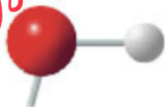
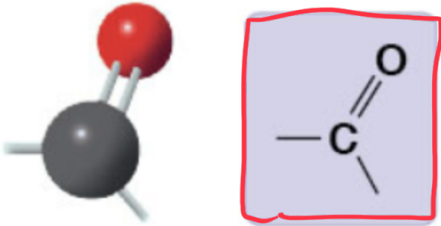
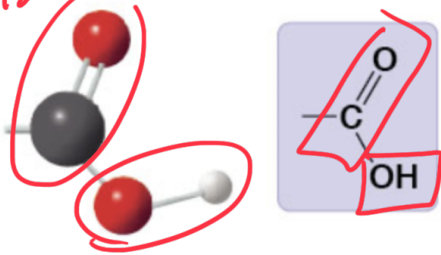
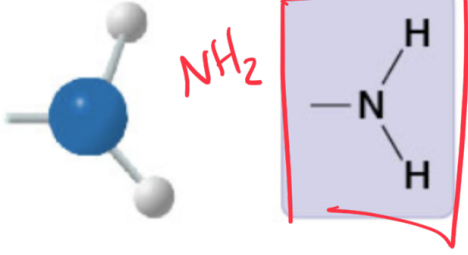

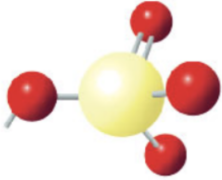
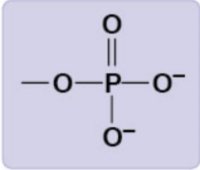
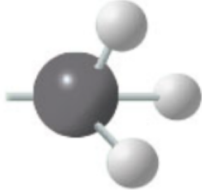
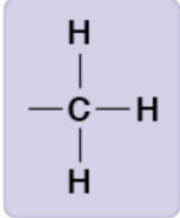


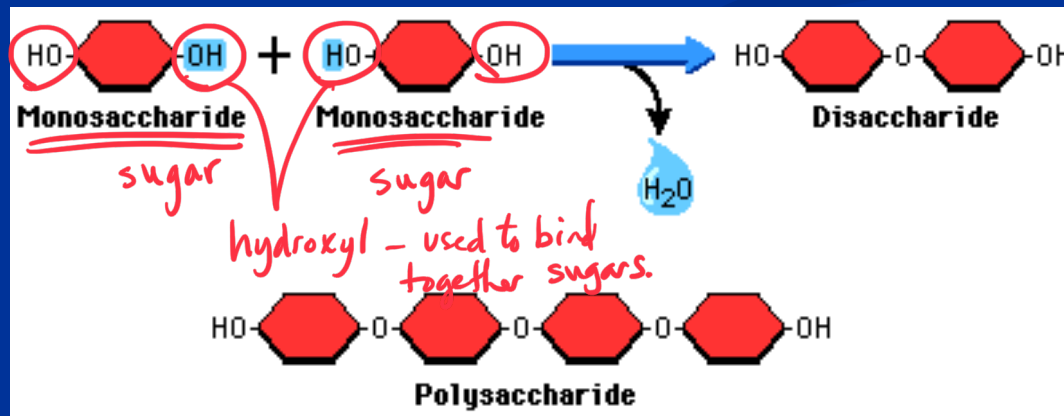
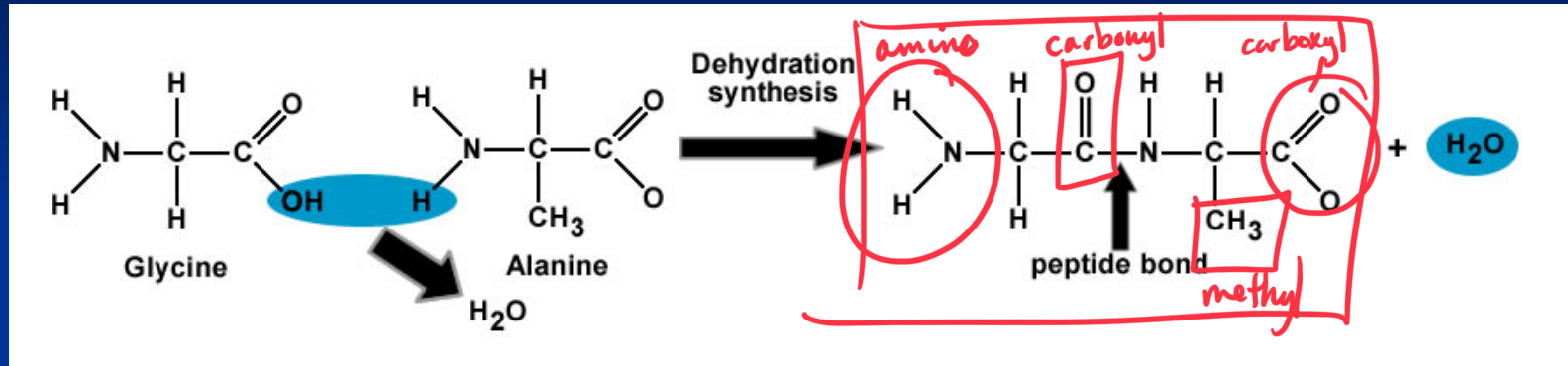
Functional Groups

