

PEEBEDU Enzyme Environment Explorer

Unit 3: Cellular Energetics

Name: _____ Period: _____ Date: _____

Open **peebedu.com** and navigate to **Enzyme Environment Explorer**. Use the **enzyme selector** to choose an enzyme, then adjust the **temperature** and **pH sliders** to observe how environmental conditions affect enzyme shape and catalytic activity. Try multiple enzymes to compare their optimal conditions.

Free Response Questions

Question 1 — Conceptual Analysis

Simulation Task: *In the Enzyme Environment Explorer, select Amylase. Set the temperature slider to 37 degrees C and adjust the pH slider to find the optimal pH. Note the enzyme's shape and activity level. Then slowly increase the temperature to 80 degrees C and observe what happens to the enzyme's shape and activity.*

(A) (1 pt) **Describe** the relationship between the temperature slider setting and the activity level the simulation displays for Amylase.

(B) (1 pt) **Explain** why reaction rate increases as temperature rises from 0 degrees C toward 37 degrees C but then sharply decreases as temperature continues to rise beyond the optimum.

(C) (1 pt) **Predict** what would happen to the rate of protein digestion in the stomach of an ectothermic predator if its body temperature dropped significantly due to a sudden decrease in environmental temperature.

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

Question 2 — Analyze Model / Visual Representation

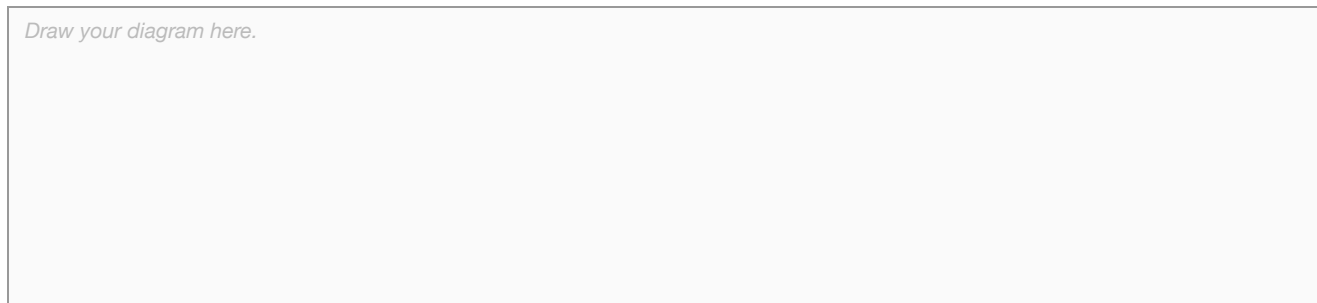
Simulation Task: *In the Enzyme Environment Explorer, select Catalase. Find the optimal temperature and pH. Then move the temperature slider to an extreme value (above 70 degrees C) to observe denaturation. Return the slider to the optimal temperature and observe whether the enzyme recovers its shape and activity.*

(A) (1 pt) **Describe** what happens to an enzyme's catalytic function when its three-dimensional shape is disrupted by an environmental change.

(B) (1 pt) **Explain** why Catalase regains its activity when the temperature slider is returned to the optimal value after a moderate increase in temperature.

(C) (1 pt) **Represent** the effect of extreme heat on an enzyme by drawing a labeled diagram of the same enzyme at its optimal temperature and at a temperature well above its optimum, with the active site shown in each state.

Draw your diagram here.



(D) (1 pt) **Explain** how the interactions that hold a protein in its tertiary shape account for an enzyme losing its activity at high temperature.

3.2.A.1, 3.2.A.2