**Electricity & Energy**

**Heat**

**Summary**

**Heat** is a form of energy that is measured in **joules** (J).

The **temperature** of an object is a measure of the average kinetic energy of the particles in the objectand is measured in **degrees Celsius** (°C).

Heat moves from regions of high temperature to regions of low temperature by three processes:

Conduction - In conduction the vibration (kinetic energy) of hot particles is passed from one particle to the next.

Conduction takes place in solids.

Convection - Cold fluids are more dense than hot fluids and so they fall, whilst the hot fluids rise, setting up *convection current*.

Convection takes place in liquids and gases.

Radiation - Heat radiation is energy in the form of electromagnetic rays (infrared rays).

Radiation is the only method of heat transfer in a vacuum.

The rate of heat loss depends on the temperature difference between the two objects.

Heat loss from the home can be reduced in the following ways:

**Loft insulation** reduces heat loss by convection through the roof space.

In **double (or triple) glazing** a space between the panes of glass reduces heat loss by conduction.

**Draught excluders** reduce heat loss by convection.

**Foil-backed plasterboard** reduces heat loss by radiation from the walls.

**Foil behind radiators** reflects heat back into room and so reduces heat loss by radiation.

In **cavity wall insulation** a filling between the inner and outer walls prevents heat loss due to convection in the gap.

**Carpets** - Reduces heat loss by conduction through floor.

The same mass of different materials requires different quantities of energy to raise the temperature of the material by one degree Celsius.

The quantity of heat energy required to raise the temperature of 1 kg of a material by 1 °C is called the **specific heat capacity**, c, of a material.

Specific heat capacity has the unit joules per kilogram per degree Celsius (J kg-1 °C-1). For example water has a specific heat capacity of 4 180 J kg-1 °C-1.

**Energy, Mass, Temperature Change and Specific Heat Capacity**

$$energy=\begin{matrix}specific\\heat\\capacity\end{matrix} ×mass × \begin{matrix}temperature\\change\end{matrix}$$

$$ E\_{h}=cmΔT$$

$$ c=\frac{E\_{h}}{mΔT}$$

$$m=\frac{E\_{h}}{cΔT}$$

$$ ΔT=\frac{E\_{h}}{cm}$$

J

J kg-1 °C-1

kg

°C

*c*

*Eh*

*m*

$$ΔT$$