

Chapter 4 Objectives

Some of these objectives will not be specifically covered in class but you are responsible for being able to answer all of them.

1. State the principles of catalysis and explain how enzymes function as catalysts.
2. Explain how the names of enzymes are derived and comment on the significance of isoenzymes.
3. Describe the effects of pH and temperature on the rate of enzyme-catalyzed reactions and explain how these effects are produced.
4. Draw graphs to represent the effects of changes in temperature, pH, and enzyme substrate concentration on the rate of enzymatic reactions. Explain the mechanisms responsible for the effects you have graphed.
5. Describe the roles of cofactors and coenzymes in enzymatic reactions.
6. Explain how the law of mass action helps to account for the direction of reversible reactions.
7. Explain how enzymes work together to produce a metabolic pathway and how this pathway may be affected by end-product inhibition and inborn errors of metabolism.
8. Using arrows and letters of the alphabet, draw a flowchart of a metabolic pathway with one branch point.

9. Describe a reversible reaction and explain how the law of mass action affects this reaction.

10. Define *end-product inhibition* and use your diagram of a branched metabolic pathway to explain how this process will affect the concentrations of different intermediates.
11. Because of an inborn error of metabolism, suppose that the enzyme that catalyzed the third reaction in your pathway (objective #10 above) was defective. Describe the effects this

- would have on the concentration of the intermediates in your pathway.
12. Explain how the first and second laws of thermodynamics can be used to predict whether metabolic reactions will be endergonic or exergonic.
 13. Define the terms *exergonic reaction* and *endergonic reaction*. Use these terms to describe the function of ATP in cells.
 14. Describe the production of ATP and explain the significance of ATP as the universal energy carrier.
 15. Define the terms *oxidation*, *reduction*, *oxidizing agent*, and *reducing agent*.
 16. Describe the use of NAD and FAD in oxidation-reduction reactions and explain the functional significance of these two molecules. Explain the meaning of the symbols NAD, NADH + H⁺, FAD, and FADH₂.
 17. Using the symbols X-H₂ and Y, draw a coupled oxidation-reduction reaction. Designate the molecule that is reduced and the one that is oxidized and state which is the reducing agent and which is the oxidizing agent.

You will need to refer back to Chapter 2 for the following objectives:

18. Describe how peptide bonds are formed and broken.
19. Describe and account for the different levels of protein structure.
20. Describe the different categories of protein function in the body and explain why proteins can serve functions that are so diverse.