GCSE Physics

ENERGY

- Energy
- Electricity
- Particle Model of Matter
- Atomic Structure

- Energy Stores
- Energy Transfer
- Kinetic Energy
- Potential Energy
- Power
- Efficiency
- Energy Transfer
- Sources of Energy

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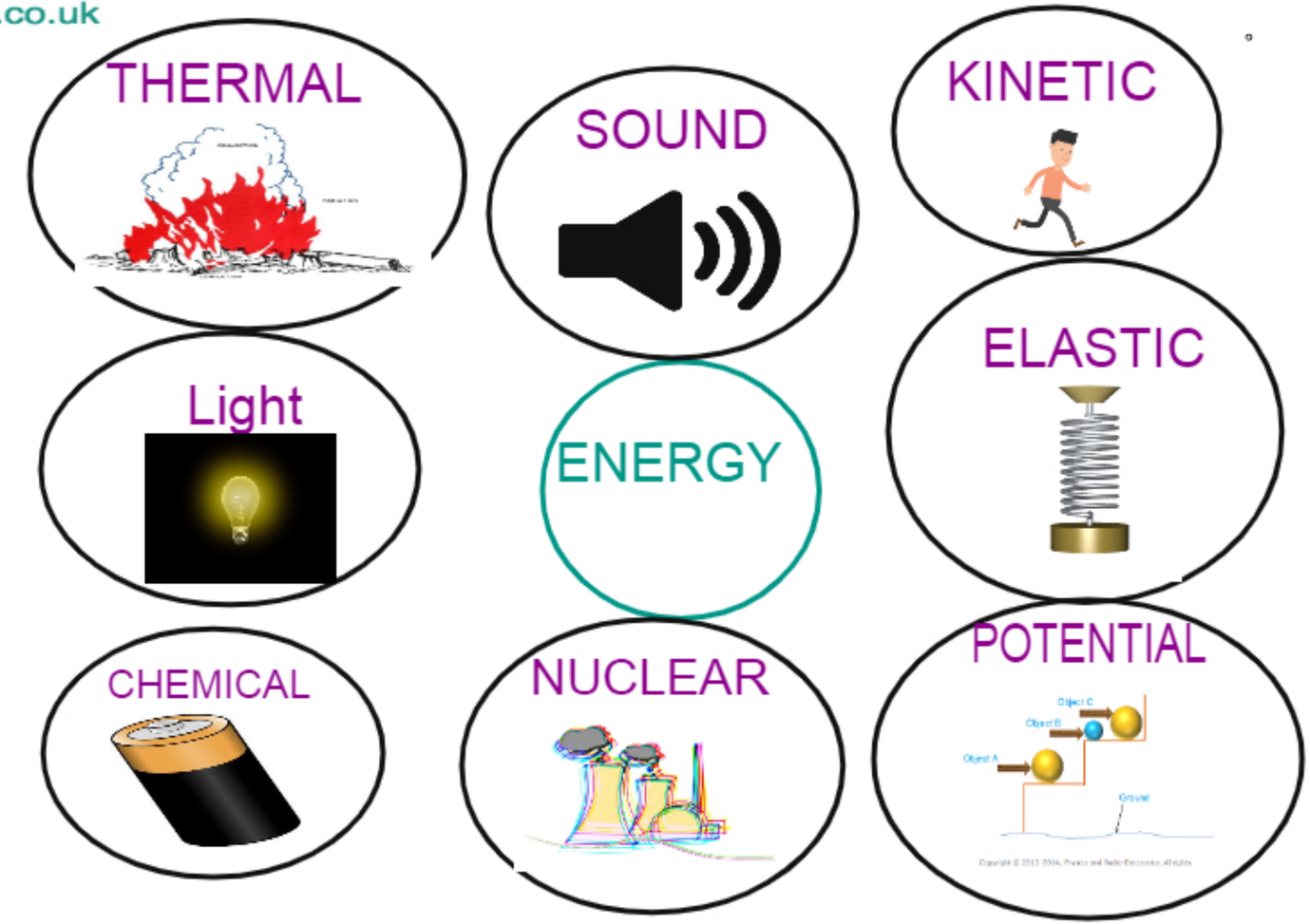
DIFFERENT FORMS OF ENERGY



