

Name: _____

Elements & Macromolecules in Organisms

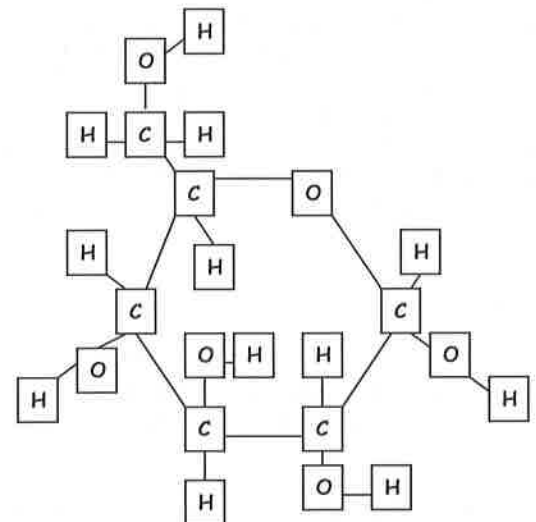
Most common elements in living things are carbon, hydrogen, nitrogen, and oxygen. These four elements constitute about 95% of your body weight. All compounds can be classified in two broad categories --- organic and inorganic compounds. Organic compounds are made primarily of carbon. Carbon has four outer electrons and can form four bonds. Carbon can 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.

Questions:

1. Name the 4 main elements that make up 95% of an organism.
2. Name the 4 types of bonds carbon can form.
3. What are macromolecules?
4. Name the 4 classes of macromolecules.
5. Give 2 examples of nucleic acids.
6. What elements make up carbohydrates & lipids (symbols)?
7. Name 3 elements your body needs trace amounts of for proper functioning.

Carbohydrates are used by the body for energy and structural support in cell walls of plants and exoskeletons of insects and crustaceans. They are made of smaller subunits called monosaccharides. Monosaccharides have carbon, hydrogen, and oxygen in a 1:2:1 ratio. Monosaccharides or simple sugars include glucose, galactose, and fructose. Although their chemical formulas are the same, they have different structural formulas. These simple sugars combine to make disaccharides (double sugars like sucrose) and polysaccharides (long chains like cellulose, chitin, and glycogen). Color code the glucose molecule on this worksheet (**carbon-black**, **hydrogen-yellow**, and **oxygen-red**).



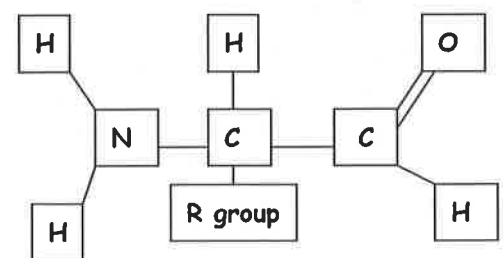
Glucose

Questions:

8. Name 2 ways your body uses carbohydrates.
9. What are the subunits called that make up carbohydrates?
10. What is the ratio of C, H, and O in monosaccharides?
11. Name 3 monosaccharides.
12. Monosaccharides are _____ sugars.
13. What are disaccharides & give an example?
14. Long chains of sugars are _____. Name three.

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). Color code the amino acid on this worksheet (**carboxyl group-blue**, **amino group-green**, and **R group-red**).

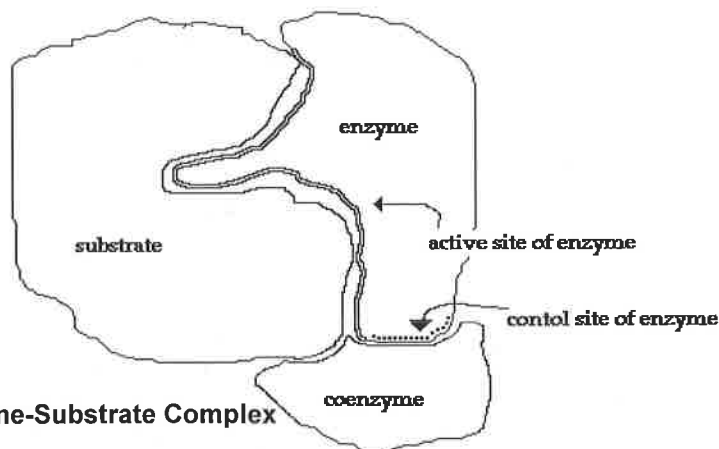
Enzymes are protein molecules that act as biological catalysts. Cells contain thousands of different enzymes to control the functions of the cell. Enzymes must physically fit a specific substrate(s) to work properly. The place where a substrate fits an enzyme to be catalyzed is called the active site. 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. **Color the enzyme purple, the substrate yellow, and the coenzyme green. Also color the active site red.**



