Chapter 5 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. List in order the steps of aerobic or cellular respiration.
2. Define the term ***glycolysis*** in terms of its initial substrates and products. Explain why there is a net gain of two molecules of ATP in this process.
3. Describe the steps of glycolysis and discuss the significance of this metabolic pathway. How many steps are there to glycolysis?
4. Discuss why glucose is converted to glucose 6-phosphate in the cell.
5. Discuss the two meanings of the term anaerobic respiration. As the term is used in the text, what are the initial substrates and final products? (You may need to define ***substrates*** and ***final products***.)
6. Describe the physiological functions of anaerobic respiration. In which tissue(s) is/are anaerobic respiration normal? In which tissues(s) is/are it abnormal?
7. Describe the pathways by which glucose and glycogen can be interconverted. Explain why only the liver can secrete glucose derived from its stored glycogen.
8. Describe how and why lactic acid is formed and explain the physiological significance of this pathway. Would this pathway be affected by liver disease? Kidney disease? Heart disease?
9. Define the term ***gluconeogenesis*** and explain how this process replenishes the glycogen stores of skeletal muscles following exercise.
10. Describe the Cori cycle.
11. Diagram the Cori cycle.
12. Describe the pathway for the aerobic respiration of glucose through the steps of the Krebs cycle. Include what

products that are needed for the Krebs cycle and the products formed. Can the Krebs cycle occur in an anaerobic environment? Explain.

13. Explain the functional significance of the Krebs cycle in relation to the electron-transport system.
14. Describe the electron-transport system and oxidative phosphorylation. Can the electron-transport system occur in an anaerobic environment? Explain.
15. Describe the role of oxygen in aerobic respiration.
16. Explain how ATP molecules are produced in the process of oxidative phosphorylation.
17. Explain why a cell gets an average of 2.5 ATP from NADH in the mitochondrion and 1.5 ATP from $FADH_2$. You will need to use Figure 5.10 to help with your explanation.
18. Compare the lactic acid pathway and aerobic respiration in terms of initial substrates, final products, cellular locations, and the total number of ATP molecules produced per glucose molecule. Which would be the preferred pathway to maximize the number of ATP produced?
19. Compare the fate of pyruvic acid in aerobic respiration with its fate in anaerobic respiration.
20. Explain how many ATP can be formed from NADH and $FADH_2$. Know where these compounds are formed and how many are formed during each step of anaerobic respiration. Know Table 5.1.
21. Explain why the NADH produced during glycolysis yields fewer ATP than that produced in the Krebs cycle.
22. Describe the chemiosmotic theory of ATP production in the mitochondria. See Figure 5.10.
23. Explain how glucose and glycogen can be interconverted and how the liver can secrete free glucose derived from its stored glycogen.
24. Define the terms ***lipolysis*** and ***β-oxidation*** and explain how these processes function in cellular energy production.

25. Explain how ketone bodies are formed.
26. Describe the process of oxidative deamination and transamination of amino acids and explain how these processes can contribute to energy production.
27. Explain how carbohydrates or proteins can be converted to fat in terms of the metabolic pathways involved.
28. State the preferred energy sources of different organs.
29. **KNOW Table 5.1**