Name	Structure	Polarity	Links	Other
<div>Hydroxyl</div> <div>↑</div> <div>Hydrogen</div>	 <div>oxygen dissolve in water</div> <div>classification: alcohol</div>	<div>Polar</div> <div>hydrophilic</div> <div>water loving</div>	Sugars	Accounts for <u>sweetness</u> .
Carbonyl		Polar	<u>Fats</u>	Head group of <u>fats</u> .
<div>Carboxyl</div> <div>↑</div> <div>carbonyl + hydroxyl</div>	 <div>acid</div>	<div>Polar</div> <div>allow amino acids to be polymers</div>	<u>Amino acids</u>	Found in <u>every amino acid</u> .
<div>Amino</div> <div>←</div>	 <div>NH₂</div>	<div>Polar</div> <div>through dehydration synthesis</div>	<u>Amino acids</u>	Found in <u>every amino acid</u> .
Sulfhydryl	 <div>like OH</div>	<u>Polar</u>	<u>Antigens</u>	Smells awful.

Binds together nucleic acids
 ATP ← phosphate

Phosphate	 	Polar	<u>DNA</u> RNA	Releases energy in ATP.
Methyl	 	<u>Nonpolar</u> found in <u>fats</u> (tails)	none	A primary component in gas.

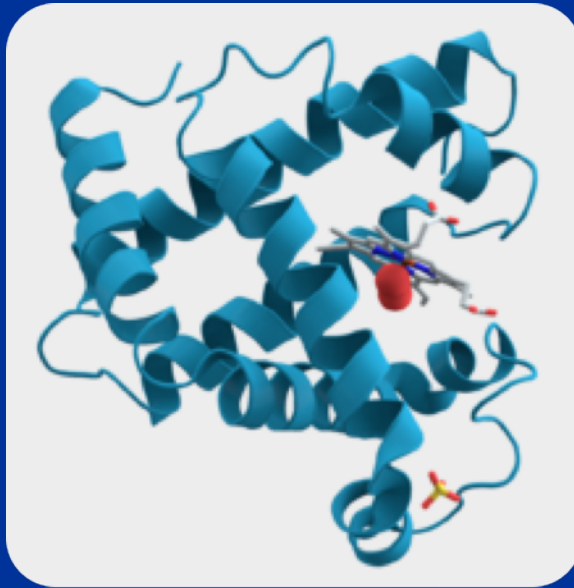
Dehydration Synthesis



I. Proteins

prototype → first draft
↳ also means primary

- “Proteios” = first or primary
- 50% dry weight of cells
- Contains: C, H, O, N, S *a lil' bit*



Myoglobin protein

Genes in DNA code for proteins

Protein Functions (+ examples)

