

Heat Transfer - Unit 1

What does heat transfer rate mean?	How fast heat travels.
What affects how fast heat travels through a barrier?	(1) What the barrier is made of (heat conductor or insulator?)(2) The difference in temperature between the two sides of the barrier (the bigger the difference the faster the rate of heat travel) (3) The area of the barrier (the wider it is the quicker the transfer)
Do all materials transfer heat at the same rate?	No, under similar conditions different materials transfer heat at different rates.
The shape and dimensions of a body affect the rate at which it transfers heat. Why is this?	The shape changes the ratio of surface area to mass of the body. The more surface area the faster it will transfer heat (area is increased). The dimensions also matter because they change the area of contact.
What is temperature?	How hot or cold something is, measured in degrees Celsius.
What is heat?	A form of energy, measured in joules
What is a fluid?	A gas or liquid - something that can 'flow'
What are the names of the three forms of heat travel?	Conduction, convection and radiation
What is the only way heat travels through a solid?	Conduction
What is the primary way heat travels through a fluid?	Convection
What is the only way heat can travel through a vacuum?	Infra Red Radiation
How do you reduce heat transfer by conduction from a surface?	Use an insulator to cover the surface.
How do you reduce the heat transfer through a fluid by convection?	Partition the fluid so that there are small sections of the fluid not a large expanse - trapped sections of the fluid.
What is thermal radiation?	It is the transfer of energy by infra red electromagnetic waves.
What do all bodies do with IR radiation?	All bodies (things - matter) emit and absorb thermal radiation all of the time.
What does a body that is hotter than its surroundings do?	The hotter a body is the more energy it radiates - to it is emitting more than it absorbs.
What does a body that is cooler than its surroundings do?	The cooler a body is the more energy it absorbs - to it is emitting less than it absorbs.
What does a body that is the same temperature as its surroundings do?	It is emitting the same as it absorbs - it is in equilibrium.
What type of surfaces are good absorbers and good emitters of radiation?	Dark, matt ones - the IR radiation finds them an easy gateway in or out!
What type of surfaces are poor absorbers and good emitters of radiation?	Light, shiny surfaces are poor absorbers and poor emitters of radiation - the IR radiation finds them a difficult gateway in or out!

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What forms of energy transfer use particles?	Conduction and convection
What form of energy transfer is less efficient if particles are in the medium it travels through?	Radiation
How is heat passed on by conduction?	(1) Particle to neighbouring particle by vibrations within the lattice of the solid structure (2) By free electron movement in good conductors (only metals have electrons that allow that to happen).
What is an insulator?	It is very poor at allowing heat to travel through it by conduction. (NEVER say it 'traps' heat - it doesn't it slows it down)
How can you tell if something is an insulator?	(1) The heat travels through it very slowly so there is (2) a large temperature gradient across it if you heat one side of it. (3) It will feel warm to the touch because it does not take the heat energy from your body very quickly.
How can you tell if something is a conductor?	(1) The heat travels through it very quickly so there is (2) hardly any temperature gradient across it if you heat one side of it. (3) It will feel cold to the touch because it takes the heat energy from your body very quickly.
How is heat passed by convection?	(1) Warm fluid expands (NOT the particles expand - they just spread out and occupy a bigger volume!!). (2) It is therefore less dense than the cooler fluid and (3) rises (4) to be replaced by cooler fluid. (5) This sets up a convection current.
Which fluid type convects heat energy the most effectively?	Gases