

7. Percent Composition

a. What percent of $\text{Ca}_3(\text{PO}_4)_2$ is calcium?

$$\frac{120.24 \text{ g Ca}}{310.18 \text{ g Ca}_3(\text{PO}_4)_2} \times 100 =$$

$$38.76\% \text{ Ca in } \text{Ca}_3(\text{PO}_4)_2$$

8. Mole Conversions

a. Find the number of molecules in 115 grams of nitrogen dioxide. NO_2

$$\frac{6.02 \times 10^{23} \text{ molecules NO}_2}{1 \text{ mol NO}_2} \times \frac{1 \text{ mol NO}_2}{46.01 \text{ g NO}_2} \times 115 \text{ g NO}_2 =$$

$$1.50 \times 10^{24} \text{ molecules NO}_2$$

b. Convert 15.0 grams of C_2H_6 to moles.

$$\frac{1 \text{ mol C}_2\text{H}_6}{30.08 \text{ g C}_2\text{H}_6} \times 15.0 \text{ g C}_2\text{H}_6 =$$

$$0.499 \text{ mol C}_2\text{H}_6$$

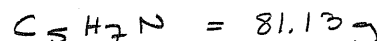
9. Empirical Formulas/Molecular Formulas

a. What is the empirical formula of a compound that consists of 74.1% carbon, 8.6% hydrogen, and 17.3% nitrogen by mass. Then, find the molecular formula given its molar mass is about 160 g/mol.

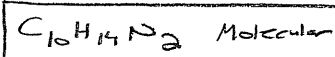
$$\frac{1 \text{ mol C}}{12.01 \text{ g C}} \times 74.1 \text{ g C} = 6.1699 \text{ mol C} \div 1.2348 = 5$$

$$\frac{1 \text{ mol H}}{1.01 \text{ g H}} \times 8.6 \text{ g H} = 8.5149 \text{ mol H} \div 1.2348 = 7$$

$$\frac{1 \text{ mol N}}{14.01 \text{ g N}} \times 17.3 \text{ g N} = 1.2348 \text{ mol N} \div 1.2348 = 1$$



$$\frac{160 \text{ g}}{81.13 \text{ g}} = 2$$

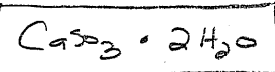


10. Hydrates: Solve the following.

a. What is the formula for the hydrate from the given information: 76.9% CaSO_3 and 23.1% H_2O .

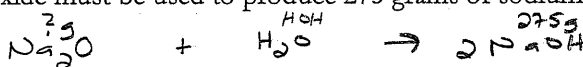
$$\frac{1 \text{ mol CaSO}_3}{120.15 \text{ g CaSO}_3} \times 76.9 \text{ g CaSO}_3 = 0.6400 \text{ mol CaSO}_3 = 1$$

$$\frac{1 \text{ mol H}_2\text{O}}{18.02 \text{ g H}_2\text{O}} \times 23.1 \text{ g H}_2\text{O} = 1.2819 \text{ mol H}_2\text{O} \div 0.6400 = 2$$



11. Mass-Mass Problems

a. Sodium oxide reacts with water to produce sodium hydroxide. What mass of sodium oxide must be used to produce 275 grams of sodium hydroxide?

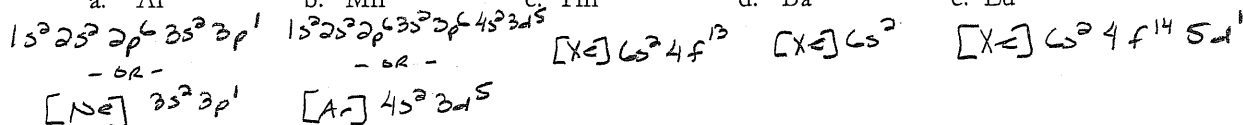


$$\frac{61.98 \text{ g Na}_2\text{O}}{1 \text{ mol Na}_2\text{O}} \times \frac{1 \text{ mol Na}_2\text{O}}{2 \text{ mol NaOH}} \times \frac{1 \text{ mol NaOH}}{40 \text{ g NaOH}} \times 275 \text{ g NaOH} =$$

$$213 \text{ g Na}_2\text{O}$$

12. Electron Configuration: What is the electron configuration for the following.

a. Al b. Mn c. Tm d. Ba e. Lu



13. Energy Problem:

a. Calculate the energy in Joules of a quantum of radiant energy whose frequency is $4.23 \times 10^{18} \text{ Hz}$.

$$E = (6.626 \times 10^{-34} \text{ J}\cdot\text{s}) (4.23 \times 10^{18} \text{ 1/s})$$

$$E = 2.80 \times 10^{-15} \text{ J}$$