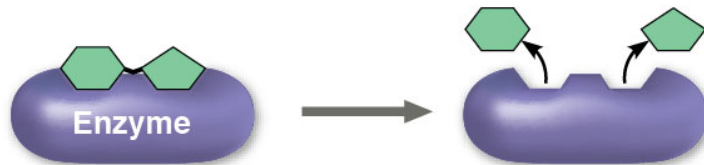
- Enzymes (lactase) → catalyzes, or speeds up, a reaction. Shape dependent
- Defense (antibodies)
- Storage (milk protein = casein) lipoprotein
- Transport (hemoglobin) → ^{protein} transports oxygen in blood
- Hormones (insulin) → facilitates sugars entering into cells
- Receptors
- Movement (motor proteins)
- Structure (keratin) → fingernails, horns, hair, feathers.

Overview of protein functions

Enzymatic proteins

Function: Selective acceleration of chemical reactions

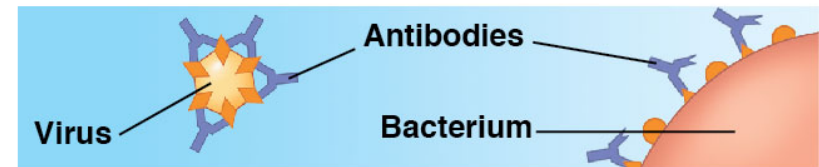
Example: Digestive enzymes catalyze the hydrolysis of bonds in food molecules.



Defensive proteins

Function: Protection against disease

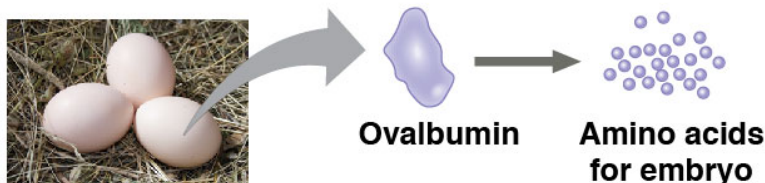
Example: Antibodies inactivate and help destroy viruses and bacteria.



Storage proteins

Function: Storage of amino acids

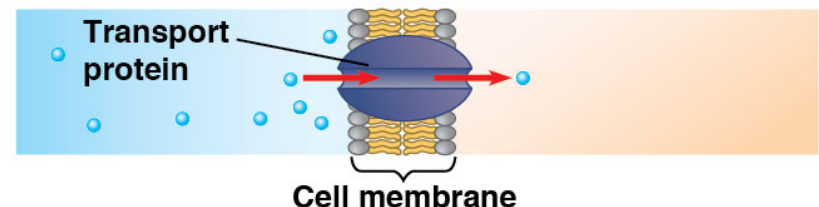
Examples: ~~Casein~~, the protein of milk, is the major source of amino acids for baby mammals. Plants have storage proteins in their seeds. Ovalbumin is the protein of egg white, used as an amino acid source for the developing embryo.



Transport proteins

Function: Transport of substances

Examples: Hemoglobin, the iron-containing protein of vertebrate blood, transports oxygen from the lungs to other parts of the body. Other proteins transport molecules across membranes, as shown here.

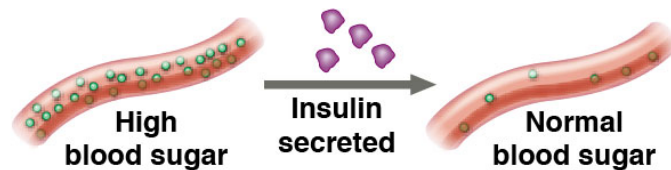


Overview of protein functions

Hormonal proteins

Function: Coordination of an organism's activities

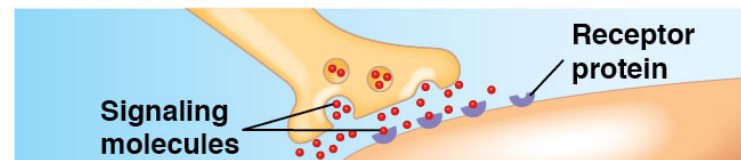
Example: Insulin, a hormone secreted by the pancreas, causes other tissues to take up glucose, thus regulating blood sugar concentration.



