

CHAPTER 8

Study Guide

Section 1: How Organisms Obtain Energy

In your textbook, read about how organisms obtain energy.

Match the definition in Column A with the term in Column B.

Column A

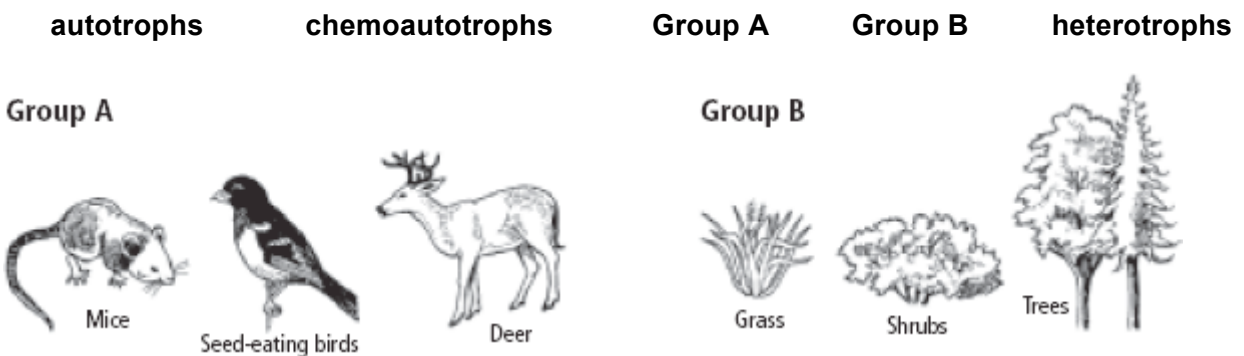
- _____ 1. the idea that energy cannot be created or destroyed
- _____ 2. all the chemical reactions in a cell
- _____ 3. anabolic pathway that converts energy from the Sun to chemical energy for use by cells
- _____ 4. ability to do work
- _____ 5. series of chemical reactions in which the product of one reaction is the substrate for the next reaction
- _____ 6. biological molecule that provides chemical energy
- _____ 7. study of the flow and transformation of energy
- _____ 8. source of nearly all energy for life
- _____ 9. catabolic pathway that breaks down organic molecules
- _____ 10. spontaneous increase in disorder, or entropy

Column B

- A.** energy
- B.** thermodynamics
- C.** first law of thermodynamics
- D.** second law of thermodynamics
- E.** metabolism
- F.** photosynthesis
- G.** cellular respiration
- H.** metabolic pathway
- I.** adenosine triphosphate (ATP)
- J.** sunlight

In your textbook, read about autotrophs and heterotrophs.

Refer to the illustrations. Use each of the terms below only once to complete the passage.



The group that makes their own food is (11) _____. The organisms in this group are called (12) _____. The group that must eat other organisms for food is (13) _____. The organisms in this group are called (14) _____. Some organisms get their energy from inorganic substances, such as hydrogen sulfide. These organisms are called (15) _____.

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Section 2: Photosynthesis

In your textbook, read about light reactions.

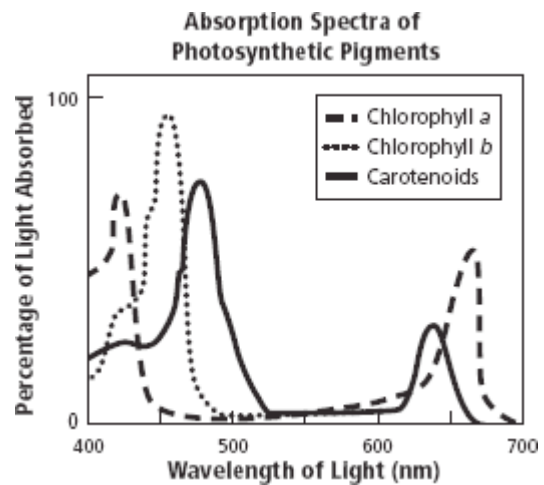
Number the following steps of light reactions in the order in which they occur.

