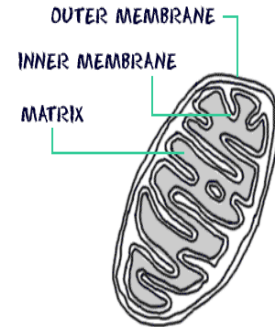


Cellular Respiration: Breaking Down Energy

Mitochondria are known as the powerhouses of the cell. They are **organelles** that act like a digestive system that takes in nutrients, breaks them down, and creates energy for the cell. The process of creating cell energy is known as **cellular respiration**. Most of the chemical reactions involved in cellular respiration happen in the mitochondria. A mitochondrion is shaped perfectly to maximize its efforts.

1. What process happens in the mitochondria?
2. What is the purpose of the process in #1 (what does it create)?



Introduction to Cellular Respiration

Organisms, such as plants and algae, can trap the energy in sunlight through photosynthesis and store it in the chemical bonds of carbohydrate molecules. The principal carbohydrate formed through photosynthesis is **glucose**. Other types of organisms, such as animals, fungi, protozoa, and a large portion of the bacteria, are unable to perform this process. Therefore, these organisms must rely on the carbohydrates formed in plants to obtain the energy necessary for their metabolic processes. This means they must eat plants and other animals in order to gain energy.

4. Some organisms perform photosynthesis to produce energy. Other organisms cannot do photosynthesis. What can they do in order to generate energy? _____

5. Animals and other organisms obtain the energy available in carbohydrates through the process of **cellular respiration**. What is the purpose of cellular respiration? _____

Cells take the carbohydrates into their cytoplasm, and through a complex series of metabolic processes, they break down the carbohydrates and release the energy. The energy is generally not needed immediately; rather it is used to combine adenosine diphosphate (ADP) with another phosphate to form adenosine triphosphate (ATP) molecules. The **ATP** can then be used for processes in the cells that require energy, much as a battery powers a mechanical device. During the process of cellular respiration, carbon dioxide is given off. Plant cells can use this carbon dioxide during photosynthesis to form new carbohydrates.

6. What happens to carbohydrates during cellular respiration? _____

7. What is the chemical energy in the cell called? _____

8. What does ATP stand for? _____

9. What is one product of cellular respiration? _____

10. How do animals get rid of the carbon dioxide? _____ What body system is involved with removing this waste? _____

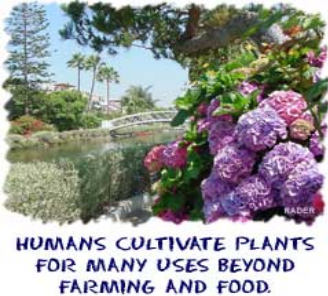
Also, in the process of cellular respiration, oxygen gas is required to serve as an acceptor of electrons. This oxygen is identical to the oxygen gas given off during photosynthesis.

11. (Circle one) Oxygen is a **PRODUCT** or **REACTANT** of respiration? (In other words, is it needed or released?)

Energy-producing process	Reaction	Location in cell
Photosynthesis	12. _____	Chloroplast
Cellular respiration	$C_6H_{12}O_6 + 6 O_2 \rightarrow 6 H_2O + 6CO_2 + \text{energy}$	13. _____

Reflection Question: Explain the relationship between photosynthesis and cellular respiration. Be sure to include the main purpose of both and where they occur inside the cell.

HUMANS AND PLANTS



Humans need plants. All animals do. Humanity's relationship with plants has actually made it possible for us to have a civilization. Before we had cities, humans went around in little packs and were hunter-gatherers. We ate rats, birds, berries, and whatever food we could find. It wasn't very efficient. One day someone had the bright idea to plant the plants we like to eat. When humans did that, they were able to stay in one place full time. Then came the cities and a huge system of agriculture to support millions of people.

BIG TIME FARMING

As time has passed, we have taken farming to new levels. We have manipulated species to create big apples and large ears of corn. The plants would never have done it in the wild. It took man to change the plants. We are also moving toward the **genetic alteration** of plants. We're trying to make plants that are resistant to disease and bugs. These stronger plants will allow our crops to give us more food from the same amount of space.

1. Genetic alteration probably refers to altering what.... _____ (found in the nucleus)