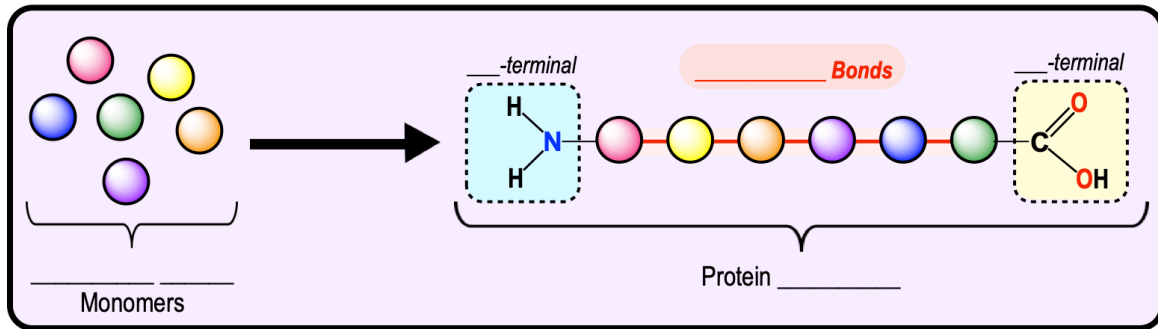


CONCEPT: PROTEINS

- **Proteins:** a class of biomolecule *polymers* made of _____ *monomers*.
 - _____ **Bonds:** covalent bonds linking adjacent amino acids together.
 - Protein polymers have *directionality* (_____ -terminal & _____ -terminal ends).

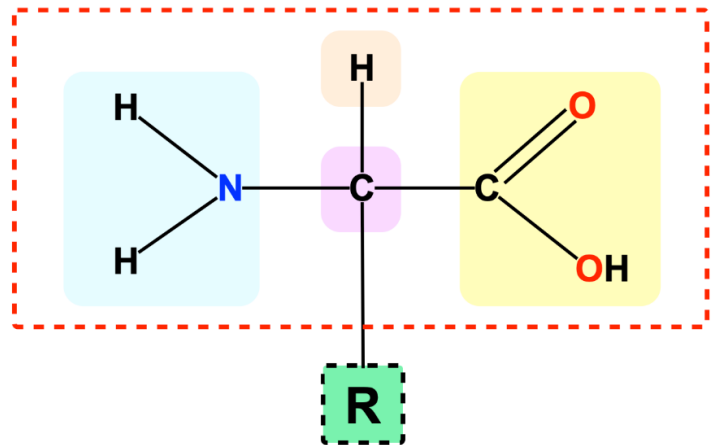
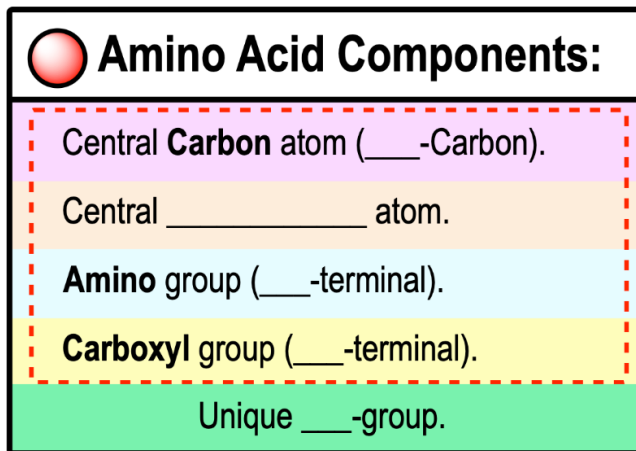
EXAMPLE: Formation proteins from amino acid monomers.



Amino Acids

- **Amino acids:** the _____ of proteins.
 - Each amino acid monomer contains *common components* & a *unique* _____ -group.
 - Living organisms primarily use _____ different amino acids, each with a _____ *R-group*.

EXAMPLE: Amino Acid Structure.



PRACTICE: The primary building blocks (monomers) of proteins are:

- a) Glucose molecules. b) Lipids. c) Nucleotides. d) Amino acids. e) None of these.

PRACTICE: Which two functional groups are always found in amino acids?

- a) Carbonyl and amino groups. b) Carboxyl and amino groups.
c) Amino and sulfhydryl groups. d) Hydroxyl and carboxyl groups.

CONCEPT: PROTEINS

5 Protein-Related Terms

- _____ terms refer to amino acid chains that _____ in length:

Term	Length of Amino Acid Chain
① Amino acid	A single protein unit or _____.
② _____ peptide	2 to ~_____ covalently linked amino acids.
③ Peptide	_____ than 50 covalently linked amino acids.
④ _____ peptide	_____ than 50 covalently linked amino acids.
⑤ Protein	One or multiple polypeptide chains in their folded/ _____ forms.

