Physics Crib Sheet: Topic 1

A Some energy resources can be replenished as they are used **(renewable)** but others can not (**non renewable).** The main uses of energy resources are **transport** and **heating**. The demand for energy is increasing and scientists are looking for alternative 'greener' and renewable resources.

B

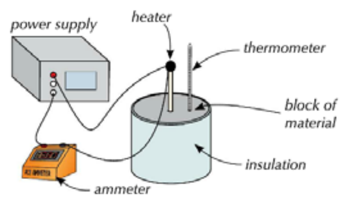
Energy Resource	How it works
Fossil fuels	The heat from burning fossil fuels is used to turn water to steam which turbines a turbine which turns a generator producing electricity.
Nuclear	The heat from nuclear fission is used to turn water to steam which turbines a turbine which turns a generator producing electricity.
Hydroelectric	Falling water turns a turbine which turns a generator producing electricity.
Tidal	Tidal movements of the water turn a turbine which turns a generator producing electricity.
Wave	Up and down motion of the waves turns a turbine which turns a generator producing electricity.
Wind	Wind turns a turbine which turns a generator producing electricity.
Geothermal	Heat from hot underground rocks is used to turn water to steam which turbines turning a generator producing electricity.
Biofuel	The heat from burning plant products or animal dung is used to turn water to steam which turns a turbine turning a generator producing electricity.

C Specific heat capacity is the amount of energy needed to raise the temperature of 1 kg of a substance by 1 °C.

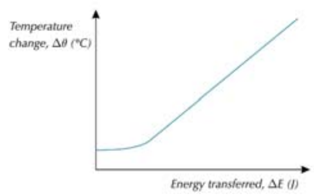
$$\Delta E = mc\Delta\theta$$

ΔE = change in thermal energy (J)
$\Delta\theta$ = temperature change (°C)
m = mass (kg)
c = specific heat capacity (J/kg°C)

D **Core practical: Investigating Specific heat capacity**



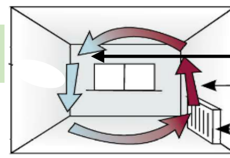
Use the current and voltage reading to calculate **power**. Use this to calculate how much energy has been transferred by the heater. Assuming no energy has been dissipated you can plot a graph:



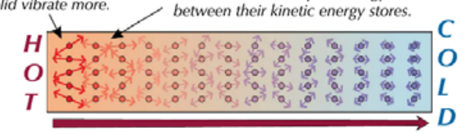
You can find the specific heat capacity of the block using the gradient of the linear part of your graph. The gradient is $\Delta\theta \div \Delta E$, so since $\Delta E = mc\Delta\theta$, the gradient is $1 \div mc$. So the specific heat capacity of the material of the block is: $1 \div$ (gradient × the mass of the block).

$$\text{efficiency} = \frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$$

E **Convection** is where energetic particles move away from hotter to cooler regions



Conduction is the process by which vibrating particles transfer energy to neighbouring particles.



F **Thermal conductivity** is a measure of how quickly energy is transferred.
Thermal insulators can be used to reduce the amount of heat transferred in buildings:

G

Energy store	Objects with energy in this store
Kinetic	Anything moving has energy in its kinetic energy store.
Thermal	Any object. The hotter it is, the more energy it has in this store. You may also see thermal energy stores called internal energy stores.
Chemical	Anything that can release energy by a chemical reaction, e.g. food, fuels.
Gravitational Potential	Anything that has mass and is inside a gravitational field.
Elastic Potential	Anything that is stretched (or compressed) e.g. springs.
Electrostatic	Anything with electric charge that is interacting with another electric charge — e.g. two charges that attract or repel each other.
Magnetic	Anything magnetic that is interacting with another magnet — e.g. two magnets that attract or repel each other.
Nuclear	Atomic nuclei have energy in this store that can be released in nuclear reactions.

H $P = \frac{E}{t}$

P = power (W), E = energy transferred (J), t = time (s)

I $P = \frac{W}{t}$

P = power (W), W = work done (J), t = time (s)

J **Work done** is energy transferred from one store to another.
The principle of **conservation of energy** states that energy can be transferred usefully, stored, dissipated but never created or destroyed
Power is the rate of energy transferred.

K

$$\text{efficiency} = \frac{\text{useful power output}}{\text{total power input}}$$

L $E_k = \frac{1}{2}mv^2$

E_k = kinetic energy (J), v = speed (m/s), m = mass (kg)

M **Lubricants** reduce friction between moving objects which reduces energy dissipated.
In any energy transfer some energy will be dissipated. This is measured by efficiency

N $E_p = mgh$

E_p = gravitational potential energy (J), g = gravitational field strength (N/kg), h = height (m), m = mass (kg)

O