Chemistry Mastery Assignment
Unit 4: The Mole

Name _____
Period _____ Date _____

To earn back Mastery Quiz points, student must complete assignment within instructor deadline. Assignment will be graded for correctness. Please use online resources posted on the Science Mastery website and tutorial time with your instructor. ALL WORK MUST BE HANDWRITTEN.

To be completed by instructor:
Assignment completed on time __
Assignment completed correctly __
Score entered into Aeries ___

Using your textbook, notes, and additional assignments, complete the following worksheet.

1. Phosgene, $CoCl_2$, was once used as a World War I poison gas. It's poisonous because when it's inhaled, it reacts with water in the lungs to produce hydrochloric acid (HCl), which causes severe lung damage, leading ultimately to death.

   a. What is the molar mass of phosgene?

   b. How many moles is 2.6 g of phosgene?

   c. What is the mass in grams of 3.63 moles of phosgene?

   d. How many molecules are in a bomb with 1.5 kg of phosgene?

   e. How many atoms of Chlorine are in the above bomb (1d)?

   f. What is the mass in grams of 9.4×10^{46} molecules of phosgene?

2. Find the molar mass of the following substances:
   a. $C_6H_8O_6$ (Vitamin C)

   b. $C_{12}H_{22}O_{11}$ (cane sugar)

3. Find the mass of:
   a. 3.88 moles of Vitamin C

   b. 11.1 moles of cane sugar

4. Find the number of moles in 171 g of Vitamin C.

5. Find the number of molecules in 44 g of cane sugar.

6. Find the mass in grams of:

   a. 8.4×10^{27} molecules of cane sugar

   b. 1.9×10^{25} molecules of Vitamin C

7. The present population of the United States is approximately 289,350,000 people based upon a recent census. A certain wealthy presidential candidate who was seeking office promised that he would distribute one mole of dollars equally to every man, woman, and child in the country. If he were elected, what would he owe you?

8. If a 1.271 g sample of aluminum metal is heated in a chlorine gas atmosphere, the mass of aluminum chloride is 6.280 g. Calculate the empirical formula of aluminum chloride?

9. A compound consists of 65.45% C, 5.492% H, and 29.06% O on a mass basis and has molar mass of approximately 110 g. Determine the molecular formula of the compound.

10. Calculate the empirical formula of each compound with the following percent composition.

a. 94.1% O, 5.9% H

b. 79.9% C, 20.1% H

c. 67.6% Hg, 10.8% S, 21.6% O

d. 27.59% C, 1.15% H, 16.09% N, 55.17% O

11. The compound meythl butanoate smells like apples. Its percent composition is 58.8% C, 9.8% H, and 31.4% O. If its gram molecular mass is 102 g/mole, what is its molecular formula?

12. You find that 7.36 of a compound has broken down to give 6.93g of oxygen. The rest of the compound is hydrogen. If the molecular mass of the compound is 34.0 g/mole, what is its molecular formula?

13. a. A compound of carbon and hydrogen has the composition of 92.25% carbon and 7.75% hydrogen by mass. What is the empirical formula of this composition?

b. If the compound has a mass of 52.03 g/mole, what is the molecular formula of the compound?

14. a. An art student runs out of yellow paint. A chemistry-minded friend offers to make yellow pigment in the form of lead (II) chromate. Calculate its percent composition.

b. Fill in the blank:
In the formula above, there are ___ elements, _____ ions, and _____atoms.

15. Calculate the molar mass for the following formulas.

a) $Ca(C_2H_3O_2)_2$

b) SiO_2

c) S_2Cl_2

d) Magnesium Phosphate

e) Calcium Carbonate

16. For the compound $Pb(NO_3)_4$, Calculate the percent composition (by mass) of each element.