

**Chemistry 100**  
**Homework Problem Set # 1**  
**Due Wednesday, September 3**

1. Complete the following mass and volume conversions:

- (a) Convert 137 eggs into dozens
  
  
- (b) Convert 450 mL into liters
  
  
- (c) Convert 12 cm into mm
  
  
- (d) Convert 3.21 quarts into milliliters (1 quart = 0.947 L)
  
  
- (e) Convert 0.05 g into mg
  
  
- (f) Convert 100 lbs into kg
  
  
- (g) Convert 2000 mg into ounces
  
  
- (h) Convert 345 mg into g
  
  
- (i) Convert 2.5 liters into mL

2. Complete the following temperature conversions:

- (a) 101.2 °F to °C
- (b) 78.0 °F to °C
- (c) -20.0 °F to °C
- (d) 22 °C to °F
- (e) -10.0 °C to K
- (f) 298 K to °C

3. Using the periodic table, specify the number of protons in
- (a) an iron atom (Fe) \_\_\_\_\_ (c) a potassium atom (K) \_\_\_\_\_
- (b) a silicon atom (Si) \_\_\_\_\_ (d) a tungsten atom (W) \_\_\_\_\_
4. For each of the following, specify whether the property is a chemical or physical property.
- (a) chlorine is a green gas \_\_\_\_\_
- (b) copper is a good conductor of heat \_\_\_\_\_
- (c) gasoline burns, forming water and carbon dioxide \_\_\_\_\_
- (d) carbon, in its diamond form, is very hard \_\_\_\_\_
- (e) alkali metals react vigorously with water \_\_\_\_\_
- (f) calcium carbonate decomposes when heated \_\_\_\_\_
5. For each of the following, specify whether the change described is a chemical or physical change.
- (a) sodium reacts violently with chlorine, forming NaCl \_\_\_\_\_
- (b) calcium carbonate releases CO<sub>2</sub> gas when mixed with an acid \_\_\_\_\_
- (c) old milk goes sour in the refrigerator \_\_\_\_\_
- (d) water vapor condenses on a cold window, forming water droplets \_\_\_\_\_
- (e) magnesium firework sparklers burn, leaving magnesium oxide ash behind \_\_\_\_\_
- (f) rubbing alcohol placed on the skin “disappears” after a minute \_\_\_\_\_
6. (Waldron, question 1.2) Comment on this statement: *Hypothesis and theories are really the same thing. Both tell you the expected outcome of a series of scientific experiments.*
7. (Waldron, question 1.8) Explain why it is incorrect to refer to a theory as being “proved.”

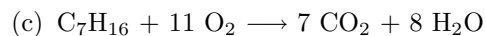
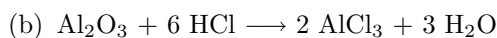
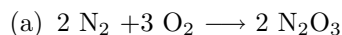
8. Evaluate and comment on the following claims:

(a) Creatures live on the moon that are completely undetectable by humans.

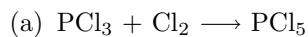
(b) A doctor claims she can cure a patient of recurring migraine headaches by simply massaging the patient's temples and directing healing energy inward. If she has the patient's complete trust, she can cure the headaches within a year. Several of her patients have testified that the doctor has cured their migraines.

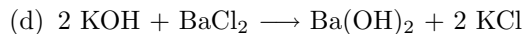
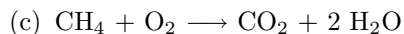
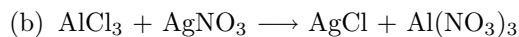
(c) Two weeks ago, your friend went to a psychic fair and got his aura cleansed. Then he got an A on his math test. He used to get C's in math, so the A must have been the result of the aura cleansing. (From: Schick, T., Vaugh, L. *How to Think About Weird Things*, 4th Ed., p. 266.)

9. All of the following are balanced equations. State the number of atoms of each element on the reactant side. (check to make sure they are the same on the product side)

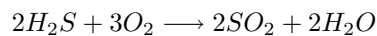


10. Are the following equations balanced? Indicate YES or NO. If NO explain why not:



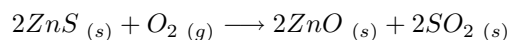


11. (Waldron 1.18) This reaction takes place when hydrogen sulfide gas, is released during a volcanic eruption:



- (a) Is this equation balanced? (b) How many atoms of each element make up the reactants? (c) How many atoms of each element make up the products? (d) If you begin the reaction with six molecules of hydrogen sulfide and nine molecules of oxygen, how many molecules of water are produced?
12. (Waldron 1.20) (a) Describe two ways a mixture of water and sand (made up primarily of silicon dioxide,  $\text{SiO}_2$ ) can be separated into its two components. (b) Is sand an element or a compound? (c) Can physical or chemical change (or both) be used to break the water and silicon dioxide down further?

13. (Waldron, 1.26) In nature, zinc is sometimes found in the form of zinc sulfide,  $\text{ZnS}$ . One step in converting this compound to pure zinc metal is to convert it first to zinc oxide,  $\text{ZnO}$ :



- (a) What coefficient must be added in front of the oxygen molecule to balance this equation? (b) What is the phase of each reactant and product? (c) If you begin the reaction with 1 unit of zinc sulfide, how many units of zinc oxide will be produced?