

CONDUCTION THROUGH SOLIDS



# Heat

Heat is transferred in 3 ways, **conduction**, **convection** and **radiation**. Heat travels from **HOT** places to **COLD** place

## Stopping Heat Transfer

**Convection and conduction** - take away the particles (create a vacuum).

**Conduction** - use insulating materials

**Radiation** - use shiny surfaces to **REFLECT** the heat back into the substance.

- use black surfaces to **ABSORB** the heat into the cooler material.

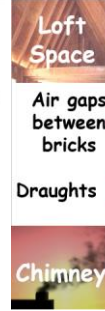
## Insulation

To keep things warm we need to stop **CONVECTION**, **CONDUCTION** & **RADIATION**.

The methods we use are types of **INSULATION**.



- Foam in wall cavity to stop **CONDUCTION** & **CONVECTION**
- Carpets trap air to stop **CONDUCTION** & **CONVECTION**
- Layer of roof insulation stops **CONDUCTION** & **CONVECTION**
- Double glazing - air gap stops **CONDUCTION** & **CONVECTION**



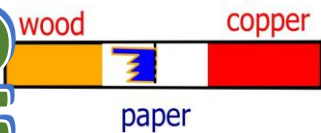
- Reducing loft space reduces **CONVECTION** & **CONDUCTION**
- Using foam in the cavity reduces **CONVECTION** & **CONDUCTION**
- Using draught excluders reduces **CONVECTION** & **CONDUCTION**
- Blocking unused chimneys reduces **CONVECTION**



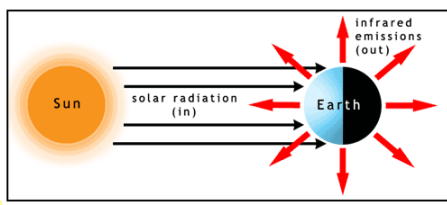
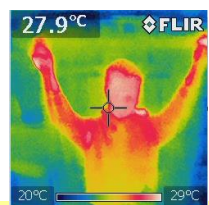
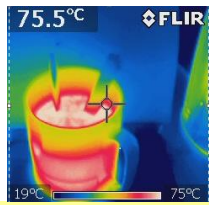
## Heat loss from houses



- The paper over the wood burns but not the over the copper.
- This is because the copper **conducts** the heat away and the paper over the copper does not get hot enough to catch fire.
- (most paper catches fire at 220 °C - 250 °C)
- Wood is a bad conductor, or a **good insulator**.



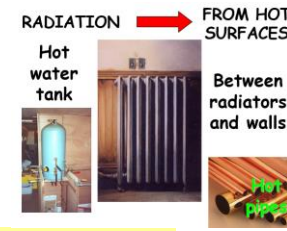
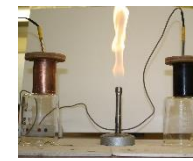
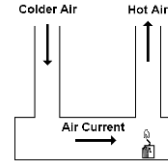
All 3 states in 1 boiling tube! The hot boiling water rises, and water is an insulator so heat doesn't conduct to the ice



**Radiation** is also called infra-red radiation is heat travelling in waves. Radiation does not need particles to travel and is the only way heat travels from the Sun to Earth. Black surfaces absorb and emit more radiation, shiny surfaces reflect more radiation



- Jackets lined with silvery material stop **RADIATION**
- Silver foil at the back of the radiator stops **RADIATION**
- Silvery pipe lagging stops **RADIATION**



**Convection:** Heat travels through fluids, (liquids and gases) when one part of a fluid is heated more. The warmed material has greater spacing between the particles so the density of the warmer material is less than the density of the colder material. The heated fluid rises, the colder fluid sinks creating a convection current. Stirring a hot fluid ensures the temperature is the same throughout the fluid.



CONVECTION THROUGH GASES



# Convection

# Radiation

Conduction: Heat can travel through solid because the energy is passed along from particle to particle.  
Metals are good conductors of heat, e.g. Silver, Copper and Aluminium  
Gases are the poorest conductors of heat, in other words they are the best insulators., materials which do not conduct heat.

# Conduction