1. Write a balance chemical reaction for the combustion of each of the following molecules:
   a. $C_2H_6$
   b. $C_6H_{14}$
   c. $C_6H_9O_2$

2. Classify each of the following reaction as a synthesis, decomposition, single-replacement, double replacement or combustion.
   a. $CuSO_4 (aq) + Al (s) \rightarrow Al_2(SO_4)_3 (aq) + Cu (s)$
   b. $K_2CO_3 (aq) \rightarrow K_2O (s) + CO_2 (g)$
   c. $AgNO_3 (aq) + K_2SO_4 (aq) \rightarrow Ag_2SO_4 (s) + KNO_3 (aq)$
   d. $SO_2 (g) + O_2 (g) \rightarrow SO_3 (g)$


4. For the decomposition of nitrous acid:
   
   $3 HNO_2 (aq) \rightarrow 2 NO (g) + HNO_3 (aq) + H_2O (l)$
   
   a. Name each compound in this reaction.
   
   b. How many moles of HNO$_2$ must undergo decomposition to produce:
      i. 6 moles of NO
      ii. 8 moles of HNO$_3$
      iii. 3.5 moles of H$_2$O
      iv. 17 total moles of products

5. Consider the following chemical reaction:
   
   $Fe_2O_3 (s) + HNO_3 (aq) \rightarrow Fe(NO_3)_3 (aq) + H_2O (l)$
   
   a. What type of reaction is this?
   
   b. Balance the reaction.
   
   c. How many grams of Iron (III) nitrate will be produced from 4g of Iron (III) oxide in excess nitric acid?
   
   d. How much of each reactant is required to produce 50 grams of iron (III) nitrate?
   
   e. 25 grams of Fe(NO$_3$)$_3$ is generated with 104 grams of Fe$_2$O$_3$ is reacted with excess HNO$_3$. What is the percent yield of this reaction?

6. Liquid water can be produced from the reaction of H$_2$ (g) and O$_2$ (g)
   
   a. Write a balanced chemical reaction for this process.
   
   b. How much water (in grams) can be produced from:
      i. 1.750 moles of H$_2$ and 1.00 moles of O$_2$
      ii. 6.00 g H$_2$ and 1.25 moles of O$_2$
      iii. 1.00 g H$_2$ and 7.00 g O$_2$.

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4b. i. 9 mol HNO$_2$   ii. 24 mol HNO$_2$   iii. 10.5 mol HNO$_2$   iv. 12.75 mol HNO$_2$
5c. 12.12 g Fe(NO$_3$)$_3$   d. 16.54 g Fe$_2$O$_3$   39.08 g HNO$_3$    e. 7.9%
6b. i. 31.54 g H$_2$O    ii. 45.05 g H$_2$O    iii. 7.885 g H$_2$O