

Enzymes

Name _____

Date _____

Period _____

Part 1 · Vocabulary

1. Write the letter of the matching description next to each term.

- | | |
|--------------------------------|---|
| _____ Enzyme | A An inorganic ion, such as Mg^{2+} or Zn^{2+} , that an enzyme needs |
| _____ Activation energy | B Binds the active site and blocks the substrate |
| _____ Substrate | C A biological catalyst, almost always a protein |
| _____ Active site | D The molecule an enzyme acts on |
| _____ Induced fit | E Binds an allosteric site and lowers the maximal rate |
| _____ Denaturation | F The enzyme's shape shifts as the substrate binds, giving the best fit |
| _____ Competitive inhibitor | G The pocket where the substrate binds |
| _____ Noncompetitive inhibitor | H The energy input a reaction needs to reach its transition state |
| _____ Feedback inhibition | I Loss of an enzyme's structure — and its ability to catalyze — from heat, pH or chemicals |
| _____ Cofactor | J A pathway's end product slows an enzyme early in the pathway |

Part 2 · How enzymes work

2. How does an enzyme speed up a reaction?

- | | |
|--|--|
| A It lowers the activation energy | C It makes the reaction release more energy |
| B It adds energy to the reactants | D It raises the temperature of the cell |

3. Sketch an energy diagram for a reaction that releases energy, with and without an enzyme. Label the reactants, the products and the activation energy. What does the enzyme change, and what does it not change?

4. What decides whether a substrate can bind an enzyme's active site?

- | | |
|---|---|
| A Its shape and charge fitting the active site | C The temperature only |
| B Its size alone | D Whether the enzyme is already bound to a product |

5. How does the induced-fit model differ from the lock-and-key model? Use glucokinase as the example.

6. After glucokinase makes glucose 6-phosphate, what happens to the enzyme?
- A It is unchanged and can bind another glucose C It becomes part of the product
B It is used up in the reaction D It denatures

Part 3 · The environment

7. Describe and explain the shape of a graph of reaction rate against temperature for an enzyme.

8. An enzyme is heated well above its optimal temperature. Why does its rate drop?
- A Its structure is disrupted (denatured), so the active site no longer works C The substrate runs out
B Molecules move too slowly to collide D Heat raises the activation energy

9. Why does an enzyme work less well outside its optimal pH range?

10. Is denaturation always permanent?

11. How does adding more substrate change the rate of an enzyme-catalyzed reaction?

Part 4 · Inhibition and regulation

12. A statin binds in the active site of HMG-CoA reductase. What kind of inhibitor is it?

- A Competitive C Allosteric activator
B Noncompetitive D Coenzyme

13. Compare the two kinds of inhibitor.

	Where it binds	Effect on the rate	Can more substrate overcome it?
Competitive			
Noncompetitive			

14. What does an allosteric activator do? Where does it bind?

15. Isoleucine, the end product of a pathway, binds threonine deaminase, an enzyme early in that pathway. What happens?

A The pathway slows: feedback inhibition

C Isoleucine is broken down

B The pathway speeds up

D Threonine deaminase makes more isoleucine

16. ATP inhibits, and ADP activates, some enzymes of sugar breakdown. Why is this useful to the cell?

17. What is the difference between a cofactor and a coenzyme? Give one example of each.
