

Elements & Macromolecules in Organism

Reading Guide

Most common elements in living things are carbon, hydrogen, nitrogen, and oxygen. These four elements constitute about 95% of your body weight. All compounds can be classified in two broad categories --- organic and inorganic compounds. Organic compounds are made primarily of carbon. Carbon has four outer electrons and can form four bonds. Carbon can form single bonds with another atom and also bond to other carbon molecules forming double, triple, or quadruple bonds. Organic compounds also contain hydrogen. Since hydrogen has only one electron, it can form only single bonds.

Each small organic molecule can be a unit of a large organic molecule called a macromolecule. There are four classes of macromolecules (polysaccharides or carbohydrates, triglycerides or lipids, polypeptides or proteins, and nucleic acids such as DNA & RNA). Carbohydrates and lipids are made of only carbon, hydrogen, and oxygen (CHO). Proteins are made of carbon, hydrogen, oxygen, and nitrogen (CHON). Nucleic acids such as DNA and RNA contain carbon, hydrogen, oxygen, nitrogen, and phosphorus (CHON P).

The body also needs trace amounts of other elements such as calcium, potassium, and sulfur for proper functioning of muscles, nerves, etc.

The four main classes of organic compounds (carbohydrates, lipids, proteins, and nucleic acids) that are essential to the proper functioning of all living things are known as polymers or macromolecules. All of these compounds are built primarily of carbon, hydrogen, and oxygen but in different ratios. This gives each compound different properties.

TO DO ON WORKSHEET: Color each of the elements on worksheet according to the color listed next to the element's symbol. Then Color code the squirrel with the correct proportion of each element's color. Now color code the carrot with the same colors as you used on the squirrel. Answer questions 1-7.

Proteins

Proteins are made of subunits called amino acids and are used to build cells and do much of the work inside organisms. They also act as enzymes helping to control metabolic reactions in organisms. Amino acids contain two functional groups, the carboxyl group (-COOH) and the amino group (-NH₂).

TO DO ON WORKSHEET: Color code the amino acid on the worksheet (carbon-black, hydrogen-yellow, nitrogen-blue, and oxygen-red).

Enzymes are protein molecules that act as biological catalysts. A catalyst is a substance that causes or accelerates a chemical reaction. Cells contain thousands of different enzymes to control the functions of the cell. Enzymes must physically fit a specific substrate(s) to work properly. The place where a substrate fits an enzyme to be catalyzed is called the active site. Excess heat, a change in pH from neutral, etc. change the shape of enzymes and their active sites so the enzyme is unable to work. Some enzymes have a second site where a coenzyme attaches to help make the substrate better fit the active site of the enzyme.

TO DO ON WORKSHEET: Color the enzyme purple, the substrate yellow, and the coenzyme green. Also color the active site red.

Answer questions 8-13.

Nucleic Acids

Nucleic acids carry the genetic information in a cell. DNA or deoxyribose nucleic acid contains all the instructions for making every protein needed by a living thing. RNA copies and transfers this genetic information so that proteins can be made. The subunits that make up nucleic acids are called nucleotides.

TO DO ON WORKSHEET: COLOR AND LABEL the parts of a nucleotide --- sugar (5-sided)-green, phosphate group (round)-yellow, and nitrogen base (6-sided)-blue. Answer questions 14-18.

