

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 rate of product formation in a cell if a mutation changed the shape of an enzyme's active site so that it more closely resembled the active site of a different enzyme in the same metabolic pathway.

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

Question 2 — Analyze Model / Visual Representation

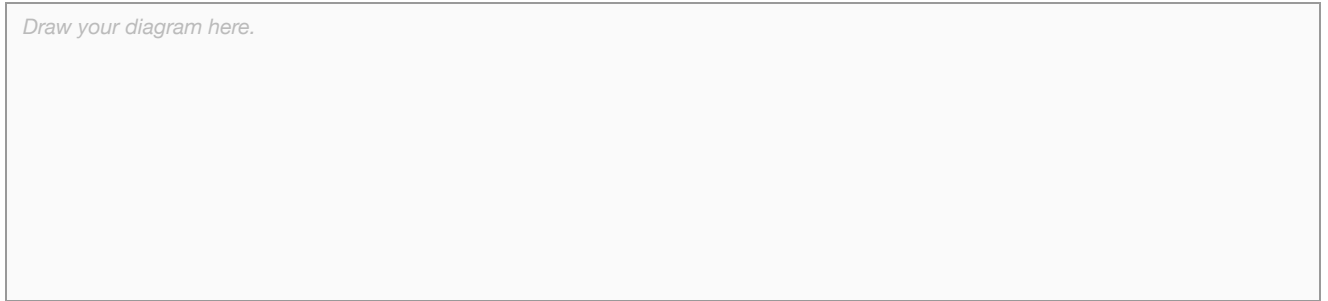
Simulation Task: *In the simulation, select **Squarase** as the enzyme and **Square substrate** as the substrate. Set Enzyme Concentration to 3 and Substrate Concentration to 25. Click **Start** and carefully watch the animation area. Observe what happens when an enzyme and substrate collide: note the 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** how an enzyme-mediated reaction proceeds from initial substrate contact to product release.

(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 enzyme-substrate complex model by drawing a labeled diagram showing a free enzyme with its active site, a substrate approaching, the enzyme-substrate complex, and the enzyme releasing the product.

Draw your diagram here.



(D) (1 pt) **Explain** how variation in enzyme structure among individuals in a population could lead to differences in reproductive success when a new substrate becomes the primary available nutrient.

3.1.A.1, EK 3.1.A.2