1. Match the empirical formula to its corresponding molecular formula by connecting them with a line:

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1. Determine whether each formula is an empirical formula. If it isn’t an empirical formula, write the empirical formula:
   1. C3H5O empirical
   2. HCl empirical
   3. C2H2 molecular, empirical is CH
   4. C12H22O11 empirical
   5. C14H28O2 molecular, empirical is C7H14O
2. Choose two of the empirical/molecular formula sets from question 1 and calculate the percent composition for each element in the molecules. Compare the percent compositions and note any observations. Show all your work.

CH2: empirical mass = 12.01 g/mol + 2(1.008 g/mol) = 14.026 g/mol

C: H:

C2H4: molar mass = 2(12.01 g/mol) + 4(1.008 g/mol) = 28.052 g/mol

C: H:

NO2: empirical mass = 14.007 g/mol + 2(15.999 g/mol) = 46.005 g/mol

N: O:

N2O4: molar mass = 2(14.007 g/mol) + 4(15.999 g/mol) = 92.010 g/mol

N: O:

The percent compositions for the empirical and molecular formulas for each substance are the same. This is because the empirical formula is scaled up to the molecular formula by a whole-number factor. The ratios of each atom in the compound don’t change.

1. A compound contains 69.94% iron and 30.06% oxygen. What is its empirical formula?

Fe: O:

1.252 mol/1.252 mol = 1 1.879 mol/1.252 mol = 1.5

2(FeO1.5) = Fe2O3

1. A compound contains 28.57% C, 4.80% H, and 66.64% N. The compound’s molar mass is 125 g/mol. What is the molecular formula for the compound?

C: H:

N:

2.379 mol/2.379 mol = 1 4.76 mol/2.379 mol = 2 4.758 mol/2.379 mol = 2

CH2N2 is the empirical formula.

Empirical mass: 12.011 g/mol + 2(1.008 g/mol) + 2(14.007 g/mol) = 42.041 g/mol

3(CH2N2) = C3H6N6 is the molecular formula.