

Biomolecules

What are Biomolecules?

- _____ compounds made by living things
- Also called biochemicals or biological molecules
- Vary in size
- Based on the most important element in living organisms...
_____!

What makes carbon so special?

- Carbon has _____ valence electrons
- That means it can form 4 covalent _____
- It bonds with itself over and over to form giant carbon chains called carbon _____

Four Biomolecule Categories

1. _____
 - Sugar
 - Starch
 - Cellulose
2. _____
 - Fats
 - Oils
3. _____
 - Made of amino acids
 - Vitamins & Minerals
4. _____
 - DNA
 - RNA

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1) Carbohydrates

- The _____ biomolecules
- Made of only 3 elements: _____
- The word carbohydrate comes from the fact that these compounds have many carbon atoms bonded to _____ (OH) groups.
- Serve 2 main functions:
 - Source of chemical _____ for cells in many living things
 - Part of the _____ material of plants
- Come in all sizes, from small rings to long chains

Two Types of Carbohydrates

1) _____ Carbohydrates

Sugar

- Break down _____ in the body
- Provide a quick burst of energy or a “sugar rush”
- _____ is the most important & simplest sugar on Earth.
 - Used in cells & created by photosynthesis
 - It comes in many forms
- *Examples:* _____



2) _____ Carbohydrates

Starch

- Long _____ of simpler sugars joined together
- These big molecules are called _____, polysaccharides or _____
- _____ to break down in the body & provide energy for a longer period of time than regular sugars.
- *Examples:* _____



Cellulose

- Unlike animal cells, _____ cells have a cell wall made of cellulose
 - The cell wall is a large part of vegetables such as **lettuce & celery**.
 - It also is what gives stems & wood strength.
- Cellulose is made from chains of thousands of glucose molecules, but the difference is in how they're linked.
- Because of this small difference, your body _____ digest cellulose the same way it can starches & sugars.

2) Lipids

- _____ & _____
- Mostly made of carbon, hydrogen, and oxygen.
- More complex & take much longer to break down.
 - So, fats are _____ molecules that plants and animals use to store energy in reserves for longer periods.
- Plants store energy in _____, like olive, corn, or peanut oil.
- An oil is a fat that is _____ at room temperature.

Structure

- Fats & oils store energy super-efficiently; 1 gram of fat contains about _____ the energy as 1 gram of carbohydrate.
- A fat molecule has a 2-part structure.
- The first part is called _____.
- Attached to glycerol are 3 long chains called _____.

Saturated and Unsaturated Fats

Saturated fats

- only _____ bonds in the carbon chain
- Most _____ fats
- “bad” fats
- Diets high in saturated fat are linked to heart disease

Unsaturated fats

- one or more _____ bonds in the carbon chain
- Most oils from _____
- “good” fats

Cholesterol

- Another lipid in cell membranes
- It is also needed to make _____ like adrenaline
- Your body makes the cholesterol that it needs, but it is also found in many foods that come from animals, like meat and eggs.
- Although you need cholesterol, eating too much of it can block arteries and lead to heart disease.



Carbohydrates & Fat

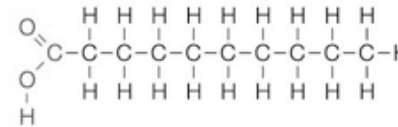
1. Carbohydrates, stored in the liver & muscles, are converted into what?

2. How many hours of energy does the average person have stored?

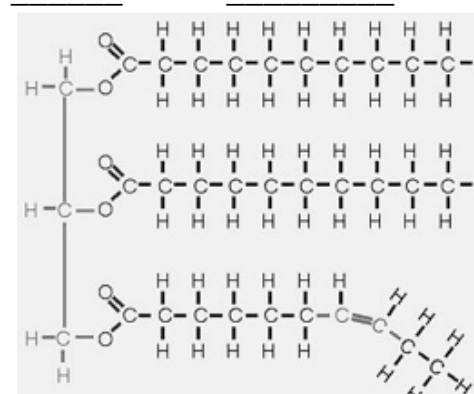
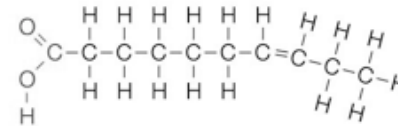
3. Converting fat to fuel requires what? _____
4. Think about it. How did our ancient ancestors affect the way our bodies work today?

Saturated & Unsaturated Fats

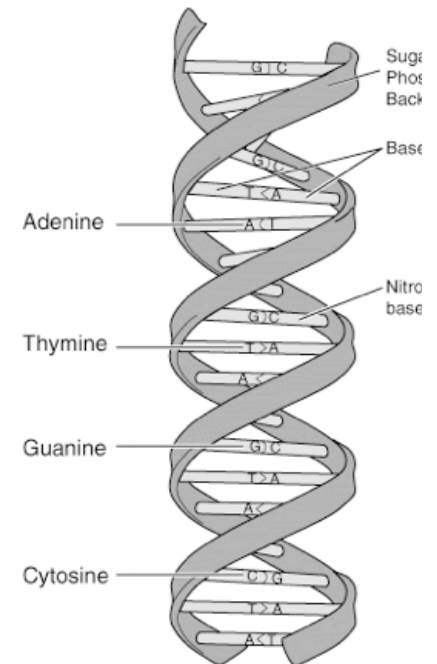
Saturated



Unsaturated

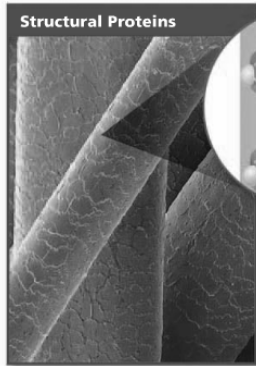


DNA Drawing for pg3 of these notes

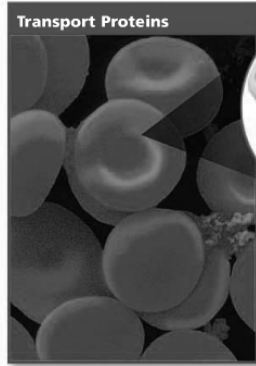


3) Proteins

- Proteins are big molecules called _____
- Made of smaller molecules called _____
- Made of carbon, hydrogen, oxygen, nitrogen, sulfur, & some other elements
- There are at least _____ proteins in your body
- Each has a different _____ that gives it a specific _____.
- There are _____ types of structure, including coils & curls.