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FORMS OF ENERGY

ENERGY	DEFINATIONS	EXAMPLE
Thermal Energy	Energy from the heated objects.	Energy in Kettle
Light Energy	Energy that helps to see.	Bulb, Torch
Electrical Energy	Energy due to the flow of charge or current	Electrical Appliances
Chemical Energy	Energy stored in the chemical bonds	Food, Batteries
Sound Energy	Energy due to vibrations	Loudspeaker
Nuclear Energy	Energy stored in the nucleus of the atom	Nuclear Reactor
Kinetic Energy	Energy due to movement	Roller coaster moving down
Potential Energy	Energy due do the position	Ball raised to a height
Elastic Energy	Energy stored in stretch objects	Springs, Rubber

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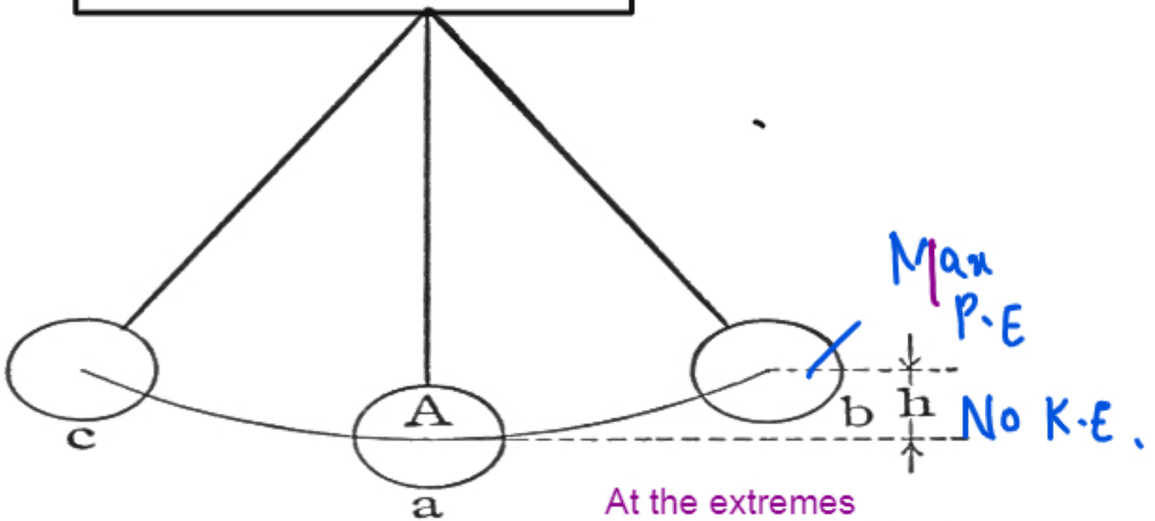
ENERGY TRANSFER

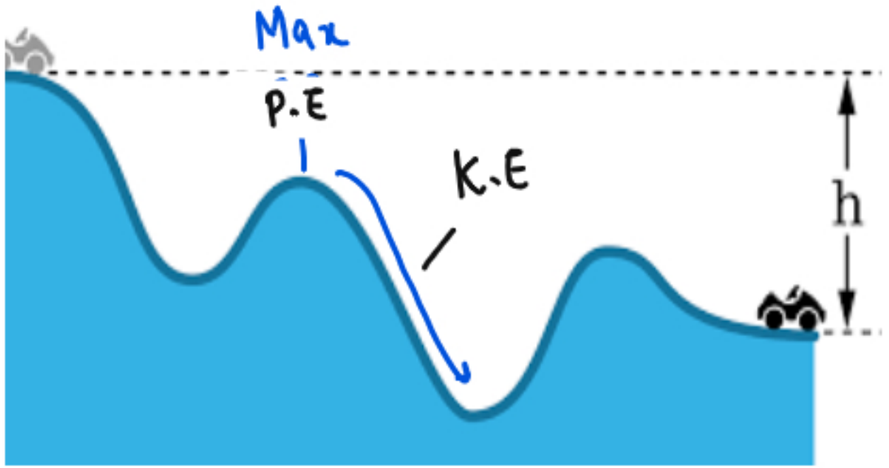
Law of Conservation of Energy: Energy is neither created nor destroyed. It changes from one form to another.

