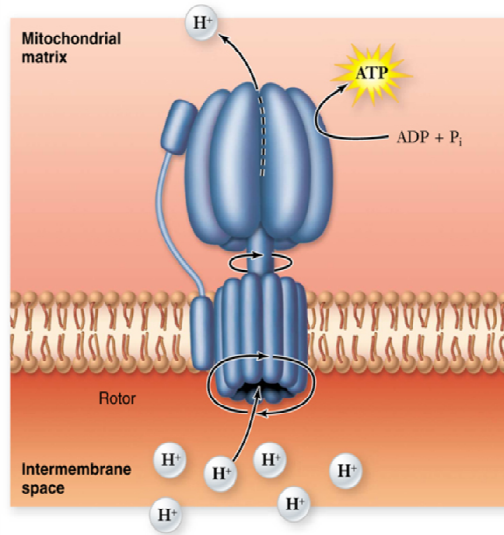


# CHAPTER 7 - HOW CELLS HARVEST ENERGY



1. Define the following terms

a. **autotrophs** \_\_\_\_\_

b. **heterotrophs** \_\_\_\_\_

c. **digestion** \_\_\_\_\_

d. **catabolism** \_\_\_\_\_

e. **aerobic respiration** \_\_\_\_\_

f. **anaerobic respiration** \_\_\_\_\_

g. **fermentation** \_\_\_\_\_

2. In what bonds is the chemical energy stored in fats and in carbohydrates?

\_\_\_\_\_  
\_\_\_\_\_

3. How is energy stored in chemical bonds?

\_\_\_\_\_  
\_\_\_\_\_

4. Identify some activities the cell uses ATP for.

\_\_\_\_\_  
\_\_\_\_\_

5. Explain why ATP is such a “high energy” molecule.

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6. How does ATP drive endergonic reactions? How does ATP function in “coupled reactions”?

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7. Explain how **ATP synthase** produces ATP.

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8. Briefly distinguish between the two methods of producing ATP in respiration:

a. **substrate-level phosphorylation** \_\_\_\_\_  
\_\_\_\_\_

b. **aerobic respiration** \_\_\_\_\_  
\_\_\_\_\_

9. List the four stages of **cellular respiration**:

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_

10. **STAGE 1: Glycolysis**

- a. occurs where? \_\_\_\_\_
- b. starts with? \_\_\_\_\_
- c. produces? \_\_\_\_\_
- d. yields how much ATP? \_\_\_\_\_
- e. produces ATP through what process? \_\_\_\_\_

11. Why is glycolysis thought to be one of the earliest of all biochemical processes to have evolved?

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12. **STAGE 2: Oxidation of Pyruvate**

- a. occurs where? \_\_\_\_\_
- b. starts with? \_\_\_\_\_
- c. produces? \_\_\_\_\_
- d. yields how much ATP? \_\_\_\_\_

13. If the body has enough ATP, what is the fate of acetyl-CoA?

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14. **STAGE 3: The Krebs Cycle**

- a. occurs where? \_\_\_\_\_
- b. starts with? \_\_\_\_\_
- c. produces? \_\_\_\_\_
- d. yields how much ATP? \_\_\_\_\_
- e. produces ATP through what process? \_\_\_\_\_

15. What is the major function of the Krebs cycle?

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16. Define each of the following:

- a. **oxidation** \_\_\_\_\_
- b. **reduction** \_\_\_\_\_

17. What are the roles of **NAD<sup>+</sup>** & **FAD** in respiration?

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**18. STAGE 4: The Electron Transport Chain**

- a. occurs where? \_\_\_\_\_
- b. starts with? \_\_\_\_\_
- c. produces? \_\_\_\_\_
- d. yields how much ATP? \_\_\_\_\_
- e. produces ATP through what process? \_\_\_\_\_

19. What is the final electron acceptor in the Electron Transport Chain? \_\_\_\_\_

20. Describe the role of the Electron Transport Chain. What happens to the electrons and  $H^+$ ?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

