

# Chapter 9: Photosynthesis and Cellular Respiration

## Concept Mapping

Using the terms and phrases provided below, complete the concept map showing the characteristics of cellular respiration.

anaerobic process

electron transport chain

fermentation

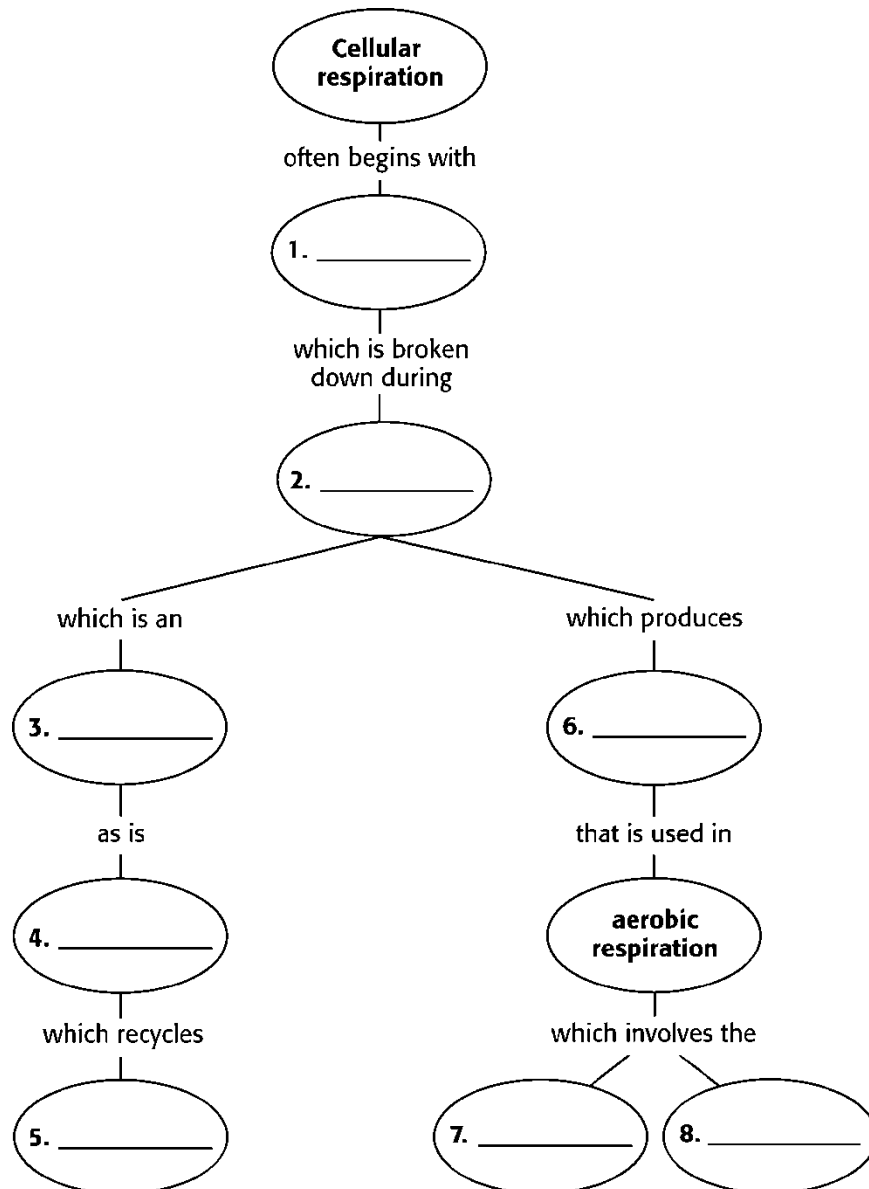
glucose

glycolysis

Krebs cycle

NAD<sup>+</sup>

pyruvate



# Chap 9 - Vocabulary Review

---

Write the correct term from the list below in the space next to its definition.

