

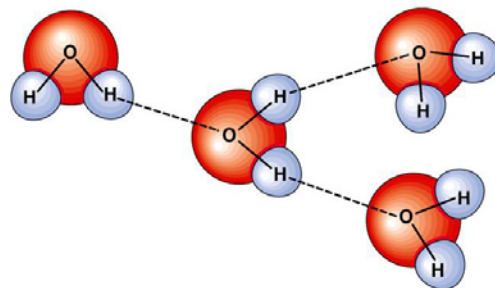
## Chapter 2 Macromolecules

### Water

#### The Nature of Water - H<sub>2</sub>O

- ▶ Exists in three forms (gas, liquid and solid)
- ▶ Makes up approx \_\_\_\_\_ of organisms
- ▶ \_\_\_\_\_
- ▶ Important in the cell's chemistry
- ▶ Gains and releases \_\_\_\_\_ slowly
- ▶ High surface tension
  - What kind of molecule is it? Why?

#### Hydrogen Bonding in Water Molecules



### 2-3: Carbon Compounds

- Compounds that contain \_\_\_\_\_ are called organic.
- Carbon: Characteristics and examples?
  
- \_\_\_\_\_ naturally occurring elements are essential for life. Carbon, hydrogen, oxygen and nitrogen (C, H, O, N) make up \_\_\_\_\_ of living matter.
- The remaining 4% is composed of seven elements (Ca, P, K, S, Na Cl, Mg). Some elements, like \_\_\_\_\_ (Fe) and \_\_\_\_\_ (I) may be required in very minute quantities and are called trace elements.

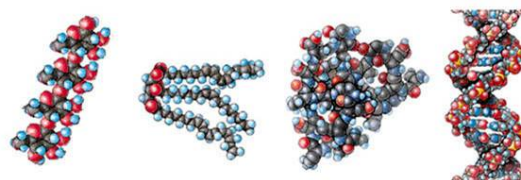
### Biological Macromolecules

#### Macromolecules

- ▶ Monomer and Polymer: What are they? How are they related?

- ▶ Examples:

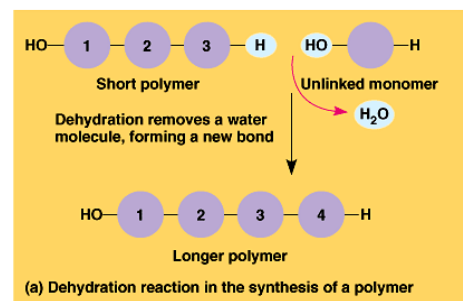
#### Biological Macromolecules



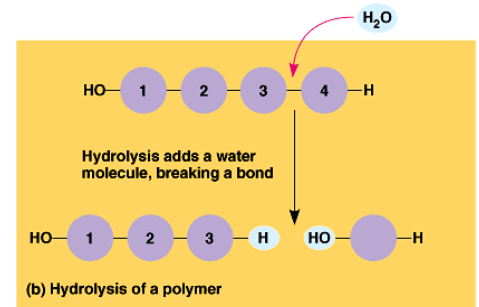
Carbohydrate (starch)      Lipid (triacylglycerol)      Protein (enzyme)      Nucleic acid (DNA)

### Polymerization

- ▶ The process of stringing together monomers to make polymers is called polymerization (or \_\_\_\_\_).
- ▶ Monomers are connected by a reaction in which two molecules are \_\_\_\_\_ bonded to each other through the loss of \_\_\_\_\_.
- ▶ Each monomer contributes part of the water molecule that is lost: one molecule provides the \_\_\_\_\_, while the other provides the \_\_\_\_\_ (-H).



Hydrolysis – explain it!



## Carbohydrates

### The Nature of Carbohydrates

- ▶ Important as:
  - A “quick energy” nutrient -
  - Serve as a storage of energy -
  - Structural significance –

### Common Disaccharides

- ▶ Sucrose ( \_\_\_\_\_ )
  - ▶ Found in plant like sugar cane, sugar beets
  - ▶ “table sugar”
- ▶ \_\_\_\_\_ (glucose + glucose)
  - ▶ Found in germinating grain
- ▶ Lactose ( \_\_\_\_\_ )
  - ▶ Found in the \_\_\_\_\_ of mammals

## Polysaccharides

- Cellulose –
- Starch –
- Glycogen –
- Chitin –

## Lipids

### The Nature of Lipids

- ▶ What’s different about lipids?
  