Amino Acid

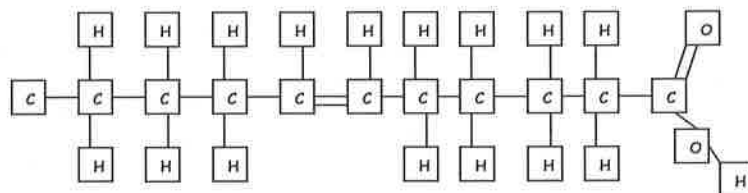
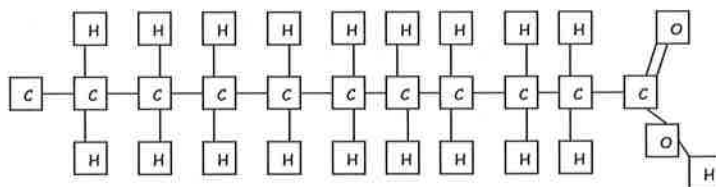
Questions:

15. What subunits make up proteins?
16. Proteins also act as _____ in cells to control reactions.
17. Name the 2 functional groups in amino acids.
18. Cells have _____ of enzymes to act as biological _____.
19. Enzymes have an attachment site called the _____ site for the _____ to join.
20. What is the effect of excess heat or temperature on an enzyme?



Lipids are large, nonpolar (won't dissolve in water) molecules. Phospholipids make up cell membranes. Lipids also serve as waxy coverings (cuticle) on plants, pigments (chlorophyll), and steroids. Lipids have more carbon and hydrogen atoms than oxygen atoms. Fats are made of a glycerol (alcohol) and three fatty acid chains. This subunit is called a triglyceride. Color the glycerol molecule using the same colors for carbon, hydrogen, and oxygen as you did before. The fatty acid chains may be saturated (only single bonds between carbons) or unsaturated (contain at least one double bond). A carboxyl functional group (-COOH) is found on the end of the fatty acid that does NOT attach to glycerol. **Circle and label the carboxyl groups in the 2 fatty acids on this worksheet. Color the fatty acid chains the same colors for carbon, hydrogen, and oxygen as you did before.**

Saturated Fatty Acid

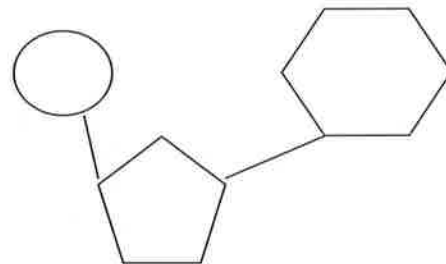


Unsaturated Fatty Acid

Questions:

21. Lipids are nonpolar. What does this mean?
22. _____ makes up cell membranes.
23. Name a waxy lipid covering plants.
24. Fats are made of an alcohol called _____ and three _____ chains. This is known as a _____.
25. If there are all SINGLE bonds between _____ in the fatty acid chain, then it is said to be _____.
26. If there is a DOUBLE bond between _____ in the fatty acid chain, then it is said to be _____.

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. **Color and label the parts of a nucleotide (sugar-green, phosphate group-yellow, and nitrogen base-blue).**



Questions:

27. Nucleic acids carry _____ information in a molecule called _____ or _____ acid.
28. DNA has the instructions for making a cell's _____.
29. The nucleic acid _____ copies DNA so _____ can be made.
30. _____ are the subunits making up nucleic acid.
31. The 3 parts of a nucleotide are a 5 carbon _____, a phosphate, and a nitrogen _____.