

- 1a.** How many atoms are in 1 molecule of propane ( $C_3H_8$ )? \_\_\_\_\_  
**b.** How many atoms are in  $2.0 \times 10^{22}$  molecules of  $C_3H_8$ ?

**c.** How many atoms are in  $1.0 \times 10^{20}$  molecules of  $XeF_4$ ?

**d.** How many atoms are in  $7.7 \times 10^{19}$  molecules of morphine ( $C_{17}H_{19}NO_3$ )?



**a.** Sucrose (table sugar) has the formula  $C_{12}H_{22}O_{11}$ . Sucrose can decompose to produce solid carbon and water vapor, as shown in the above equation. (This was in a demo earlier this term!)

Suppose that 125 grams of  $C_{12}H_{22}O_{11}$  are decomposed, and then the carbon produced is collected, washed, dried, and weighed. If 52.8 grams of carbon are collected, what is the percent carbon (by mass) in the sucrose, according to this experiment?

**b.** Calculate the percent carbon (by mass) in  $C_{12}H_{22}O_{11}$ , according to the periodic table masses.

**3.** Morphine has the formula  $C_{17}H_{19}NO_3$ .

**a.** Calculate the molar mass of morphine.

**b.** Morphine is used in anesthesia. If a patient is given 14 mg of morphine (0.014 g), how many molecules of morphine is this?

**c.** Convert  $3.1 \times 10^{22}$  morphine molecules into moles.

4a. Calculate the molar mass of chlorine. (Hint:  $H_2O_2F_2Br_2I_2N_2Cl_2$ )

4b. How does 1.00 mole of  $H_2O$  compare to 1.00 mole of  $Cl_2$ ? (circle the *answer* for each)

Which has more molecules? *the  $H_2O$*       *the  $Cl_2$*       *they contain the same # of molecules*

Which has more atoms? *the  $H_2O$*       *the  $Cl_2$*       *they contain the same # of atoms*

Which has more mass? *the  $H_2O$*       *the  $Cl_2$*       *they have the same mass*

5. What if you had a mole of chemistry worksheets?!?!?

a. Given that 1 sheet of paper is 0.011 cm (or 0.00011 m) thick, how tall would a stack of 1 mole of worksheets be? Report answer in meters.

b. Would the height of the worksheet stack (in part (a)) be greater than the following distances:

\_\_\_\_\_ Distance from the earth to the moon:  $3.8 \times 10^8$  m

\_\_\_\_\_ Distance from the earth to the sun:  $1.4 \times 10^{11}$  m

\_\_\_\_\_ Distance to the nearest star (besides the sun); Alpha centauri system:  $4 \times 10^{16}$  m

\_\_\_\_\_ Diameter of our galaxy:  $9 \times 10^{20}$  m

\_\_\_\_\_ Distance to the edge of the observable universe:  $4 \times 10^{26}$  m

c. What if you stacked the worksheets end-to-end the long way? How tall/long would the stack be, in meters?

Note: the length of one sheet of paper is 11 inches, or 28 cm, or 0.28 m.

6. The molecular formula of ibuprofen is  $C_{13}H_{18}O_2$ .

a. One tablet of Advil contains 200. mg (0.200 grams) of ibuprofen. How many moles of ibuprofen is this?

b. What is the mass of  $4.00 \times 10^{22}$  molecules of ibuprofen?

c. How many atoms are in the  $4.00 \times 10^{22}$  molecules of ibuprofen? (hint, this is like problem #1)