

Chapter 3: Chemistry of Life

Section 3: Carbon Compounds

Before we begin, let's review Cells and Chemistry

Use the word bank provided to match the cell part with its function.

Word Bank				
cell wall	nucleus	ribosome	cell membrane	mitochondria

- RIBOSOME makes proteins
- NUCLEUS control center for the cell; protects DNA
- CELL MEMBRANE the outer boundary of all cells; controls what goes in and out; made of phospholipids
- CELL WALL strength and support for plant cells and some prokaryotic cells
- MITOCHONDRIA where energy stored in food (glucose) is converted into energy for the cell (ATP)

Use the word bank provided to match the chemistry term with its definition.

Word Bank				
molecule	polar	valence	covalent	carbon

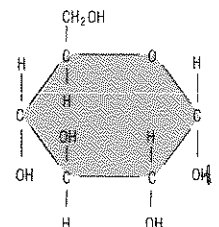
- COVALENT a bond formed by a sharing of electrons
- MOLECULE two or more atoms covalently bonded
- VALENCE the electrons in the outermost energy level
- POLAR a type of molecule that has a slightly positive end and a slightly negative end
- CARBON the atom in the second row of the periodic table that has 4 valence electrons

*Read page 59 then answer the following questions.*Building Blocks of Cells

- The parts of a cell are made up of large, complex molecules, often called BIOMOLECULES.
- The basic units of most biomolecules contains atoms of CARBON.
- Carbon atoms have 4 valence electrons, so they can form COVALENT bonds with as many as 4 other atoms.
- Carbon atoms can bond with each other to form CHAINS or RINGS.

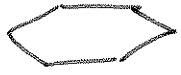
*Read page 60 then answer the following questions.*Carbohydrates

- Carbohydrates are molecules made up of SUGARS. A sugar contains CARBON, HYDROGEN, and OXYGEN in a ratio of 1:2:1. (TWICE AS MUCH HYDROGEN AS CARBON: OXYGEN)
- Refer to Figure 9. Count the number of each atom.

Carbon: 6 Hydrogen: 12 Oxygen: 6This sugar is called GLUCOSE and the chemical formula is C₆H₁₂O₆.

3. A single sugar molecule is called a MONOSACCHARIDE. - GLUCOSE } SIMPLE CARBS
4. Two sugar molecules linked make a DISACCHARIDE. - SUCROSE } COMPLEX CARBS
5. Many sugar molecules linked make a POLYSACCHARIDE. - GLYCOGEN - COMPLEX CARBS
6. Cells use carbohydrates for sources of ENERGY, STRUCTURAL materials, and cellular IDENTIFICATION

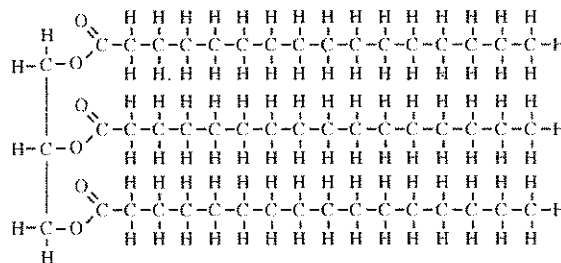
Use your knowledge of carbohydrates to fill in the table below.

Why does YOUR body need carbohydrates?	What foods/drinks do YOU consume to bring in carbohydrate molecules?	What is the general shape of a carbohydrate molecule?
ENERGY	STRAWBERRIES OATMEAL	RING STRUCTURE 

Read page 61 then answer the following questions.

Lipids

1. Lipids are another class of biomolecules that contains FATS, PHOSPHOLIPIDS, STEROIDS, and WAXES.
2. The main functions of lipids include STORING energy and controlling WATER movement. ← PHOSPHOLIPID BILAYER
3. Lipids also include steroid hormones, used as SIGNALING molecules, and some PIGMENTS, which absorb light.



4. The molecule above is a type of lipid called Triglyceride which is a major component in human skin oils. Count the number of each atom.

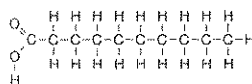
Carbon: 51 Hydrogen: 98 Oxygen: 6 The chemical formula is C₅₁H₉₈O₆.

5. Two common lipids in human diets are saturated and unsaturated fats. Saturated fats are SOLID at room temperature and are ANIMAL based fats. Unsaturated fats are LIQUID at room temperature and are PLANT based fats.

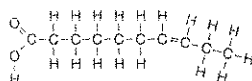
6. Refer to the images below. What is the difference in the molecular structures of saturated and unsaturated fats?

IN UNSATURATED FATS - TWO HYDROGEN ATOMS ARE REMOVED CAUSING

Saturated




Unsaturated



CARBON TO DOUBLE BONDS. THIS CREATES A BEND IN THE MOLECULE.

