

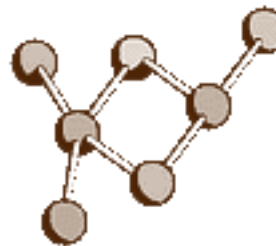


Losing It

Activity 1: Grades 5-8

Tasty Models

Understanding the arrangement of atoms within nutrient molecules often helps explain their chemical behavior, health attributes and role in weight balance. Although atomic representations do not accurately represent electron configurations, they can be used to show the arrangement of nuclei and bond type. In the following activities, you'll construct several different molecular models that represent substances that play an essential role in our nutritional needs.



This activity page will offer:

- A hands-on experience in constructing models
- A chance to visualize the atomic arrangements of nutrient molecules
- An opportunity to apply critical thinking to atomic modeling

Glucose

Carbohydrates are a group of nutrients that include sugars and starches. The most familiar carbohydrate building block is probably glucose. Glucose is the basic "fuel" of living things. During the process of cellular respiration, glucose breaks down and releases the energy needed to maintain life processes.

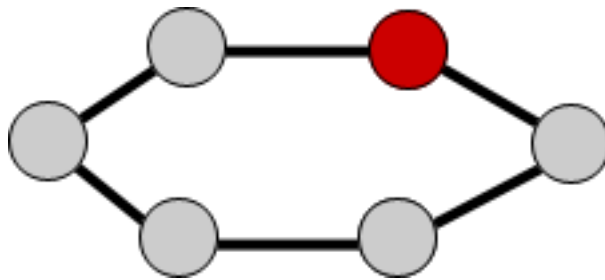
Materials

- Gum drops (variety of colors)
- Toothpicks

Glucose Model

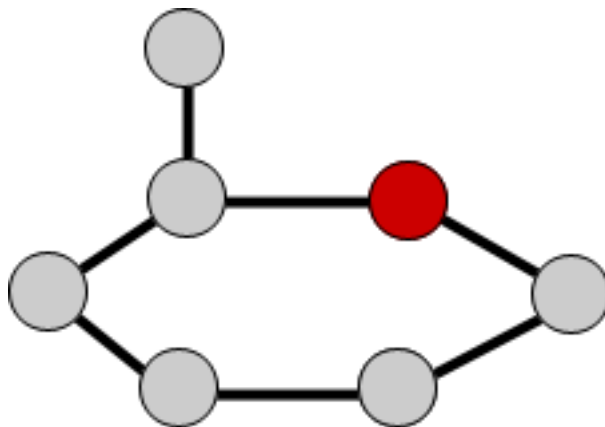
1. Examine the supply of gumdrops that you will be using to assemble your molecular models. Now, consider the formula of glucose, $C_6H_{12}O_6$. Based on this formula, how should you assign specific colors to the component atoms? (The most common color should be assigned to hydrogen, since hydrogen atoms are the most numerous.)
2. To build the ring version of glucose, let's construct a closed ring formed

by five carbon atoms and one oxygen atom.

