

Name: _____

Date: _____

Pipe-Cleaner Proteins

Your Instructions...

1. **Work with a partner.** One partner gets two long pieces of pipe cleaner from the teacher, and the other gets 8 felt pens or markers. You'll need the following 8 colours: **red, yellow, brown, green, orange, blue, purple, pink.** Each partner will colour one of the pipe cleaners.
2. Starting at one end of the pipe cleaner, colour a **2 cm segment** with one of the colours of felt pen (choose any colour you like to start with). Then leave a 1.5 cm space and colour another 2 cm segment a **different colour**, then continue on in the same fashion down the whole length of the pipe cleaner. Again, the order of colours is up to you (don't use the order listed in step 1 though), but only use each colour once. Make sure that the order you choose is **NOT** the same as your partners. *Write out the order in the boxes below:*

Strand #1								
Strand #2								

3. Once coloured from end to end, what you have represents a chain of amino acids. The coloured segments represent the amino acids and the uncoloured segments represent the bonds.

a	In the box to the right, draw an amino acid and label the groups on it.	
b	How many kinds of R groups are there?	
c	Draw a dipeptide, and colour the bond that forms between the two amino acids red.	
	What is the name of the bond that forms between two amino acids?	
e	What type of bond is this, and what is special about it?	
f	What do you call a chain of 8 amino acids?	
g	The straight chain that you've just made represents what level of protein structure?	

4. Wrap the pipecleaner around a pencil to form a spiral shape.

a	Draw the shape in the box to the right	
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b	What is the name of this shape?	
c	What causes it?	
d	What level of protein structure does it represent?	

5. Suppose that there is an attraction between the blue and the orange amino acids. Let's also suppose that a "disulfide bridge" (a covalent bond that forms between sulfur atoms in "R" groups) forms between the **red** and **green** amino acid. Let's further suppose that there is repulsion between the **purple** and **yellow** amino acids. Make your amino acid chain assume the shape that would seem the most logical, based on the information above.

a.	What level of protein structure does the chain represent now?	
b.	Compare the shape of your protein chain to that of your partners, as well as that of two other people in the class. Are they the same? What is responsible for the difference?	
c.	Using colour, make a sketch of your chain in the box to the right.	

6. Join your amino acid chain to the one that your partner made, in a way that makes sense based on the information given in step 5. Show your completed protein to your teacher.

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a. What level of protein structure does this represent now?				
b. Now that you have made your protein, what conclusions can you form about the effect of the primary structure on the shape of the protein?				
c. Exactly what determines the function of a protein?				
d. What does it mean to denature a protein?				
e. List 3 ways that proteins can be denatured.	1			
	2			
	3			
f. Summarize the functions of proteins in the table to the right.	Examples of Structural Functions		Metabolic Functions	
	1		1	
	2		2	
	3		3	
			4	
			5	

Primary Structure of Protein

