

Knowledge Organiser: Year 8: - Heating and Cooling

Section 1: Key Words

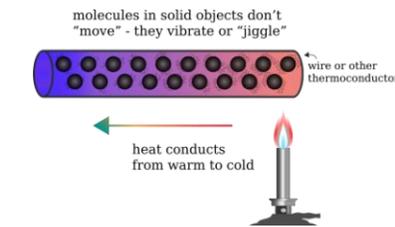
Thermal conductor	A material that will let heat flow through it
Thermal insulator	A material that will not let heat flow through it
conduction	The movement of heat (or electricity) through a substance. Heat is conducted due to particles vibrating and hitting each other
Convection	The transfer of heat through a liquid or gas (fluid) Convection occurs when particles with a lot of heat energy in a liquid or gas move and take the place of particles with less heat energy
Radiation	Heat can be transferred by infrared radiation, this is an electromagnetic wave and doesn't use particles
Temperature	temperature is a measure of how hot something is
Heat	heat is a measure of the thermal energy contained in an object.
Thermal energy	Energy that is due to particles moving and results in an object having a temperature. It is transferred as heat

Section 2: Transferring Thermal Energy

	Temperature change	Direction of energy flow
Object hotter than surroundings	Temperature of object decrease until it is the same as the surroundings	Energy flows out of the object to the surroundings
Object colder than surroundings	Temperature of object increases until it is the same as the surroundings	Energy flows into the object to the surroundings
Object the same temperature of the surrounds	The object's temperature stays the same	The is no net flow of energy

Section 3: Conduction

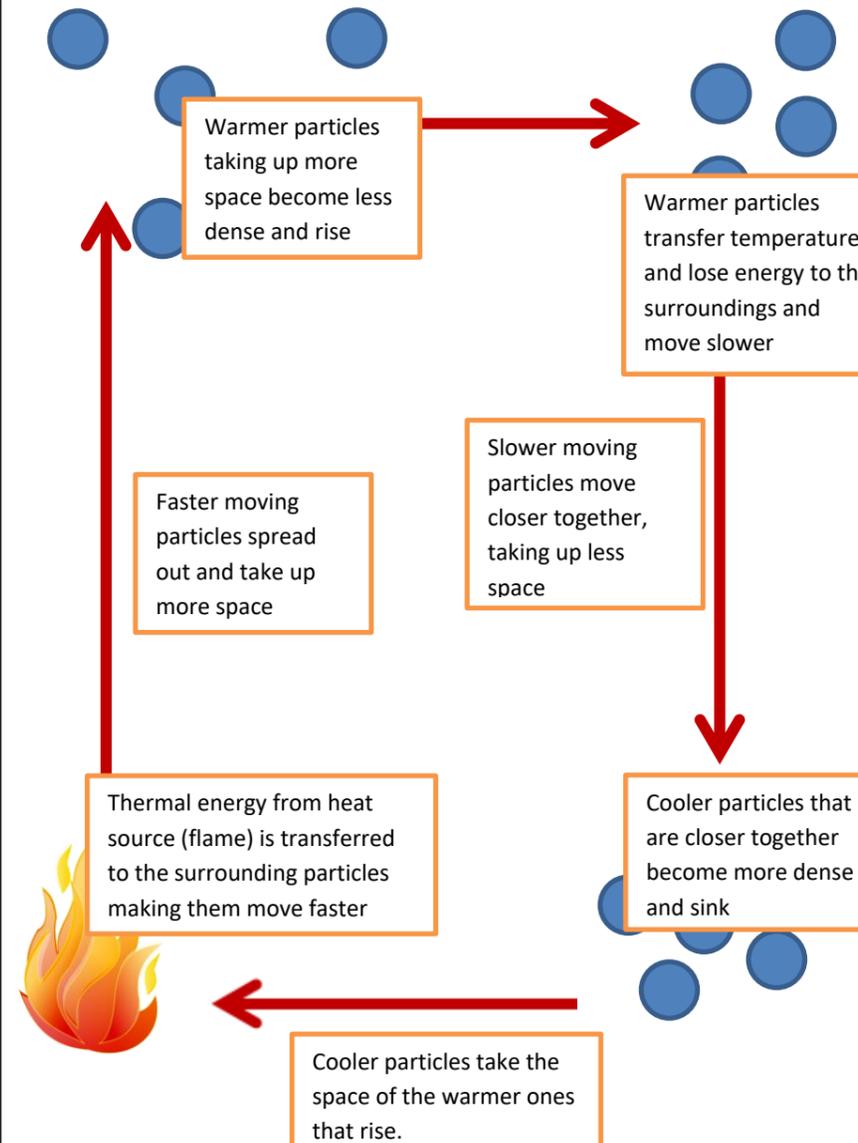
State of matter	Solids
Description	Heat moves from the hotter part of the object to the colder part
Explanation	Particles in the metal are packed closely together. As they are heated the particles gain kinetic energy and vibrate more. The particles that are vibrating collide with other particles and start to make them vibrate. This passes the kinetic energy from the heated particles to the cooler particles causing them to heat up too.



Section 4: Convection

State of matter	Liquids and Gases
Description	Particles with lots of heat energy in a liquid or gas move and take the place of particles with a lot of energy. Heat energy is transferred from hot places to cooler places by convection
Explanation	Liquids and gases expand when they are heated. This happens because the particles in the liquid or gas moves faster when they are heated. This causes the particles to take up more space as the gaps between particles gets bigger. The liquid or gas in hot areas is less dense than the liquid or gas in the cold areas, so it rises into the cold areas. The denser cold liquid or gas falls into the warm areas. In this way, convection currents form that transfer heat from one place to another

Section 5: Convection Currents



Section 8: Comparing conduction, convection and radiation

	Conduction	Convection	Radiation
Particles	Y	Y	N
Solids	Y	N	Y
Liquids	N	Y	Y
Gases	N	Y	Y
Particles move far part	N	Y	n/a
Particles vibrate on the spot	Y	N	n/a
Particles rise and fall to transfer energy	N	Y	n/a
Particles hit each other to transfer energy	Y	N	n/a

Section 6: Radiation

State of matter	n/a
Description	A type of electromagnetic radiation called infrared radiation.
Explanation	Infrared radiation involves waves instead of particles. As such it can travel through a vacuum e.g. space. The hotter an object is, the more infrared radiation it emits.

Section 7: Reflection and absorption of heat by radiation

colour	finish	ability to emit thermal radiation	ability to absorb thermal radiation
dark	dull or matt	good	good
light	shiny	poor	poor

Light, shiny surfaces are also good reflectors of infrared radiation

Section 9: Types of thermal insulation

Appliance/feature	Description
Boiler	This has a large surface area to allow for large amounts of heat energy to be transferred to its surrounding through convection
Radiator	This is specially designed to have a heating element at the bottom. Convection currents heat all the water in it.
Double Glazing	Windows and doors with 2 planes of glass with air trapped between them (or a vacuum between them). Air is a poor conductor and there is no convection because the air is trapped and cannot for convection currents
Loft Insulation	A thick layer of the loft floor. It works because it's a poor conduction and traps air, stopping convection
Floor Insulation	An insulation layer under the floor. Prevents heat loss because it is a poor conductor
Draught excluders	Brushes and seals on doors. Prevents warm air escaping from the home
Cavity wall insulation	Insulation place in the cavity of the walls. It works because it traps air which is a poor conductor. However, energy could still be lost due to convection so a insulating material is injected into the gap to create pockets of air and prevent convection currents forming