aerobic	cellular respiration	Krebs cycle
anaerobic	chlorophyll	photosynthesis
ATP	electron transport chain	pigment
ATP synthase	fermentation	thylakoid
Calvin cycle	glycolysis	

- \_\_\_\_\_ 1. the process some organisms are able to use by which they convert light energy to chemical energy
- \_\_\_\_\_ 2. the main method photosynthesizing organisms use for carbon dioxide fixation
- \_\_\_\_\_ 3. a set of chemical reactions that break down pyruvate, producing electron carriers for an electron transport chain that powers ATP production
- \_\_\_\_\_ 4. the process cells use to produce energy from carbohydrates
- \_\_\_\_\_ 5. a substance that absorbs some wavelengths of light and reflects others, giving something its color
- \_\_\_\_\_ 6. the green substance that absorbs light and provides energy for photosynthesis
- \_\_\_\_\_ 7. disc-shaped sacs in chloroplasts in which photosynthesis takes place
- \_\_\_\_\_ 8. the series of molecules in the inner membranes of chloroplasts and mitochondria down which excited electrons pass, releasing energy for ATP production
- \_\_\_\_\_ 9. process by which  $\text{NAD}^+$  is recycled under anaerobic conditions in order to continue the break down of carbohydrates to supply energy for producing ATP
- \_\_\_\_\_ 10. adenosine triphosphate, a substance that stores and releases energy for most cell processes
- \_\_\_\_\_ 11. describes a process that requires oxygen
- \_\_\_\_\_ 12. describes a process that does not require oxygen
- \_\_\_\_\_ 13. the process by which glucose is broken down into pyruvate in the absence of oxygen, producing a small amount of ATP
- \_\_\_\_\_ 14. the enzyme that aids in the production of adenosine triphosphate and which also acts as a carrier protein for hydrogen ions in active transport across a membrane

# 9.1 - Directed Reading

---

## Section: Energy in Living Systems

In the space provided, write the letter of the description that best matches each term.

- |                               |   |
|-------------------------------|---|
| _____ 1. photosynthesis       | a. involves building molecules that can be used as an energy source, or breaking down molecules in which energy is stored                                 |
| _____ 2. autotroph            |   |
| _____ 3. cellular respiration | b. the process by which plants, algae, and some bacteria use energy from sunlight to combine carbon dioxide and water, producing carbohydrates and oxygen |
| _____ 4. metabolism           | c. an organism that is able to use sunlight to make organic compounds that serve as food  |
|                               | d. the process by which cells get energy from carbohydrates   |

Determine the order in which the steps of energy flow through the ecosystem take place. Write the number of each step in the space provided.

- \_\_\_\_\_ 5. Animals get energy by eating autotrophs, substances produced by autotrophs, or organisms that consume autotrophs.
- \_\_\_\_\_ 6. Autotrophs absorb sunlight.
- \_\_\_\_\_ 7. Autotrophs use energy from sunlight to make organic compounds.
- \_\_\_\_\_ 8. Light from the sun reaches Earth.

Read each question, and write your answer in the space provided.

9. List the inputs (the products needed) for photosynthesis.
- \_\_\_\_\_
10. List the outputs of (what is produced through) photosynthesis.
- \_\_\_\_\_
11. List the inputs (the products needed) for cellular respiration.
- \_\_\_\_\_
12. List the outputs of (what is produced through) cellular respiration.
- \_\_\_\_\_
13. In which type of organelle does photosynthesis take place?
- \_\_\_\_\_

# 9.2 - Directed Reading

---

## Section: Photosynthesis

Read each question, and write your answer in the space provided.

1. Describe the structure of a chloroplast. How do the inner membranes differ from the outer membranes?

---

---

---

Complete each statement by writing the correct term in the space provided.

Flat discs inside chloroplasts that are arranged in stacks are called

(2) \_\_\_\_\_ (3) \_\_\_\_\_ are light-absorbing

substances that are inside chloroplasts. They absorb light of different

(4) \_\_\_\_\_. The green pigment in plants that is essential for photosynthesis is (5)

\_\_\_\_\_. Light energy absorbed by this pigment excites (6) \_\_\_\_\_.

