

Study Guide

Bioenergetics

Module 1- Module 1- Review of Biochemistry

Define the following terms:

- Metabolism
- Anabolism
- Catabolism
- Sarcolemma
- Sarcoplasm
- Endergonic reaction
- Exergonic reaction
- Oxidation
- Reduction

Study Questions:

1. Explain how catabolic and anabolic reactions are related to metabolism.
2. What is the purpose of “bioenergetics”?
3. Describe the general structure and features of a muscle cell.
4. What is the role of NAD and FAD in the metabolic process?
5. Describe the “lock-and-key” model of enzyme activity.
6. How do pH and temperature affect enzyme activity?
7. What are the different classifications of enzymes and what do they do?

Module 2- Fuel Sources for Exercise

Define the following terms:

- ATP
- Hydrolysis
- Glycogen
- Glycogenolysis

Study Questions:

1. Describe the different types of carbohydrates.
2. Describe the different types of fats.
3. How are proteins structured? What is their role in exercise metabolism?
4. Describe how energy is released from an ATP molecule.
5. Describe the process and purpose of the creatine kinase and myokinase reactions.

Module 3- Energy Systems

- Anaerobic metabolism
- Aerobic metabolism
- Beta-oxidation
- Electron Transport Chain

Study Questions:

1. List the 3 Energy Systems.
2. What is the difference between aerobic and anaerobic metabolism? Which energy systems are anaerobic? Which are aerobic?
3. What is the purpose of the energy systems?
4. Describe the ATP-PC System in detail.
 - a. Where does it occur?
 - b. What is the biochemical pathway?
 - c. What is the “substrate”?
 - d. When is it “used”?
5. Explain whether or not exogenous creatine supplementation can be beneficial for performance. Explain.
6. Describe glycolysis in detail.
 - a. Where does it occur?
 - b. What is the biochemical pathway?
 - c. What is the “substrate”?
 - d. When is it “used”?
7. How does glycolysis differ when starting with glycogen vs glucose?
8. When does glycolysis “end”? What is the end product? What happens to this end product if anaerobic conditions are present? What happens if aerobic conditions are present?
9. What is the difference between lactic acid and lactate? Which one exists in the body?
10. Describe the aerobic/oxidative energy system.
 - a. Where does it occur?
 - b. What is the biochemical pathway?
 - c. What is the “substrate”?
 - d. When is it “used”?
11. What is the purpose of the Krebs’ Cycle? The ETC?
12. What is the process of B-oxidation?

13. What intermediate does the aerobic metabolism of carbohydrates, fats, and protein, have in common?
14. What are the rate-limiting enzymes for each energy system?
15. What factors stimulate/ “turn on” or inhibit/“turn off” each energy system?
16. What determines which energy system is being used? Explain and give examples.

Additional Study Tools:

Use the following table to help organize the details of the energy systems:

Energy System	Substrate(s)	Location	Rate of Process	ATP Produced	Rate Limiting Enzyme
ATP-PC					
Glycolysis					
Aerobic Oxidation					

