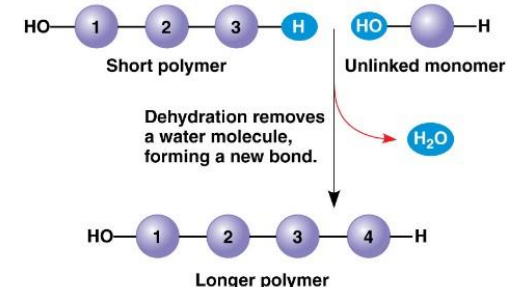
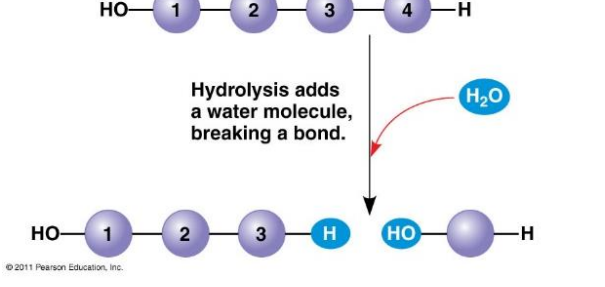
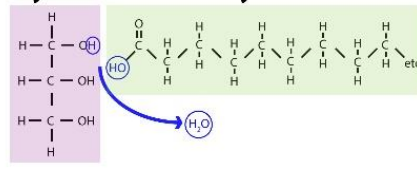
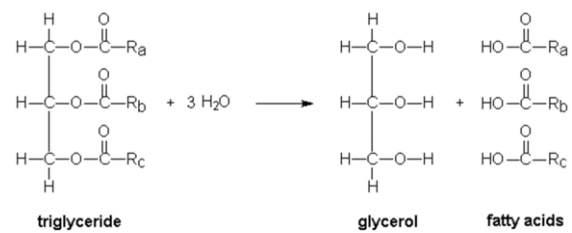
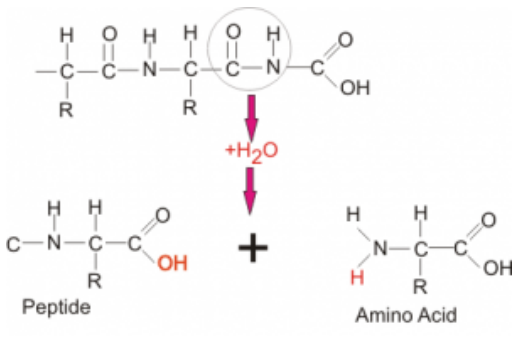
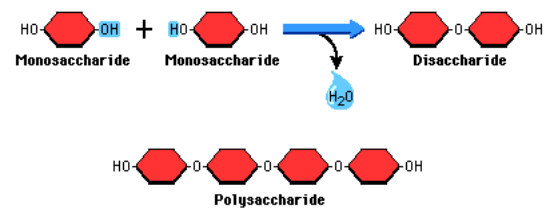


# Ch. 5: The Structure and Function of Large Biological Molecules

Vocabulary	Monomers	Polymers	Macromolecules
Types of Reactions	<p><b>Dehydration Synthesis (Condensation Reaction)</b></p> <ul style="list-style-type: none"> <li>• Make _____</li> <li>• _____ → _____</li> <li>• A + B → _____</li> </ul> <p>(a) Dehydration reaction: synthesizing a polymer</p> 	<p><b>Hydrolysis</b></p> <ul style="list-style-type: none"> <li>• _____ polymers</li> <li>• _____ → _____</li> <li>• AB → _____</li> </ul> <p>(b) Hydrolysis: breaking down a polymer</p> 	
Concept Check	<p>Label <b>Hydrolysis</b> or <b>Condensation</b> Reaction</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="462 1270 876 1533"> <p><b>Glycerol</b>      <b>Fatty acid</b></p>  </div> <div data-bbox="917 1186 1485 1417">  </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div data-bbox="357 1554 868 1953">  </div> <div data-bbox="958 1617 1502 1953">  </div> </div>		

**PROTEINS**

Elements:

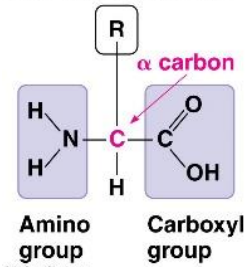
Functions:

- \_\_\_\_\_ (lactase) – catalyze chemical reactions
- Defense (\_\_\_\_\_)
- \_\_\_\_\_ (milk protein = casein)
- \_\_\_\_\_ (hemoglobin)
- Hormones (\_\_\_\_\_)
- \_\_\_\_\_
- \_\_\_\_\_ (motor proteins)
- \_\_\_\_\_ (keratin)

Monomer = \_\_\_\_\_

- R group = \_\_\_\_\_ (variable parts of amino acids)
- Properties can vary:
  - hydrophobic
  - hydrophilic
  - ionic (acids & bases)
- “amino”
- “acid”

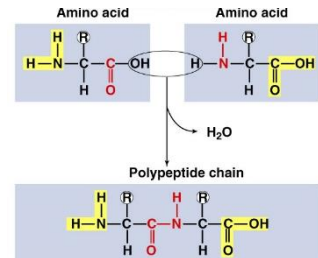
Side chain (R group)



**How to Build Proteins**

How are **peptide bonds** formed?

Label the peptide bond.

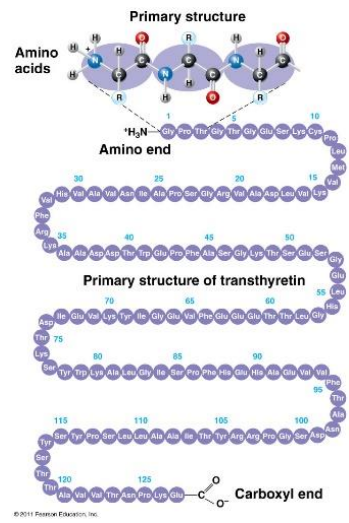
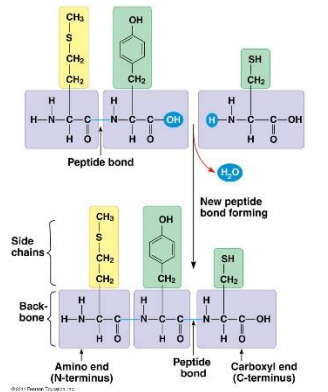


**Four Levels of Protein Structure**

1. **Primary Structure**

- \_\_\_\_\_
- 20 different AA's
- \_\_\_\_\_ link AA's

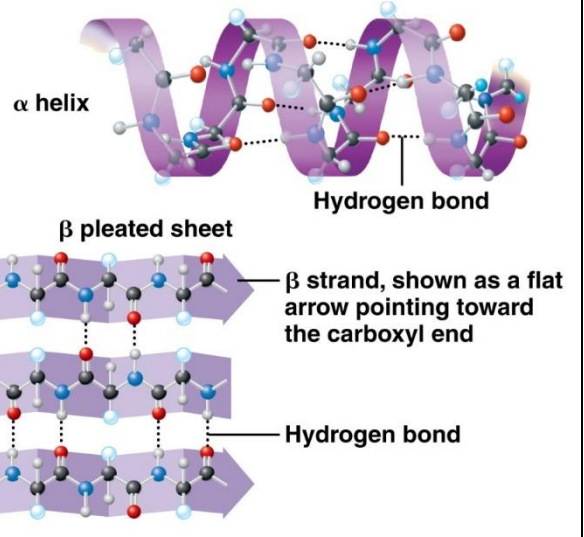
Peptide bonds are formed between \_\_\_\_\_ during a \_\_\_\_\_ (condensation) reaction.



2. **Secondary Structure**

- Gains \_\_\_\_\_ shape (folds, coils) by \_\_\_\_\_
- \_\_\_\_\_ (α) \_\_\_\_\_, \_\_\_\_\_ (β) \_\_\_\_\_

Notes:

