

Intro to Energy



Energy

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Energy

- Energy – an intangible phenomenon which can change the position, physical composition or temperature of matter.
- Energy – the ability to do work



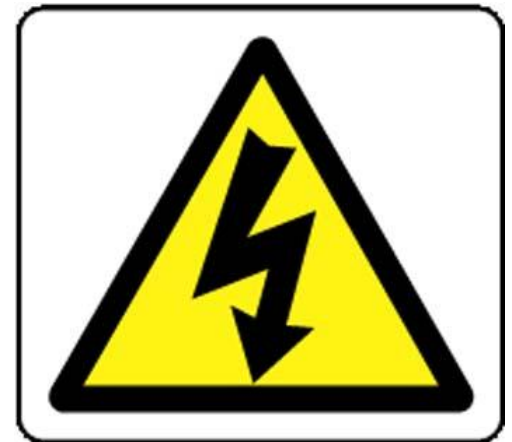
Energy

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 - **Potential Energy**
 - **Kinetic Energy**

What is the difference between these types of energy?



Energy

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 - **Potential Energy** – energy of position
 - **Kinetic Energy** – energy of motion



Energy

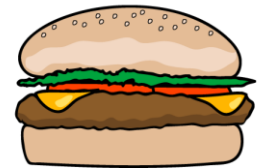
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 - **Potential Energy** – energy of position
 - **Kinetic Energy** – energy of motion

What are some examples of these types of energy?



Types of Potential Energy

- Chemical energy- stored in the bonds of atoms and molecules. (Biomass, petroleum, natural gas, propane, and coal)
- Nuclear Energy- stored in the nucleus of an atom (energy in the nucleus of uranium atoms)
- Stored Mechanical Energy- stored in objects by the application of force. (compressed springs and stretched rubber bands)
- Gravitational Energy- energy of a place or position. (Water in a reservoir behind a hydropower dam)



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Types of Kinetic Energy

- Radiant Energy- electromagnetic energy that travels in transverse waves. (Solar Energy)
- Thermal Energy- or heat is the internal energy in substances- the vibration or movement of atoms and molecules in substances (Geothermal)
- Motion- the movement of a substance from one place to another (Wind and hydropower)
- Sound- movement of energy through substances in longitudinal waves
- Electrical energy- movement of electrons (Lighting and electricity)



Forms of Energy

POTENTIAL

Chemical
Energy



Stored
Mechanical
Energy



Gravitational
Energy



Nuclear
Energy



KINETIC

Electrical
Energy



Radiant
Energy



Thermal
Energy



Motion
Energy



Sound
Energy



The Laws of Energy

- Scientists have summed up essential facts about energy into a set of laws known as the Laws of Thermodynamics

The First Law of Thermodynamics

- The first law of thermodynamics states that the amount of energy in the universe remains constant.
- Energy is conserved.

The First Law of Thermodynamics

- Energy cannot be created or destroyed – it can only change form.
- Example: The potential energy of water behind a dam will equal the kinetic energy of that water moving down the riverbed.



The Second Law of Thermodynamics

- The second law of thermodynamics states that, apart from an outside force, energy will move from a more-ordered state to a less-ordered state.
- System move toward increasing disorder (entropy).

The Second Law of Thermodynamics

- Example: Firewood has potential energy stored in its chemical bonds. As that firewood is burned, the energy is converted to heat and light (1st law). The end product of a campfire is more disordered than before the fire (2nd law).



Energy Conversion Efficiency

- In every energy transfer, some portion will be unusable and will “escape” – **usually in the form of heat.**
- Energy conversion efficiency is a measure of how successfully energy is transferred between forms.

Energy Conversion Efficiency

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- How much of the energy used by an incandescent light bulb actually produces light?

5%



Illustrating Energy

- Working with a partner, think of your own example of an energy transformation that illustrates the first and second laws of thermodynamics.
- Illustrate this example and explain it in a few sentences.

Energy Transformations



Chemical



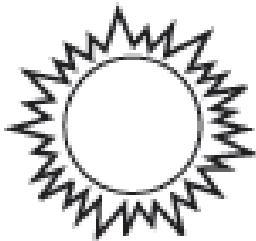
Motion



Chemical



Motion



Radiant



Chemical



Electrical



Thermal

Units of Energy

When energy is used it is converted from one form to another. Energy can be measured in heat, watts, calories, and joules.

Heat/ Therm= used by gas companies to measure sales
1 therm= 100,000 BTU

Watts =time rate of doing work 1 watt= 1 joule/sec
most energy/electrical bills are recorded in kilowatt hours (kWh). This is simply the number of kilowatts times the number of hours used.

Calories= amount of heat required to raise the temperature of 1 gram of water. 1 calorie= 4.186 joules

BTU (British Thermal Unit) = amount of heat required to raise the temperature of one pound of water. 1 BTU= 252 cal.