

Name _____ Period _____ Assignment # _____

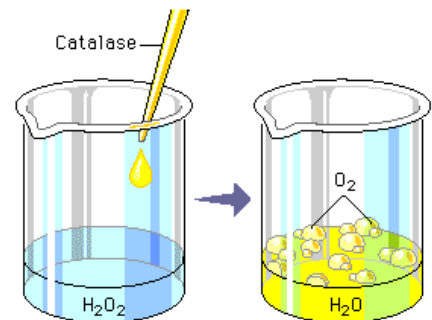
Virtual Lab 13 Enzyme Catalysis

http://www.phschool.com/science/biology_place/labbench/lab2/intro.html

- 1) How do enzymes catalyze reactions?
- 2) Define activation energy
- 3) Define substrate
- 4) What happens to an enzyme after it catalyzes a reaction?
- 5) What is the equation for the catalysis of hydrogen peroxide?

Refer to the figure to the right to answer the next 2 questions

- 6) How will you know hydrogen peroxide is being catabolized?
- 7) What molecule is making the bubbles?

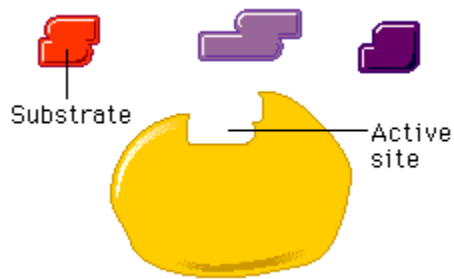


Click *Next Concept*

- 8) What are enzymes?
- 9) Define active site
- 10) What determines whether or not the substrate will bind to the active site?

Click *Next Concept*

11) Circle the substrate below that will bind to the active site



12) Explain your answer to the question above

Click *Next Concept*

13) Define induced fit

Click *Next Concept*

14) How is the shape of an enzyme maintained?

15) pH and temperature are not the only 2 factors that can affect enzyme function. Come up with at least 2 other abiotic or biotic factors that could affect enzyme function.

16) Define denatured

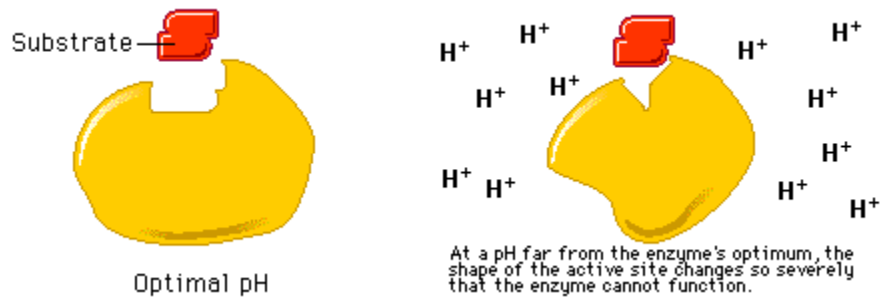
Click *Next Concept*

17) What type of pH is best for the functioning of pepsin?

18) What type of pH is best for the functioning of lipase?

19) What happens to enzymes and other proteins when there is excess H^+ or OH^- ions?

20) Explain what happened to the enzyme below and why, and what the consequence is.



Click *Next Concept*

21) What happens to chemical reactions as temperature increases?

22) What happens to enzymes and other proteins when temperature increases beyond the optimal range?

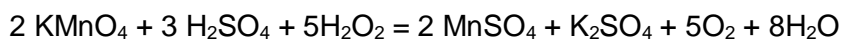
Click *Next*

23) What is used to stop the functioning of catalase?

24) What molecule is used to determine how much hydrogen peroxide remains after the reaction has been stopped?

Click *Next*

25) Explain how the amount of KMnO₄ added is used to measure the amount of H₂O₂ present. Use the equation below in your explanation.



Click *Next*

26) Define meniscus

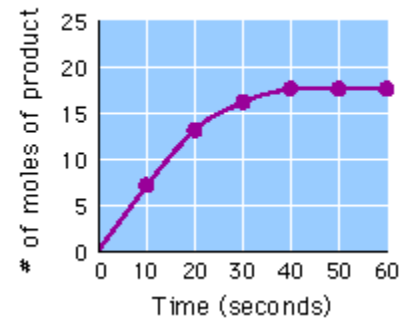
Click *Next*

27) Define mole

28) Calculate the rate in moles/second between 40 and 50 seconds.

SHOW YOUR WORK

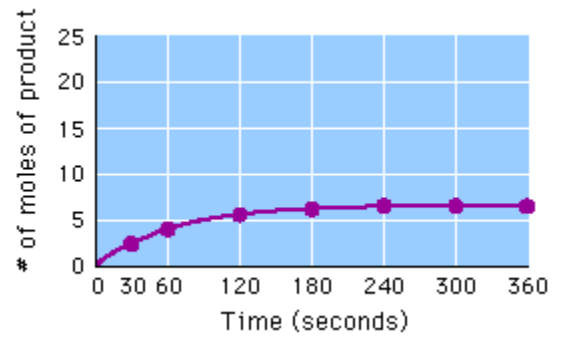
Enzyme Action Over Time



29) Explain your answer to the question above

Click *Self Quiz*

30) During what time interval is the enzyme working at its maximum velocity?



