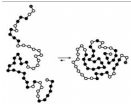

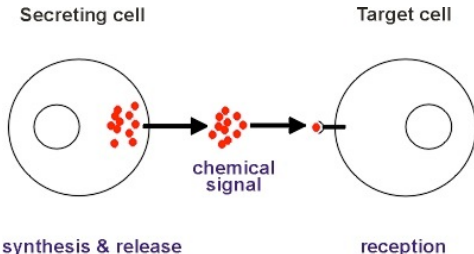

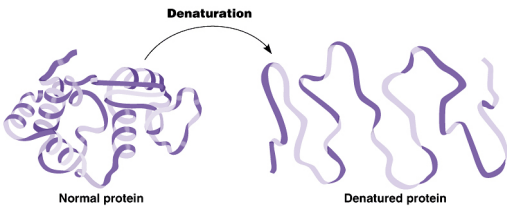


**LT: I can collect and present data to model enzyme function.**

**LE Standards: 5.1f**

Background:

<p>Structure</p>	<p><b>Enzymes are long protein chains</b> that are made of many amino acid molecules. The order of those amino acids determines the shape of the protein.</p> 	<p><b>Enzymes speed up chemical reactions</b> Enzymes are proteins that help to speed up chemical reactions. Enzymes are also known as catalysts.</p> 		
<p>Essential</p>	<p><b>Essential Amino Acids</b> There are 20 different types of amino acids that your body needs to make proteins. There are 8 of them that your body can't make. If you don't eat them then your body can't make proteins.</p>	<p><b>Receptor molecules</b> on the cell membrane are proteins that allow cells to communicate with one another.</p> 	<p><b>Essential Proteins</b> There are many different essential proteins such as hormones, antigens, antibodies, and enzymes.</p>	
<p>Specific</p>	<p><b>Enzymes and Substrates!</b> Enzymes only act on specific shapes of molecules known as substrates. The substrate attaches to the enzyme at an area known as its active site.</p>	<p><b>Enzymes are Specific!</b> Enzymes complete very specific jobs and nothing else. Like a key that only fits one lock.</p> 	<p><b>Enzyme shape is important!</b> The shape of an enzyme is very important because if the substrate does not fit the active site, the enzyme won't be able to carry out its function.</p>	<p><b>Temperature can change the rate of reaction!</b> It is possible that increasing the temperature of a system will increase the number of collisions of enzyme and substrates. Thus, within limits, the enzyme will function at it's highest levels and the rate of reaction (or how fast the reaction happens) will increase.</p>
<p>Shape</p>	<p><b>Temperature and pH can change the enzyme's shape!</b> Enzymes, like all proteins, tend to change shape at yet even higher temperatures or when in contact with strong acids and bases.</p>	<p><b>Denaturing!</b> When a protein changes shape this is known as denaturing the protein. Denaturing is permanent and cannot be reversed.</p> 		<p><b>A change in shape changes function!</b> A change in shape also changes its function so the protein doesn't work anymore.</p>



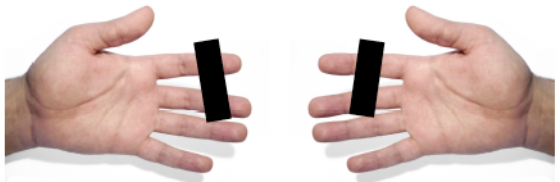
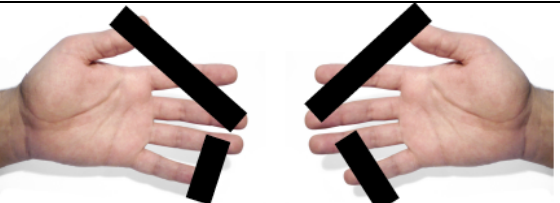

