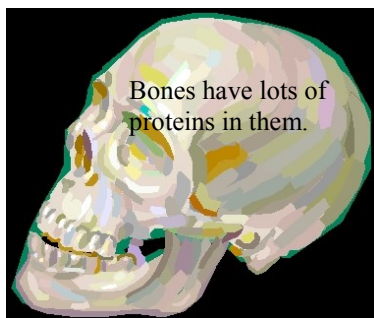


and oxygen, but they have some nitrogen (N) and phosphorus (P) atoms in them too.

You have probably heard of DNA. Those initials stand for deoxyribonucleic acid. DNA is the chemical compound that makes up your genes.

Proteins are the other group of chemicals that make up living things. They are very diverse in their use of atoms. They are mostly carbon, hydrogen, and oxygen, but they include many other elements as well. For instance, hemoglobin, a protein in red blood cells, has iron atoms in it.

Proteins are hardworking molecules. They are found in muscles, hormones, bones, blood, and many other body parts.



But are the molecules of life alive? It is amazing that all of the living things we know about can be made up of only four types of molecules and are composed mainly of three types of atoms with a few others added. Of course in our search for the difference between living things and non-living things, these four groups of molecules don't help us because none of them are living! They all come from living sources, but not one of them is alive.

Assignments:

1. Make up your own glossary of these words by writing them in alphabetical order on notebook paper and defining them from the text above:
Atom, Molecule, Carbohydrate, Lipid, Nucleic acid, Protein, Organic
2. Make a tree map of the molecules of life.
3. What atom or molecule names do you hear in these words? Carbohydrate; phospholipid;
4. Why are these molecules called 'the molecules of life' if they are not alive?

Living or Not The Molecules of Life

What makes some things alive and others not? This is a question that has puzzled people for a long time. What do you think? Maybe you think that things that can move on their own are alive and things that can't are not.

Maybe it's what they are made of. Are living and non-living things made of different things? Scientists tell us that atoms are tiny things that join together to make up everything.



They say atoms are the 'smallest units of matter.' There are just over 100 different

kinds of atoms. So then there are just a little over 100 kinds of matter.

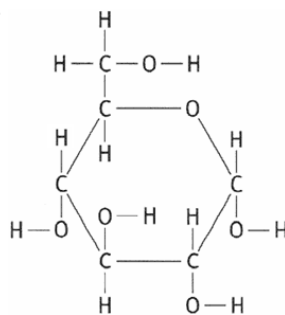
Less than 20 kinds of atoms are found in living things. The most

abundant ones are carbon (C), hydrogen (H), and oxygen (O). Non-living things can have those three in them, but they are also made of all of the others. Atoms are rarely found as pure elements. They are usually combined with other atoms. When more than one atom are joined (or bonded) together it is called a molecule.

As scientists studied living things they found that the molecules that make up living things fit into four categories: carbohydrates, lipids, nucleic acids, and proteins. These are called organic molecules because they come from living things. 'Organic' is an adjective meaning, 'of, relating to or derived from living matter. Carbohydrates, lipids, nucleic acids, and proteins are derived from living matter. We could say they are "the molecules of life."



Carbohydrates are made of many carbon, hydrogen and oxygen atoms. The carbohydrates you are probably most familiar with are sugars. Glucose is a sugar made of 6 carbons, 12 hydrogens, and 6 oxygens (or $C_6H_{12}O_6$). Other carbohydrates in living things are made of many glucose molecules bonded to each other.

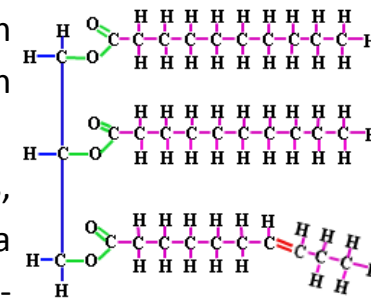


Sucrose is the kind of sugar in your sugar bowl at home. Alcohols and starches are carbohydrates too.

Can you hear parts of the words carbon and hydrogen in 'carbohydrate?' Maybe you hear the word hydrate. What does it mean when you are dehydrated? Have you heard a parent or coach tell you to keep hydrated when you're playing on a hot day? What do they mean? 'Keep hydrated,' means don't let your body lose too much water. Dehydrated means 'dried out.' Carbohydrates are molecules made of carbon and water; water is H_2O . So carbohydrates are made of carbon, hydrogen and oxygen.

Living things use carbohydrates for short-term energy storage. If they are not needed immediately they are turned into lipids (fats).

Lipids are fats and oils. They are made of long carbon chains with hydrogens on the sides, they have a fewer oxygen atoms than carbohydrates.



French fries are cooked in lipids because cooking oil is a kind of lipid.

Living things use lipids in different ways. Some examples are: they make up membranes, they are for long-term energy storage, and they lubricate joints.

Nucleic acids are not the kind of acids that burn your skin or destroy things. They store important information about how living things are put together and control how they operate. Like the other molecules they are mostly carbon, hydrogen