1. Balance the following equations:
   
   a. \( \text{S}_2(\text{s}) + \text{H}_2(\text{g}) \rightarrow \text{H}_2\text{S}(\text{g}) \)
   
   b. \( \text{Al}(\text{s}) + \text{Br}_2(\text{l}) \rightarrow \text{AlBr}_3(\text{s}) \)
   
   c. \( \text{H}_2\text{O}(\text{l}) + \text{P}_2\text{O}_5(\text{s}) \rightarrow \text{H}_3\text{PO}_4(\text{aq}) \)
   
   d. \( \text{Ca(OH)}_2(\text{aq}) + \text{HNO}_3(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{Ca(NO}_3)_2(\text{aq}) \)
   
   e. \( \text{C}_2\text{H}_2(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{C}_2\text{H}_6(\text{g}) \)
   
   f. \( \text{C}_3\text{H}_8(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{g}) \)
   
   g. \( \text{AgNO}_3(\text{aq}) + \text{Cu}(\text{s}) \rightarrow \text{Cu(NO}_3)_2(\text{aq}) + \text{Ag}(\text{s}) \)
   
   h. \( \text{KBr}(\text{aq}) + \text{Pb(NO}_3)_2 \rightarrow \text{PbBr}_2(\text{s}) + \text{KNO}_3(\text{aq}) \)
   
   i. \( \text{C}_4\text{H}_{10}(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{g}) \)
   
   j. \( \text{PbO}_4(\text{s}) \rightarrow \text{PbO}(\text{s}) + \text{O}_2(\text{g}) \)

2. Complete the following calculations with the appropriate number of significant figures.
   
   a. \( 1.34 + 3.00067 = \)
   
   b. \( 4.786 \times 9.2 = \)
   
   c. \( \frac{(18.34 + 5.4)}{2.578} = \)
   
   d. \( 2.45 - 5.678 + 23.6177 = \)
   
   e. \( 3.00 \times 1.6 \times \frac{5.13}{8.64} = \)
   
   f. \( 2.223 + 11.9 + 4.56 + 8.963 = \)
   
   g. \( 7.0001 \times 8.900 \times 2.3 \times 1.6006 = \)
   
   h. \( 11.3 - 4.578 - 9.00 + 23.7689 = \)
3. Complete the following unit conversions using the correct number of significant figures:

a. 12.4 inches to centimeters
b. 2.1 years to days
c. 3.05 gallons to liters
d. 1.4356 pounds to grams
e. 98.6°F to °C
f. 15,000 ppb to ppm

4. Explain what is meant by “The Periodic Law” and identify the various groups (alkali metals etc.) of elements in the periodic table by number and name.

5. Describe the three fundamental states of matter.
6. Explain how to construct a barometer and describe how it is used to predict weather.

7. Describe the various levels of the earth’s atmosphere and the significance of each with respect to air pollution.

8. Draw a heating curve for water and describe all of the various components (\(\Delta H_{\text{fus}}, \Delta H_{\text{vap}}\) etc.) of the graph.
9. List the six EPA criteria pollutants, describe their origins and the effect that each has on the environment.

10. Write a balanced equation for the complete theoretical combustion of isooctane (C₈H₁₈) in air. Show how this differs from the equation for “real” combustion of fossil fuels in air. Define all acronyms used in the equations (VOC, PIC, AA etc.)