Name Period Date

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

$$C_6H_{12}O_6 + 6O_2 \rightarrow\rightarrow\rightarrow\rightarrow\rightarrow\rightarrow 6CO_2 + 6H_2O$$

1. What is cellular respiration?

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

3. What happens in the Krebs cycle?

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