- _____ 1. The energy lost by electrons as they pass through the electron transport chain is used to make ATP.
- _____ 2. The electrons pass from the chlorophyll to an electron transport chain.
- _____ 3. Sunlight strikes the chlorophyll molecules in the thylakoid membranes.
- _____ 4. NADP⁺ molecules change to NADPH as they carry the electrons to the stroma of the chloroplast.
- _____ 5. Light energy is transferred to the chlorophyll's electrons.
- _____ 6. The electrons are passed down a second electron transport chain.

Refer to the graph. Respond to each statement.

7. Explain why there are usually several types of pigments present in chloroplasts.

8. State the name of the pigment that absorbs the most light at about 450 nm. _____



In your textbook, read about the Calvin cycle and alternative photosynthesis pathways.

Complete the table by checking the correct column(s) for each description.

Description	Calvin	C ₄	CAM
9. The second phase of photosynthesis, in which energy is stored in glucose			
10. Pathway(s) that help(s) plants photosynthesize while minimizing water loss			
11. Pathway that allows carbon dioxide to enter leaves only at night			
12. Light-independent reactions			
13. Uses the enzyme rubisco to convert carbon dioxide into molecules that can be used by the cell			
14. Type of plant found in hot, dry environments			

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Study Guide

Section 3: Cellular Respiration

In your textbook, read about cellular respiration and glycolysis.

Use each of the terms below only once to complete the passage.

- | | | | | | |
|----------------|-------------------|---------------------|-----------------------------|------------------|---------------|
| aerobic | anaerobic | ATP | cellular respiration | cytoplasm | energy |
| glucose | glycolysis | mitochondria | NADH | oxygen | |

Organisms obtain energy in a process called (1) _____. This process harvests electrons from carbon compounds, such as (2) _____, and uses that energy to make (3) _____. ATP is used to provide (4) _____ for cells to do work. In (5) _____, glucose is broken down into pyruvate. Glycolysis is a(n) (6) _____ process because it does not require oxygen. Glycolysis takes place in the (7) _____. Two molecules of ATP and two molecules of (8) _____ are formed for every glucose molecule that is broken down. (9) _____ respiration takes place in the (10) _____. It is aerobic because the process requires (11) _____.

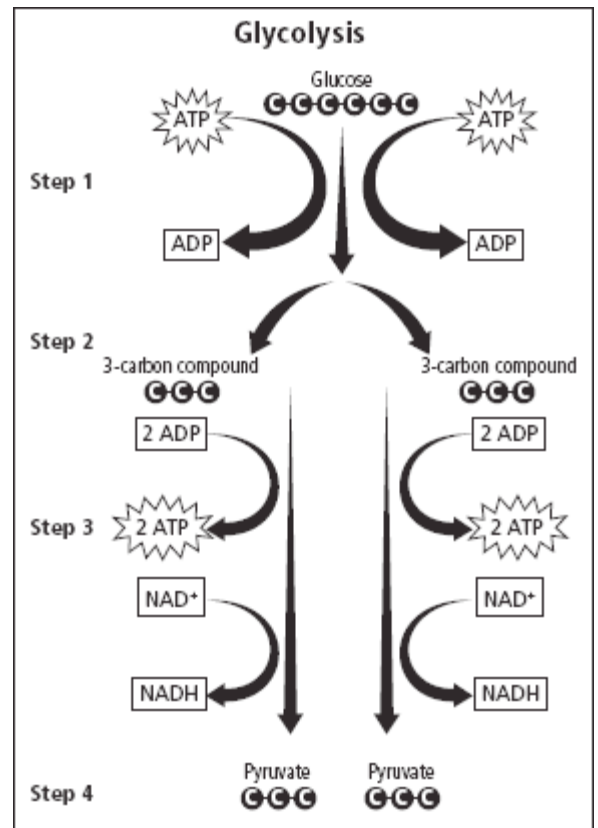
Refer to the diagram of glycolysis. Label the steps in the description to match the diagram.