Energy change in Pendulum



At the extremes pendulum gains kinetic energy. As it comes back to mean position kinetic energy converts to gravitational potential energy.

Energy change in Roller Coaster



It goes to a height and gains potential energy. The potential energy is converted into kinetic energy when it moves.

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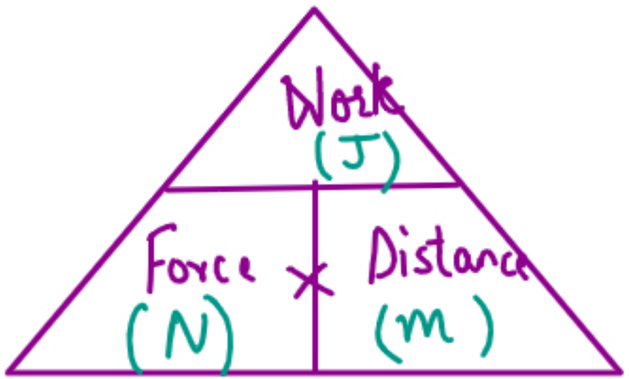
WORK AND ENERGY FORMULAE



Potential Energy

$$P.E = m \times g \times h$$
(J) (kg) (N/kg) (m)

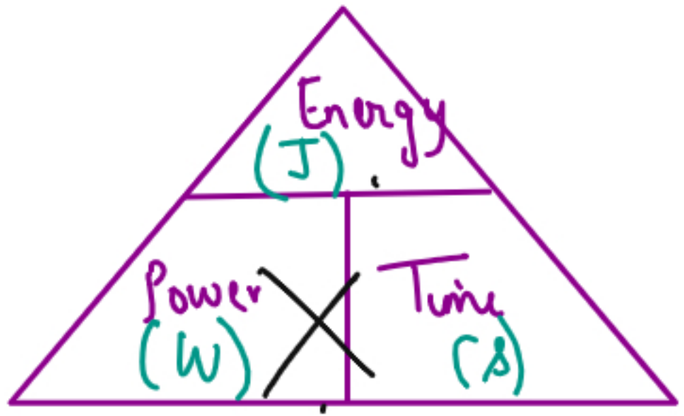
Kinetic Energy

$$K.E = \frac{1}{2} m v^2$$
(J) (kg) (ms^{-1})

Elastic Potential Energy

$$E.P.E = \frac{1}{2} k e^2$$
(J) (N/m) (m)

$$\text{Efficiency} = \frac{\text{Useful output}}{\text{Total input}} \times 100$$



m = mass of the object
g= Acceleration due to gravity
v = velocity of an object
k= spring constant
e= extension

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EXAMPLES

Q1 Calculate the work done when 2 N of force moves a block to a distance of 2 m .

$W = F \times s = 2 \times 2 = 4\ J$

Q2 Calculate the kinetic energy when a 2kg block moves at the speed of 3 m/s.

$K.E = \frac{1}{2}mv^2 = \frac{1}{2} \times 2 \times 3^2 = 9\ J$

Q3 Calculate the potential energy when the mass of 2 Kg is raised to a height of 5 m above the ground.

