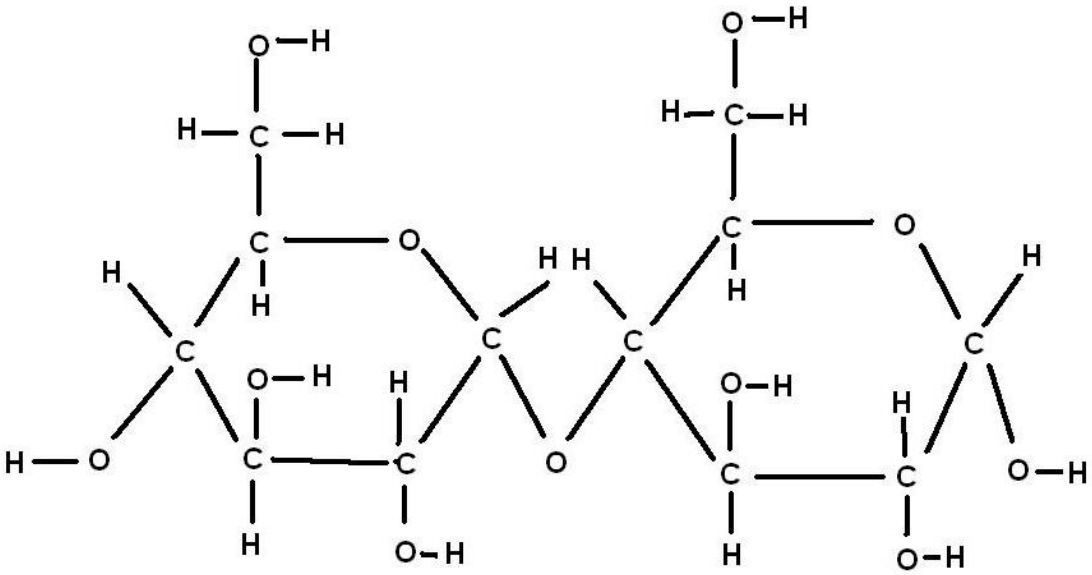
Atoms - How sweet they are!



Glucose is a very important sugar used by all plants and animals as a source of energy. Maltose is the next most complicated sugar, and is formed from two glucose molecules. The atomic ingredients of the maltose molecule is shown in the diagram above, which is called the structural formula for maltose. As an organic compound, it consists of three types of atoms: hydrogen (H), carbon (C), and oxygen (O).

Problem 1 - How many molecules does maltose contain of A) hydrogen? B) oxygen? C) carbon?

Problem 2 - What is the ratio of the number of hydrogen atoms to oxygen atoms?

Problem 3 - What fraction of all the maltose atoms are carbon?

Problem 4 - If the mass of 1 hydrogen atoms is 1 AMU, and 1 carbon atom is 12 AMU and 1 oxygen atom is 16 AMU, what is the total mass of one maltose molecule in AMUs?

Problem 5 - Write the chemical formula of maltose by filling in the missing blanks:

$C\_\_ \quad H\_\_ \quad O_{11}$

Answer Key

Problem 1 - How many molecules does maltose contain of A) hydrogen? B) oxygen? C) carbon? Answer: A) There are 22 hydrogen atoms; B) There are 11 oxygen atoms; C) there are 12 carbon atoms.

Problem 2 - What is the ratio of the number of hydrogen atoms to oxygen atoms? Answer: 22 hydrogen atoms / 11 oxygen atoms so the ratio is 2/1

Problem 3 - What fraction of all the maltose atoms are carbon? Answer: The total number of atoms is 12 + 22 + 11 = 45, so carbon atoms are 12/45 of the total.

Problem 4 - If the mass of 1 hydrogen atoms is 1 AMU, and 1 carbon atom is 12 AMU and 1 oxygen atom is 16 AMU, what is the total mass of one maltose molecule in AMUs? Answer: 1 AMU x 22 atoms hydrogen + 12 AMU x 12 atoms carbon + 16 AMU x 11 atoms oxygen = 342 AMU.

Problem 5 - Write the chemical formula of maltose by filling in the missing blanks:

$C_{12}\ H_{22}\ O_{11}$

More Challenging Extra Problem:
Below is the structural formula for Mefenamic Acid. Students can determine its chemical formula as $C_{15}H_{15}\ N\ O_2$ and its mass as 241 AMU. In this kind of diagram, carbon atoms in the hexagonal rings are located at each vertex. Hydrogen atoms at the vertices are not labeled as well. Challenge your students to GOOGLE the term 'structural diagram' in the 'images' area and try to decipher other more complex molecules such as Lorazepam or Vancocin !