- ▶ Lipids are a highly varied group in form and function.
- ▶ Highest source of energy – that’s why our extra energy is stored as fat in fat tissue
- ▶ Also important as:

Examples of Lipids

- ▶ General term for compounds which are not soluble in water.
- ▶ Lipids are soluble in \_\_\_\_\_
- ▶ Remember: “stores the most energy”

Examples:

Fats

- ▶ Two types of molecules used to make a fat:
- ▶ \_\_\_\_\_ (three carbon molecule)
- ▶ \_\_\_\_\_ (long hydrocarbon chain, usually 16-18 carbons atoms in length) that is hydrophobic (does not dissolve in water).

Saturated vs. Unsaturated Fats

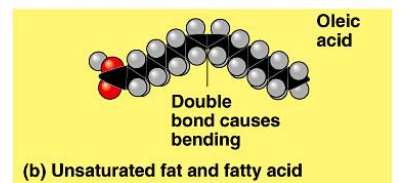
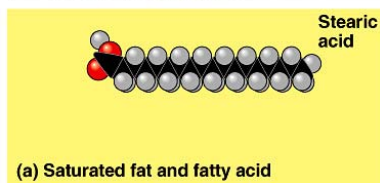
<p>▶ Saturated Fats</p> <ul style="list-style-type: none"> <li>▪ _____</li> <li>▪ White in color</li> <li>▪ Derived from _____</li> <li>▪ Bonds: _____</li> <li>▪ Fatty acids: _____</li> <li>▪ Examples are the hard fats (lard)</li> <li>▪ Health: _____</li> </ul>	<p>▶ Unsaturated Fats</p> <ul style="list-style-type: none"> <li>▪ _____</li> <li>▪ _____</li> <li>▪ Derived from _____</li> <li>▪ Bonds: _____</li> <li>▪ Fatty acids: _____</li> <li>▪ Examples include corn, canola, and olive oils</li> <li>▪ Health: _____</li> </ul>
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Polyunsaturated

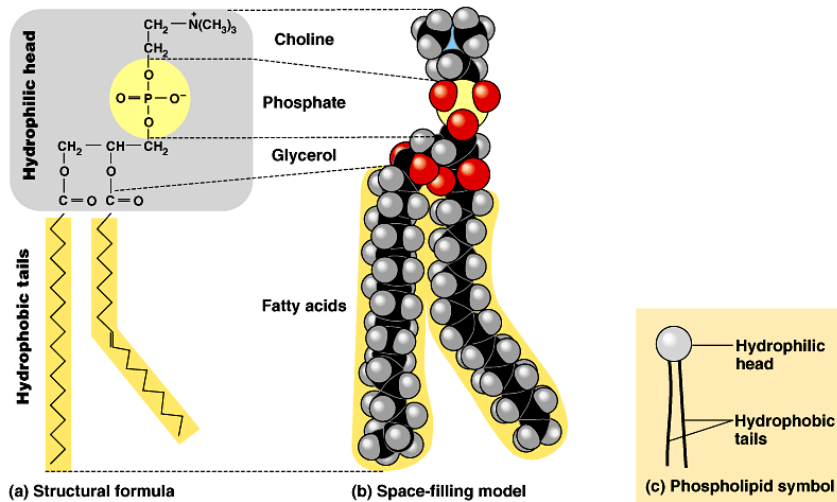


Phospholipids

- ▶ Where do you find phospholipids in organisms? What is the structure for?



- ▶ Phospholipids are similar to fats but they only have \_\_\_\_\_ fatty acid tails, instead of three, attached to a glycerol molecule.
- ▶ A phospholipid has a \_\_\_\_\_ head that wants to interact with water and two fatty acid tails that are \_\_\_\_\_ and are repelled by water.



