https://www.bbc.co.uk/bitesize/topics/z89ddxs bbcbitesize-ks4 science-physics – aqa combined science – energy - changes in energy stores – work, power and efficiency
https://www.senecalearning.com Seneca-combined science physics – AQA foundation or higher – energy changes or energy transfers
https://app.senecalearning.com/classroom/course/fe56ca00-05aa-11e8-9a61-01927559cfd5

Change in thermal energy = mass **X** specific heat capacity **X** temperature change

$\Delta E = m \times c \times \Delta\theta$

Specific Heat Capacity	***Energy needed to raise 1kg of substance by 1°C***	Depends on: mass of substance, what the substance is and energy put into the system.

HIGHER: efficiency can be increased using machines.

Efficiency = Useful power output / Total power input

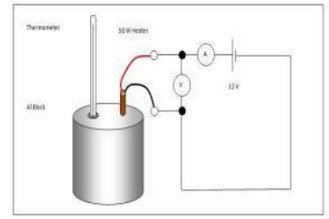
Efficiency = Useful output energy transfer / Total input energy transfer

Efficiency	***How much energy is usefully transferred***

Kinetic energy	***Energy stored by a moving object***	½ x mass x (speed)^2 0.5 x m x v^2
Elastic Potential energy	***Energy stored in a stretched spring, elastic band***	½ x spring constant x (extension)^2 0.5 x m x ke^2 (Assuming the limit of proportionality has not been exceeded)
Gravitational Potential energy	***Energy gained by an object raised above the ground***	Mass x gravitational field strength x height m x g x h

Gravitational field strength, or gravity on Earth has the value 9.8 N/kg.

The moon is smaller so has a much smaller value for gravity.



Weight is a force that acts downwards. All objects have a weight.

Weight = mass x gravity

Dissipate	***To scatter in all directions or to use wastefully***	When energy is 'wasted', it dissipates into the surroundings as internal (thermal) energy.

Ways to reduce 'wasted' energy	House – loft insulation, double glazing,	Car - streamline design, lubrication of moving parts.

System	***An object or group of objects that interact together***	EG: Kettle boiling water.
Energy stores	***Kinetic, chemical, internal (thermal), gravitational potential, elastic potential, magnetic, electrostatic, nuclear***	Energy is gained or lost from the object or device.
Ways to transfer energy	***Light, sound, electricity, thermal, kinetic are ways to transfer from one store to another store of energy.***	Chemical energy in a battery of a torch is transferred to useful light energy and some is wasted as thermal
Unit	***Joules (J)***	

Work	***Doing work transfers energy from one store to another***	By applying a force to move an object the energy store is changed.	Work done = Force X distance moved W = F x s
Power	***The rate of energy transfer***	1 Joule of energy per second = 1 watt of power	Power = energy transfer ÷ time P = E ÷ t Power = work done ÷ time, P = W ÷ t

Closed system	***where the total amount of energy stays the same. No energy is transferred in or out.***
Open system	***Energy can transfer in or out. A pendulum will never swing to the same height.***

Energy Conservation and Dissipation

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Frictional forces cause energy to be transferred as thermal energy. This is wasted.

Reducing friction - using wheels, applying lubrication. Reducing air resistance – travelling slowly, streamlining.

Principle of conservation of energy	***The amount of energy always stays the same.***	Energy cannot be created or destroyed, only changed from one store to another.

	Units
Specific Heat Capacity	***Joules per Kilogram degree Celsius (J/Kg°C)***
Temperature change	***Degrees Celsius (°C)***
Work done	***Joules (J)***
Force	***Newton (N)***
Distance moved	***Metre (m)***
Power	***Watts (W)***
Time	***Seconds (s)***
Weight	Newtons (N)

Useful energy	***This is energy that is transferred for a useful purpose***
Wasted energy	***This energy has been lost or dissipated into the atmosphere or lost as thermal energy.***

Prefix	***Multiple***	Standard form
Kilo	***1000***	10^3
Mega	***1000 000***	10^6
Giga	***100 000 000***	10^9

Energy stores and changes

	Units
Energy (KE, EPE, GPE, thermal)	***Joules (J)***
Velocity	***Metres per second (m/s)***
Spring constant	***Newton per metre (N/m)***
Extension	***Metres (m)***
Mass	***Kilogram (Kg)***
Gravitational field strength	***Newton per kilogram (N/Kg)***
Height	***Metres (m)***