What is Energy?

Energy is the ability to do work. It comes in many forms, including:
-mechanical energy (potential and kinetic)
-thermal energy
-chemical energy
-electrical energy
-nuclear energy
-sound energy

All of these forms of energy can be converted into one another. For example, when a car burns gasoline, the chemical energy in the gasoline is converted into thermal energy, which is then converted into mechanical energy to make the car move.

The SI unit of energy is the joule (J), which is defined as the amount of work done when a force of one newton is applied over a distance of one meter. One joule is a very small amount of energy, so we usually use the kilojoule (kJ), which is 1000 joules.

Energy can be either potential or kinetic. Potential energy is stored energy that has the ability to do work. For example, the energy stored in a stretched rubber band has the potential to do work (like shooting a rubber band at a target). Kinetic energy is the energy of motion. For example, a moving car has kinetic energy.

The total energy of a system is the sum of the potential and kinetic energies.

The Law of Conservation of Energy states that energy cannot be created or destroyed, only converted from one form to another. This means that the total amount of energy in the universe is always the same.

Work

Work is defined as the force applied to an object times the distance the object moves in the direction of the force. For example, if you push a box across the floor, the work you do is equal to the force you apply to the box times the distance the box moves.

The SI unit of work is the joule (J), which is defined as the work done when a force of one newton is applied over a distance of one meter.

The formula for work is:

$W = F*d$

Where W is the work done, F is the force applied, and d is the distance the object moves.

Power

Power is the rate at which work is done. It is measured in watts (W), which is defined as one joule of work per second.

The formula for power is:

$P = W/t$

Where P is the power, W is the work done, and t is the time it takes to do the work.

Potential Energy

Potential energy is stored energy that has the ability to do work. It comes in many forms, including:
-gravitational potential energy
-chemical potential energy
-electrical potential energy
-elastic potential energy

Gravitational potential energy is the energy stored in an object due to its position in a gravitational field. For example, the energy stored in a raised weight is gravitational potential energy.

The formula for gravitational potential energy is:

$U = mgh$

Where U is the gravitational potential energy, m is the mass of the object, g is the acceleration due to gravity, and h is the height of the object.

Chemical potential energy is the energy stored in the bonds between atoms. For example, the energy stored in a piece of TNT is chemical potential energy.

The formula for chemical potential energy is:

$U = E - H$

Where U is the chemical potential energy, E is the energy of the system, and H is the enthalpy of the system.

Electrical potential energy is the energy stored in an electric field. For example, the energy stored in a capacitor is electrical potential energy.

The formula for electrical potential energy is:

$U = 1/2 * C * V^2$

Where U is the electrical potential energy, C is the capacitance, and V is the voltage.

Elastic potential energy is the energy stored in an elastic object. For example, the energy stored in a stretched rubber band is elastic potential energy.

The formula for elastic potential energy is:

$U = 1/2 * k * x^2$

Where U is the elastic potential energy, k is the spring constant, and x is the displacement from the equilibrium position.

Kinetic Energy

Kinetic energy is the energy of motion. It is equal to the work done to accelerate an object from rest to its current velocity.

The formula for kinetic energy is:

$K = 1/2 * m * v^2$

Where K is the kinetic energy, m is the mass of the object, and v is the velocity of the object.

The Law of Conservation of Energy

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