

Study Guide

KEY CONCEPT

The overall process of cellular respiration converts sugar into ATP using oxygen.

VOCABULARY

cellular respiration	anaerobic
aerobic	Krebs cycle
glycolysis	

MAIN IDEA: Cellular respiration makes ATP by breaking down sugars.

1. What is cellular respiration?

It releases chemical energy from sugars to make ATP

2. Why is cellular respiration called an aerobic process?

It needs oxygen to take place

3. Where does cellular respiration take place?

In the mitochondrion

4. What happens during glycolysis?

Glucose is split into 2 three carbon molecules

MAIN IDEA: Cellular respiration is like a mirror image of photosynthesis.

5. In what two ways does cellular respiration seem to be the opposite of photosynthesis?

Photosynthesis absorbs sunlight energy and build sugars

Cellular respiration breaks down sugar to get energy The products of one are the reactants of the other

6. In which two parts of a mitochondrion does cellular respiration take place?

the matrix and the inner membrane

7. Write the chemical equation for the overall process of cellular respiration.

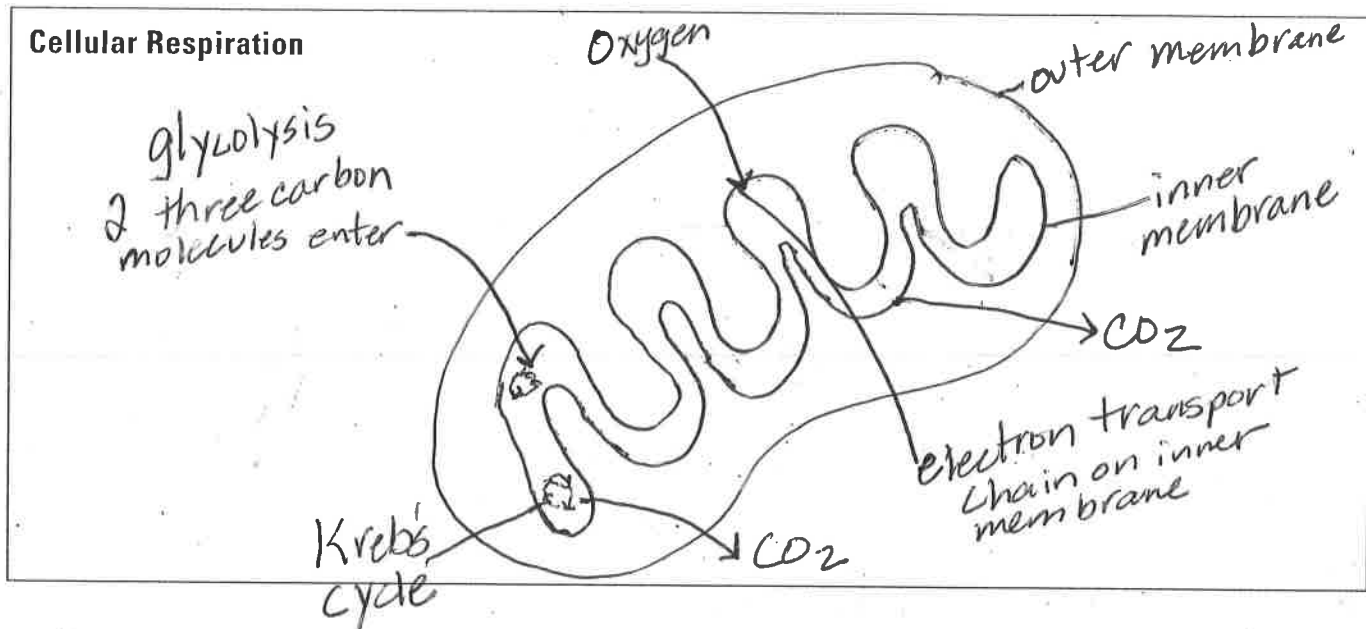


8. Explain what the equation means. Identify the reactants, products, and the meaning of the several arrows.

Reactants - $C_6H_{12}O_6$, O_2 Products - CO_2 , H_2O

There are several arrows because many steps and many enzymes are involved

Use the space below to sketch and label a mitochondrion. On the sketch, write the four steps of the cellular respiration process that occur in the mitochondrion.



Vocabulary Check

9. The prefix *glyco-* comes from a Greek word that means “sweet.” The suffix *-lysis* comes from a Greek word that means “to loosen.” How are the meanings of these word parts related to the meaning of *glycolysis*?

To loosen a sweet or to cut a sugar, glycolysis means cut a sugar into 3 carbon molecules

