**Modeling Template Biology Grade**: 9-10 **Standard** B.5.4

**Title of investigation:** Understanding The Unique Shape and Activity of Proteins

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**Science Standard:**

B.5.4 Explain how the unique shape and activity of each protein is determined by the sequence of its amino acids.

**Leading Question(s)/Engagement:** Are all proteins created equal? What are some of the things proteins do in our bodies?

**Summary of the investigation:** In order to help students recognize that proteins have unique shapes, students will be assigned a protein class to research. They must find the function of their class of proteins, give examples that must include visual representations of their particular class of proteins, i.e. pictures, videos etc. They must also identify where these proteins can be found within an organism**.** They must also address the effect on the organism when this protein is damaged or missing.

To help students see that enzymes speed up reactions and can be denatured, students will do an enzyme lab in the traditional way (your choice). Example: “Zyme Time” from Prentice Hall. “Investigating Enzyme Function” by SEPUP. Students will then watch an animation about how enzymes form and denaturation changes the shape.

After the investigation is complete we will do a whiteboard activity. Students will then be assigned a specific enzyme and asked to find optimal temperature, pH, and function of the enzyme.

To reinforce the idea that the number and sequence of amino acids determines the protein (in this case enzyme) made, they will be asked to determine how are enzymes are created.

**Equipment used:**

For research projects:

Computer access

Animation on how enzymes work and for denaturation:

[http://Highered.mcgraw-hill.com/sites/0072943696/student\_view)/chapter2/](http://Highered.mcgraw-hill.com/sites/0072943696/student_view%29/chapter2/)

**Description of Procedures, notes (teacher manual):**

Protein classes include: enzymes, transport proteins, signaling proteins, receptor proteins, immune system and disease proteins, storage proteins, and structural proteins.

For the specific enzyme research, suggested enzymes are

Pepsin, amylase, ligase, trypsin, catalase, lactase, sucrase, hexokinase, cellulose. (Tip) Include enzymes that have different functions.

**Follow-up Science Questions:**

Why is pH and temperature homeostasis essential in humans?

Why does boiling water contaminated with disease causing bacteria make it safe to drink?

How are different enzymes created?

If an organism has cellulase, what does that tell you about the food source of the organism?

If someone is lactose-intolerant, what does that tell you about the enzyme that is missing?