Name _____ **Date** _____

Problem Set #1

This problem set covers the first chapter of our book. The questions maybe challenging, but everyone should have already studied these concepts. To help you answer these questions you may use the internet. You may also go to the library or a book store and use a chemistry book there. The best Chemistry book to use is the text we will be using, the *fifth edition* of **Chemistry** by **Zumdahl**.(If they do not have the fifth edition use any edition.) Many of these questions came from Zumdahl's Chemistry textbook and you can use it to help you answer the questions. If you have any questions, feel free to email me at dougwolfejr@rocketmail.com or post a question to the forum at http://www.wolfescience.com/ap/forum.php.

1. Define and explain the differences between the following terms:
   a. law and theory

   b. theory and experiment

   c. qualitative and quantitative

   d. hypothesis and theory

   e. precision and accuracy

2. Which of the following statements (hypotheses) could be tested by quantitative measurement?
   a. Ty Cobb was a better baseball player than Pete Rose

   b. Ivory soap is $99\frac{44}{100}\%$ pure.

   c. Rolaids consumes 47 times its weight in excess stomach acid.

3. A student performed an analysis of a sample for its calcium content and got the following results:

   14.92%, 14.91%, 14.88%, 14.91%

   The actual amount of calcium in the sample is 15.70%. What conclusion can you draw about the accuracy and precision of these results.

4. Which of the following are exact numbers?
   a. The elevation of Breckenridge, Colorado, is 9600 ft. _____
   b. There are 12 eggs in a dozen. _____
   c. One yard is equal to 0.9144m. _____
   d. The announced attendance at a football game was 41,302. _____
   e. In 1983, 1759 Ph.D.s in chemistry were awarded in the United States. _____
   f. The budget deficit of the U.S in the fiscal year 2004 was 412.5 billion. _____
   g. There are 100 cm in 1 m. _____
   h. $\pi = 3.14.15926$ _____

5. How many significant figures are in each of the following? Then express each number in exponential form (using scientific notation)?

	# of sig figs	Exponential form
a. 0.0012		
b. 437,000		
c. 900		
d. 506		
e. 125,900,300		
f. 4.036		
g. 2008		
h. 4010.5		
i. 0.0005063		
j. 100.		

6. Use exponential notation to express the number of 362,000 to
   a. One significant figure
   b. Two significant figures
   c. Three significant figures
   d. Four significant figure
   e. Five significant figures

7. Perform the following mathematical operations and express each result to the correct number of significant figures.
   a. $4.184 \times 100.62 \times (25.27 - 24.16)$

   b. $\dfrac{8.1 \times 100.48}{7.521 + 4.026}$

   c. $0.1654 + 2.07 - 2.114$

   d. $6.022 \times 10^{23} \times 1.05 \times 10^{8}$

e. $\dfrac{6.262\times10^{-34}\times2.998\times10^{8}}{2.54\times10^{-9}}$

f. $1.689\times10^{-2}+1.24\times10^{-3}+1.879\times10^{-1}$

8. Complete the following conversions.
   a. How many millimeters are in 5 meters?

   b. How many seconds in one day?

   c. How many kilometers are in $6.50\text{x}10^{2}$ terameters?

   d. How many kilograms are in 25 femtograms?

   e. How many liters are in 8.0 cubic decimeters?

   f. How many microliters are in one milliliter?

   g. How many picograms are in one microgram?

9. Many atomic dimensions are expressed in angstroms. (1 Å = $1x10^{-8}$).
   a. What is the angstrom equal to in terms of the SI units nanometer (nm) and picometer (pm).

   b. Two atoms in a molecule are 134 pm apart. What is the distance in nanometers and angstroms?

10. The circumference of the earth is 25,000 mi at the equator. What is the circumference in kilometers and in meters?

11. A rectangular solid measures 2.0 m by 6.5 cm by 2.1 dm. Express its volume in cubic meters, liters, cubic centimeters and mL.

12. According to The Sporting News, the fastest recorded fastball was thrown by Nolan Ryan and had a velocity of 100.8 mi/h. Calculate this velocity in meters per second.

13. The speed of light is $3.00x10^{8}$m/s. How far will a beam of light travel in 1.00ns?

14. If the temperature in a room is 74°F, what is this temperature on the Celsius scale? On the Kelvin scale?

15. Helium boils at about 4K. What is this temperature in °F? In °C?

16. The density of osmium (the densest metal) is 22.57g/cm^3.
    a. What is the mass of a block of osmium with dimensions 5.00 cm x 4.00 cm x 2.50 cm?

    b. What volume would be occupied by 1.00 kg of osmium?

17. Two spherical objects have the same mass. One floats on the water; the other sinks. Which object has the greater diameter? Explain your answer.

18. What are some of the differences between a solid, a liquid and a gas?

19. What is the difference between homogeneous and heterogeneous matter?

20. Classify each of the following as homogeneous or heterogeneous.
    a. soil _____
    b. atmosphere _____
    c. a carbonated soft drink _____
    d. gasoline _____
    e. gold _____
    f. a solution of ethanol and water _____

21. Classify each of the following as a mixture or a pure substance.
    a. water _____
    b. blood _____
    c. the oceans _____
    d. iron _____
    e. brass _____
    f. leather _____
    g. table salt (NaCl) _____

22. Of the pure substances in the last problem, which are elements and which are compounds?