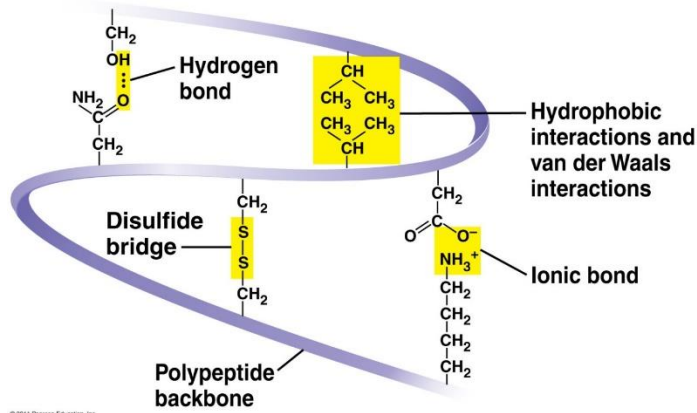


**Protein Folding Rules**

- Hydrophobic AA buried in \_\_\_\_\_ of protein (hydrophobic interactions)
- Hydrophilic AA exposed on \_\_\_\_\_ of protein (hydrogen bonds)
- Acidic + Basic AA form \_\_\_\_\_ bridges (ionic bonds).
- Cysteines can form \_\_\_\_\_ bonds.

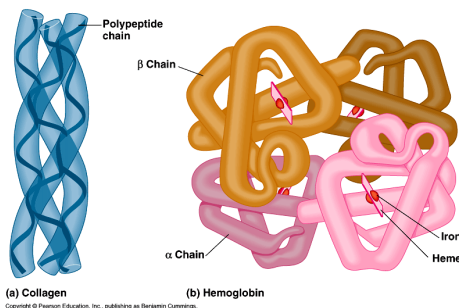
• **Tertiary Structure**

- Bonding between \_\_\_\_\_ (R groups) of amino acids
- \_\_\_\_\_ bonds, ionic bonds, \_\_\_\_\_ bridges, van der Waals interactions



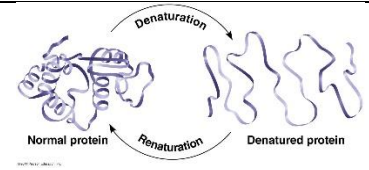
4. **Quaternary Structure**

- \_\_\_\_\_ bond together



What are **CHAPERONINS**?

How are proteins affected by environment?



change in \_\_\_\_\_ = change in \_\_\_\_\_

**Denaturation** unfolds a protein by disrupting \_\_\_\_\_, \_\_\_\_\_, & \_\_\_\_\_.

Denaturation affects the \_\_\_\_\_ & \_\_\_\_\_ structure of a protein.

**NUCLEIC ACIDS**

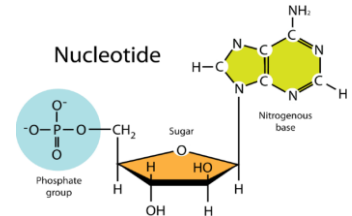
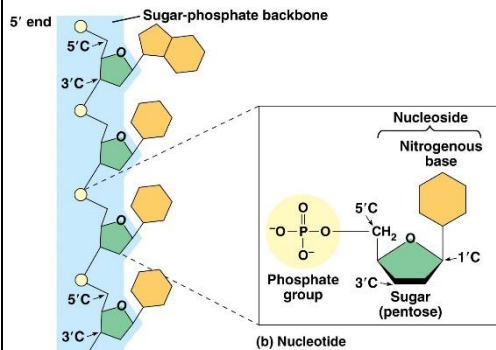
Elements:

Function:

DNA	RNA
<ul style="list-style-type: none"> <li>• _____-stranded helix</li> <li>• N-bases: A, G, C, _____</li> <li>• Stores _____ info</li> <li>• Longer/larger</li> <li>• Sugar: _____</li> </ul>	<ul style="list-style-type: none"> <li>• _____-stranded</li> <li>• N-bases: A, G, C, _____</li> <li>• Carry info from DNA to _____</li> <li>• tRNA, rRNA, mRNA, RNAi</li> <li>• Sugar: _____</li> </ul>

Monomer: \_\_\_\_\_

3 parts:

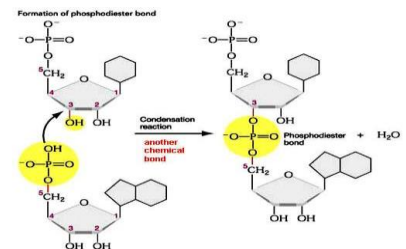


Purines	Pyrimidines
<ul style="list-style-type: none"> <li>• Adenine</li> <li>• Guanine</li> </ul>	<ul style="list-style-type: none"> <li>• Cytosine</li> <li>• Thymine (DNA)</li> <li>• Uracil (RNA)</li> </ul>
• Double ring	• Single ring