$P.E = mgh = 2 \times 10 \times 5 = 100\ J \quad [g = 10\ m/s^2]$

Q4 Calculate the energy dissipataed by a 10 W bulb in 2 minutes

$E = P \times t = 10 \times 2 \times 60 = 1200\ J$

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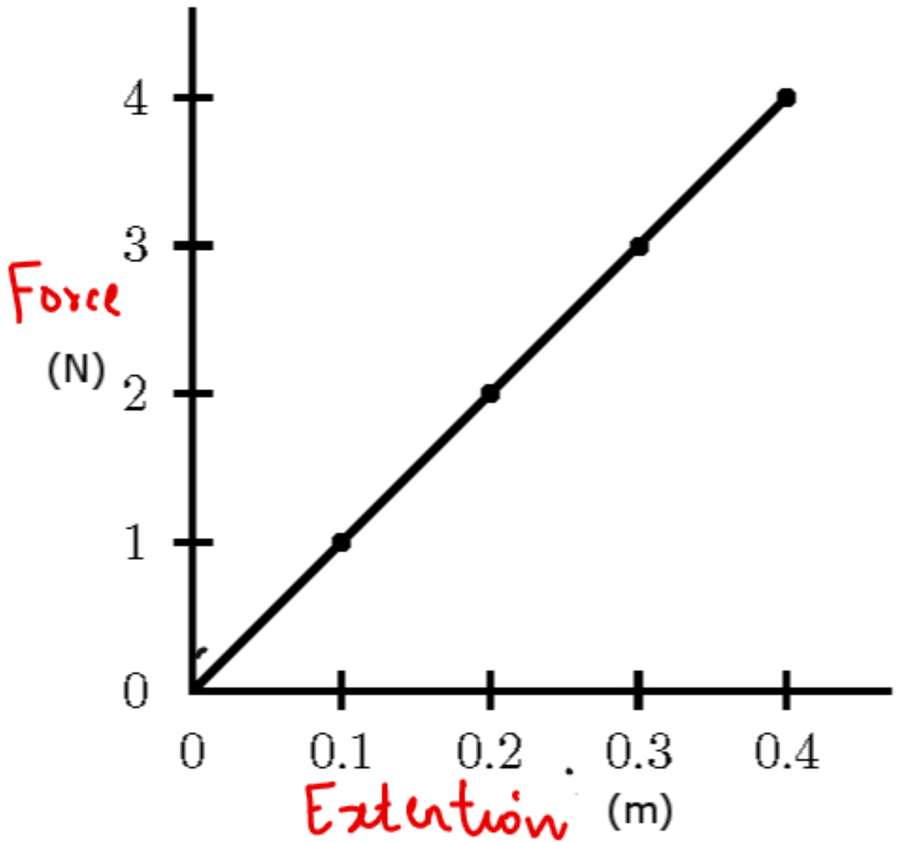
HOOKE's LAW



The extension produced in an elastic object is directly proportional to the force applied on it.

$F \propto e$

$F = ke$ (N) (m) — spring constant (N/m)

