

Multiple Choice Practice: Tasty and Delicious

1. An element X combines with oxygen to form a compound of formula XO_2 . If 24.0 g of element X combine with exactly 16.0 g of O to form this compound, what is the atomic weight of element X?

(a) 48.0 amu b. 24.0 amu c. 16.0 amu d. 12.0 amu

$$16 \text{ g O} \times \frac{1 \text{ mol O}}{16 \text{ g O}} \times \frac{1 \text{ mol X}}{2 \text{ mol O}} = 0.5 \text{ mol X} \quad \left. \vphantom{\frac{1 \text{ mol X}}{2 \text{ mol O}}} \right\} \frac{24.0 \text{ g}}{0.5 \text{ mol}} = 48 \text{ g/mol}$$

b/c XO_2

2. A new ore contains 52.3% silver by mass. How many grams of the ore are needed to obtain 10.0 moles of silver?

(a) 2,060 g b. 1,080 g c. 564 g d. 10.0 g

$$10.0 \text{ mol Ag} \times \frac{107.87 \text{ g}}{1 \text{ mol Ag}} = 1,078.7 \text{ g} \quad \left. \vphantom{\frac{1,078.7 \text{ g}}{x}} \right\} \frac{1,078.7 \text{ g}}{x} = 0.523 \Rightarrow x \approx \frac{1,000}{0.5} = 2,000$$

3. A compound is made up of entirely silicon and oxygen atoms. If there are 14.0 g Si and 32.0 g O present, what is the empirical formula of the compound?

a. SiO_2 (b) SiO_4 c. Si_2O d. Si_2O_3

$$\begin{array}{l} Si: 14.0/28 = 0.5 \\ O: 32.0/16 = 2 \end{array} \quad \left. \vphantom{\frac{32.0}{16}} \right] \div 0.5 \quad \begin{array}{l} = 1 \\ = 4 \end{array}$$

4. A chemist suspects that a given sample of $CaSO_4$ is impure. Upon testing, the chemist finds that the sample contains 31.6% calcium, but pure $CaSO_4$ is 29.4% calcium by mass. Which of the following might account for the measured percent mass of the sample?

a. The sample is composed entirely of $CaSO_4$.] no change to % Ca

(b) The sample is a mixture of $CaSO_4$ and $CaCO_3$. $FW(CO_3^{2-}) < FW(SO_4^{2-})$

c. The sample is a mixture of $CaSO_4$ and $MgSO_4$.] \downarrow % Ca

d. The sample is a mixture of $CaSO_4$ and $Ca(BrO_3)_2$.] \downarrow % Ca

5. Styrene has the empirical formula CH with a molar mass of 104.13 g/mol. Approximately how many hydrogen atoms are present in a 52 g sample of styrene?

- a. 5.0×10^{22} H atoms
 (b) 2.4×10^{24} H atoms
 c. 8.0×10^{23} H atoms
 d. 6.1×10^{23} H atoms

$$FW(CH) \approx 13$$

$$\frac{104}{13} \approx 8 \times CH = C_8H_8$$

$$\left. \begin{array}{l} 52 \text{ g} \\ 104 \text{ g} \\ 2 \text{ } C_8H_8 \end{array} \right\} \times \frac{1 \text{ mol}}{104 \text{ g}} \times \frac{8 \text{ mol H}}{1 \text{ mol } C_8H_8} \times \frac{6.023 \text{ atoms H}}{1 \text{ mol H}} = 24 \text{ E } 23 = 2.4 \text{ E } 24$$

6. What is the empirical formula for a compound that contains 7.48 g N and 1.08 g H?

- a. N_2H
 (b) NH_2
 c. NH
 d. NH_5

$$\begin{array}{l} N: 7.48 / 14 \approx 0.5 \\ H: 1.08 / 1.008 = 1 \end{array} \left. \vphantom{\begin{array}{l} N \\ H \end{array}} \right\} \div 0.5 = \begin{array}{l} 1 \\ 2 \end{array}$$

7. If the compound in #6 has a molecular mass of 32.05 g/mol, what is its molecular formula?

- a. N_2H_2
 b. N_4H_2
 c. N_2H_{10}
 (d) N_2H_4

$$FW(NH_2) \approx 16$$

$$32 / 16 = 2 \times NH_2$$

8. An Olympic medal contains 71.5% of gold by mass. How much gold could be extracted from a medal that weighs 115 g?

- (a) 0.417 mol
 b. 0.817 mol
 c. 2.43 mol
 d. 4.86 mol

$$115 \times 0.7 \approx 70 \text{ g Au} \times \frac{1 \text{ mol Au}}{196.97 \text{ g Au}} \approx \frac{70}{200} = \frac{35}{100} = 0.35$$

9. Two different samples are analyzed. Sample A contains 2.8 g of N and 1.6 g of O. Sample B contains 14.0 g of N and 8.0 g of O. Which of the following statements is true?

- a. Sample A and B are the same compound because they contain the same types of atoms.
 (b) Sample A and B are the same compound because their mass ratios indicate they both contain the same ratio of atoms within the molecule.
 c. Sample A and B are different compounds because they contain different numbers of atoms indicating a different ratio of atoms within the molecule.
 d. Sample A and B are different compounds because their molar masses are different.