KEY CONCEPT  Cellular respiration is an aerobic process with two main stages.

Cellular respiration takes place in the mitochondria of eukaryotic cells. Before cellular respiration can occur, glucose is broken down in a cell’s cytoplasm during an anaerobic process called glycolysis.

- During glycolysis, two ATP molecules are used to split a glucose molecule into two three-carbon molecules that eventually become molecules called pyruvate. Four molecules of ATP (a net increase of two ATP), and two molecules of an energy-carrying molecule called NADH are formed.

When oxygen is available, the pyruvate and NADH are used for cellular respiration in the mitochondria. The first part of cellular respiration, including the Krebs cycle, takes place in the mitochondrial matrix. The second part takes place within and across the inner mitochondrial membrane.

1. Pyruvate is broken down and is linked to a molecule called Coenzyme A. This molecule enters the Krebs cycle. In the Krebs cycle, carbon-based molecules are broken down and rearranged to produce NADH and FADH₂, which are energy-carrying molecules, two molecules of ATP, and carbon dioxide waste.

2. Energized electrons are removed from NADH and FADH₂ by proteins in the electron transport chain. Hydrogen ions are pumped across the inner membrane, then flow through ATP synthase to produce ATP. Oxygen picks up the electrons that travel along the chain. Water is released as a waste product.

1. What happens during glycolysis?

2. Describe the first stage of cellular respiration in mitochondria.

3. What is the function of the electron transport chain in cellular respiration?

4. What does oxygen do in cellular respiration?

5. What are the overall reactants and products in cellular respiration?