Receptor proteins

Function: Response of cell to chemical stimuli

Example: Receptors built into the membrane of a nerve cell detect signaling molecules released by other nerve cells.

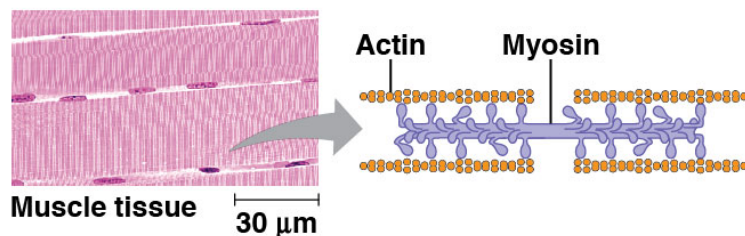


Contractile and motor proteins

Function: Movement

Examples: Motor proteins are responsible for the undulations of cilia and flagella.

Actin and myosin proteins are responsible for the contraction of muscles.

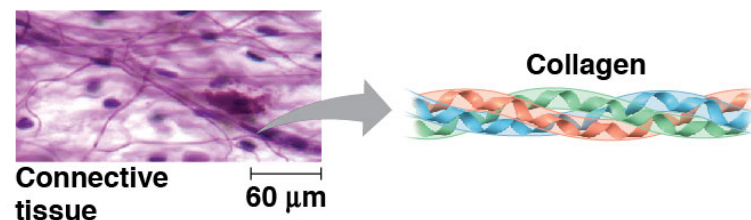


Structural proteins

Function: Support

Examples: Keratin is the protein of hair, horns, feathers, and other skin appendages. Insects and spiders use silk fibers to make their cocoons and webs, respectively.

Collagen and elastin proteins provide a fibrous framework in animal connective tissues.

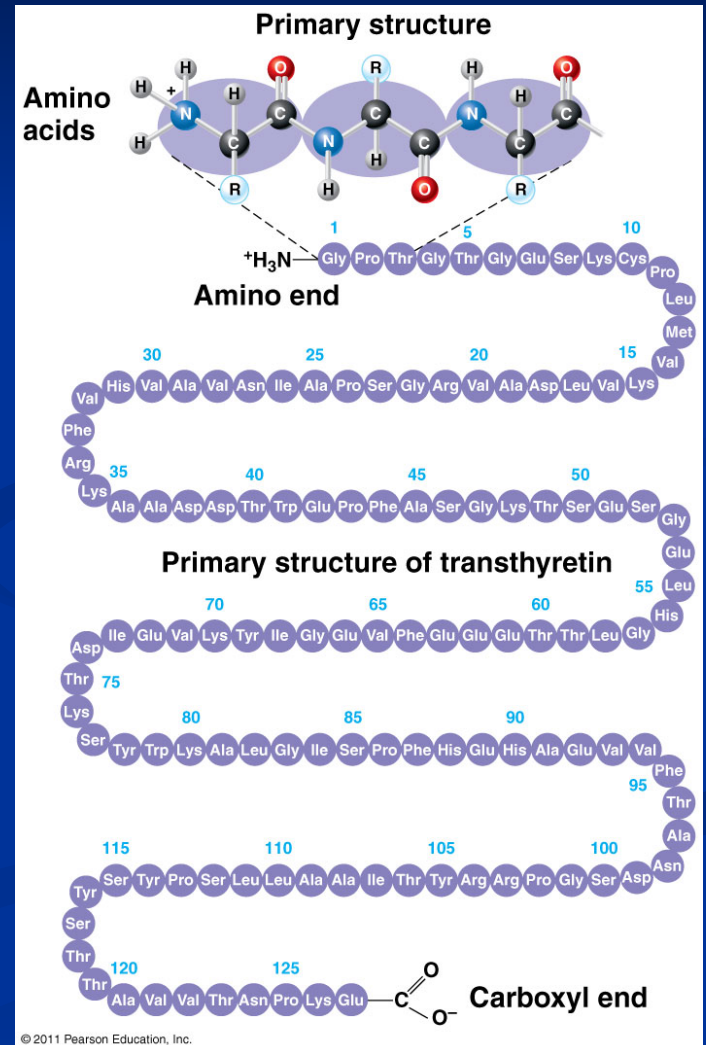
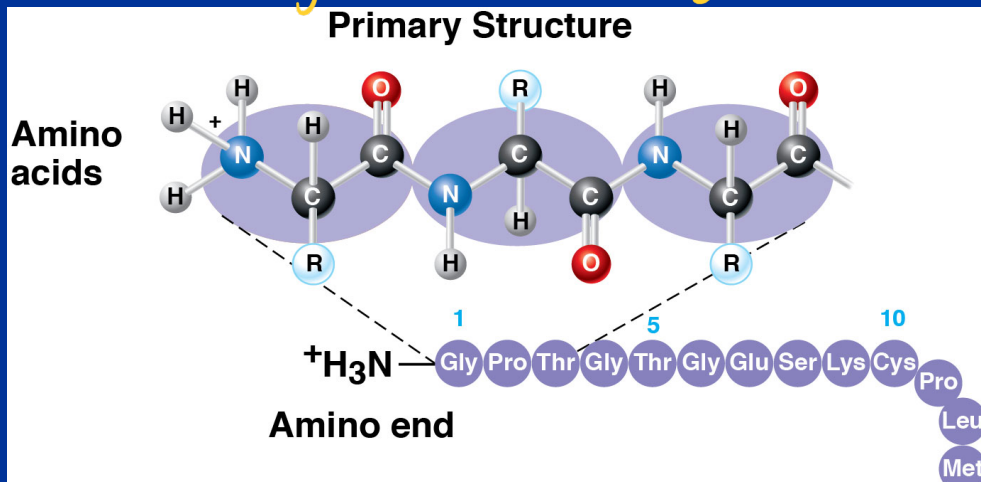


