

Basics of Energy - Definitions

Energy

A measurement of matter based on the capacity for matter to perform tasks (*do things, i.e. Work*) based on their mass (*weight*) and velocity (*speed*)

Energy Transfer

The process where energy is transferred (*moved*) from one object to another during a collision or interaction

Work

The physical result that occurs when two objects collide. The interaction causes a change of velocity (*speed*) and/or direction.

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Basics of Energy - Definitions

Kinetic Energy

The energy matter based on the movement of matter in space as *heat* or *velocity*. Kinetic Energy is energy that has been released and is causing a change in a material (*velocity and/or movement*)

Potential Energy

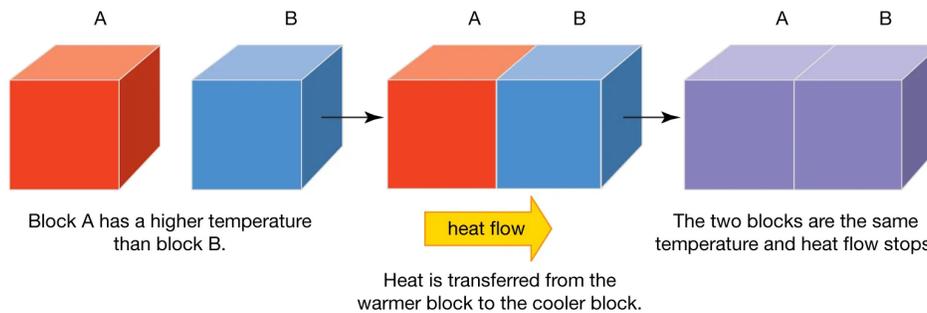
The stored energy of matter based on the physical connections, location, or interaction with other forms of matter that could be transferred to Kinetic Energy. Potential Energy is often locked up in connected atoms (*bonds*)

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Movement of Energy

Energy Flow and Energy Transfer

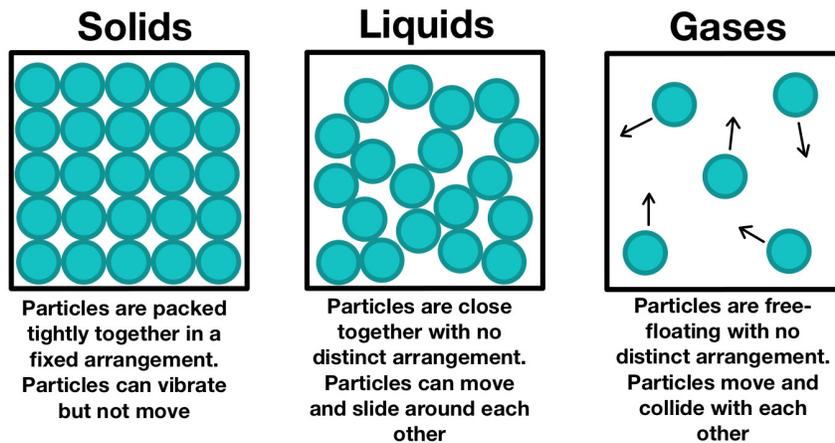
Energy flow is the process in which energy **transfers** (*moves from one object to another*) between particles in a direct interaction



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States of Matter

The interactions between particles based on the energy of matter

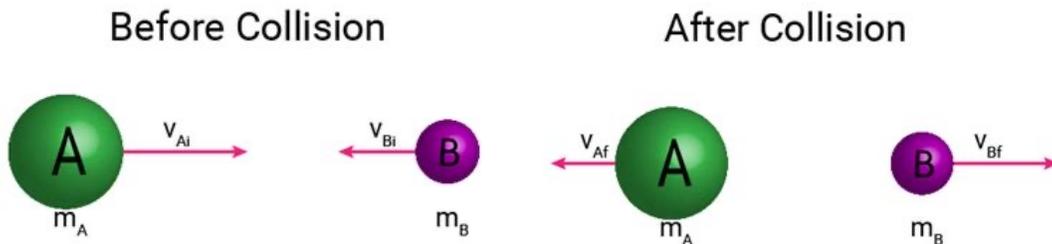


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Movement of Energy - Collisions

Elastic Collisions

The interaction (*collision*) between two particles where each particle absorbs energy from another object but does not bond, instead bounces off in the other direction keeping their original energy.

