**Chapter 8 Review: Introduction to Metabolism**

1. Define the following terms:

a. Kinetic energy

b. Heat/thermal energy

c. Chemical energy

d. Thermodynamics

e. First Law of Thermodynamics

f. Second Law of Thermodynamics

g. Free Energy

2. Compare anabolic vs. catabolic reactions.

3. Compare exergonic vs. endergonic reactions. Which type of reaction is spontaneous? How do you know if a reaction is spontaneous?

4. Can a closed system at equilibrium do work? Why or why not?

5. List the three main kinds of cellular work done by ATP and give an example of each.

6. Label the diagram below and indicate how cellular work is done by ATP.



7. How is ATP used to do cellular work?

8. What is activation energy?

9. How does an enzyme affect a reaction?

10. Label the diagrams below including the change in free energy.

11. Define the following terms:

a. Substrate

b. Enzyme-substrate complex

c. Active site

d. Induced fit

12. Label the following diagram:



13. How do temperature and pH (specifically) affect enzyme activity?

a. Temperature

b. pH

14. How will these treatments affect an enzyme’s activity? Explain.

* Changing the pH of a solution
* Decreasing the temperature
* Increasing the temperature
* Adding more substrate
* Adding more enzyme
* Adding a competitive inhibitor
* Adding a noncompetitive inhibitor

15. Contrast a competitive inhibitor to a noncompetitive inhibitor.

16. What is a cofactor?

17. What is allosteric regulation and how does it assist in the regulation of metabolism?

18. How do an activator and an inhibitor have different effects on an allosterically regulated enzyme?

19. What is feedback inhibition? How does it allow a cell to manage its resources?

20. An experiment was conducted to measure the reaction rate of the human salivary enzyme α-amylase. Ten mL of a concentrated starch solution and 1.0 mL of α-amylase solution were placed in a test tube. The test tube was inverted several times to mix the solution and then incubated at 25oC. The amount of product (maltose) present was measured every 10 minutes for an hour. The results are given in the table below.

|  |  |
| --- | --- |
| **Time (minutes)** | **Maltose Concentration (μM)** |
| 0 | 0 |
| 10 | 5.1 |
| 20 | 8.6 |
| 30 | 10.4 |
| 40 | 11.1 |
| 50 | 11.2 |
| 60 | 11.5 |

1. **Graph** the data and **calculate** the rate of reaction for the time period of 0 to 30 minutes.
2. **Explain** why a change in the reaction rate was observed after 30 minutes.
3. **Draw** and **label** another line on the graph to predict the results if the concentration of amylase was doubled. **Explain** your predicted results.
4. **Identify** TWO environmental factors that can change the rate of an enzyme-mediated reaction. **Discuss** how each of those two factors would affect the reaction rate of an enzyme.