Four Levels of Protein Structure

1. **Primary** *reading music → music notes*

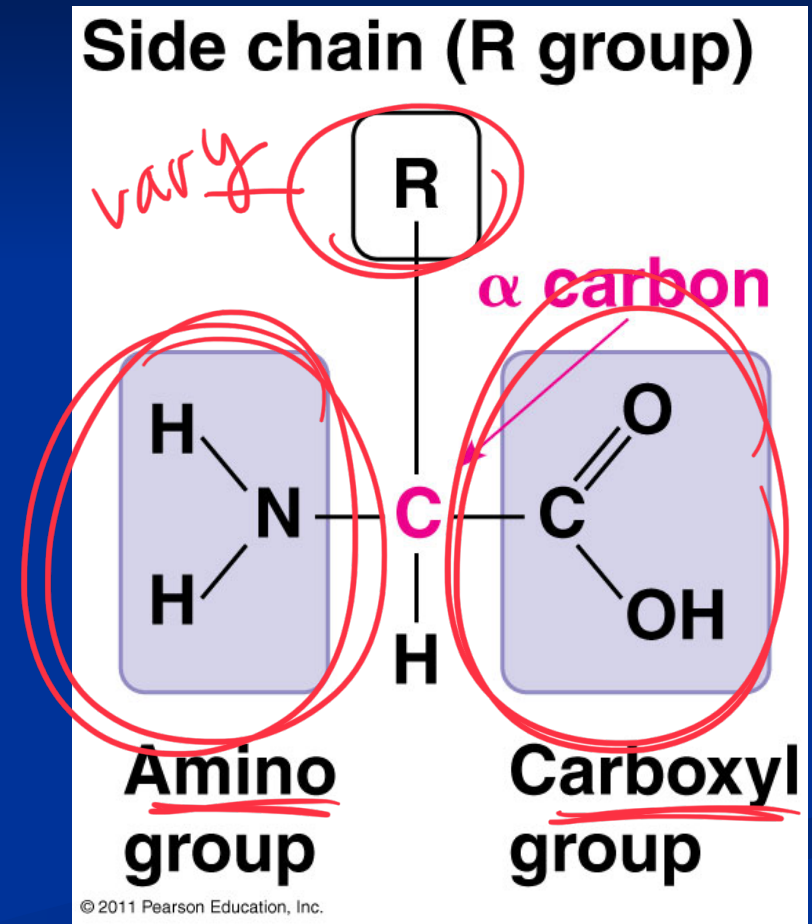
- **Amino acid** (AA) sequence
- 20 different AA's
- **peptide bonds** link AA's

