Chemistry: *Atoms, Mass, and the Mole*

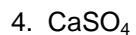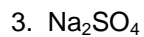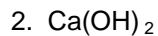Use appropriate conversion factors and unit cancellation to solve the following problems. In order to get full credit, you must show the set-up and include units in all quantities.

1. Find the number of atoms of phosphorus (P) in 3.44 moles of phosphorus.

2. What is the mass of 0.38 moles of cobalt (Co)?

3. How many moles of nickel (Ni) is 3.88×10^{25} atoms of nickel?

4. How many atoms is 3.75 moles of iron (Fe)?

5. Find the number of moles of sodium (Na) in 145 g of sodium.

6. How many moles is 0.55 g of magnesium (Mg)?

7. If you have 7.22×10^{23} atoms of chromium (Cr), how many moles of chromium do you have?

8. What mass of tungsten (W) is 35 moles of tungsten?

9. How many atoms is 5.2 moles of titanium (Ti)?

10. How many moles of iron (Fe) is 5.98 x 10^{24} atoms of iron?

11. What mass of molybdenum (Mo) is 6.68 moles of molybdenum?

12. How many moles is 586 g of rhenium (Re)?

13. How many atoms of palladium (Pd) is 400 g of palladium?

14. Find the mass of 4.55 x 10^{28} atoms of vanadium (V).

15. Find the mass of 4.77 x 10^{22} atoms of scandium (Sc).

16. Find the number of atoms in 36 g of germanium (Ge).

17. How many atoms are in 8500 g of selenium (Se)?

18. Find the mass of 1.43 x 10^{28} atoms of polonium (Po).

Chemistry: *Molar Mass and Percentage Composition*

Calculate the molar masses and percentage composition of each of the following compounds. Show your work and always include units.

1. Ca_3P_2

2. $Ca(OH)_2$

3. Na_2SO_4

4. $CaSO_4$

5. $(NH_4)_2SO_4$

6. $Zn_3(PO_4)_2$

7. $Mg(NO_3)_2$

8. KCl

Chemistry: *Percentage Composition and Empirical & Molecular Formula*

Solve the following problems. Show your work, and always include units where needed.

1. A compound is found to contain 36.5% Na, 25.4% S, and 38.1% O. Find its empirical formula.

2. Find the empirical formula of a compound that is 53.7% iron and 46.3% sulfur.

3. Analysis of a sample of a compound indicates that is has 1.04 g K, 0.70 g Cr, and 0.86 g O.   What is its empirical formula?

4. If 4.04 g of nitrogen combine with 11.46 g of oxygen to produce a compound with a molar mass of 108.0g, what is the molecular formula of this compound?

5. The molar mass of a compound is 92 g. Analysis of the sample indicates that it contains 0.606 g N and 1.390 g O. Find the compound's molecular formula.

6. An acid commonly used in the automotive industry is shown to be 31.6% phosphorous, 3.1% hydrogen, and 63.5% oxygen. Determine the empirical formula of this acid.

7. A solvent is found to be 50.0% oxygen, 37.5% carbon, and 12.5% hydrogen. What is the empirical formula of this solvent.

8. A particular sugar is determined to have the following composition: 40.0% carbon, 6.7% hydrogen, and 53.5% oxygen. Determine the empirical formula of this sugar molecule.

9. If the molar mass of the sugar in question #8 is 180.0 g, find the molecular formula of the sugar.

10. Ethene, a gas used extensively in preparing plastics and other polymers, has a composition of 85.7% carbon and 14.3% hydrogen. Its molar mass is 28 g. Find the molecular formula for ethane.

Limiting Reagent problems

1. Consider the reaction $2 I_2O_5 + 5 CO \longrightarrow 5 CO_2 + I_2$

a) 80.0 grams of iodine (V) oxide, I_2O_5, reacts with 28.0 grams of carbon monoxide, CO. Determine the mass of iodine I_2, which could be produced.

b) If, in the above situation, only 0.160 moles of iodine, I_2, was produced, what mass of iodine was produced and what percentage yield of iodine was produced?