

## MYP Biology: Protein Structure Modeling

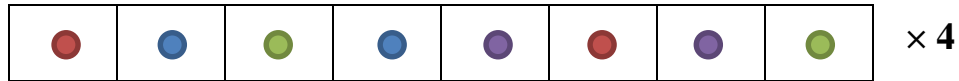
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Follow the instructions below to model the four levels of protein structure:

### Instructions:

1. Take four strips of paper and fold them into 8<sup>ths</sup>. Draw in lines to separate the parts.
2. Tape the strips together end to end to create one long piece of paper with 32 total squares.
3. Using colored pencils, crayons, or markers placed a **colored dot** in each “box.” Each box represents one **amino acid**. You can only use the following colors: **Red, orange, yellow, green, blue, and purple**. Put the colors in any order or pattern you want. You must use all the colors at least once.

Diagram:



**NOTE:** You have now created the **primary structure** of your protein. The primary structure is the order of the amino acids. The colors you used show the order of the amino acids in your protein. You had six colors (amino acids) to choose from whereas in your body there are 20. The order of amino acids is unique to each type of protein.

4. If your first name begins with A-L, fold your protein like a fan/accordion. Emphasize the folds. Your protein is a **Beta-pleated sheet**. If your first name begins with M-Z, take your protein and roll it around your finger. Your protein is an **Alpha-helix**. This is your protein’s secondary structure.

**NOTE:** The **secondary structure** for proteins is how the strand of amino acids is either folded or spiraled. A folded structure is called a Beta-pleated sheet and a spiraled structure is called an Alpha-helix. Both of these secondary structures are held together by hydrogen bonds.

5. For your proteins **tertiary** (third level) structure follow the rules below, **using tape**:
  - a) If you have two red or blue amino acids *four or more spaces apart* connect them together with tape.
  - b) If you have 3 or more amino acids with the same color in a row form a loop with them.
  - c) If you have ends that are the same color attach them together.
  - d) If you have 2 or fewer connections made, make **four random connections** between your amino acids.

**NOTES:** The **tertiary structure** of proteins is the three dimensional folding of the protein back on itself. This occurs because of interactions between the amino acids.

6. For your protein’s quaternary structure, connect your protein structure to someone else’s protein at your table.

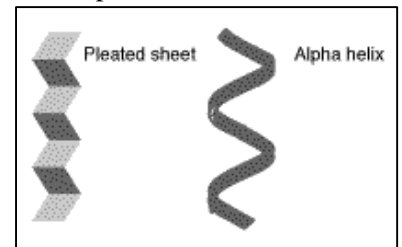
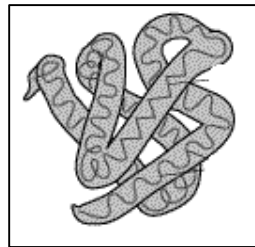
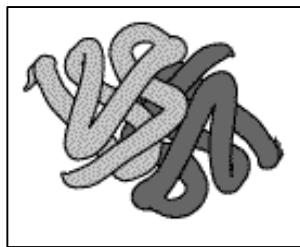
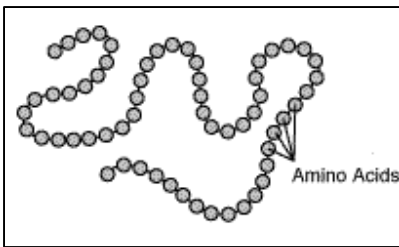
**NOTE:** The **quaternary structure** of a protein is when two or more protein units attach to one another. There are two main types: globular that form blobs and fibrous that form long strands. Not all proteins form quaternary structures. Some also join with vitamins and other non-protein materials during this step.

## Protein Folding Activity Questions

NAME: \_\_\_\_\_

1. What did the different **color dots** represent in your protein model?
2. What are the **two** different shapes that proteins can fold into in their **secondary structure**?
3. How is your protein different from other students' proteins? Give at least **three** ways in which it is different:

4. Label each of the images below as either primary, secondary, tertiary, or quaternary levels of protein structure:



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