- 12. Step _____. Each three-carbon compound is converted into a three-carbon pyruvate.
- 13. Step _____. A six-carbon compound is broken down into two three-carbon compounds.
- 14. Step _____. Phosphate groups from two ATP molecules are transferred to a glucose molecule.
- 15. Step _____. Two NADH molecules and four ATP molecules are produced.

Respond to each question.

- 16. **Interpret** How many total ATP molecules are produced from the glycolysis of one six-carbon glucose?

- 17. **Explain** Why is there a net gain of only two ATP molecules in the glycolysis of one six-carbon glucose?



Study Guide, Section 3: Cellular Respiration continued

In your textbook, read about the Krebs cycle, electron transport, and anaerobic respiration.

Refer to the diagram of cellular respiration. Respond to each question and statement.

18. **Recall** What is the net yield of ATP produced by each of the circled processes in the diagram?

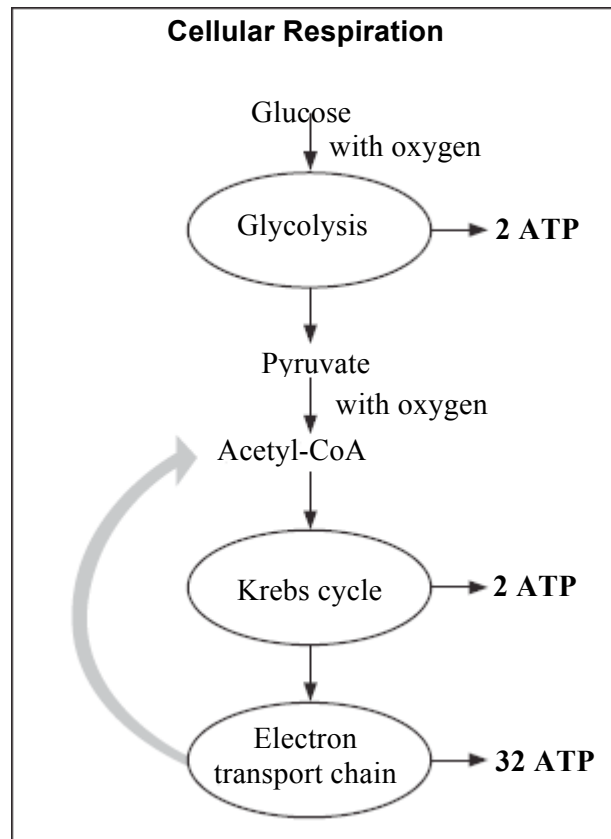
Glycolysis = _____ ATP

Krebs cycle = _____ ATP

Electron transport chain = _____ ATP

19. **Find** the total net yield of ATP from one molecule of glucose.

20. **Specify** Based on the diagram and your calculations, which process produces more energy—the anaerobic pathway or the aerobic pathway?



For each statement below, write true or false.

- _____ 21. The anaerobic pathway that follows glycolysis in the absence of oxygen is fermentation.
- _____ 22. The hydrogen necessary in the electron transport chain comes from the splitting of carbon dioxide molecules.
- _____ 23. Cellular respiration in eukaryotes is slightly more efficient than in prokaryotes.
- _____ 24. The Krebs cycle is sometimes called the TCA cycle or the citric acid cycle.
- _____ 25. Fermentation occurs in the mitochondria.
- _____ 26. Skeletal muscle produces lactic acid when the body cannot supply enough oxygen.
- _____ 27. Alcohol fermentation is found in some bacteria and in humans.
- _____ 28. The two pyruvate molecules formed during glycolysis result in two Krebs cycles.
- _____ 29. Electron transport is the first step in the breakdown of glucose.