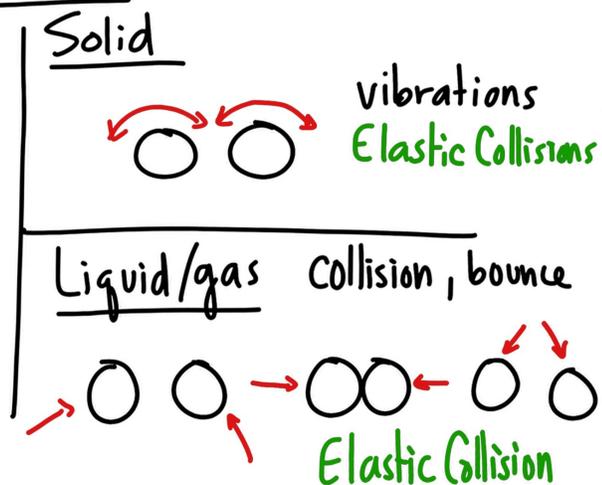


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Collisions and atomic motion

Elastic Collision

When particles collide they transfer energy to each other. Each particle collides then moves away.

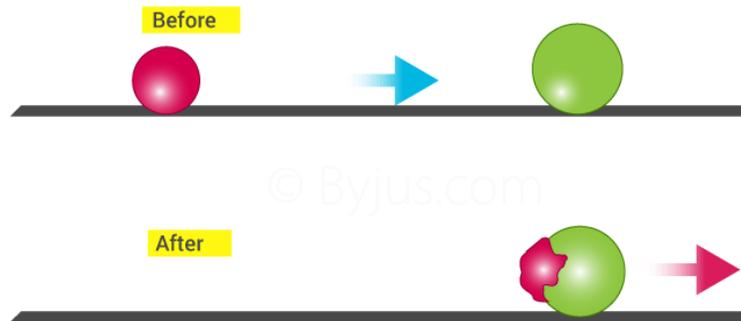


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Movement of Energy - Collisions

Inelastic Collisions

The interaction (*collision*) between two particles where each particle absorbs energy causing the particles to bond (*stick*) together



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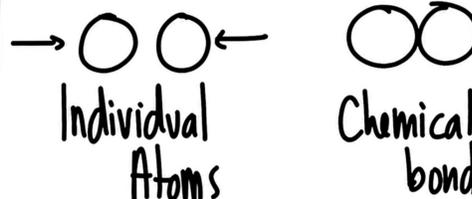
Collisions and atomic motion

Inelastic Collision

When particles collide they transfer energy to each other. When bonding occurs they stick together and connect

A chemical bond is a electron connection between two or more atoms.

Inelastic Collision



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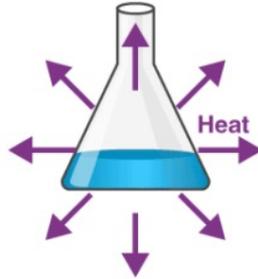
Defining Energy Flow

Exothermic System

A system that has more energy than the surroundings

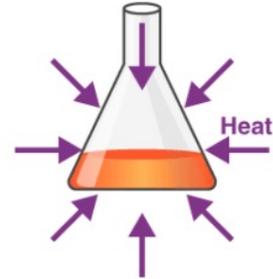
Energy transfers from the system to the surroundings

Sign = - (*lose heat*)



Exothermic Reactions

A reaction that releases energy from the system in the form of heat.



Endothermic Reaction

A reaction that the system absorbs energy from its surrounding in the form of heat.

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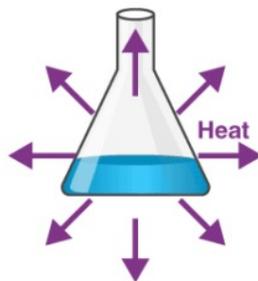
Defining Energy Flow

Endothermic System

A system that has less energy than the surroundings

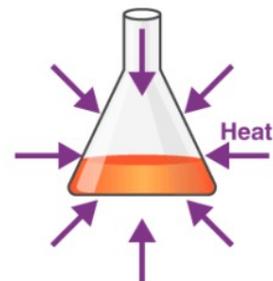
Energy transfers from the surroundings to the system

Sign = + (*gain heat*)



Exothermic Reactions

A reaction that releases energy from the system in the form of heat.



Endothermic Reaction

A reaction that the system absorbs energy from its surrounding in the form of heat.

