

Energy in Chemical Processes and Everyday Life

When we eat and digest food, it is broken down into smaller and smaller units until it becomes small enough to be used in our cells as **glucose molecules**. At the same time, we are inhaling **oxygen** that travels from our lungs through our bloodstream into smaller and smaller blood vessels until it reaches our cells. When glucose and oxygen reach the cells, they have the materials needed to perform another important metabolic process called **cellular respiration**. This process starts in the cells' **cytoplasm** and is completed in the **mitochondria** - the cellular powerhouse. In those tiny organelles, one molecule of glucose and six molecules of oxygen are transformed into 36 molecules of **ATP** – the energy cells use to run their metabolic processes, such as breathing, circulating blood, digesting, responding to stimuli, creating new cells, repairing and growing, moving muscles, etc. Everything the body needs to do uses energy.

Cellular respiration occurs in every cell in both animals and plants. Let's compare them.

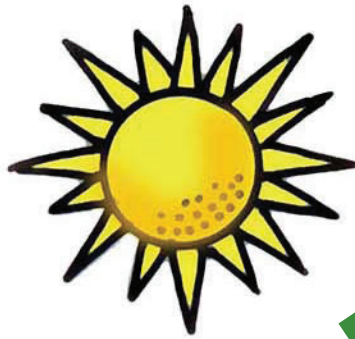
Plants (and other photosynthetic organisms) create **glucose molecules** through the chemical process of **photosynthesis**, which also releases oxygen. The glucose molecules then drive cellular respiration in the plant cells, which creates ATP, which fuels plant growth and reproduction.

Animals eat the plants (or other animals that eat plants) and break them down through digestion into **carbohydrate molecules** and then into the smaller **glucose molecules**. The glucose molecules then drive cellular respiration in the animal cells, which converts the glucose and oxygen into ATP, the cellular form of energy, which fuels animal growth and reproduction. It also releases carbon dioxide and water.

LS1.C: Organization for Matter and Energy Flow in Organisms – Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

- Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)

Energy in Chemical Processes and Everyday Life



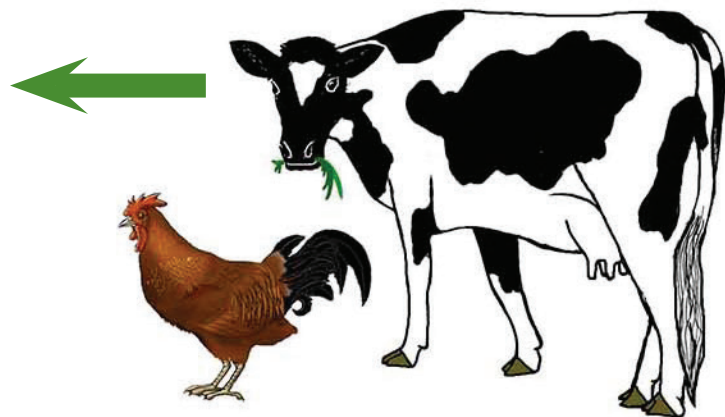
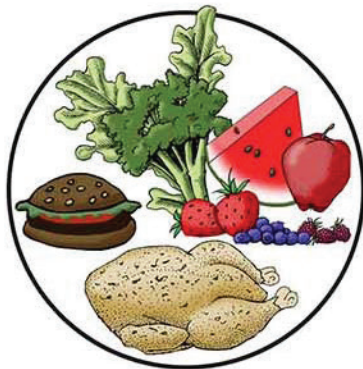
Energy from the sun is captured by plants in the chemical process that forms plant matter (**photosynthesis**).



Energy Flow Between Organisms

Animals (including humans) eat **plants** or other animals that eat plants to get the energy they need for bodily functions.

Plants are eaten by **animals**, passing on the fuel they make from sunlight and giving animals the energy they need for bodily functions.



PS3.D: Energy in Chemical Processes and Everyday Life -The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6)

Photosynthesis and Cellular Respiration

