

Name: _____ Period: _____ Date: _____

Open **peebedu.com** and navigate to **Enzyme Lock-and-Key Interactive**. Click the **Introduction** button to read the concept cards about Enzymes, Active Site, Specificity, Substrate, ES Complex, and Rate Factors. Then close the introduction and familiarize yourself with the Simulation Controls panel on the left.

Free Response Questions

Question 1 – Conceptual Analysis

Simulation Task: *In the simulation, select Triase as the enzyme and Triangle substrate as the substrate. Set Enzyme Concentration to 1 and Substrate Concentration to 10. Click Start and observe the animation. After 15 seconds, click Stop. Then click Reset, select Triase again but change the substrate to Square substrate. Set the same concentrations and click Start. Compare the Total Reactions counter and the Molecules vs Time graph for both trials.*

(A) (1 pt) **Describe** the property of an enzyme that determines which substrate it can bind and catalyze.

(B) (1 pt) **Explain** why Triase produces products with the triangle substrate but produces no products with the square substrate.

(C) (1 pt) **Predict** what would happen to the Total Reactions counter for Triase and the triangle substrate if the shape of Triase's active site were altered so that it no longer matched the triangle substrate.

(D) (1 pt) **Justify** your prediction.

Question 2 — Analyze Model / Visual Representation

Simulation Task: *In the simulation, select Squarase as the enzyme and Square substrate as the substrate. Set Enzyme Concentration to 3 and Substrate Concentration to 25. Click Start and carefully watch the animation area. Observe what happens when an enzyme and substrate collide: note the yellow glow that appears during enzyme-substrate complex formation and what happens after the product is released. Watch the same enzyme molecule catalyze multiple reactions.*

(A) (1 pt) **Describe** what happens to an enzyme molecule in the simulation after it releases its product.

(B) (1 pt) **Explain** why biological reactions proceed at rates sufficient for life even though most biological molecules are stable at body temperature.

(C) (1 pt) **Represent** the catalytic cycle of a single enzyme by drawing a labeled diagram showing a free enzyme with its active site, the substrate bound in the enzyme-substrate complex, the product being released, and the same enzyme free again.

Draw your diagram here.



(D) (1 pt) **Explain** how the sequence of amino acids in an enzyme determines the shape of the active site that gives that enzyme its specificity.

3.1.A.1