

These problems are intended to *supplement* the problems in the textbook, not *replace* them.

Questions

Calculate the percent composition by mass of the following:

1. $C_4H_6O_2$
2. C_3H_3N
3. Na_3PO_4
4. $(CH_3)_2N_2O$

Answer these questions:

5. Cyanocobalamin (vitamin B_{12}) contains 4.34% cobalt by mass. What is the molar mass of cyanocobalamin, assuming that there is one atom of cobalt in every molecule ?
6. Hemoglobin is 0.342% Fe by mass, and each hemoglobin molecule contains four iron atoms. What is the molar mass of hemoglobin ?
7. An ionic compound formed from aluminum and a group VIA element is 18.56% Al by mass. What is the formula of the compound ?
8. A gold compound decomposes upon heating with a catalyst to gold(III) chloride and oxygen gas. If a 0.07976 g sample is completely decomposed and produces 30.92 mg of oxygen gas, then what is the percent oxygen in the gold compound ?

Find the empirical formulas for the following:

9. a compound that is 34.59% Na, 23.31% P, and 42.10% O by mass
10. a compound, a sample of which contains 0.388 g Li, 2.922 g Cr, and 3.147 g O
11. a compound, a sample of which contains 15.4 g Al, 27.5 g S, and 54.8 g O
12. a compound that is 24.5% Na, 14.9% Si, and 60.6% F by mass

Find the empirical and molecular formulas for the following:

13. a compound composed of only antimony and oxygen which is 83.53% Sb by mass and has a molar mass between 550 and 600 g/mol
14. a compound that is 14.5% C, 1.8% H, 64.3% Cl, and 19.4% O by mass, with a molar mass of 662 g/mol
15. a compound, a sample of which contains 0.398 moles of the substance, and consists of 38.2 g C, 4.8 g H, and 38.2 g O
16. a compound that is 80% I and 20% O by mass, with a molar mass of 318 g/mol

Answers

If you cannot figure out how to get the correct answer, go to your instructor, Science Tutoring Center, SI, etc.

NOTE: molar mass values were taken from the CHE 111 Lab Manual and used without rounding

1. 55.80% C, 7.025% H, 37.17% O
2. 67.90% C, 5.699% H, 26.40% N
3. 42.07% Na, 18.89% P, 39.04% O
4. 32.42% C, 8.163% H, 37.82% N, 21.60% O
5. 1.36×10^3 g/mol
6. 6.53×10^4 g/mol
7. Al_2Se_3
8. 38.77% O
9. $\text{Na}_4\text{P}_2\text{O}_7$
10. $\text{Li}_2\text{Cr}_2\text{O}_7$
11. $\text{Al}_2\text{S}_3\text{O}_{12}$ note: this is $\text{Al}_2(\text{SO}_4)_3$
12. Na_2SiF_6
13. empirical formula is Sb_2O_3 and molecular formula is Sb_4O_6
14. empirical formula is $\text{C}_2\text{H}_3\text{Cl}_3\text{O}_2$ and molecular formula is $\text{C}_8\text{H}_{12}\text{Cl}_{12}\text{O}_8$
15. empirical formula is $\text{C}_4\text{H}_6\text{O}_3$ and molecular formula is $\text{C}_8\text{H}_{12}\text{O}_6$
16. empirical formula is IO_2 and molecular formula is I_2O_4