Energy CANNOT be created or destroyed

Energy types

* Gravitational Potential – Increased with height
* Kinetic Energy – Increased with speed
* Elastic Energy – Increased when stretched or squashed
* Thermal Energy – Gained when heated, often lost (wasted) to the surroundings

Energy Transfers

* Mechanically – When a force is applied
* Heating – When an object is heated
* Electrically – When an object is powered by electricity

A ball rolling down a hill: Gravitational Potential Energy is turned mechanically into kinetic energy

Gravitational Energy $E_p = M \times G \times h$
(J) (Kg) (N/Kg) (m)

The higher an object or the more mass it has the more gravitational energy it has.

Kinetic Energy $E_k = \frac{1}{2} \times \text{mass} \times \text{Velocity}^2$
(J) (Kg) (m/s)

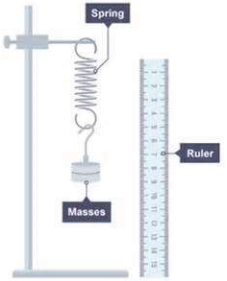
The faster and heavier an object the more kinetic energy it has.

Calculating Velocity
$E_p = M \times G \times H$
$= 2 \times 10 \times 3 = 60J$

$E_p = E_k \Rightarrow E_k = 60J$

$V = \sqrt{\frac{Ek}{\frac{1}{2}xm}} = \sqrt{\frac{60}{\frac{1}{2}x2}} = 7.7m/s$

Springs



When you add a force (weight) to a spring it extends.

Extension = Stretched length – original length

The energy stored in a spring can be calculate:

$E_e = \frac{1}{2} \times \text{spring constant} \times \text{extension}^2$
(J) (N/m) (m)

Power is a measure of how quickly energy is used. The shorter the time the more powerful it is.

$\text{Power} = \frac{\text{Energy (J)}}{\text{Time (s)}}$
(W)

Specific heat capacity (SHC)

The amount of energy needed to heat a 1Kg material by 1°C.

Heat Energy = Mass x SHC x Change in Temp
(J) (Kg) (J/Kg°C) (°C)

C = $\frac{E}{mx\Delta\theta}$ **m** = $\frac{E}{c\ x\ \Delta\theta}$ **Δθ** = $\frac{E}{mxc}$

This experiment only gives an estimate for the values calculated as energy is lost to the surroundings.

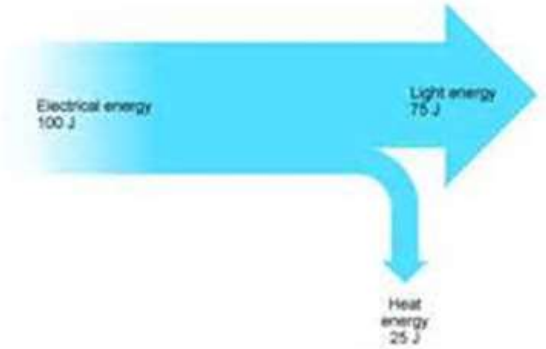
Heat Transfer

1.The higher the thermal conductivity of a material the higher the rate of heat transfer by conduction.

Renewable Sources of electricity
ALL turn a turbine to turn a generator.

* Wind (Wind turns a turbine)
* Hydroelectric (water turns a turbine)
* Waves/Tide (The sea turns a turbine)
* Geothermal (Heat from volcanoes used to boil water – make steam - turn a turbine)
* Biomass (Living material burnt to boil water)

Advantages of ALL
*Don't give out CO_2 which causes global warming
* Renewable (will NOT run out)
Disadvantages
They are **all** more expensive than fossil fuels
* Wind – Not always windy
* Hydroelectric – Can damage habitats
* Waves/Tides – Can damage habitats
* Geothermal – Only a few places on Earth
* Biomass – Carbon neutral (gives out CO_2 when burnt)



Efficiency = $\frac{Useful\ Energy\ Out}{Total\ Energy\ In}$ x 100

Efficiency = $\frac{Useful\ Power\ Out}{Total\ Power\ In}$ x 100

Answers for efficiency must be written as a percentage or a decimal. E.g 80% or 0.8