Chem!stry

Calculating the Molecular Formulae of Organic Compounds
Macroconcepts – Systems and Change

a) An alkane was found to have the following percentage composition:

C = 85.71 %

H = 14.29 %

And a molar mass of 84.0 g/mol

Taking the relative atomic mass of carbon to be 12.0 and the relative atomic mass of hydrogen to be 1.0, calculate the *simple (empirical)* and *true (molecular)* formulae of the alkane.

Draw and name the possible structural formulae that this alkane could have.

b) Calculate the relative molecular mass of *propane*. What percentage of propane is carbon? What percentage of propane is hydrogen? Take the relative atomic mass of carbon to be 12.0 and the relative atomic mass of hydrogen to be 1.0. Write a balanced chemical equation for the *complete* combustion of propane in air. What will the products of combustion be if the propane burns in a *limited* supply of oxygen? Why is it dangerous to burn propane in a limited supply of oxygen?

c) An organic compound was found to have the following percentage composition:

C = 29.27 %

H = 5.69 %

Br = 65.04 %

And a molar mass of 123.0 g/mol

Taking the relative atomic mass of carbon to be 12.0, the relative atomic mass of hydrogen to be 1.0 and the relative atomic mass of bromine to be 80.0, calculate the *simple (empirical)* and *true (molecular)* formulae of the organic compound.

Draw and name the possible structural formulae that this compound could have.

d) An organic compound was found to have the following percentage composition:

C = 60.00 %

H = 13.33 %

O = 26.67 %

And a molar mass of 60.0 g/mol

Taking the relative atomic mass of carbon to be 12.0, the relative atomic mass of hydrogen to be 1.0 and the relative atomic mass of oxygen to be 16.0, calculate the *simple (empirical)* and *true (molecular)* formulae of the organic compound.

Draw and name the possible structural formulae that this compound could have.

e) An organic compound was found to have the following percentage composition:

C = 85.71 %

H = 14.29 %

And a molar mass of 56.0 g/mol

Taking the relative atomic mass of carbon to be 12.0 and the relative atomic mass of hydrogen to be 1.0, calculate the *simple (empirical)* and *true (molecular)* formulae of the hydrocarbon.

Draw and name the possible structural formulae that this compound could have.

f) An organic compound was found to have the following percentage composition:

C = 54.55 %

H = 9.09 %

O = 36.36 %

And a molar mass of 88.0 g/mol

Taking the relative atomic mass of carbon to be 12.0, the relative atomic mass of hydrogen to be 1.0 and the relative atomic mass of oxygen to be 16.0, calculate the *simple (empirical)* and *true (molecular)* formulae of the organic compound.

Draw and name the possible structural formulae that this compound could have.

For class discussion: In this worksheet, a mathematical *system* has been used to *change* a percentage composition into a molecular formula. Where else in science can raw data be manipulated by a mathematical *system* to produce useful information?

• Scan the QR code given below to view the answers to this assignment.

http://www.chemist.sg/organic_chem/worksheets/calculate_formulae_ans.pdf