

Chapter 2 Lesson 4- Energy for Life

What is energy, and how does it contribute to maintaining life on Earth?

Energy is the ability to do work or cause change:

- Energy is necessary for living organisms. The processes of life (such as growth, reproduction, building molecules, and movement) require energy.
- Some cells are able to use the energy in sunlight, other cells use **chemical energy** stored in food.
- Energy exists in different forms of kinetic and **potential energy**.
- Energy can be measured in joules, calories, or ergs.

What are kinetic and potential energy?

Kinetic energy and potential energy are the two main forms of energy:

- Kinetic energy is often referred to as energy of motion; it is the work needed to move a body of a given mass from rest to its stated velocity.
- Potential energy, or stored energy, is the energy in a body or system based on its position or configuration.
- **Thermal energy** is a form of kinetic energy. It is a measurement of the kinetic energy of atoms and molecules in matter.
- Chemical potential energy or chemical energy is the energy that is used to bond ions and atoms together; chemical energy is released or absorbed during chemical reactions.

What are the laws of thermodynamics?

There are three laws of **thermodynamics**:

- According to the first law of thermodynamics (also called the Law of Conservation of Energy), energy can be transferred from one system to another, or transformed from one form into another form.
- The second law of thermodynamics states that thermal energy cannot be transferred from a colder body to a hotter body.
- The third law of thermodynamics defines absolute zero (0K or -273°C) as the point where all thermal motion is removed from molecules.

What is the difference between endergonic and exergonic reactions?

Endergonic and exergonic reactions are often linked in cell processes:

- An **endergonic reaction** is a chemical reaction that is not spontaneous and requires the input of energy.

- An **exergonic reaction** is a chemical reaction that is spontaneous and releases energy.

What is the difference between oxidation and reduction reactions?

Redox reactions describe all chemical reactions in which atoms have their **oxidation** number changed:

- Oxidation is half of a **redox reaction** where the molecule, atom, or ion loses an electron, increasing the oxidation state.
- **Reduction** is half of a redox reaction where the molecule, atom, or ion gains an electron, decreasing the oxidation state.