Elastic Potential Energy $= \frac{1}{2} k e^2$

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ENERGY EFFICIENCY

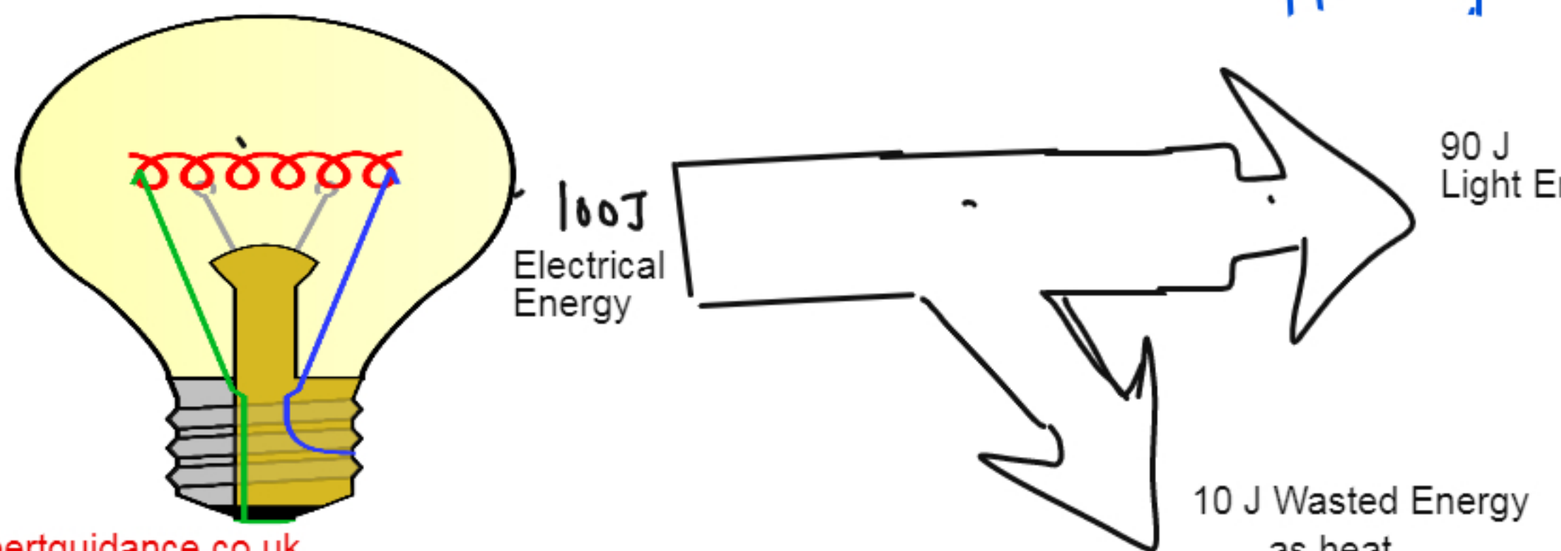
All appliances do not convert 100% of the input energy into useful energy.

The waste energy is dissipated to the surroundings.

Energy efficiency = $\frac{\text{Useful}}{\text{Total}} \times 100$

$\frac{90 \times 100}{100}$

= 90 %



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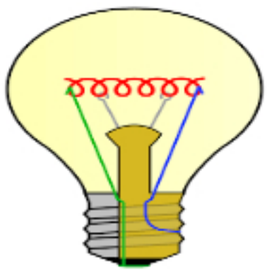
USEFUL AND WASTE ENERGY

Device	Useful Energy	Waste Energy
	Light Energy	Heat Energy
	Kinetic Energy	Heat and Sound Energy
	Heat Energy	Light and Sound

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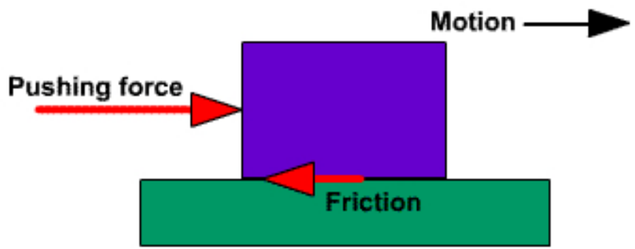
FRICTION



Friction is the force that opposes the motion of the body.

It results in loss of energy.

Methods to prevent friction:-

a) Lubricate , paint or smooth the surface by regular oiling of the machines

b) Streamline the body of the object like ship or plane to cut down air resistance

c) Tighten the loose parts to precent friction and reduce sound energy.

