Year 7 Physics Knowledge Organiser – Pg 5
Topic 3: Energy

KPI 3.2: describe how thermal energy transfers from one place to another

Thermal energy transfer

Thermal energy will always be transferred from hotter objects/areas to cooler objects/areas. This includes hot objects transferring thermal energy to the surroundings (the air, nearby surfaces and so on). Thermal energy transfer continues until **thermal equilibrium** is reached (the temperature is equal).

You can reduce the amount of thermal energy transferred using **insulation**.

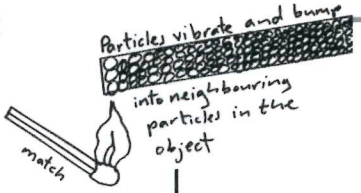
Thermal energy transfer by infra red radiation

All objects give out some infra red radiation, but the hotter they are the more radiation they give out. All objects can also absorb infra red radiation: when they do, they heat up. Radiation can travel through empty space – so this is how the Sun heats up the Earth.
The colour of the surface of an object affects how rapidly it emits and absorbs infra red radiation. Black, matt surfaces are the best absorbers and emitters. Shiny, silver surfaces are the worst absorbers and emitters.

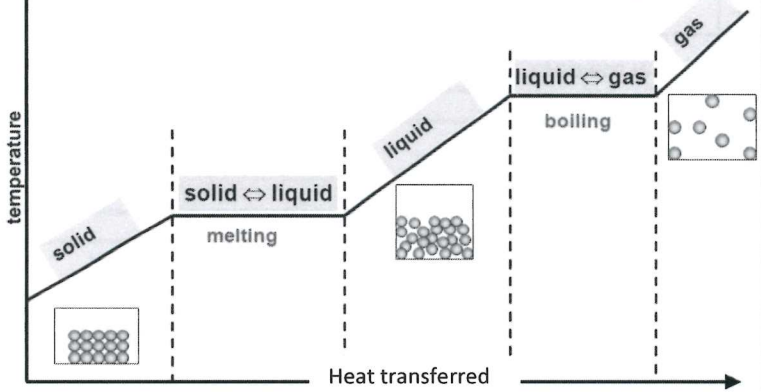
Key Terms	Definitions
temperature	The measure of the average amount of kinetic energy of all the particles in a substance.
temperature gradient	A difference in temperature between two places. Thermal energy always moves from hotter to colder places or materials.
thermal equilibrium	A situation where the temperature in two places is equal.
heat	The energy stored in substances thanks to the energy of their particles. Also called thermal energy.
conduction	One way that thermal energy can be transferred. Objects that are touching can transfer thermal energy, from the hotter object to the cooler one.
radiation	Another way that thermal energy can be transferred. All objects give out **infra red radiation**. Hotter objects give out (emit) infra red radiation that is absorbed by cooler objects.
emit	To give out
absorb	To take in

Thermal energy transfer by conduction

Thermal energy can be transferred between materials that are touching. Thermal energy is still transferred from the hotter object/area to the cooler object/area. This is called **conduction** of thermal energy. As the diagram shows, the particles in the area at a higher temperature vibrate more: their **kinetic energy** increases. They bump into neighbouring particles and pass on (transfer) thermal energy.



You can see that temperature does not change while changes of state are happening.



Energy when increasing temperature and when changing state

When heating a substance (solid, liquid or gas) and it doesn't change state, its temperature rises. This is because the particles move around more: their **kinetic energy** increases.

When heating a substance and causing it to change state, its temperature does NOT change during the state change. However, energy cannot disappear. The heat transferred to the substance increases the **potential energy** of the substance: it moves the particles it is made from apart until the substance has melted or boiled.