31) Explain your answer to the question above

32) In order to keep the rate constant over the entire time course, which of the following should be done?

33) Explain your answer to the question above

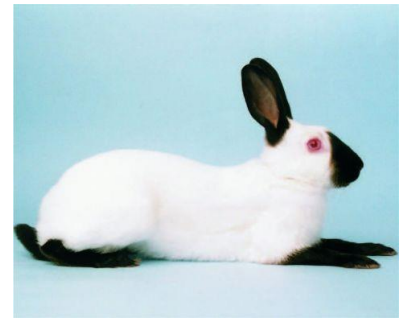
- 34) Draw a graph that represents the rate of the reaction shown above. The y-axis MUST be number of molecules/sec.
- 35) Explain your answer to the question above
- 36) What is the role of sulfuric acid (H_2SO_4) in this experiment?
- 37) Explain your answer to the question above
- 38) A student was performing a titration for this laboratory, and accidentally exceeded the endpoint. What would be the best step to obtain good data for this point?
- 39) Explain your answer to the question above
- 40) Well-preserved mammoths have been found in ice and frozen soil in northern Siberia. Using information about **enzyme activity** learned in this lab, explain why these animal carcasses have survived all of these years.

- 41) Ethylene glycol, the main ingredient in antifreeze, is an odorless, colorless, sweet-tasting water-soluble chemical that, when ingested, is a toxic poison. If a pet or human drinks antifreeze the ethylene glycol is rapidly absorbed into the circulatory system and, if not treated, will lead to organ failure and death. This treatment will consist of gastric lavage followed by an initial intravenous dose of 10% ethanol and lower ethanol doses for several hours. Ethylene glycol is metabolized by the enzyme alcohol dehydrogenase (ADH) into four toxic agents. If this reaction can be inhibited, then the kidneys will eliminate the ethylene glycol intact before the toxins are produced. Chemists know that ADH has 100X greater affinity for ethanol than for ethylene glycol.

Given your knowledge of enzyme activity and inhibitors, speculate about the mechanism by which ethanol prevents ethylene glycol poisoning and **Justify** your response.

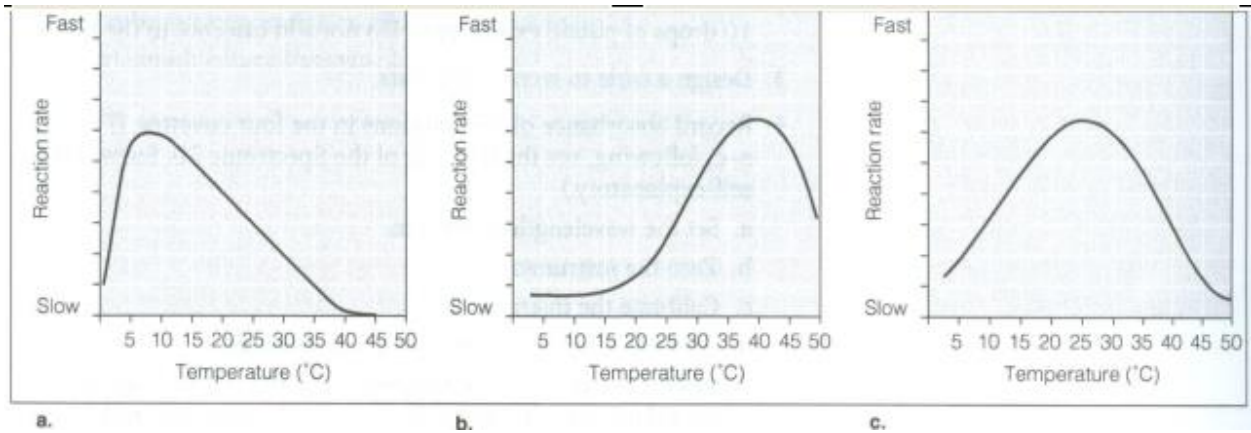
- 42) There is an enzyme that catalyzes the production of the pigment responsible for dark fur color in Siamese cats and Himalayan rabbits. This enzyme is thermolabile, meaning that it does not function at higher temperatures. Rabbits raised at 5°C are all black. If raised at 20°C, they are white with black paws, ears, and nose; they are all white when raised at 35°C.

Why are the extremities of these animals dark, while their cores are light if raised at 20°C?



- 43) Which of the following graph on the next page best represents an activity curve for thermolabile?

Explain why.



44) You are investigating a specific compound known to inhibit the activity of an enzyme. You hypothesize that the compound is a competitive inhibitor of the enzyme's activity. To test your hypothesis, you design an experiment where you add increasing amounts of the enzyme's substrate to a solution containing the enzyme, and then you test the reaction rate.

Which of the following graphs represents the predicted results of your experiment, based on your hypothesis?

Explain why.