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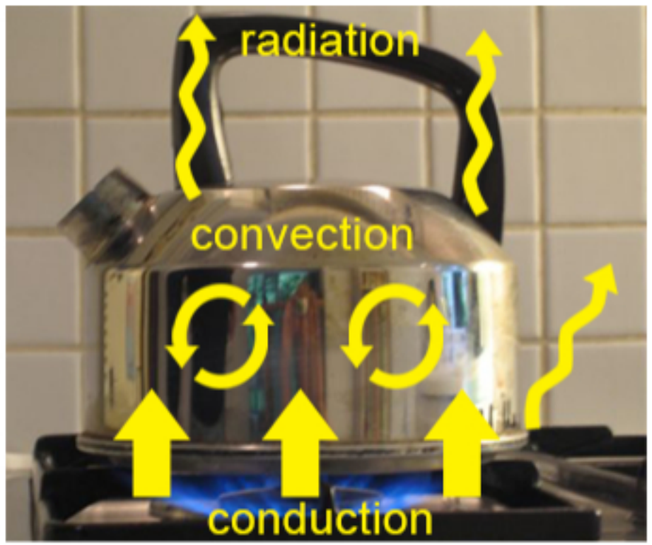
HEAT TRANSFER



The stove element heats the kettle and the kettle heats the water by conduction. Water circulating in the kettle transfers heat by convection. Near the stove, air would feel warm due to heat transfer by radiation.

CONDUCTION

The process by which heat is transferred by the direct contact of the particles and the particles vibrate and conduct heat.

Greater the transmission greater is the thermal conductivity of the material.

CONVECTION

Heat transfer through fluids in which the hot molecules rises and the cold molecules sink generating a convection current

RADIATION

The process of heat transfer by electromagentic radiation. There is not a direct contact between the two surfaces.

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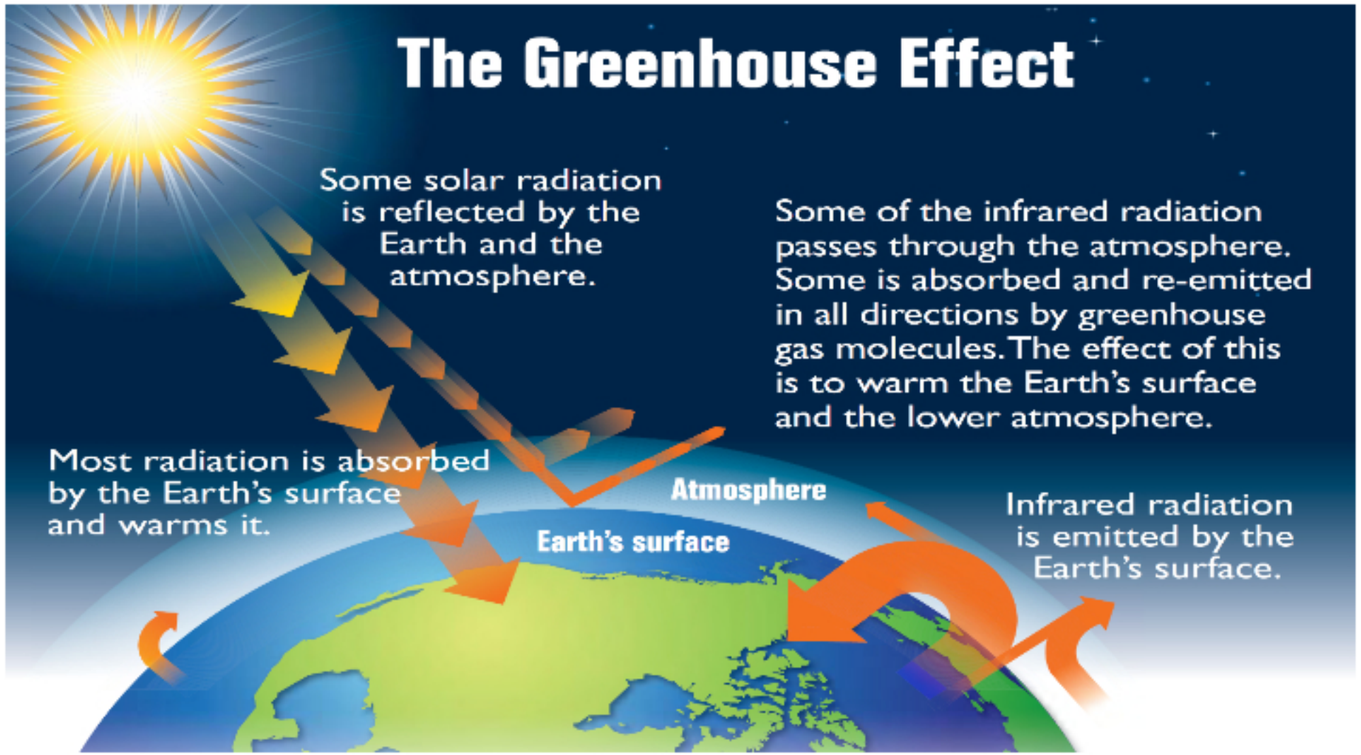
GREENHOUSE EFFECT



