Protein Folding Activity

Summary

This activity uses manipulation of a prop to understand the type of interactions formed when a protein is undergoing tertiary structure folding and how the properties of amino acids can dictate the final three-dimensional shape of a protein.

Pre activity: pre-reading on protein and amino acids and a short mini-lecture on primary and secondary structure.

Class size: 10-60 students

Materials needed:

- Pipe cleaners
- Different colored tape

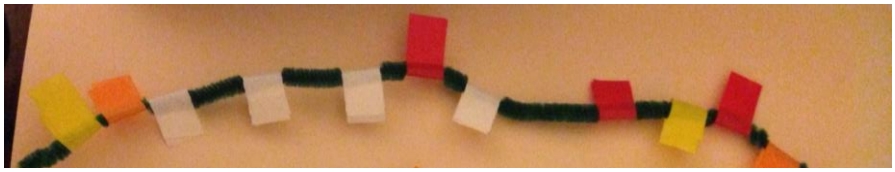
Duration: 15-20 min

Type: Manipulation of prop following prompts on screen.

Key concepts: tertiary structure, protein folding, hydrophobic interactions, hydrogen bonds, ionic bonds, disulfide bridges, amino acid structure.

Part 1: Hydrophobic vs Hydrophilic Amino Acids

Assume the green pipe-cleaner represents a polypeptide that has folded into a helical secondary structure and the tape represents the R groups from the amino acids comprising this polypeptide.



Given the key below, predict what the tertiary structure of this polypeptide will be.

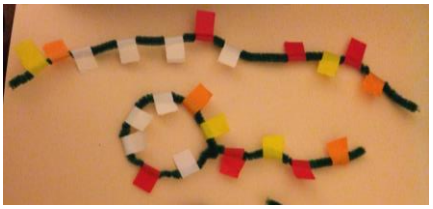
White: hydrophobic R groups

Red: hydrophilic R groups

Orange: hydrophilic R groups

Yellow: hydrophilic R groups

Suggested Answer:

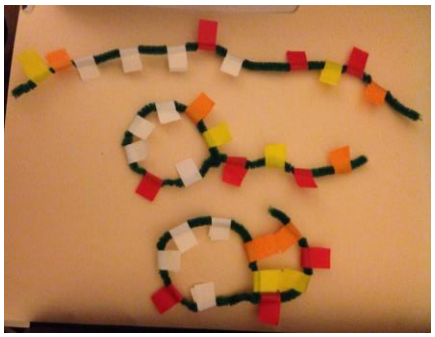


Part 2: Introduction of charged and thiol containing amino acids

Given the key below and your knowledge of the bond types that help stabilize a protein's tertiary structure, predict how the polypeptide could possible continue to fold.

- White: hydrophobic R groups
- Red: hydrophilic R groups
- Orange: -SH containing R group
- Yellow: Charged R groups (assume opposite charges)

Suggested Answer:



Part 3: Follow-up Questions

1. What is the type of bond formed between the two orange R groups?
2. What is the type of bond formed between the two yellow R groups?
3. Using the amino acid table on pg. 53 what is the only possible amino acid that can be represented by the orange tape?
4. What possible interactions are occurring between the red R groups and the aqueous environment of the cytoplasm?