Hair is made of a structural protein called keratin. The keratin molecule is shaped like a coil.



Hemoglobin carries oxygen in blood. The protein myoglobin, shown above, stores oxygen for muscles to use.

Amino Acids

- Think of proteins as being like a word. Amino acids are the letters in that word. Rearranging the letters makes words with different meanings.
- There are _____ amino acids required for human life to exist.
- _____ amino acids are made in our bodies, but the other _____ must be obtained by eating _____ that contain them.

Enzymes

- Some proteins curl up into a shape like a ball of enzymes.
- An enzyme is a special protein & a _____ for a chemical reaction in living things.
- Catalysts speed up the rate of a reaction.
- Enzymes are needed for many chemical reactions in your body.
- Without them, these reactions would occur too slowly to keep you alive.

Proteins in the Diet

- It's important to have lots of protein in your diet!
- Proteins in foods such as _____, _____, & _____ are broken down into amino acids.
- Without protein, your body can't function perfectly..
- This is why it's important for vegetarians to find protein from non-animal sources.

Vitamins

Most of the chemicals needed for life can be made by your own body, like proteins. However, there are certain chemicals that your body does not automatically make. We call these vitamins & _____. Important daily vitamins & minerals include calcium, Vitamin A, C, D, and a whole bunch of B vitamins. The only place to get these: food!!

Vitamin C

- _____ is needed for several important processes in your brain & nervous system. _____ results from a lack of vitamin C in your diet. It causes spots on the skin, spongy gums, and bleeding membranes, and can eventually lead to death. The British Royal Navy were among the first to discover this vitamin deficiency, when they noticed their sailors would get sick without fresh fruits & vegetables.

4) Nucleic Acids

- The largest & most complex biomolecule Includes: _____ & _____
- Contain information that cells use to make proteins
- Made of: Carbon, Hydrogen, Oxygen, Nitrogen

Protein Synthesis

- Every cell in your body has a complete set of nucleic acids.
- The process of making proteins from amino acids is called _____
- How does protein synthesis work? DNA!

DNA

- Stands for deoxyribonucleic acid One of the largest molecules
- A single DNA molecule has more than _____ atoms.

Structure

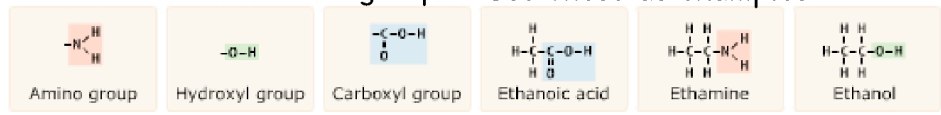
- Twisted ladder or _____
- The sides of the ladder are made of:
 - _____ molecules called deoxyribose
 - _____ group
- The "rungs" of the ladder are made of _____

4 Nitrogen Bases

- Occur in matched sets:
 - _____ (A) to _____ (T)
 - _____ (C) to _____ (G)
- The order of the bases in DNA is the way in which DNA stores instruction for making proteins.
- Each of the 20 amino acids is represented by a series of _____ DNA bases.
- For example, the sequence T-A-C is the code for the amino acid tyrosine.

Suffix	Type of Compound	Functional Group	Examples
-ol	alcohol		
-oic	carboxylic acid		
-amine	amine		

Use these as functional groups Use these as examples



Place the number of the word in front of its correct definition

- 1** Amino acid a member of a class of organic compounds that are the basic building blocks of proteins
- 2** Nucleic acid the total mass of all living matter
- 3** Biomass a large organic molecule found in living organisms, which includes lipids, proteins, carbohydrates, and nucleic acids
- 4** Organic compound an organic compound used by cells to store and release energy
- 5** Hydrocarbons a group of atoms that replaces a hydrogen atom in organic compounds
- 6** Biomolecule molecules that contain only carbon and hydrogen atoms
- 7** Functional group a biological compound, including fats and oils, which is not soluble in water and it contains carbon, hydrogen, and oxygen
- 8** Carbohydrate a molecule that shares electrons equally and does not have oppositely charged ends
- 9** Lipid a biomolecule, such as RNA and DNA that stores cellular information in cells in all plants and animals
- 10** Nonpolar molecule a large number of compounds that contain the element carbon

Draw a line to match the term with its correct definition:

- Saturated Hydrocarbon** Each carbon atom in the molecule shares a single bond with each of 4 other atoms. Also called alkanes
- Unsaturated Hydrocarbon** Based on benzene and often have strong odors
- Aromatic Hydrocarbon** Contains at least 2 carbon atoms that share a double or triple bond. Also called alkenes or alkynes

Use pgs 408-411 & pg3 in the additional reading to complete the table below

Draw the functional group	Definition	Additional info	examples
Carbohydrates			
Lipids (Fats)			
Proteins			
Nucleic Acids			