→ Methane, Carbon dioxide, Water Vapours.

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ENERGY LOSS IN HOMES

LOFT INSULATION

Uses fibre glass in the loft. Fibre glass is an insulator and prevents the heat loss by conduction.

Thicker the layer better the conduction.

CAVITY WALL INSULATION

It is the insulation between the two layers of the bricks.

The insulation between the bricks traps air and prevent loss of energy by conduction.

DOUBLE GLAZING

Thicker glass with dry air or vaccum in between.

Glass has lower conductivity and air act as an insulator prevent loss by conduction.

The vaccum prevent loss by convection.

THICK BRICKS

Thich bricks with lower thermal conductivity prevents the loss of heat by conduction.

FOILING

Foiling between the radiator and the panel reflect the heat back into the home and prevent it from escaping.

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SOURCES OF ENERGY

RENEWABLE

The source of energy that can be replinished and will never run out.

eg Solar, Wind, Geothermal Tidal

NON RENEWABLE

The source of energy that cannot be replinished and will run out.

Example: Fossil Fuels like coal, petrol , natural gas

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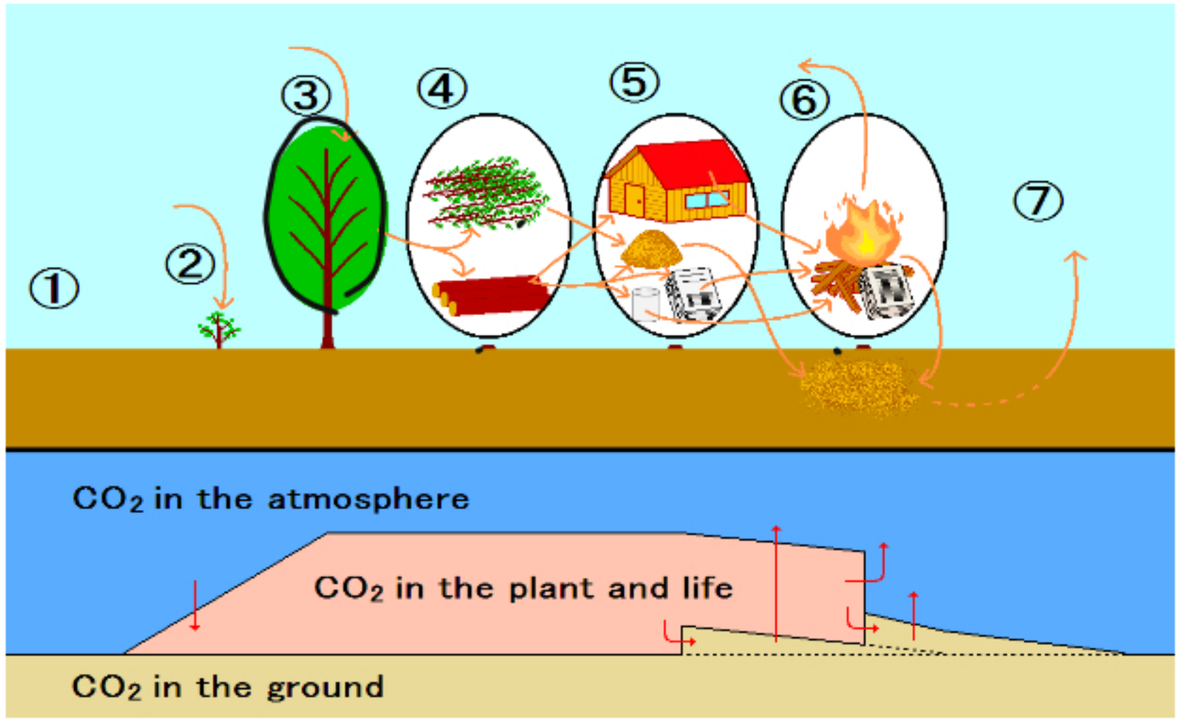
BIOFUELS



