1. Express the following concentrations as molarities.
    A. 4.78 ppm Pb^{2+}
    B. 3.22 ppb Zn^{2+}
    C. 3.00% H_2O_2 by volume. Pure H_2O_2 has a density 1.45 g/mL
    D. 10.74% NaOH by mass. The NaOH solution has a density of 1.40 g/mL.

2. Balance the following equations

    A. $Mg + HNO_3 \rightarrow H_2 + Mg(NO_3)_2$
    B. $CaC_2 + H_2O \rightarrow Ca(OH)_2 + C_2H_2$
    C. $S + O_2 \rightarrow SO_3$
    D. $UO_2 + HF \rightarrow UF_4 + H_2O$

3. Identify the following for the reactions below.

    A. Molecular Equation (predict the product and balance the reaction including states)
    B. Overall ionic equation (including states).
    C. Net Ionic Equation (including states). If no reaction occurs, write NR.
    D. Spectator Ions (if any).

        i. $HClO_3 + RbOH \rightarrow$
        ii. $Pb(NO_3)_2 + NH_4Cl \rightarrow$
        iii. hydrobromic acid + sodium iodide $\rightarrow$
        iv. chromium(III)perchlorate + potassium flouride $\rightarrow$

4. Identify the following as strong electrolytes, weak electrolytes, and nonelectrolytes

    A. $Be(OH)_3$
    B. $Fe(NO_3)_3$
    C. NH_3
    D. KOH
    E. C_3H_8
    F. H_2SO_4
    G. HF
    H. Rb_3PO_3
    I. CH_4O

5. Identify whether the reaction is an oxidation reduction reaction. If so, identify what is oxidized, reduced, the oxidizing agent, and the reducing agent.

    A. $4\ Fe(s) + 3\ O_2(g) \rightarrow 2\ Fe_2O_3$
    B. $ZnO(s) + C(s) \rightarrow Zn(s) + CO(g)$
    C. $HI(aq) + NaOH(aq) \rightarrow NaI(aq) + H_2O(l)$
    D. $C_3H_8(g) + 5\ O_2(g) \rightarrow 3\ CO_2(g) + 4\ H_2O(l)$

6. Predict whether each of the following sets of reactants will produce products.

   A. $Cu(s) + 2\ AgCl(s) \rightarrow$
   B. $Ni(s) + CaBr_2(aq) \rightarrow$
   C. $SnI_2(aq) + Zn(s) \rightarrow$

7. Answer the following about the reaction below.

$$2\ Na(s) + 3\ N_2(g) \rightarrow 2\ NaN_3(s)$$

   A. How many grams of solid sodium are required to fully react with 3.14×10^{23} molecules of nitrogen gas?
   B. How many grams of sodium azide (NaN_3) will result from this reaction?

8. If 4.30×10^{22} molecules of nitrogen gas reacts with 5.00 g of solid lithium according to the reaction below, to yield 4.00 grams of lithium nitride, what is the percent yield of the reaction?

$$N_2(g) + 6\ Li\ (s) \rightarrow 2\ Li_3N$$

9. If 24.2 g of solid magnesium reacts with 550.0 mL of 3.00 M of hydrochloric acid, (A) how many grams of magnesium chloride are produced? (B) How many grams of the excess reactant are remaining?

$$Mg(s) + 2\ HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

10. Combustion of 135.0 g of a hydrocarbon produces 440.0 g of CO_2 and 135.0 g of H_2O. The molar mass of the hydrocarbon is 270 g/mol. What is the molecular formula of the compound?

11. How many milliliters of 0.100 M HNO_3 are needed to titrate 58.5 mL of 0.0100 M $Sr(OH)_2$?