Memory Aid:

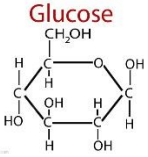
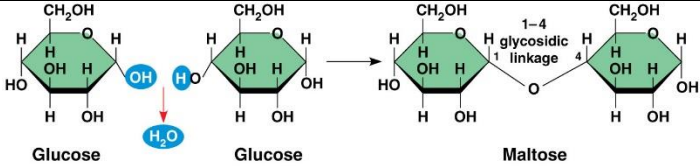
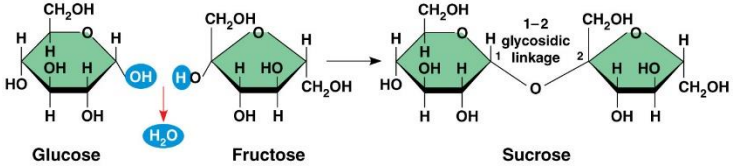
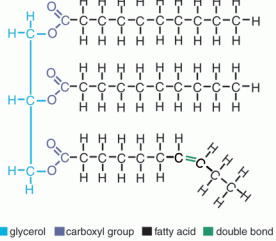
How are nucleic acids formed?

- Nucleotides join together to form the DNA backbone (S-P) via \_\_\_\_\_
- N-bases held together by \_\_\_\_\_



What is the **CENTRAL DOGMA** of Biology?

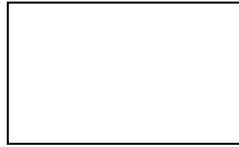
Information flow in a cell:  
 \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_

<b>CARBOHYDRATES</b>	Elements:
	Monomers:
	Naming:
	Role of functional groups:
Examples/Types:	
Functions:	 <p>(a) Dehydration reaction in the synthesis of maltose</p>
How are sugars built?	 <p>(b) Dehydration reaction in the synthesis of sucrose</p>
Role of isomers?	
<b>LIPIDS</b>	Elements:
	Monomers:
	Types/Examples & Functions:
	
A. _____ (triglyceride): _____	<ul style="list-style-type: none"> <li>• Glycerol + 3 Fatty Acids</li> <li>• saturated, unsaturated, polyunsaturated</li> </ul>
B. _____: _____ and hormones	
C. _____: lipid bilayer of cell membrane	<ul style="list-style-type: none"> <li>• _____ head, _____ tails</li> </ul>

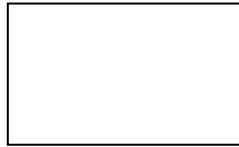
**LIPIDS**  
Cont'd.

**Phospholipid structure**

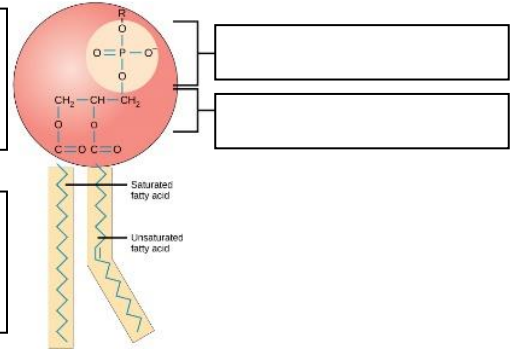
Hydrophobic or hydrophilic?  
fatty acid tails =



PO<sub>4</sub> head =



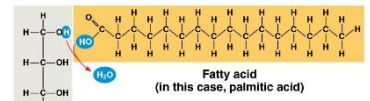
Can "self assemble" into



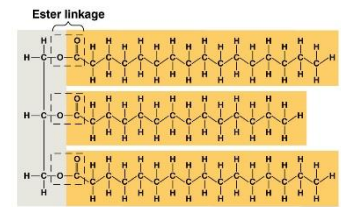
Can form a phospholipid \_\_\_\_\_ (aka, cell membrane)

Why are they important?

How are fats/lipids built?



