

# 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.

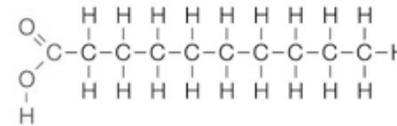


## Carbohydrates & Fat

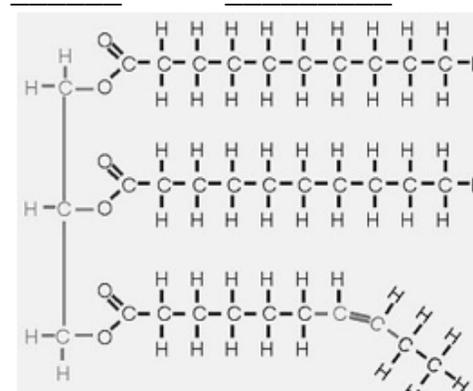
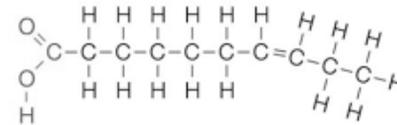
1. Carbohydrates, stored in the liver & muscles, are converted into what?  
\_\_\_\_\_
2. How many hours of energy does the average person have stored?  
\_\_\_\_\_
3. Converting fat to fuel requires what? \_\_\_\_\_
4. Think about it. How did our ancient ancestors affect the way our bodies work today?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### Saturated & Unsaturated Fats

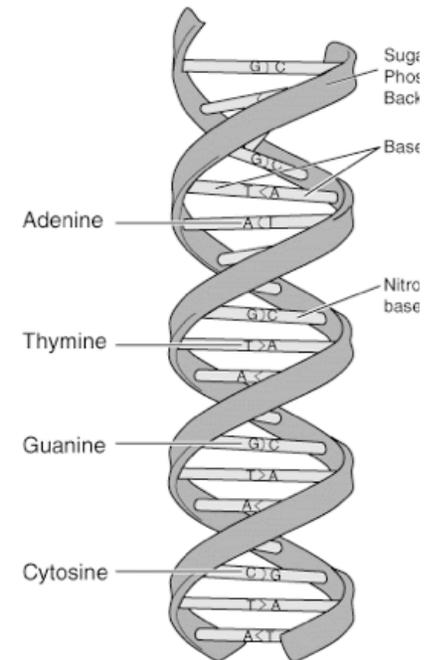
#### Saturated



#### Unsaturated

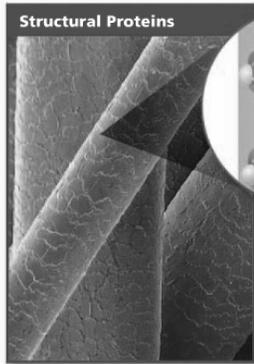


### DNA Drawing for pg3 of these notes

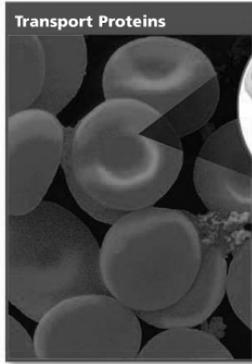


# 3) Proteins

- 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

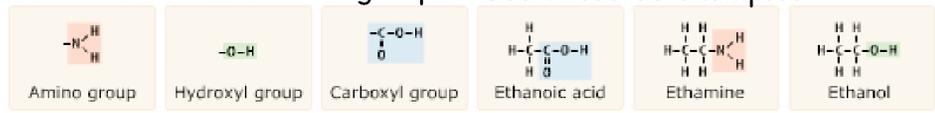
- Twisted ladder or \_\_\_\_\_
- The sides of the ladder are made of:
  - \_\_\_\_\_ molecules called deoxyribose
  - \_\_\_\_\_ group
- The "rungs" of the ladder are made of \_\_\_\_\_

## 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

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

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

- |                                |   |
|--------------------------------|---|
| <b>Saturated Hydrocarbon</b>   | Each carbon atom in the molecule shares a single bond with each of 4 other atoms. Also called alkanes |
| <b>Unsaturated Hydrocarbon</b> | Based on benzene and often have strong odors  |
| <b>Aromatic Hydrocarbon</b>    | 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	_____	_____	_____