1.6 What changes the shape of a protein?

Name: __________________________ Hr: ___

What have we figured out so far ...

What causes traits to change? For example, what causes one person to be albino?

What determines the function of a protein?

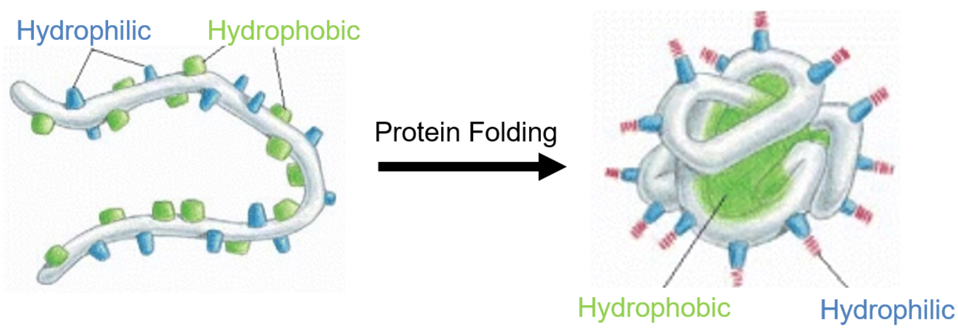
Still trying to figure out ...

What determines the shape of a protein?

Protein Structure

Proteins are a long chain of Amino Acids. There are 20 different amino acids, each with a different R group on the side. Different R groups have different properties that can cause a protein to fold. For example, some amino acids are Hydrophobic (water fearing) and other amino acids are Hydrophilic (water loving).

Hydrophilic (water loving) Amino Acids	**Hydrophobic (water fearing) Amino Acids**	**Neither - Charged Amino Acids**
Gather on the **outside** of the protein forming hydrogen bonds with water	Gather on the **inside** of the protein away from water	Not hydrophilic or hydrophobic. Tends to make salt bridges
Glutamine (Glu) Asparagine (Asn) Histidine (His) Serine (Ser) Threonine (Thr) Tyrosine (Tyr) Cysteine (Cys) Tryptophan (Trp)	Alanine (Ala) Isoleucine (Ile) Leucine (Leu) Methionine (Met) Phenylalanine (Phe) Valine (Val) Proline (Pro) Glycine (Gly)	Arginine (Arg) Lysine (Lys) Aspartic Acid (Asp) Glutamic Acid (Glu)



Using Models to see how proteins change shape:
Models help us explore scientific phenomena, especially when they are hard to experience directly (such as very small proteins). Models have rules and they help us make predictions. We are going to use a protein model to help us figure out what changes the shape of a protein.

Protein Model Rules to Follow:

- Proteins are a long chain of amino acids
- The chain can fold on itself
- Hydrophobic amino acids fold towards the inside of the protein (represented by green beads)
- Hydrophilic amino acids fold towards the outside of the protein (represented by blue beads)

Directions:

1. Work with a partner - each of you will have a different protein to create.
2. Using the sequence of amino acids provided, string the amino acid beads on a pipe cleaner.
3. When stringing the amino acids leave a small amount of space between beads and fold over the ends of the pipe cleaner so the beads don't fall off.
4. Using the protein model rules, fold your protein.
5. Compare the shape and sequence of protein with your partner.

What did you figure out?

What questions do you still have?

Could our experiences help us figure out albinism?

Amino Acid Sequences

Partner 1

Amino Acid	Code	Characteristic	Color Bead
Alanine	Ala		
Glutamine	Glu		
Asparagine	Asn		
Histidine	His		
Serine	Ser		
Threonine	Thr		
Tyrosine	Tyr		
Valine	Val		

Sketch the shape of your protein

Partner 2

Amino Acid	Code	Characteristic	Color Bead
Alanine	Ala		
Glutamine	Glu		
Asparagine	Asn		
Leucine	Leu		
Serine	Ser		
Threonine	Thr		
Tyrosine	Tyr		
Valine	Val		

Sketch the shape of your protein

Key

Amino Acid Sequences

Partner 1

Amino Acid	Code	Characteristic	Color Bead
Alanine	Ala	Hydrophobic	green
Glutamine	Glu	Hydrophilic	blue
Asparagine	Asn	Hydrophilic	blue
Histidine	His	Hydrophilic	blue
Serine	Ser	Hydrophilic	blue
Threonine	Thr	Hydrophilic	blue
Tyrosine	Tyr	Hydrophilic	blue
Valine	Val	Hydrophobic	green

Sketch the shape of your protein

Partner 2

Amino Acid	Code	Characteristic	Color Bead
Alanine	Ala	Hydrophobic	green
Glutamine	Glu	Hydrophilic	blue
Asparagine	Asn	Hydrophilic	blue
Leucine	Leu	Hydrophobic	green
Serine	Ser	Hydrophilic	blue
Threonine	Thr	Hydrophilic	blue
Tyrosine	Tyr	Hydrophilic	blue
Valine	Val	Hydrophobic	green

Sketch the shape of your protein