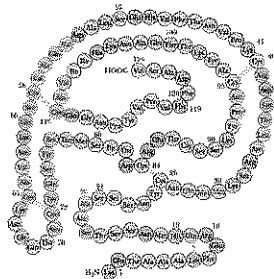
Use your knowledge of lipids to fill in the table below.

Why does YOUR body need lipids?	What foods/drinks do YOU consume to bring in lipid molecules?	What is the general shape of a lipid molecule?
ENERGY STORAGE	BACON / BUTTER - SAT. FATS OLIVE OIL - UNS. FATS	 "SQUIDWARD"

Read page 62 then answer the following questions.


Proteins

1. Proteins are the WORKHORSE molecules of all living things.
2. Proteins are chains of AMINO ACIDS that twist and fold into certain SHAPES that determine what the proteins do. Amino acids contain carbon, hydrogen, oxygen, and nitrogen.
3. Some proteins provide STRUCTURE and SUPPORT and others enable MOVEMENT. Some proteins aid in COMMUNICATION and TRANSPORTATION. Others help carry out important CHEMICAL REACTIONS → ENZYMES.
4. When amino acids are chained together the link is called a PEPTIDE bond. Interesting fact...every time a peptide bond is formed a water molecule falls out. Water is added to proteins in order to break them apart into individual amino acids again.
5. There are 20 types of amino acids that chain together in different sequences to make different proteins. The cell part that chains these amino acids together to form a protein is called the RIBOSOME.



← EACH "BEAD" IS ONE AMINO ACID

Use your knowledge of proteins to fill in the table below.

Why does YOUR body need protein?	What foods/drinks do YOU consume to bring in protein molecules?	What is the general shape of a protein molecule?
BUILD & REPAIR	LEAN MEAT - CHICKEN / FISH PEANUTS MILK EGGS	"BEADED NECKLACE"  100,000 +

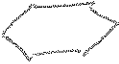


Read page 63 then answer the following questions.

Nucleic Acids

1. A nucleic acid is a long chain of NUCLEOTIDE units.
2. Two examples of nucleic acid molecules are DNA and RNA.
3. Nucleic acids STORE and TRANSMIT hereditary information.

That's enough about nucleic acids for now...we have weeks of it to come!

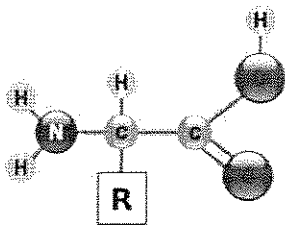
Carbon Compound Review

	Carbohydrates	Lipids	Proteins	Nucleic Acids
Repeating Molecule	MONOSACCHARIDE	FATTY ACIDS	AMINO ACID	NUCLEOTIDE
Foods where this can be found	FRUIT, BREAD	BUTTER, OIL	MEAT, DAIRY	
Shape of Molecule	"RING" 	"SQUIDWARD" 	"BEADS NECKLACE" 	
Use of Molecule	ENERGY	ENERGY STORAGE & WATER BARRIER	BUILD & REPAIR	STORES HEREDITARY INFO

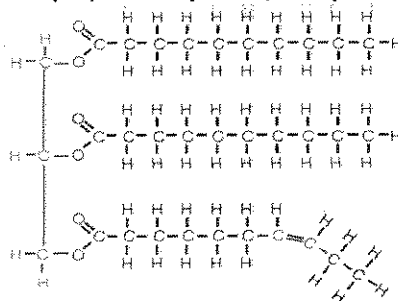
In the space provided, write the letter of the description that best matches each term.

- | | |
|--|--|
| <p><u>d.</u> 4. nucleic acid</p> <p><u>g.</u> 5. carbohydrate</p> <p><u>b.</u> 6. water</p> <p><u>e.</u> 7. protein</p> <p><u>a.</u> 8. lipid</p> <p><u>c.</u> 9. amino acid</p> <p><u>f.</u> 10. sugar ; MONOSACCHARIDE</p> <p><u>h.</u> 11. carbon</p> | <p>a. stores energy</p> <p>b. lipids act as _____ barriers at the boarder of a cell</p> <p>c. subunit of proteins</p> <p>d. contains the genetic code</p> <p>e. meat and beans are a good source of this biomolecule.</p> <p>f. subunit of carbohydrates</p> <p>g. has a ring like structure</p> <p>h. this atom is included in all biomolecules</p> |
|--|--|

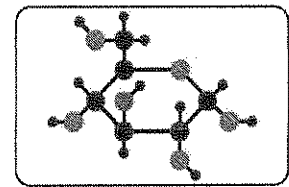
For each image below, determine which is a lipid, carbohydrate, and protein (amino acid).



PROTEIN (AMINO ACID)



LIPID



CARBOHYDRATE