak acid completely ionizes when dissolved in water. [2 pts]

FALSE

b) HBr is a strong acid. [2 pts]

TRUE

c) A base is a hydrogen ion (H^+) donor. [2 pts]

FALSE

4. Assign oxidation numbers to Mg and O in the compound, MgO, and identify the *reactant* that is oxidized and the *reactant* that is reduced in the following reaction. [4 pts]

$$2\,Mg\,(s) + O_2\,(g) \rightarrow 2\,MgO\,(s)$$

Oxidation number of Mg in MgO **+2**

Oxidation number of O in MgO **–2**

Reactant reduced **O_2**

Reactant oxidized **Mg**

5. Hydrobromic acid [HBr(*aq*)] is a solution of hydrogen bromide gas in water. Calculate the **molarity** of a hydrobromic acid solution if 455 mL contains 173.4 g of hydrogen bromide. [4 pts]

$$173.4 \text{ g HBr} \times \frac{1 \text{ mol HBr}}{80.91 \text{ g HBr}} = 2.143 \text{ mol HBr}$$

$$M = \frac{\text{mol solute}}{\text{L soln}} = \frac{2.143 \text{ mol}}{455 \times 10^{-3} \text{ L}} = \mathbf{4.710\ \textit{M}}$$

6. In the CHM 151 laboratory, you are asked to prepare 250.0 mL of a 0.100 *M* HCl solution from a 6.0 *M* HCl solution. How many **milliliters** of the 6.0 *M* HCl solution are needed to prepare the dilute solution? [3 pts]

$M_c V_c = M_d V_d$
$(6.0\ M)(V_c) = (0.100\ M)(250.0 \text{ mL})$
$\boldsymbol{V_c = 4.17 \text{ mL}}$

7. In the CHM 151 laboratory, you are given an unknown solution that contains potassium hydrogen phthalate ($KHC_8H_4O_4$, molar mass = 204.22 g/mol).

$$NaOH(aq) + KHC_8H_4O_4(aq) \rightarrow H_2O(l) + KNaC_8H_4O_4(aq)$$

You titrate the solution with 0.105 *M* NaOH. It takes 16.15 mL of the 0.105 *M* NaOH solution to reach the endpoint of the titration. What is the **mass** of potassium hydrogen phthalate, $KHC_8H_4O_4$, in the solution? [5 pts]

$$\frac{0.105 \text{ mol NaOH}}{1 \text{ L soln}} \times 0.01615 \text{ L} = 0.00170 \text{ mol NaOH}$$

$$0.00170 \text{ mol NaOH} \times \frac{1 \text{ mol KHP}}{1 \text{ mol NaOH}} \times \frac{204.22 \text{ g KHP}}{1 \text{ mol KHP}} = \mathbf{0.346 \text{ g KHP}}$$

$M = \dfrac{\text{mol solute}}{\text{L of soln}}$ Molar masses: H (1.008 g/mol), C (12.01 g/mol), O (16.00 g/mol), K (39.10 g/mol), Br (79.90 g/mol)