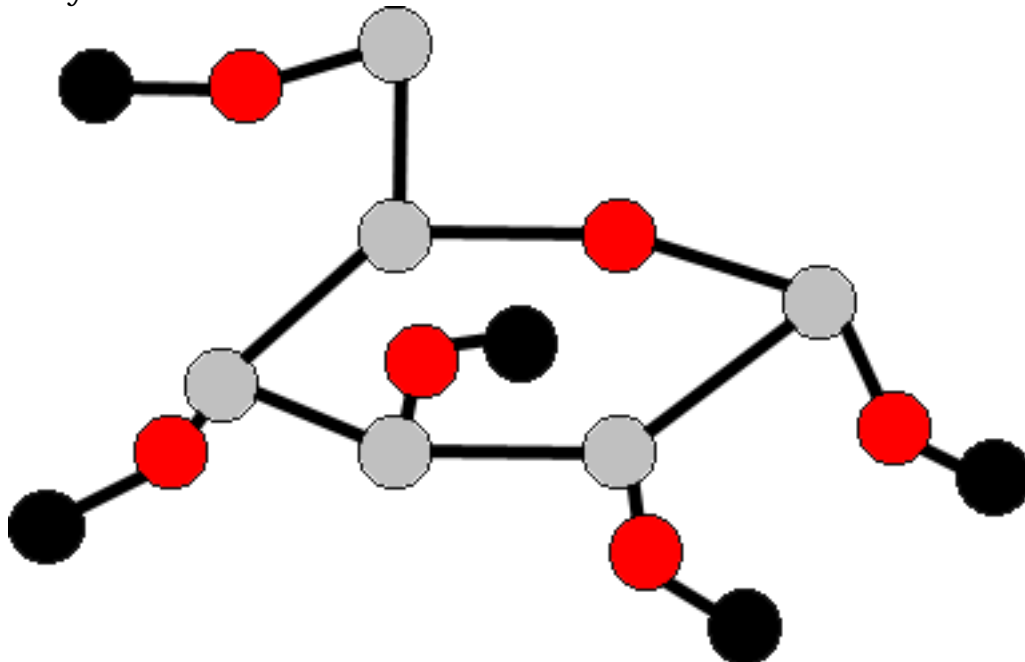


3.

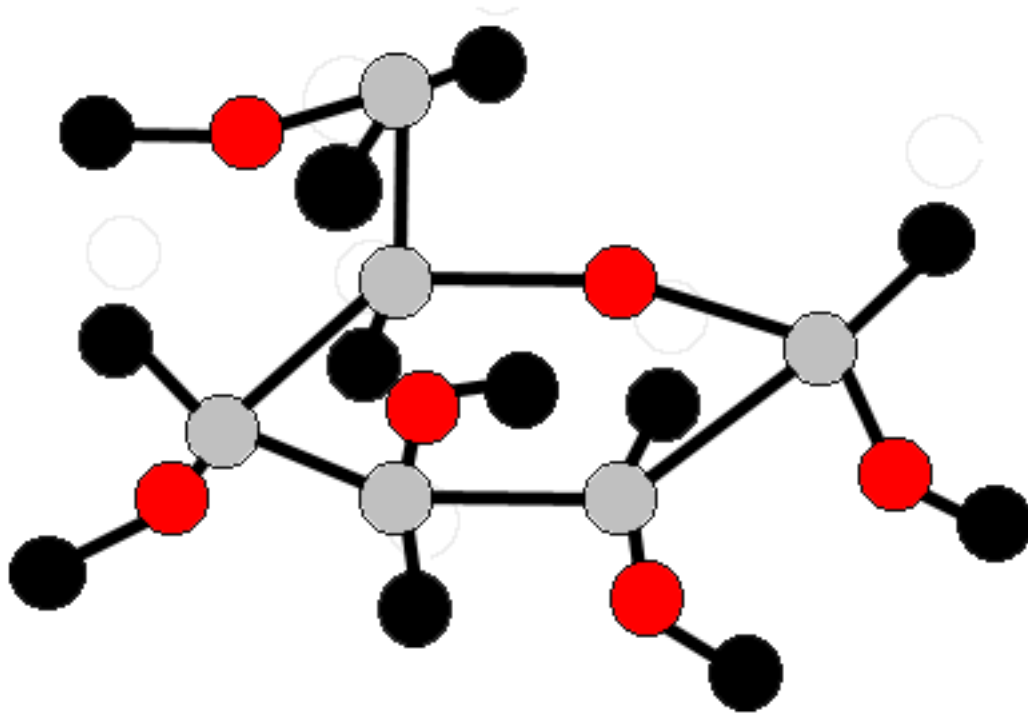
Now, let's add the sixth carbon atom. It is attached to the ring carbon that is immediately to the left of the oxygen atom.



4. The remaining five oxygen atoms are part of hydroxyl (OH) groups. They are added as shown here



5. Complete the model by adding the remaining seven hydrogen atoms so that each carbon atom forms four bonds.



Questions

1. What does the 12 refer to in the chemical formula $C_6H_{12}O_6$?
2. How many total atoms are in one molecule of glucose?
3. Write a balanced equation that illustrates the breakdown of glucose during aerobic respiration.