They are transferred to a(n)

(7) \_\_\_\_\_. Then they move down an electron transport

chain.

Read each question, and write your answer in the space provided.

8. Summarize the three steps in the electron transport chain that produces ATP.

---

---

---

9. Summarize the two steps in the electron transport chain producing NADPH.

---

---

---

**Study the following stages of photosynthesis. Determine the order in which the stages take place. Write the order of each stage in the space provided.**

- \_\_\_\_\_ 10. Energy stored in ATP and NADPH powers the formation of organic compounds, using carbon dioxide.
- \_\_\_\_\_ 11. Energy is captured from sunlight.
- \_\_\_\_\_ 12. Light energy is converted to chemical energy, which is temporarily stored in ATP and NADPH.

**Read each question, and write your answer in the space provided.**

13. What are ATP and NADPH used for in photosynthesis?

---

---

---

14. Describe the four steps of the Calvin cycle?

---

---

---

---

---

---

15. What are three environmental factors that affect photosynthesis?

---

14. In which type of organelle does cellular respiration take place?

---

15. In the space provided, make a diagram that shows how the products of photosynthesis and the products of cellular respiration cycle through the ecosystem in the carbon cycle. Indicate the organelles involved.

16. What is the difference between getting energy from cellular respiration and getting energy from a log by burning it?

---

---

17. Why is ATP called a portable “energy currency”?

---

---

18. How is energy released from ATP?

---

---

---

19. What is ATP synthase, what does it do, and what is the process it powers?

---

---

---

20. Define the electron transport chain and describe its locations and purpose?

---

---

---

## 9.3 - Directed Reading

---

### Section: Cellular Respiration

Complete each statement by writing the correct term or phrase in the space provided.

1. Cells harvest the energy in organic compounds to make ATP through a process called \_\_\_\_\_.
2. In this process, cells transfer energy from organic compounds to \_\_\_\_\_.
3. The primary fuel for cellular respiration is \_\_\_\_\_.
4. The first stage of cellular respiration is called \_\_\_\_\_.

**Read the question, and write your answer in the space provided.**

5. There are three main steps in glycolysis. What are the starting and ending products for each step?

---

---

---

---

---

**Complete each statement by writing the correct term in the space provided.**

6. Glycolysis takes place without oxygen, so it is \_\_\_\_\_.

7. Metabolic processes requiring oxygen are \_\_\_\_\_. They release \_\_\_\_\_ energy than processes that don't require oxygen.

8. The first stage of aerobic respiration is the \_\_\_\_\_. It begins with \_\_\_\_\_, the end product of glycolysis. It can result in the production of up to \_\_\_\_\_ molecules.

**Read the question, and write your answer in the space provided.**

9. What happens during the Krebs cycle when carbon-carbon bonds are broken or rearranged?

---

10. What happens during the Krebs cycle as electrons pass down the electron transport chain? Where does this step take place?

---

---

11. How does the electron transport chain active during the Krebs cycle affect the hydrogen ion concentration in a mitochondrion?

---

12. What is the role of ATP synthase in the Krebs cycle?

---

13. How is water formed as a by-product of the Krebs cycle?

---

---

**Complete each statement by writing the correct term or phrase in the space provided.**

14. When oxygen is not present, the \_\_\_\_\_  
\_\_\_\_\_ does not function.

15. Two types of fermentation are \_\_\_\_\_ and \_\_\_\_\_  
\_\_\_\_\_ fermentation.

16. The role of fermentation in cellular respiration is to recycle \_\_\_\_\_ so that  
\_\_\_\_\_ can continue to be made by \_\_\_\_\_.

**Read the question, and write your answer in the space provided.**

17. Which is most efficient in producing ATP: glycolysis, fermentation, or the Krebs cycle? Why?

---

---