*How are peptide bonds formed?
dehydration synthesis*



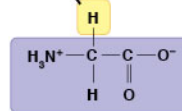
Amino Acid

- **R group** = side chains
- Properties:
 - hydrophobic
 - hydrophilic
 - ionic (acids & bases)
- “amino” : -NH_2
- “acid” : -COOH

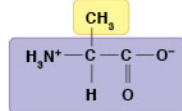


Nonpolar side chains; hydrophobic

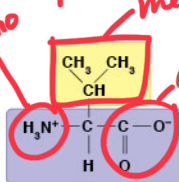
Side chain
(R group)



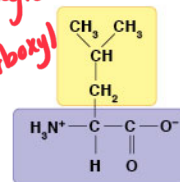
Glycine
(Gly or G)



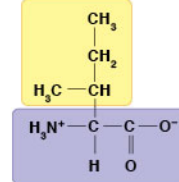
Alanine
(Ala or A)



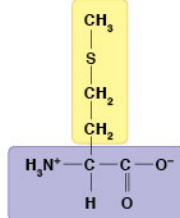
Valine
(Val or V)



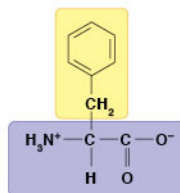
Leucine
(Leu or L)



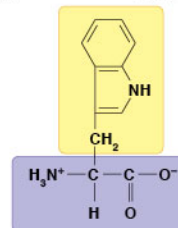
Isoleucine
(Ile or I)



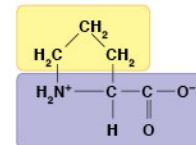
Methionine
(Met or M)



Phenylalanine
(Phe or F)

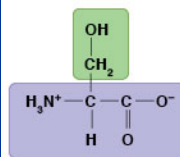


Tryptophan
(Trp or W)

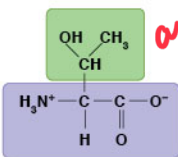


Proline
(Pro or P)

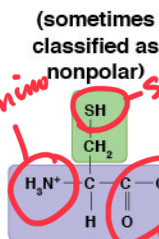
Polar side chains; hydrophilic



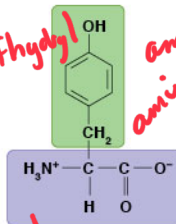
Serine
(Ser or S)



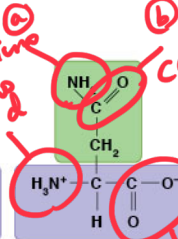
Threonine
(Thr or T)



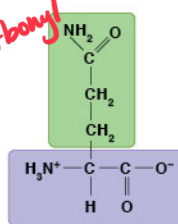
Cysteine
(Cys or C)



Tyrosine
(Tyr or Y)



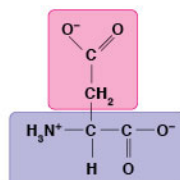
Asparagine
(Asn or N)



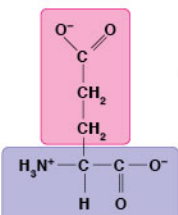
Glutamine
(Gln or Q)

Electrically charged side chains; hydrophilic

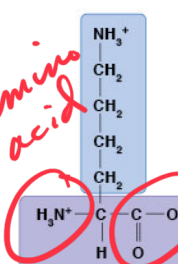
Acidic (negatively charged)



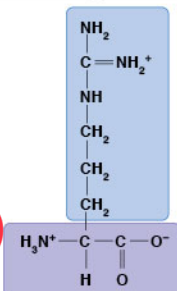
Aspartic acid
(Asp or D)



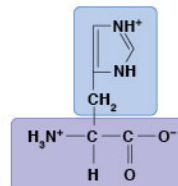
Glutamic acid
(Glu or E)