## Steroids

- ▶ Steroids are lipids characterized by a carbon skeleton consisting of four fused rings.
- ▶ Cholesterol:

- ▶ Hormones are \_\_\_\_\_ released in one part of the body that travel through the \_\_\_\_\_ and affect the activities of cells in other parts of the body.
- ▶ They do this by binding to specific \_\_\_\_\_ on target cells. If a cell does not have receptors, the hormone has no effect.

## Proteins

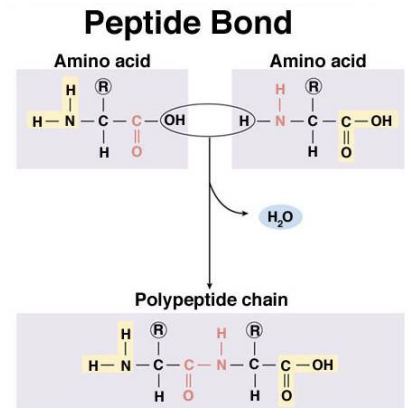
### The Nature of Proteins

- ▶ Elements:
- ▶ What are proteins made of? Why are there so many types of proteins in the world?

- ▶ Amino acids link together by peptide bonds
  - Makes \_\_\_\_\_

### Six functions of proteins:

1. Storage: \_\_\_\_\_
2. Transport: \_\_\_\_\_
3. Regulatory: \_\_\_\_\_
4. Movement: \_\_\_\_\_
5. Structural: \_\_\_\_\_
6. Enzymes: \_\_\_\_\_



## Proteins (Polypeptides)

- ▶ Four levels of protein structure:

A. \_\_\_\_\_ Structure (1°)

- ▶ Amino acids bonded together by \_\_\_\_\_

B. Secondary Structure (2°)

- ▶ 3-dimensional folding arrangement of a primary structure into \_\_\_\_\_ and \_\_\_\_\_ held together by hydrogen bonds.

- ▶ Two examples:

C. Tertiary Structure (3°)

- ▶ Secondary structures bent and folded into a more complex 3-D arrangement.
- ▶ Bonds: H-bonds, ionic
- ▶ Called a “\_\_\_\_\_”.

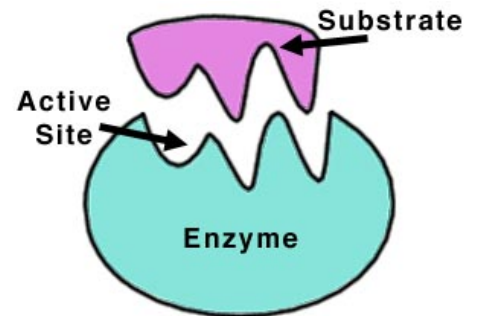
D. \_\_\_\_\_ Structure (4°)

- ▶ Composed of 2 or more “subunits”.
- ▶ Example: \_\_\_\_\_

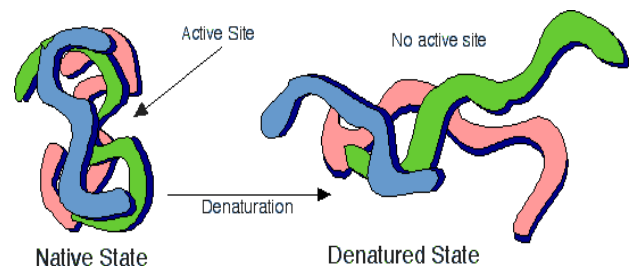
## Enzymes

- ▶ Acts as \_\_\_\_\_
- ▶ Speed up a chemical reaction
- ▶ Lower \_\_\_\_\_
- ▶ Needed to start a reaction
- ▶ Specific
- ▶ Act on a substrate

## Enzyme Action



## Denaturation



# Nucleic Acids

## The Nature of Nucleic Acids

- ▶ Two types: \_\_\_\_\_
- ▶ Composed of units called \_\_\_\_\_:
  - 
  - 
  -
  
- ▶ Shape and strands:

## Importance of Nucleic Acids

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