# Molar Mass

Name: _____

Student ID: _____

Date: _____

"If we hollowed out the earth and filled it with blueberries, the number of berries would be about the same as the number of atoms in a grapefruit." — Unknown

**1.** (a) One carbon atom weighs 1.994 x10$^{-23}$ grams.  How many carbon atoms are in 2.74 grams of carbon?

(b) One mole of carbon atoms weighs 12.01 grams.  How many moles of carbon atoms are in 2.74 grams of carbon?

**2.** A car has two fenders, one engine, and four tires.  We might represent a car as:

$$F_2EnT_4$$

<u>Use dimensional analysis</u> to answer each of the following questions.

(a) How many tires are in seven cars?

(b) How many tires in 2.5 dozen cars?  (a dozen is just 12 of something)

(c) How many tires in 2.5 moles of cars? (a mole is just 6.022 x 10$^{23}$ of something)

(d) How many oxygen atoms in 2.5 moles of $H_2SO_4$ molecules?

(e) How many oxygen atoms in seven $H_2SO_4$ molecules?

**3.** How much does **<u>one mole</u>** of each of the following weigh? (the molar mass)

(a) Oxygen atoms     _____      (b) Oxygen molecules   _____

(c) Carbon atoms     _____      (d) Carbon molecules   _____
                                                (this is a trick question)

(e) Sulfur atoms     _____      (f) Sulfur molecules   _____

(g) $H_2O$     _____      (h) Magnesium chloride _____

**4.** How many moles (of molecules) are in each of the following?

(a) A sample of copper dust weighing 12.32 grams.

(b) A sample of nitrogen gas weighing 4.325 grams.

(c) A sample of sodium chloride crystals weighing 95.27 grams.

(d) A sample of potassium nitrate powder weighing 105.3 grams.

**5.** A 2004 Ford F350 truck weighs 5,415 lbs.   If each axel weighs 315 lbs, what percentage of the total truck weight comes from the axels?

**6.** A liquid is found on Mars.  When we burn 23.45 grams of it, we find that the sample is composed of 0.8648 grams of hydrogen, 8.857 grams phosphorus, and 13.73 grams oxygen.  What is the percent composition of each element in this compound?

**7.** Is the compound in question #6 more likely to be phosphoric acid or phosphorous acid?  (Hint: what is the percent composition of each element in each acid?)

**8.** What is the empirical formula of a substance that consists of 32.86% potassium and 67.14% bromine?

**9.** What is the molecular formula of a compound with the empirical formula $CH_2O$ and molar mass of 180.18g?