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Forming and Breaking Ionic Bonds

Bonds are formed or broken based on energy of matter

Breaking Ionic Bonds

Bonds break when energy is added (*endothermic*) to a system (KE)

Forming Ionic Bonds

Bonds are formed when energy is removed (*exothermic*) from a system (KE)

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Energy in ionic bonding

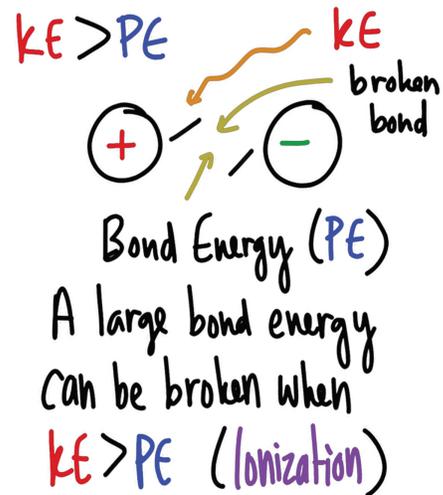
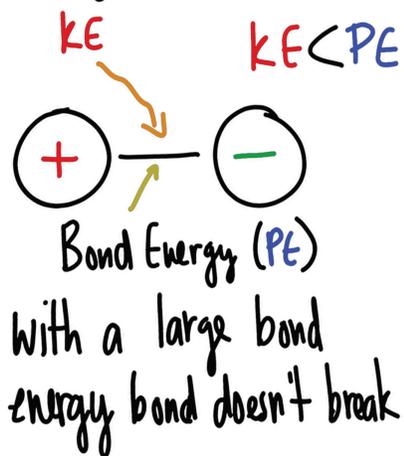
Energy transfer

Electron transfer

Bond PE (+to-bond)

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Breaking Ionic Bonds



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Forms of Energy

Thermal Energy

Heat, the energy given off due to the interaction of different forms matter, which causes a change in speed (i.e. temperature)

Examples of Thermal Energy

Combustion (*burning*) Reaction
 Geothermal Sources (*geysers, lava*)
 Biological Functions (*body heat*)



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Forms of Energy

Radiant + Light Energy

Energy flow through the movement of light with the environment based on the electromagnetic spectrum
(*the types of light that exist based on their wavelength*)

Examples

Heat transmitted from the sun as infrared radiation
Visible Light in Lasers



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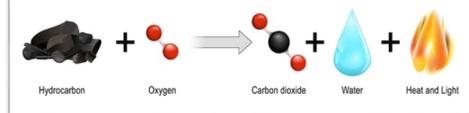
Forms of Energy

Chemical Energy

Energy absorbed (*endothermic*) or released (*exothermic*) through the breaking and forming of bonds

Examples

Chemical Reactions
Ionization (*forming ions*)
Breaking and formation of bonds



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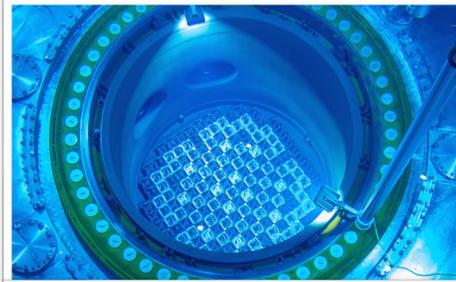
Forms of Energy

Nuclear Energy

Energy given off due to the breakdown of atoms themselves in unstable isotopes or atoms such as Uranium, Plutonium, or Bismuth

Examples

Nuclear Reactors in Power Plants
Nuclear Weapons
Medical Imaging using nuclear isotopes to view internal structures



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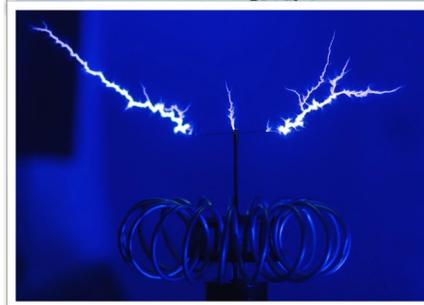
Forms of Energy

Electrical Energy

Energy flow due to the production movement of electrons (- charges)

Examples

Electronic Appliances
Lighting, Cooling, and Heating of homes, and offices
Large Scale material production



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Forms of Energy

Mechanical Energy

Energy flow due to the movement and interaction (*collisions*) of particles directly with each other

Examples

General Movement on matter
Automotive and Industrial Motors
Breaking, Tearing, or Reforming of matter within industry
Construction

