Part of this will be covered in the demonstrations in class. You should be able to answer those questions even if you did not see the demos.

**Balanced equations should include the abbreviations for forms of matter.**

**Decomposition**

1. Decomposition of aqueous hydrogen peroxide (dihydrogen dioxide) into water and oxygen
   a. Write the balanced equation:

   \[ \text{Write the balanced equation:} \]

   b. In what physical state is the oxygen produced? What did you observe during the reaction to support this?

   c. We added a “helper” to the reaction to increase the rate. The helper did not change during the reaction. What is this helper called?

2. Aqueous dihydrogen carbonate, (carbonic acid found in soft drinks) decomposes into carbon dioxide gas and water.
   a. Write the balanced chemical equation:

   \[ \text{Write the balanced chemical equation:} \]

   b. How does this reaction cause a soft drink to go flat? (what happens to the carbon dioxide?)

**Single Replacement**

3. \[ \text{Cu (s) + 2AgNO}_3\text{(aq) } \rightarrow \text{2Ag(s) + Cu(NO}_3\text{)}_2\text{(aq)} \]
   a. Which reacting species changes from its elemental form to an ion? ____________

   b. What metal is visible in the product? ____________

   c. Why would AgCu not be a reasonable product for this reaction?

4. A specific type of single replacement reaction is an acid reaction.
   \[ \text{Fe (s) + HNO}_3\text{(aq) } \rightarrow \text{Fe(NO}_3\text{)}_3\text{ + H}_2\text{(g)} \]
   a. This single replacement reaction is an example of an acid reaction because of the cation that is replaced. What cation is replaced by iron?

   b. Predict the products of the replacement reaction of zinc metal with hydrochloric acid:
   \[ \text{Zn (s) + HCl (aq) } \rightarrow \]
Double Replacement

5. \[ \text{AgNO}_3 (aq) + \text{NaCl}(aq) \rightarrow \text{AgCl}(s) + \text{NaNO}_3 (aq) \]

a. In this reaction, silver chloride is called a __________________________

b. Name the species that are soluble in water. ____________________________

6. An acid-base neutralization is a type of double replacement. The reaction of Maalox with hydrochloric acid in the stomach is shown below.

\[ \text{Al(OH)}_3(s) + 3\text{HCl}(aq) \rightarrow \text{AlCl}_3(aq) + 3\text{H}_2\text{O}(l) \]

a. Name the cation and anion that combine to form water. ______________

7. Balance the equation for the combustion of octane to keep your car running. (or pretty close to the reaction)

\[ \text{C}_8\text{H}_{18} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{energy} \]

b. What is the ratio of oxygen to octane in the reaction? _________________

8. Label the reactions described or shown as exothermic or endothermic.

a. \[ \text{H}_2 + \text{I}_2 + \text{heat} \rightarrow 2\text{HI} \] _________________

b. metabolism of glucose to provide energy. _________________

c. ammonium nitrate + water absorbs heat from the surroundings to make a cold pack _________________

d. _________________

e. The products are lower in energy than the reactants _________________

f. A reaction that will not occur in a cold room. _________________

8. Two ways of increasing the rate of a reaction are increasing amount of reactant and adding heat. Both help the reaction in a similar way. How do they help the reaction occur?