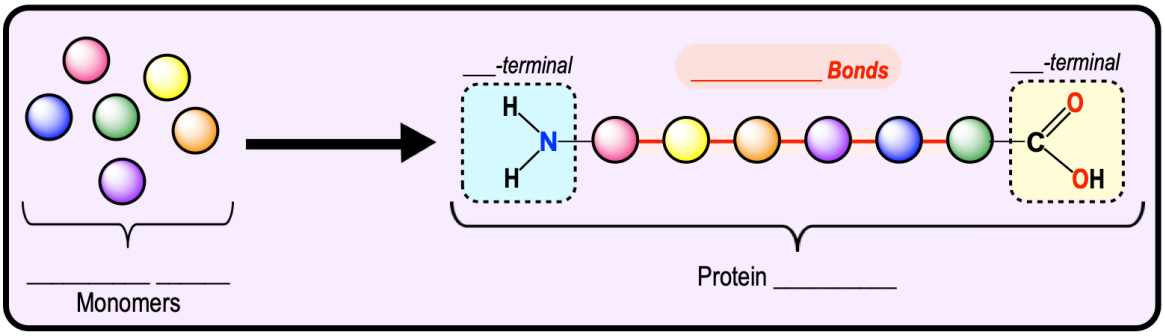
CONCEPT: PROTEINS

●**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.



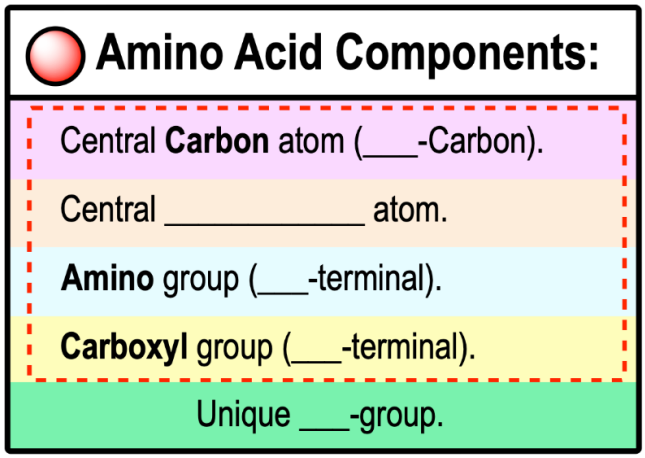
Amino Acids

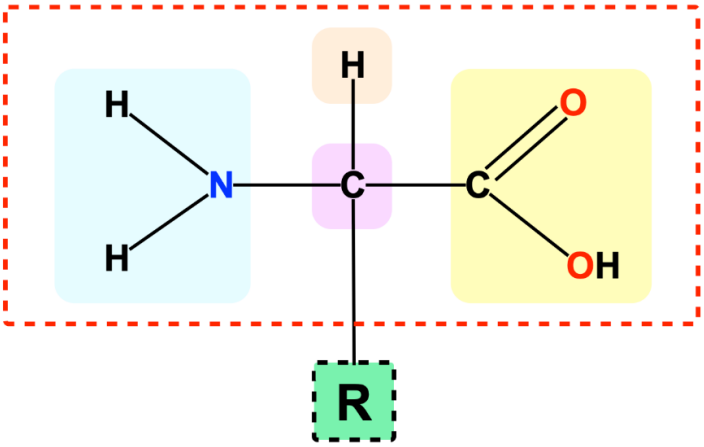
●**Amino acids**: the _____ of proteins.

□ 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:

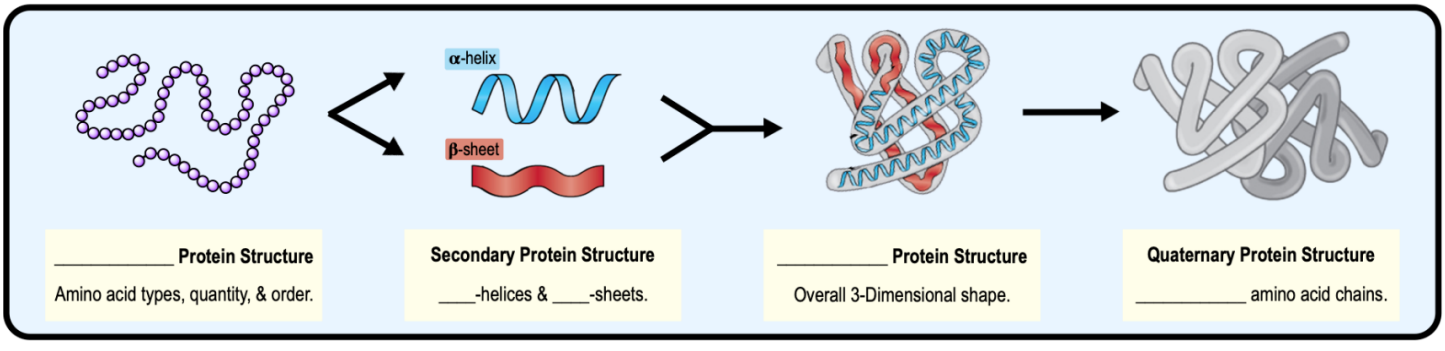
1) **Primary (_____°):** types, quantity & _____ of *amino acids*. Determines all other levels of structure.

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

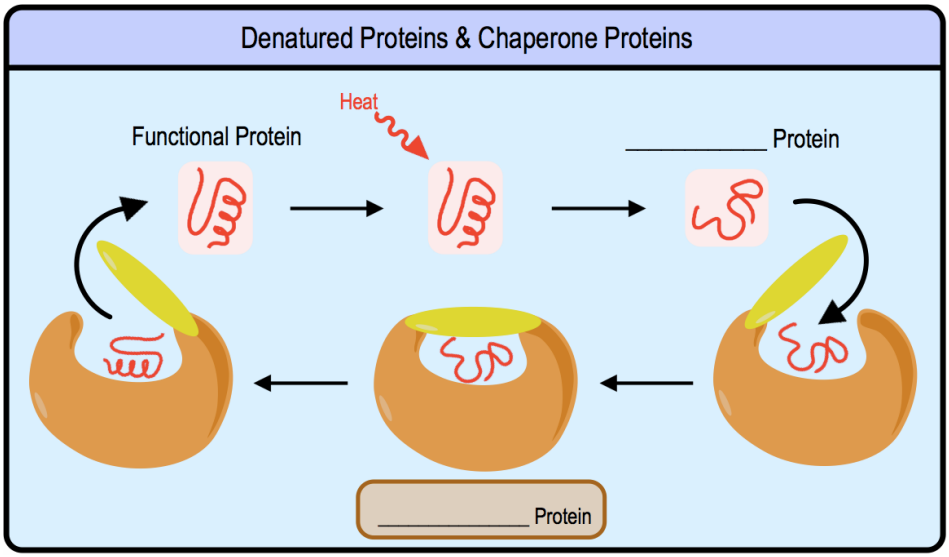
●A protein's *structure* & *shape* is critical for its proper _____.

●_____ **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.