Point totals for each question are listed to the right of the problem number. Show your work on numerical problems to receive credit.

1. (5 points) Classify each of the following acids as a strong electrolyte (SE) or a weak electrolyte (WE).
   - HNO₂ ___________________
   - H₂SO₄ ___________________
   - HBr _________________
   - HF _________________
   - H₂C₄H₅O⁵ _______________

2. (5 points) Classify each of the following salts as soluble (S) or insoluble (I).
   - BaI₂ _________________
   - CaCO₃ _________________
   - NaHC₂O₄ _______________
   - Cr(NO₃)₃ _______________
   - SrSO₄ _________________

3. (10 points) Ibuprofen, a headache remedy, contains 75.69% C, 8.80% H, and 15.51% O by mass and has a molar mass of 206 g/mol. Find the empirical formula and molecular formula for ibuprofen. Show your work.
4. (16 points) Show your work on the following.

a. What is the mass of 13.45-mol of CHF₃?

b. How many oxygen atoms are contained in 12.3-g of CO₂?

c. How many sulfur atoms are contained in 100 molecules of Na₂S₂O₈? (Read this carefully!)

d. How many grams of P are contained in 3.45-mol of P₂O₅?
5. (16 points) For each of the following equations:
- Write the correct formulas for the products, including the state (s, ℓ, aq) (2 points)
- Balance the equation (1 point)
- Write the complete ionic equation (4 points)
- Write the net ionic equation (1 point)

\[ \text{K}_3\text{PO}_4 \text{ (aq)} + \text{BaI}_2 \text{ (aq)} \rightarrow \]

\[ \text{HNO}_2 \text{ (aq)} + \text{Ba(OH)}_2 \text{ (aq)} \rightarrow \]
6. (10 points) Show your work throughout this problem. Hydrogen sulfide is an impurity in 
natural gas that must be removed because it is toxic. One common removal method is the 
Claus process, based on the reaction:

\[
8 \text{H}_2\text{S} \text{(g)} + 4 \text{O}_2 \text{(g)} \rightarrow \text{S}_\ell + 8 \text{H}_2\text{O} \text{(ℓ)}
\]

a. Suppose the reaction is carried out with 45.0-g of H\(_2\)S and 25.0-g of O\(_2\). Which is 
the limiting reactant? Show your work. Don’t make me guess – tell me which 
one is the limiting reactant.

b. How many grams of S\(_8\) (ℓ) could be produced based on the reactant amounts in 
part a?

c. How many grams of the excess reactant would remain at the end of the reaction in 
part a?

d. If 39.8-g of S\(_8\) (ℓ) are actually produced, what is the percent yield?