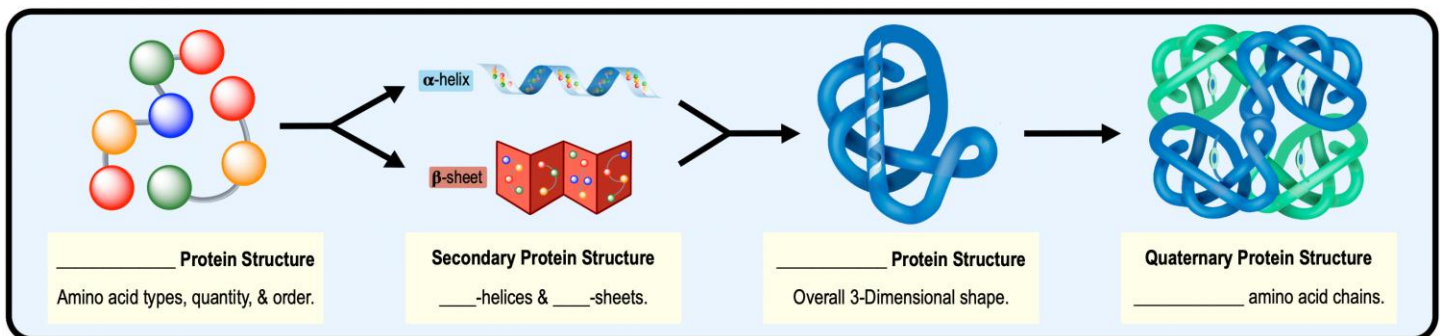
PRACTICE: What term is used for an amino acid chain that has greater than 50 covalently linked amino acids?

- a) Protein. b) Peptide. c) Amino acid. d) Polypeptide.

Protein Structure

- Proteins have a *hierarchy* of structure organized into _____ levels:
 - 1) **Primary** (____°): types, quantity & _____ of *amino acids*. Determines all other levels of structure.
 - 2) **Secondary** (____°): formation of either _____-helices or _____-sheets in the protein backbone.
 - 3) **Tertiary** (____°): overall 3D-shape of a *polypeptide* chain.
 - 4) **Quaternary** (____°): _____ polypeptide chains *associate* to form a single, functional protein.

EXAMPLE: The four levels of protein structure:



PRACTICE: The specific amino acid sequence in a protein is its:

- a) Primary structure. b) Secondary structure. c) Tertiary structure. d) Quaternary structure.

CONCEPT: PROTEINS

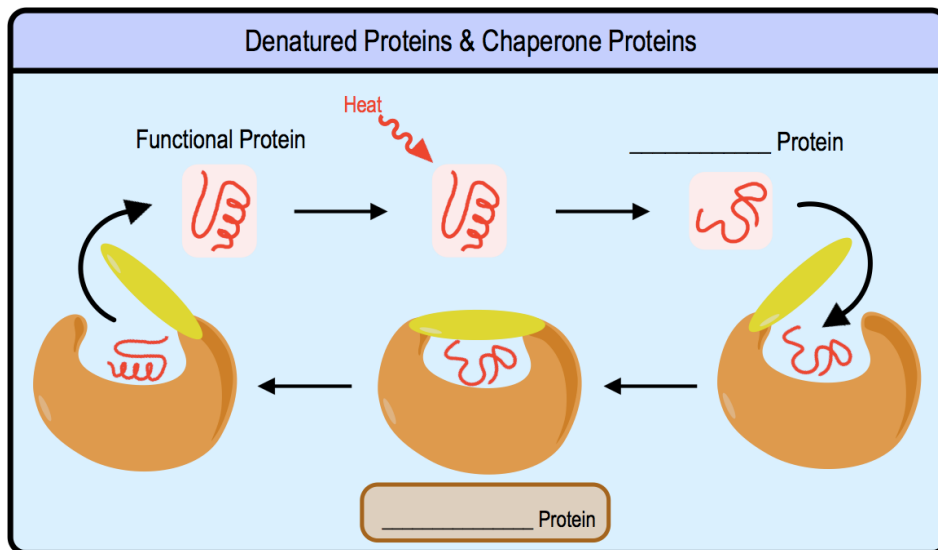
PRACTICE: Which of the following is true of protein structure?

- a) Peptide bonds are formed by hydrolysis.
- b) Peptide bonds join the amine group on one amino acid with the R group of another amino acid.
- c) Secondary protein structures are caused by hydrogen bonding between atoms of the peptide backbone.
- d) Tertiary protein structure emerges when there is more than one polypeptide in a protein.

Denatured Proteins & Chaperones

- A protein's *structure & shape* is critical for its proper _____.
- _____ **Protein:** a _____-functional protein that has *altered* its shape.
 - Results from _____ in the environment (ex. changes in *pH*, *temperature*, or *salt concentration*).
 - _____ **Proteins:** proteins that help other proteins can re-form their shape (or "*re-nature*").

EXAMPLE: Protein denaturation and renaturing.



PRACTICE: What is the role of a chaperone protein?

- a) Assist in RNA and DNA folding.
- b) Assist in membrane transport.
- c) Assist in protein denaturation.
- d) Assist in dehydration synthesis reactions.
- e) Assist in protein folding or re-naturing.