**Materials:**

-30 pennies placed heads side down

-timer

-masking tape

**Procedure:**

<p>(30°C)- Each member of the team, USING ONE HAND ONLY, will attempt to turn over as many pennies as possible so that the head side is facing up. Record the number of pennies turned over in two trials of 15 seconds each. To save time, each member of the group should do the procedure at the same time. *If there are 3 lab partners and each member does 2 trials, there will be 6 numbers recorded for this temperature.</p>	
<p>(32°C)- Each member of the team, USING BOTH HANDS, will attempt to turn over as many pennies as possible so that the head side is facing up. Record the number of pennies turned over in two trials of 15 seconds each. To save time, each member of the group should do the procedure at the same time. *If there are 3 lab partners and each member does 2 trials, there will be 6 numbers recorded for this temperature.</p>	
<p>(37°C)- Again, each member the team should wrap tape around their pointer and middle finger of both hands so neither can move independently of the other. Record the number of pennies turned over in two trials of 15 seconds each. To save time, each member of the group should do the procedure at the same time. *If there are 3 lab partners and each member does 2 trials, there will be 6 numbers recorded for this temperature.</p>	
<p>(42°C)- For the temperature change, each team member should tape the middle and pointer fingers along with their thumb. Then separately also tape the pinky and index finger together of both hands. Record the number of pennies turned over in two trials of 15 seconds each. To save time, each member of the group should do the procedure at the same time. *If there are 3 lab partners and each member does 2 trials, there will be 6 numbers recorded for this temperature.</p>	
<p>(47°C)- Each team member should make two tight fists. Record the number of pennies turned over in two trials of 15 seconds each. To save time, each member of the group should do the procedure at the same time. *If there are 3 lab partners and each member does 2 trials, there will be 6 numbers recorded for this temperature.</p>	

**Table:** Record the number of pennies turned over in 15 seconds at each temperature. Include data for each trial and calculate the average for each temperature.

**Graph:** Create a line graph to show the average number of pennies turned over in 15 seconds at each temperature.

**Conclusion/Analysis:**

1. How does temperature affect enzyme reaction rate? \*Include specific data evidence to support your claim.
2. Using the knowledge that you gained from this lab, how does a fever affect the body?
3. How did the activity *model* enzyme activity?
  - a. What represented the enzyme and substrate? What did the tape represent?
  - b. Since denaturing a protein can never be undone, how would you model the permanent denaturing of an enzyme?

	3	2	1
<b>Data Tables</b>	Table includes a title, units and numbers (including averages) rounded to the nearest tenth. All data is calculated and recorded thoroughly and accurately. There are no major errors.	Most data is calculated and recorded thoroughly and accurately. There are few major errors.	Little data is calculated and recorded thoroughly and accurately. There are many major errors.
<b>Graph</b>	The graph clearly shows the relationship between both variables. The graph accurately includes all of the following: -a title -axes labels (with units of measure) -units following constant scale -bars/lines represent correct values -a key (or labels) identify all lines/bars	The graph shows the relationship between both variables. The graph accurately includes most of the following: -a title -axes labels (with units of measure) -units following constant scale -bars/lines represent correct values -a key (or labels) identify all lines/bars	The graph partially shows the relationship between both variables. The graph accurately includes few of the following: -a title -axes labels (with units of measure) -units following constant scale -bars/lines represent correct values -a key (or labels) identify all lines/bars
<b>Conclusion/Analysis</b>	Conclusion/analysis is thorough. There are many thorough, thoughtful, and relevant reflections that communicate purpose and next steps. Specific data evidence and reasoning are included.	Conclusion/analysis is general. There are several thorough, thoughtful, and relevant reflections that communicate purpose and next steps. Specific data evidence/reasoning is limited.	Conclusion/analysis is incomplete. There are few thorough, thoughtful, and relevant reflections that communicate purpose and next steps. Specific data evidence/reasoning is not used.

<b>Participation</b>					
I often contributed good ideas that were relevant to the topic and task. I came to meetings prepared. I did my share of the work.	4	3	2	1	I seldom contributed good ideas. Sometimes I was talking off-task. I did not come to meetings prepared. I did not do my share of the work.
<b>Working with Others</b>					
I often compromised and cooperated. I did take initiative when needed and/or listened and respected the ideas of others.	4	3	2	1	I seldom compromised and cooperated. I did not take initiative when needed and/or did not listen and respect the ideas of others.
<b>Product</b>					
My part of the task is complete and accurate. My work was submitted on time.	4	3	2	1	I did not complete my part of the task. The information I presented was inaccurate and/or not done correctly. It was not completed on time.
<b>Understanding Content</b>					
I can speak about the topic and group work knowledgeably. I can sum-up the lesson.	4	3	2	1	I do not understand what I did in my group. I did not ask or answer questions. I cannot sum-up the lesson.