Making methane, ethanol or other fuel by using plant and animal waste which is :

- Renewable
- Carbon Neutral

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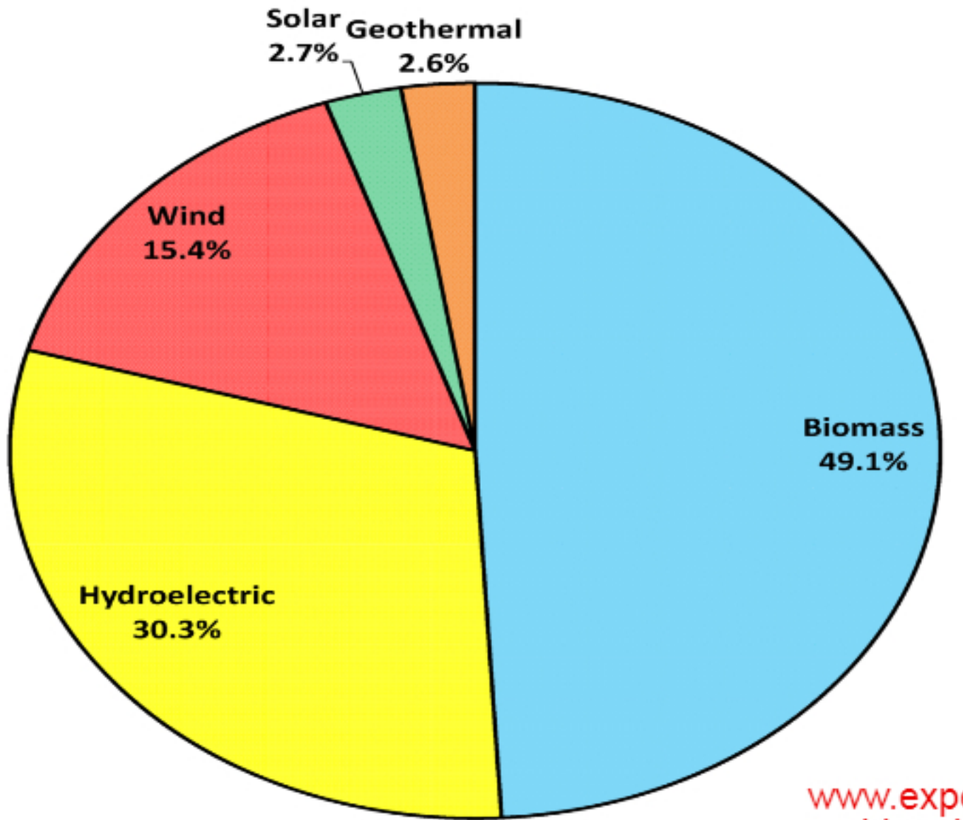
RENEWABLE SOURCE OF ENERGY



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ENERGY ISSUES

- Reliability
- Cost
- Demand
- Supply

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KEY TERMS

Kinetic Energy

Gravitation Potential Energy

Elastic Energy

Work Done

Power

Energy Efficiency

Useful Energy

Waste Energy

Friction

Conduction

Convection

Radiation

Loft Insulation

Cavity Wall Insulation

Double Glazing

Greenhouse Effect

Renewable Energy

Non renewable Energy

Biofuel

Carbon Neutral

Geothermal Energy

Tidal Energy

Solar Energy

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