Glycerol  
(a) One of three dehydration reactions in the synthesis of a fat

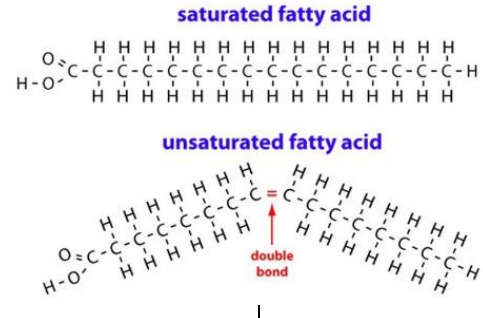


(b) Fat molecule (triaclyglycerol)

Saturated	Unsaturated	Polyunsaturated
-----------	-------------	-----------------

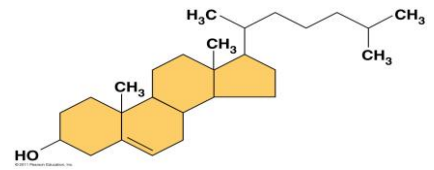
- "saturated" with \_\_\_\_\_, so \_\_\_\_\_ double bonds
- In \_\_\_\_\_
- \_\_\_\_\_ at room temp
- Eg.

- Have some C=C ( \_\_\_\_\_ bonds), result in \_\_\_\_\_/bends
- In \_\_\_\_\_
- \_\_\_\_\_ at room temp
- Eg.

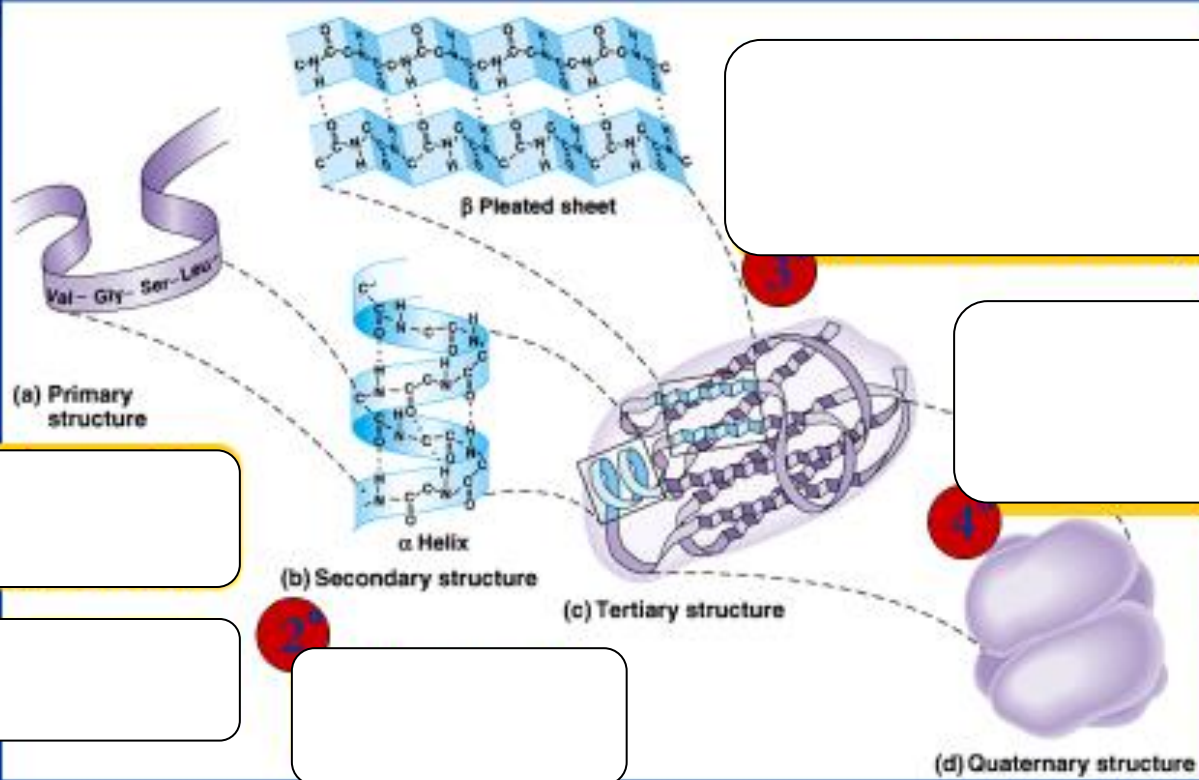


What is **cholesterol**?

