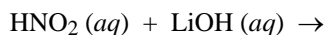


Name (PRINT) _____

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



molecular equation: $\text{HNO}_2(aq) + \text{LiOH}(aq) \rightarrow \text{H}_2\text{O}(l) + \text{LiNO}_2(aq)$

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

- a) $\text{HCl}(aq) + \text{OH}^-(aq) \rightarrow \text{H}_2\text{O}(l) + \text{Cl}^-(aq)$
b) $\text{H}^+(aq) + \text{Cl}^-(aq) + \text{K}^+(aq) + \text{OH}^-(aq) \rightarrow \text{H}_2\text{O}(l) + \text{KCl}(s)$
c) $\text{HCl}(aq) + \text{KOH}(aq) \rightarrow \text{H}_2\text{O}(l) + \text{KCl}(aq)$
d) $\text{H}^+(aq) + \text{OH}^-(aq) \rightarrow \text{H}_2\text{O}(l)$
e) $\text{H}^+(aq) + \text{KOH}(aq) \rightarrow \text{H}_2\text{O}(l) + \text{K}^+(aq)$

3. True or False

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

FALSE

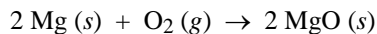
- b) HBr is a strong acid. [2 pts]

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]



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]

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

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

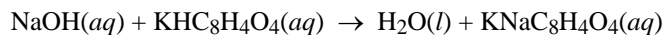
6. In the CHM 151 laboratory, you are asked to prepare 250.0 mL of a 0.100 M HCl solution from a 6.0 M HCl solution. How many **milliliters** of the 6.0 M HCl solution are needed to prepare the dilute solution? [3 pts]

$$M_c V_c = M_d V_d$$

$$(6.0 \text{ M})(V_c) = (0.100 \text{ M})(250.0 \text{ mL})$$

$$V_c = \mathbf{4.17 \text{ mL}}$$

7. In the CHM 151 laboratory, you are given an unknown solution that contains potassium hydrogen phthalate (KHC₈H₄O₄, molar mass = 204.22 g/mol).



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, KHC₈H₄O₄, in the solution? [5 pts]

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

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

$$M = \frac{\text{mol solute}}{\text{L of soln}}$$

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)