Virtual Lab: Enzyme Controlled Reactions
Worksheet

Go to the website: http://www.mhhe.com/biosci/genbio/virtual_labs/BL_11/BL_11.html

1. Which of the following does NOT apply to an enzyme:
   a. Catalyst
   b. Inorganic
   c. Protein
   d. All of the above apply to an enzyme

2. When an enzyme catalyzes a reaction:
   a. Substrate(s) bind in the active site
   b. Products bind in the active site
   c. The shape of the enzyme remains unchanged
   d. The enzyme is consumed by the reaction

3. Which of the following would interfere most with the ability of an enzyme to catalyze a reaction?
   a. Reduced concentration of substrate available
   b. Reduced concentration of product available
   c. Increased concentration of substrate available
   d. A change in the pH

4. Feedback mechanisms regulate the rate of enzyme activity, effectively “turning off” an enzyme in a reversible way until more product is needed. Which of the following would be most effective as a feedback mechanism?
   a. Reduced concentration of product
   b. Increased concentration of substrate
   c. A change in pH
   d. Temporary binding of a non-substrate molecule in the active site

5. Which of the following statements is accurate in describing the activity of the lactase enzyme?
   a. Lactase can function equally effectively at many different pH levels
   b. The shape of lactase does not change during the reaction
   c. Lactase is converted to glucose and galactose by the reaction
   d. One lactase enzyme can catalyze many reactions
6. Look up and write in the following definitions as they apply to chemical reactions:
   a. Catabolic
   b. Anabolic
   c. Endergonic
   d. Exergonic

7. Is the action of the enzyme illustrated in the video:
   a. Anabolic or catabolic?
   b. Endergonic or exergonic?

8. Endergonic or exergonic? Is the action of lactase:
   a. Anabolic or catabolic?
   b. Endergonic or exergonic?

9. Why is enzyme activity similar to, but not exactly like, a “Lock” and “Key”?

### Table 1: Record your data on the number of product molecules formed per minute obtained from the virtual lab.

<table>
<thead>
<tr>
<th>Amount of Substrate (Lactose)</th>
<th>pH 3</th>
<th>pH 5</th>
<th>pH 7</th>
<th>pH 9</th>
<th>pH 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 g</td>
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<tr>
<td>1.0 g</td>
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<tr>
<td>2.0 g</td>
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<tr>
<td>4.0 g</td>
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<tr>
<td>8.0 g</td>
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</tr>
</tbody>
</table>
10. What substrate amount was required to achieve the maximum reaction rate?

11. At what pH level did the maximum reaction rate occur?

12. Why was there no increase in the reaction rate with 8.0 g. of substrate as compared to 4.0 g. of substrate? What would you need to add to see an increase in the reaction rate with 8.0 g. of substrate?

13. In the graph you created in the lab simulation with your data:
   a. What is represented by the green line?
   b. what is the optimal pH for lactase enzyme activity?

14. Consider only the experiment you conducted with 0.5 g. of lactose.
   a. What is the independent variable?
   b. What is the dependent variable?

14. The maximum rate of this reaction is 350 molecules product/minute. List two changes you could make in the experimental conditions or variables that would increase this reaction rate. Explain why each change you listed will increase the reaction rate.