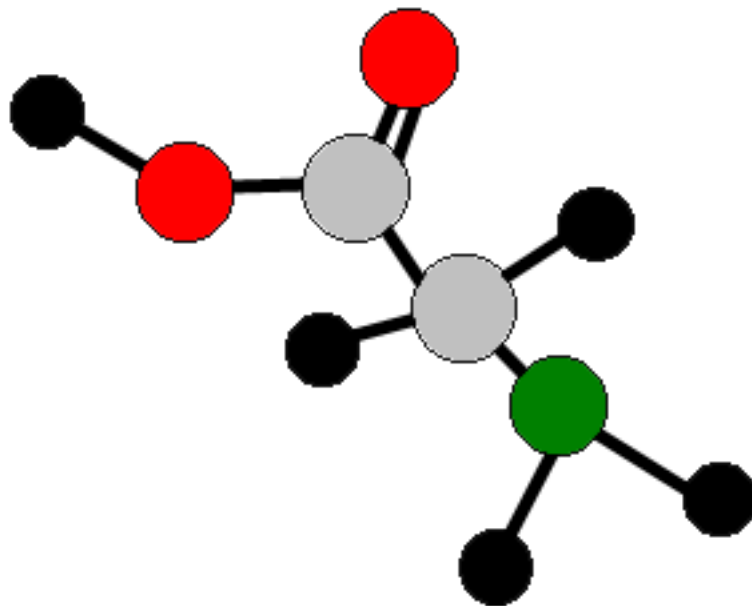
Protiens

Proteins are large molecules that are found in every living cell. Like carbohydrates, they compose a critical part of our diet. They are also the profiled nutrient in the Atkins diet. The basic building block of a protein molecule is an amino acid. All amino acids share a common feature. They contain both an amine (NH_2) group and a carboxyl ($COOH$) group

Glycine Model

1. Glycine is the simplest amino acid. Like all amino acids it has an amine, (NH_2) group. Use gumdrops to construct this functional group.
2. Like all amino acids, glycine also has a carboxyl ($COOH$) group. In this group, one of the oxygen atoms forms a double bond with the carbon atom. Use gumdrops to construct this functional group. Remember to

- retain consistency in your assignment of gumdrop colors.
3. The amine and acid group are both attached to a central carbon atom. The remaining two bonds of this backbone carbon are saturated with hydrogen. Your finished glycine model should resemble this image.



Questions

1. What are amino acids?
2. What are common features to all amino acids?
3. Compare and contrast the composition of an amino acid to a sugar.

Finding Nutrients

What foods contain the highest percentages of carbohydrates, proteins and fats? Use Internet and print resources to uncover the common dietary sources for these nutrients. Does an individual's economic status effect the sources? Explain.

Computer Modeling

There are all sorts of computer molecular modeling programs on the Web. Many are free to use and offer powerful construction and manipulation tools. [Check out](http://ep.llnl.gov/msds/dvc/viewrs.html) some of these free tools at <http://ep.llnl.gov/msds/dvc/viewrs.html>. For MACs running under OS X, iMOL is a powerful program that you can [download](http://www.pirx.com/iMol) it at <http://www.pirx.com/iMol>.

3D Models From a 2D Image

By "freeviewing" two side-by-side images, you can experience the stereoscopic illusion of depth. This technique is sometimes used by scientists to help illustrate three-dimensional layout of molecules. [Check out this URL](#) for some screen-popping examples of the freeviewing effect: <http://valhalla.chem.udel.edu/3-D.html>.

Web Connection

Nutrition Navigator

A comprehensive site maintained by Tufts University that offers a rating guide to nutrition websites

<http://navigator.tufts.edu/family/>

Specialized Diets

A reference to the biochemistry of various nutrients and diets.

<http://reference.allrefer.com/encyclopedia/>

<N/nutritio-human-nutrition-specialized-diets.html>

The Digestive System

An overview to the biology of digestion

<http://health.yahoo.com/health/centers/digestive/20.html>

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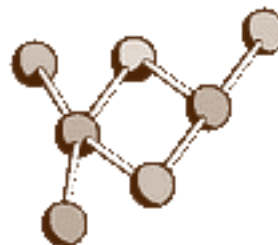
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Activity 1: Grades 5-8 Tasty Models



Glucose Model

Questions

1. What does the 12 refer to in the chemical formula $C_6H_{12}O_6$?
(It is the subscript that identifies the number of hydrogen atoms in each molecule of glucose)
2. How many total atoms are in one molecule of glucose?
(24 atoms)
3. Write a balanced equation that illustrates the breakdown of glucose during aerobic respiration.
($C_6H_{12}O_6 + 6O_2$ yields $6H_2O + 6CO_2 +$ energy)

Glycine Model

Questions

1. What are amino acids?
(They are the building blocks of proteins)
2. What are common features to all amino acids?
(An amine (NH_2) group and a carboxyl ($COOH$) group)
3. Compare and contrast the composition of an amino acid to a sugar.
(Both are composed of carbon, hydrogen, and oxygen atoms. Amino acids also contain atoms of nitrogen)