P2: Energy Transfer By Heating Knowledge Organiser (Triple) PT10.2

Thermal conductivity	•The rate at which thermal energy is transferred through a material. •The higher the rate of thermal conductivity of a material, the more energy is transferred through it per second •Metals have the highest thermal conductivity- they are the best conductors
Insulator	•A material that has a low thermal conductivity •Fibreglass and wool are good examples of insulators •Energy transfer through insulators is as low as possible •Thick layers of insulators work best to reduce the rate of energy transfer
Specific Heat Capacity, c	•The amount of energy needed to to change the temperature of 1kg of a substance by $1^{o}C$ •Measured in J/ kg ^{o}C •The higher the SHC, the more energy needed to raise its temperature •Use $c = \Delta E \div (m \times \Delta\theta)$ to find the SHC of a material •Heavier objects increase in temperature more slowly when heated.
Storage heater	•These have special bricks of material with a high SHC inside •They are heated overnight when electricity is less expensive •The energy is released slowly over the course of the day.
Solar panels	•Absorb IR energy from the Sun •This can be used to heat water directly •A solar cell panel generates electricity •This means we need to use less electricity or gas to heat our houses •Fitted on South facing roof so that it absorbs as much IR as possible over the day

Cavity Wall Insulation	•Reduces the rate of energy transfer through the outer walls of a house •The cavity is the space between two layers of the wall of the house •The insulation is a foam that is pumped into the cavity and traps air in small pockets •The foam is a better insulator than the air it replaced, so reduces the rate of energy transfer by conduction through the walls.
Double Glazing	•Have two panes with a layer of dry air or a vacuum between them •Reduces the rate of energy transfer by conduction as dry air is a good insulator •A vacuum also reduces the rate of energy transfer by convection as there are no particles in a vacuum •Thicker panes of glass have lower thermal conductivity
Aluminium foil behind radiators	•Reduces energy transfer by radiation as IR energy from the heater is reflected back into the room away from the wall
Infrared Radiation	•All objects emit and absorb IR radiation •The hotter the object, the more IR it emits in a given time. •At a constant temperature, an object absorbs and emits radiation at the same rate. •Objects at constant temp emit radiation across a continuous range of wavelengths. •The intensity of the radiation emitted depends on the temperature of the object, i.e. the hotter the object the higher the peak intensity

Key Equations To Learn	
Energy Transferred	Energy transferred = mass x SHC x temp change $\Delta E = m \times c \times \Delta\theta$

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Black Body Radiation	•A perfect black body is an object that absorbs all of the radiation incident on it. •A perfect black body doesn't reflect or transmit any radiation. •Black Body radiation is the radiation emitted by a perfect black body. •Good absorbers are also good emitters, so perfect black bodies are the best possible emitters of IR radiation.
Radiation and Earth's Temperature	•The Earth's temperature is affected by many things. These include the absorption of IR radiation from the Sun, and the emission of IR radiation from the Earth's surface and atmosphere. •IR from the Sun can be reflected back into space from the Earth's surface, absorbed by the Earth's surface or absorbed by the Earth's atmosphere •IR can also be emitted from the Earth's surface and from the Earth's atmosphere into space.

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