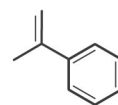


Determining Empirical Formula Worksheet



Answers

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

$$50 \text{ g O} \left(\frac{1 \text{ mol O}}{16 \text{ g O}} \right) = 3.125 \text{ mol O} \div 3.125 \text{ mol} \rightarrow 1$$

$$37.5 \text{ g C} \left(\frac{1 \text{ mol C}}{12 \text{ g C}} \right) = 3.125 \text{ mol C} \div 3.125 \text{ mol} \rightarrow 1$$

$$12.5 \text{ g H} \left(\frac{1 \text{ mol H}}{1 \text{ g H}} \right) = 12.5 \text{ mol H} \div 3.125 \text{ mol} \rightarrow 4$$

The empirical formula is CH₄O.

2. 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.

$$40 \text{ g C} \left(\frac{1 \text{ mol C}}{12 \text{ g C}} \right) = 3.33 \text{ mol C} \div 3.33 \text{ mol} \rightarrow 1$$

$$6.7 \text{ g H} \left(\frac{1 \text{ mol H}}{1 \text{ g H}} \right) = 6.7 \text{ mol H} \div 3.33 \text{ mol} \rightarrow 2$$

$$53.5 \text{ g O} \left(\frac{1 \text{ mol O}}{16 \text{ g O}} \right) = 3.34 \text{ mol O} \div 3.33 \text{ mol} \rightarrow 1$$

The empirical formula is CH₂O

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

$$4.04 \text{ g N} \left(\frac{1 \text{ mol N}}{14 \text{ g N}} \right) = 0.289 \text{ mol N} \div 0.289 \text{ mol} \rightarrow 1 \times 2 = 2$$

$$11.46 \text{ g O} \left(\frac{1 \text{ mol O}}{16 \text{ g O}} \right) = 0.716 \text{ mol O} \div 0.289 \text{ mol} \rightarrow 2.48 \times 2 = 5$$

The empirical formula is N₂O₅.

4. 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.

$$0.606 \text{ g N} \left(\frac{1 \text{ mol N}}{14 \text{ g N}} \right) = 0.0433 \text{ mol N} \div 0.0433 \text{ mol} \rightarrow 1$$

$$1.390 \text{ g O} \left(\frac{1 \text{ mol O}}{16 \text{ g O}} \right) = 0.0869 \text{ mol O} \div 0.0433 \text{ mol} \rightarrow 2$$

The empirical formula is NO₂.