10. What does it mean to say that glycolysis is an anaerobic process?

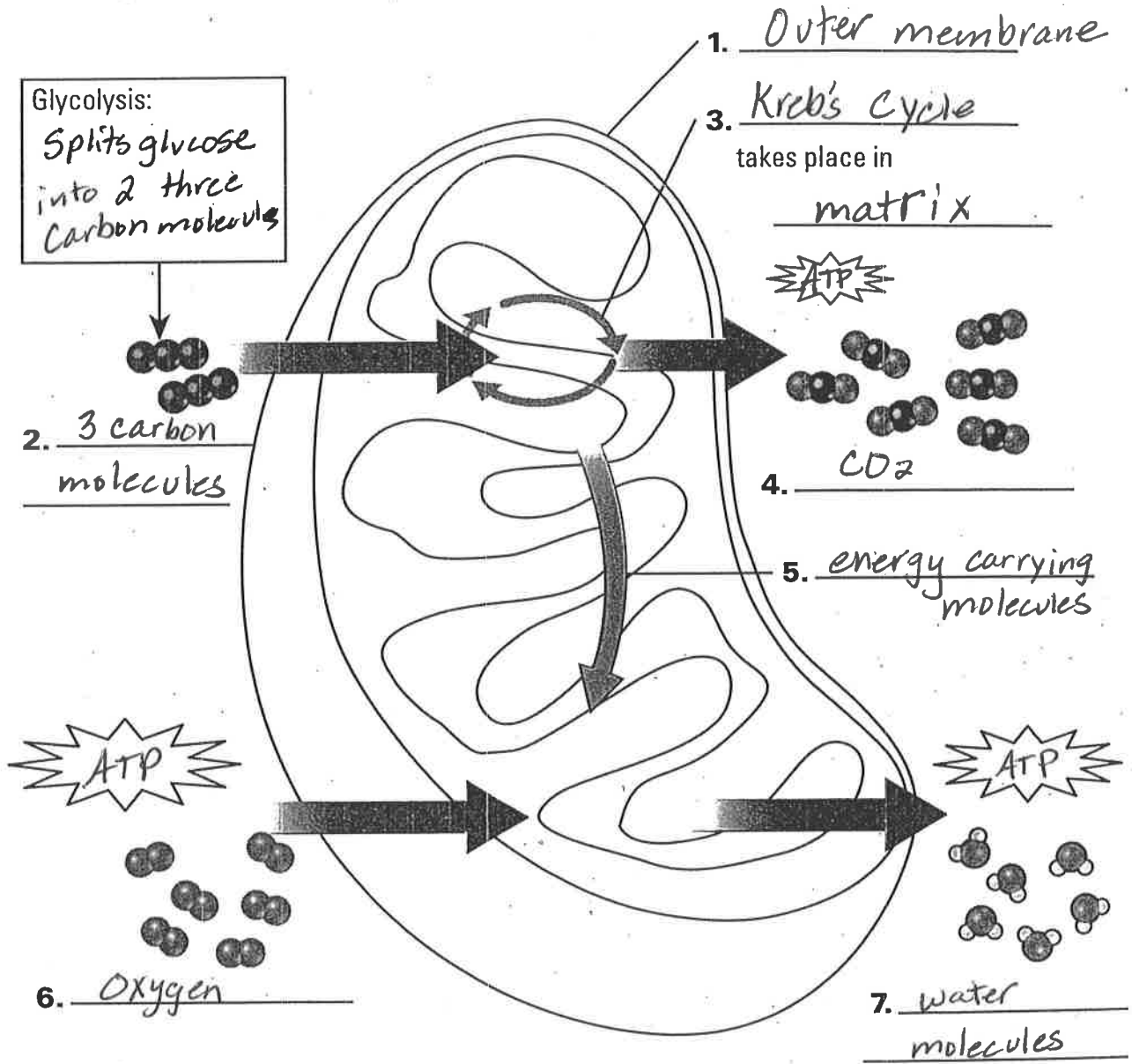
It does not need oxygen to take place

11. What is the Krebs cycle?

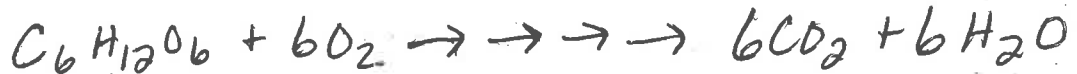
Three carbon molecules enter the cycle, energy carrying molecules are produced to be used in the electron transport chain

Power Notes

Cellular respiration: releasing chemical energy from sugars to make ATP



Write the equation for cellular respiration.



SECTION

4.4

OVERVIEW OF CELLULAR RESPIRATION

Reinforcement

KEY CONCEPT The overall process of cellular respiration converts sugar into ATP using oxygen.

Cellular respiration is a process in all eukaryotes that breaks down sugars and other carbon-based molecules to make ATP when oxygen is present. Because cellular respiration needs oxygen, it is an **aerobic** process. In eukaryotic cells, the aerobic parts of the process take place in mitochondria. The step that leads to cellular respiration takes place in the cytoplasm and is **anaerobic**, which means it does not need oxygen.

The anaerobic process that leads to cellular respiration is called glycolysis. In **glycolysis**, two ATP molecules are used to split a molecule of glucose into two three-carbon molecules, which produces four ATP molecules. Glycolysis yields a net increase of two ATP molecules. Then, if oxygen is available, the products of glycolysis are used in cellular respiration. Cellular respiration takes place in two general stages, in two different parts of the mitochondria.

- The **Krebs cycle** is a series of chemical reactions that further breaks down the three-carbon molecules from glycolysis. The Krebs cycle takes place in the matrix, or interior space, of mitochondria. These chemical reactions produce carbon dioxide, a small number of ATP molecules, and energy-carrying molecules that are used in the second stage of cellular respiration.
- An electron transport chain uses the energy-carrying molecules from the Krebs cycle to produce a large number of ATP molecules. Water, which is released as a waste product, is also formed. The electron transport chain is in the inner mitochondrial membrane.

The overall, simplified chemical equation for the cellular respiration process is



1. What is cellular respiration?

a process that breaks down

2. What is glycolysis, and why is it an anaerobic process?

the splitting of glucose into 2 three carbon molecules
it is anaerobic because it does not need oxygen

3. What happens in the Krebs cycle?

the breakdown of 3 carbon sugars to produce
energy carrying molecules, produce CO₂

4. What is the function of the electron transport chain?

to produce a large number of ATP molecules, water is
also formed