

Name: _____ Class: _____ Date: _____

Cells cannot work without energy any more than a phone can work without being charged. The energy that cells use comes from food. What is food? For animals, food may be a sandwich, a mouse, or a blade of grass. For plants, food is carbohydrates - sugars made in their leaves by the process of photosynthesis. What all foods have in common, however, is particles that contain chemical energy.

The energy in food can only be released after food particles have entered the cells and have been broken down to produce chemical energy. The process that releases food energy is called cellular respiration.

You probably think of respiration as breathing in and out. That is what you and all other air-breathing animals do to obtain oxygen from the air and to get rid of carbon dioxide. Remember that cells carry out all the functions of living things. Your cells use the oxygen you breathe in for cellular respiration, and they produce the carbon dioxide that you breathe out. Cellular respiration occurs in nearly all living cells of every organism – in plants and micro-organism, as well as in animals.

Inside cells, oxygen combines with food particles (such as fats and sugars) to produce energy in cellular respiration. Remember this equation:

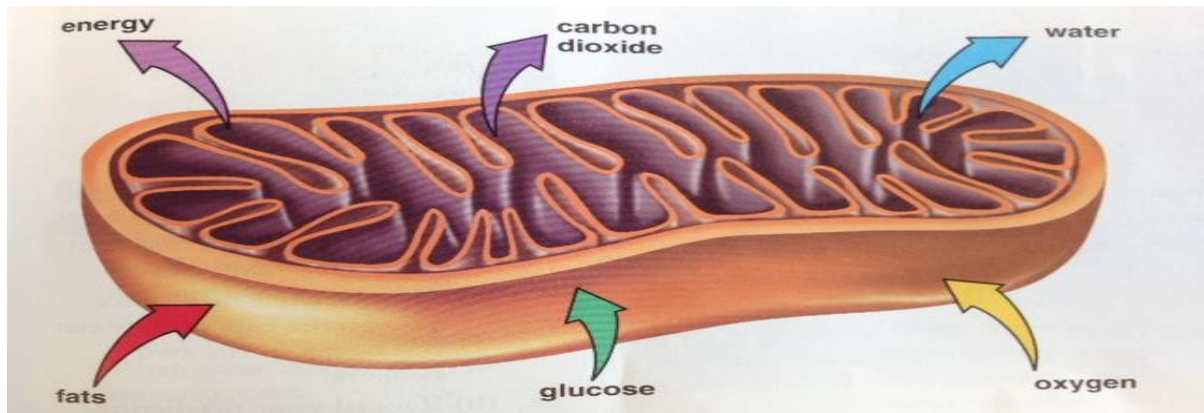
Carbohydrates + Oxygen		Carbon dioxide + water + energy (heat and chemical)
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This chemical change can be compared to the burning of fuel. Like burning, much of the energy from the reaction ends up as heat. Think about what happens when your body demands more energy, such as if you run a race. First, you need a good meal of energy rich carbohydrates. As you run, you breathe more quickly, pumping in more oxygen for your cells to use. The oxygen and food particles react inside your cells, producing energy for your muscles. At the end of the race, you feel warm (sometimes HOT).

Powerhouses of the cell

Cellular respiration does not take place everywhere inside the cell. It occurs mainly inside the mitochondria. Because energy is produced within the mitochondria, these organelles are often called the “powerhouses” of the cell. Different cells use different amounts of energy and have different numbers of mitochondria. Active cells, such as those in muscles, may contain several hundred mitochondria. The energy produced inside the mitochondria can be used by other parts of the cell.

Why do cells need energy? Cell membranes need energy to move materials into and out of cells by active transport. Muscle cells need energy to contract. Nerve cells use energy to send signals. Most cells also use energy to grow and reproduce.



So, plant cells create energy in their chloroplasts through capturing the sun's energy, taking Carbon Dioxide and water and producing sugars and Oxygen. Animals (herbivores and omnivores) consume plants and their sugars and the mitochondria in their cells take in the plant-based sugars and turn the sugar back into a usable chemical energy and produce heat, Carbon Dioxide and water. Both plants and animals sometimes store extra energy as oil or fat (e.g., vegetable oil, butter or lard). These oils and fats can also be broken down by mitochondria. So, through the action of chloroplasts in plants, and mitochondria in plants and animals, energy is stored and converted back into usable energy. Again, we see, on a cellular level, why animals need plants.

1. Energy is the ability to do work. It is power or fuels the work done by a machine or organism.

2. The **mitochondria** makes energy in the cell from carbohydrates.

3. -both give energy to the thing.

4 A plant gets food by capturing the light energy from the sun through photosynthesis.

5. Photosynthesis is a chemical process that captures light energy and creates sugars which is chemical energy.

6. Cellular Respiration is the name given to the process that releases food energy.

7.

Carbohydrates + Oxygen → Carbon Dioxide + water + energy (ATP)

8. You would expect to have many mitochondria in a muscle cell because the muscle cell uses a lot of energy in contracting (creating movement).

9. Other words to describe mitochondria may be outlet, generator, energy provider, energy converter,...

10. The cell needs energy for active transport, reproduction, to contract (muscle cells), to transmit impulses (nerves), repairing cells, etc

11. Lactic acid is a byproduct of anaerobic respiration and happens when you need energy too quickly. It is an acid that can build up in your muscle and create cramps and pain. It is broken down slowly by your other muscle cells.

12. Muscle cells use energy to contract, repair themselves and reproduce.

Nerve cells use energy to create electrical impulses and transmit them to other cells (muscle cells and other nerve cells).