21. What is **chemiosmosis** and how is it generated?

\_\_\_\_\_

\_\_\_\_\_

22. Explain why respiration is considered exergonic.

\_\_\_\_\_

\_\_\_\_\_

23. What is the main reason energy is harvested in stages in respiration

\_\_\_\_\_

\_\_\_\_\_

24. What happens to most of the energy released during cell respiration?

\_\_\_\_\_

\_\_\_\_\_

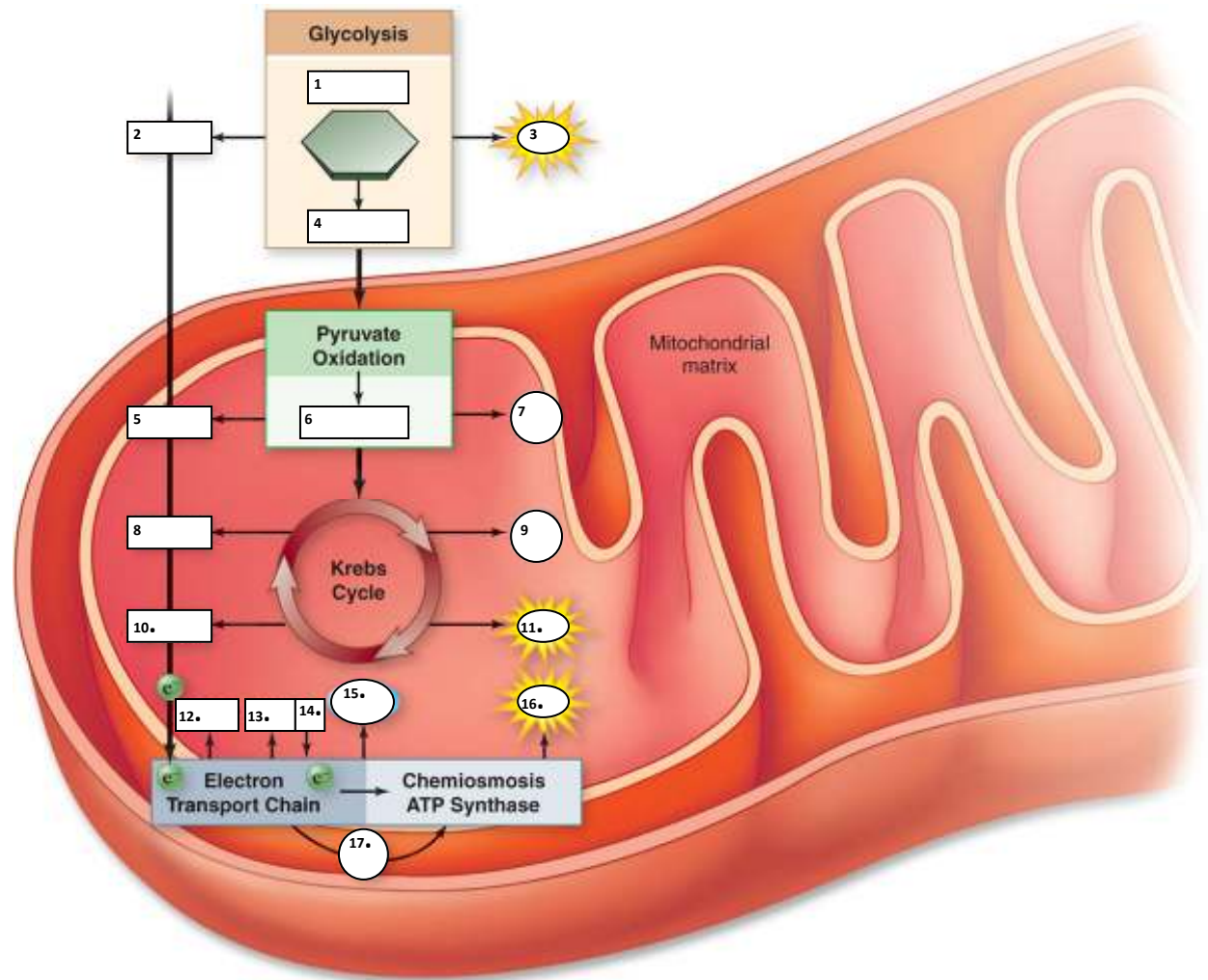
25. What is the theoretical ATP yield of aerobic respiration? ...the actual yield? Explain why they differ.

\_\_\_\_\_

\_\_\_\_\_

26. Write the summary equation for cellular respiration: \_\_\_\_\_
- a. Where did the glucose come from? Where did it go? \_\_\_\_\_
- b. Where did the O<sub>2</sub> come from? Where did it go? \_\_\_\_\_
- c. Where did the CO<sub>2</sub> come from? Where did it go? \_\_\_\_\_
- d. Where did the H<sub>2</sub>O come from? \_\_\_\_\_
- e. Where did the ATP come from? \_\_\_\_\_
- f. What else is produced that is not listed in this equation? \_\_\_\_\_

27. Label the diagram.



28. Glucose catabolism is controlled by what 2 factors? Be specific.
- a. \_\_\_\_\_
- b. \_\_\_\_\_

29. Identify examples of each of the following feedback mechanisms in aerobic respiration:

a. negative feedback \_\_\_\_\_

b. positive feedback \_\_\_\_\_

30. List two classes of prokaryotes that utilize anaerobic respiration and explain what molecules they use as electron acceptors (instead of oxygen).

a. \_\_\_\_\_

b. \_\_\_\_\_

31. **Fermentation**

a. Alcoholic fermentation converts glucose to \_\_\_\_\_

b. Alcoholic fermentation is utilized by what organisms? \_\_\_\_\_

c. Lactic acid fermentation converts glucose to \_\_\_\_\_

d. Lactic acid fermentation is utilized by what organisms? \_\_\_\_\_

32. What is the fate of these other organic molecules when they are used as fuel molecules:

a. proteins \_\_\_\_\_

b. fats \_\_\_\_\_

33. What are the 5 major milestones of metabolism that evolved before atmospheric oxygen was present?

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

e. \_\_\_\_\_

**34. Critical Thinking:**

a. Why do we eat? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

b. Why do we breathe? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_