Name : _____ Date : _____

Percent Composition and Empirical & Molecular Formula

1. Calculate the percent composition of the following compounds.

a. HCl

b. K_2CO_3

2. A compound contains 63.52 % iron and 36.48 % sulfur. Find its empirical formula.

3. A sample in the laboratory contains 1.05 grams of nickel and 0.29 grams of oxygen. Determine the empirical formula.

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.

5. 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.

Name : _____ Date : _____

Percent Composition and Empirical & Molecular Formula

Answers

1. Calculate the percent composition of the following compounds.

a. HCl

Molar mass = 1 g + 35.5 g = 36.5 g
H: 1 g/36.5 g x 100% = 2.7 %
Cl: 35.5 g/ 36.5 g x 100% = 97.3%

b. K_2CO_3

Molar mass = 2 x 39.1 g + 12 g + 3 x 16 g = 138.2 g
K: 2 x 39.1 g/138.2 g x 100% = 56.6 %
C: 12 g/ 138.2 g x 100% = 8.68%
O: 3 x 16 g/ 138.2 g x 100% = 34.7%

2. A compound contains 63.52 % iron and 36.48 % sulfur. Find its empirical formula.

Fe: 63.52 g /56 g mol^{-1} = 1.14 mol/1.14 mol → 1
S: 36.48 g /32 g mol^{-1} = 1.14 mol/1.14 mol → 1
The empirical formula is FeS

3. A sample in the laboratory contains 1.05 grams of nickel and 0.29 grams of oxygen. Determine the empirical formula.

Ni: 1.05 g /58.7 g mol^{-1} = 0.0179 mol/0.0179 mol → 1
O: 0.29 g /16 g mol^{-1} = 0.018 mol/0.0179 mol → 1
The empirical formula is NiO

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.

N: 0.606 g /14 g mol^{-1} = 0.0433 mol/0.0433 mol → 1
O: 1.390 g /16 g mol^{-1} = 0.0869 mol/0.0433 mol → 2
The empirical formula is NO_2
Molecular mass = 14 g + 2 x 16 g = 46 g → 92 g/46 g = 2 → $2(NO_2)$
Molecular formula = N_2O_4

5. 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.

P: 31.6 g / 30.97 g mol^{-1} = 1.02 mol/1.02 mol → 1
H: 3.1 g / 1.01 g mol^{-1} = 3.01 mol/1.02 mol → 3
O: 63.5 g / 16 g mol^{-1} = 4.08 mol/1.02 mol → 4
The empirical formula is H_3PO_4