



Be sure to use dimensional analysis for all conversions!

1. What is the representative particle of each of the following types of matter?  
a. element: \_\_\_\_\_ b. molecular compound: \_\_\_\_\_ c. ionic compound: \_\_\_\_\_
2. How many representative particles are in a mole of anything? \_\_\_\_\_
3. Determine the molar mass of each of the following substances:  
a) Xe: \_\_\_\_\_ b) carbon: \_\_\_\_\_ c)  $\text{Li}_2\text{S}$ : \_\_\_\_\_ d) magnesium nitrate: \_\_\_\_\_
4. What is a mole and what is it based on?
5. What is Avogadro's number?
6. What is molar mass and what is its unit?
7. Where can molar masses of elements be found and how can molar masses of compounds be determined?
8. What is the molar mass of each of the following? (You need to write the correct formulas for the substances first!)  
a. silver b. diphosphorus pentoxide c. copper(II) phosphate
9. What is the percent composition of 8b and 8c?
10. Colorado Springs is 68.6 miles from Denver. How many millimeters is this? (1.61 km = 1 mi)

Perform each of the following conversions.

- 11)  $4.2 \times 10^{22}$  atoms W = ? mol W
- 12) 3.19 mol  $\text{H}_2\text{O}$  = ? molecules of  $\text{H}_2\text{O}$
- 13) 132 g  $\text{C}_6\text{H}_{12}\text{O}_6$  = ? mol  $\text{C}_6\text{H}_{12}\text{O}_6$
- 14)  $8.31 \times 10^{24}$  formula units  $\text{NiCl}_2$  = ? g  $\text{NiCl}_2$
- 15) 73.25 g  $\text{Na}_2\text{SO}_4$  = ? formula units  $\text{Na}_2\text{SO}_4$
16. If the density of hexane ( $\text{C}_6\text{H}_{14}$ ) is 0.655 g/mL, how many molecules of hexane are in 83.12 mL of hexane?
17. An unknown compound is 88.80% carbon and 11.20% hydrogen. Its molar mass is 54.10 g/mol.  
a. What is the unknown compound's empirical b. What is its molecular formulas?
18. A certain compound is analyzed and it is determined that it contains 11.89 g of iron and 5.11 g of oxygen. What is the empirical formula of the compound?
19. Make sure that you understand what you did in the magnesium oxide lab!

Answers:

1. a) atom; b) molecule; c) formula unit
2.  $6.02 \times 10^{23}$
3. a) 131.29 g/mol; b) 12.01 g/mol; c) 45.95 g/mol; d) 148.32 g/mol
4. A mole is the number of atoms in 12 grams of carbon-12. It is a quantity equal to  $6.02 \times 10^{23}$ .
5.  $6.02 \times 10^{23}$
6. molar mass is the mass of one mole a substances. unit = g/mol
7. molar masses of elements are on the periodic table. the molar masses compound are calculated by adding the individual molar masses of each component element together.
8. a) 107.87 g/mol      b) 141.94 g/mol      c) 380.59 g/mol
9. b) 43.64% P and 56.36% O      c) 50.09% Cu, 16.27% P, and 33.64% O
10.  $1.10 \times 10^8$  mm
11. 0.070 mol W
12.  $1.92 \times 10^{24}$  molecules  $\text{H}_2\text{O}$
13. 0.733 mol glucose
14. 1790 g  $\text{NiCl}_2$
15. 3.104 formula units of  $\text{Na}_2\text{SO}_4$
16.  $3.80 \times 10^{23}$  molecules of  $\text{C}_6\text{H}_{14}$
17. empirical formula:  $\text{C}_2\text{H}_3$ ; molecular formula:  $\text{C}_4\text{H}_6$
18.  $\text{Fe}_2\text{O}_3$