Lysine
(Lys or K)

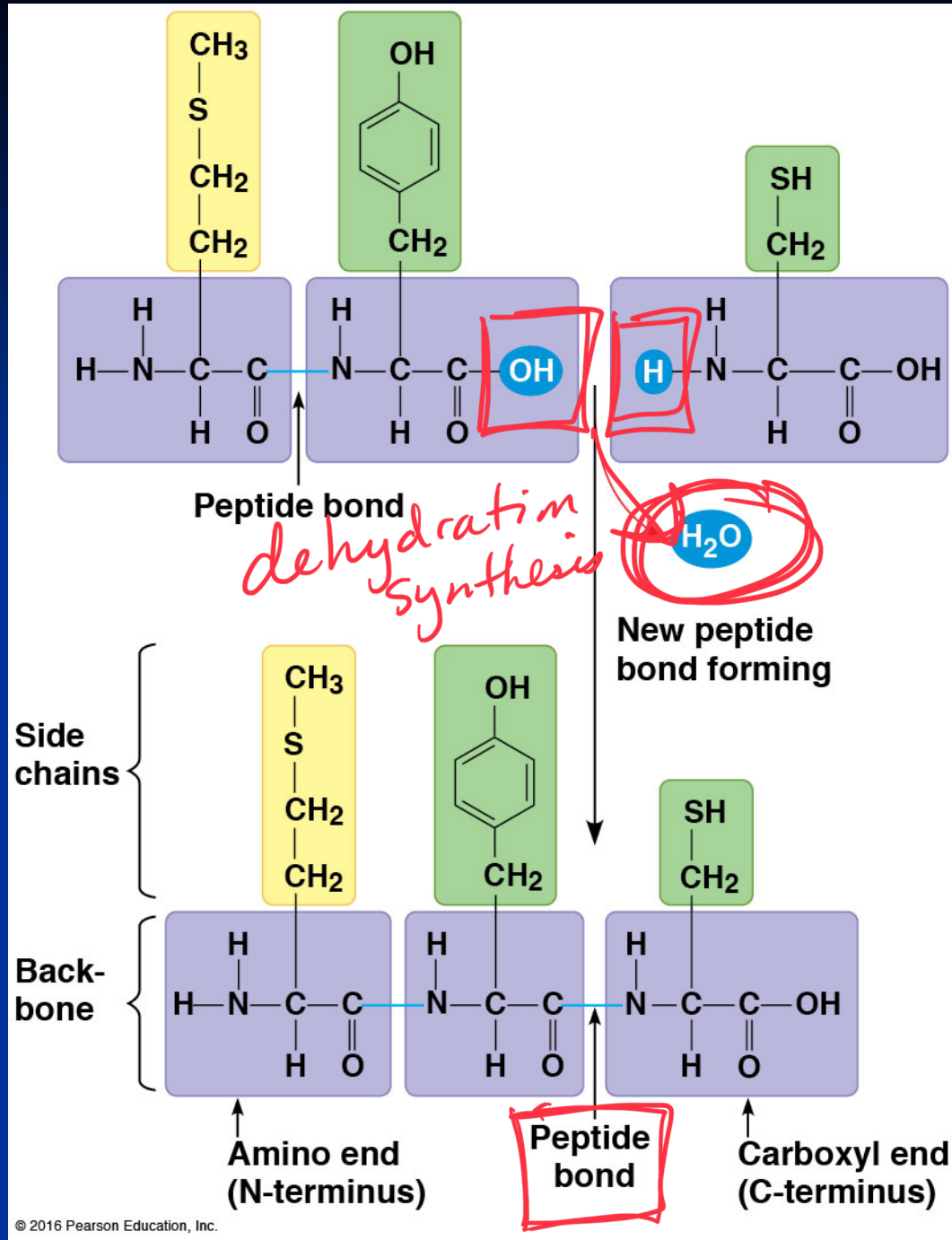


Arginine
(Arg or R)



Histidine
(His or H)

Basic (positively charged)



Peptide Bonds