Why is cholesterol important?



# Protein structure (review)

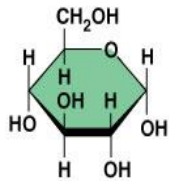
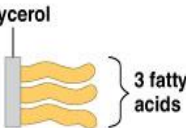

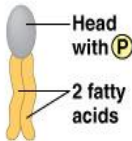
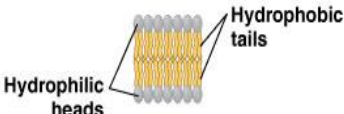
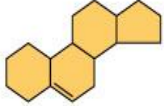
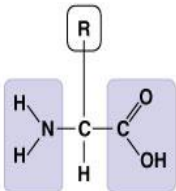
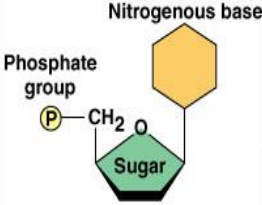




1

2

3

(d) Quaternary structure

Large Biological Molecules	Components	Examples	Functions
<p><b>CONCEPT 5.2</b></p> <p>Carbohydrates serve as fuel and building material</p>	 <p>Monosaccharide monomer</p>	<p><b>Monosaccharides:</b> glucose, fructose</p>	<p>Fuel; carbon sources that can be converted to other molecules or combined into polymers</p>
		<p><b>Disaccharides:</b> lactose, sucrose</p> <p><b>Polysaccharides:</b></p> <ul style="list-style-type: none"> <li>Cellulose (plants)</li> <li>Starch (plants)</li> <li>Glycogen (animals)</li> <li>Chitin (animals and fungi)</li> </ul>	
<p><b>CONCEPT 5.3</b></p> <p>Lipids are a diverse group of hydrophobic molecules</p>	<p>Glycerol</p>  <p>3 fatty acids</p>	<p><b>Triacylglycerols</b> (fats or oils): glycerol + 3 fatty acids</p>	<p>Important energy source</p> 
	 <p>Head with P</p> <p>2 fatty acids</p>	<p><b>Phospholipids:</b> phosphate group + 2 fatty acids</p>	<p>Lipid bilayers of membranes</p>  <p>Hydrophilic heads</p> <p>Hydrophobic tails</p>
	 <p>Steroid backbone</p>	<p><b>Steroids:</b> four fused rings with attached chemical groups</p>	<ul style="list-style-type: none"> <li>Component of cell membranes (cholesterol)</li> <li>Signaling molecules that travel through the body (hormones)</li> </ul>
<p><b>CONCEPT 5.4</b></p> <p>Proteins include a diversity of structures, resulting in a wide range of functions</p>	 <p>Amino acid monomer (20 types)</p>	<ul style="list-style-type: none"> <li>Enzymes</li> <li>Structural proteins</li> <li>Storage proteins</li> <li>Transport proteins</li> <li>Hormones</li> <li>Receptor proteins</li> <li>Motor proteins</li> <li>Defensive proteins</li> </ul>	<ul style="list-style-type: none"> <li>Catalyze chemical reactions</li> <li>Provide structural support</li> <li>Store amino acids</li> <li>Transport substances</li> <li>Coordinate organismal responses</li> <li>Receive signals from outside cell</li> <li>Function in cell movement</li> <li>Protect against disease</li> </ul>
<p><b>CONCEPT 5.5</b></p> <p>Nucleic acids store, transmit, and help express hereditary information</p>	 <p>Nucleotide monomer</p>	<p><b>DNA:</b> </p> <ul style="list-style-type: none"> <li>Sugar = deoxyribose</li> <li>Nitrogenous bases = C, G, A, T</li> <li>Usually double-stranded</li> </ul>	<p>Stores hereditary information</p>
		<p><b>RNA:</b> </p> <ul style="list-style-type: none"> <li>Sugar = ribose</li> <li>Nitrogenous bases = C, G, A, U</li> <li>Usually single-stranded</li> </ul>	<p>Various functions during gene expression, including carrying instructions from DNA to ribosomes</p>