HEAT TRANSFER

CfE Heat Topic

Homework for the Block

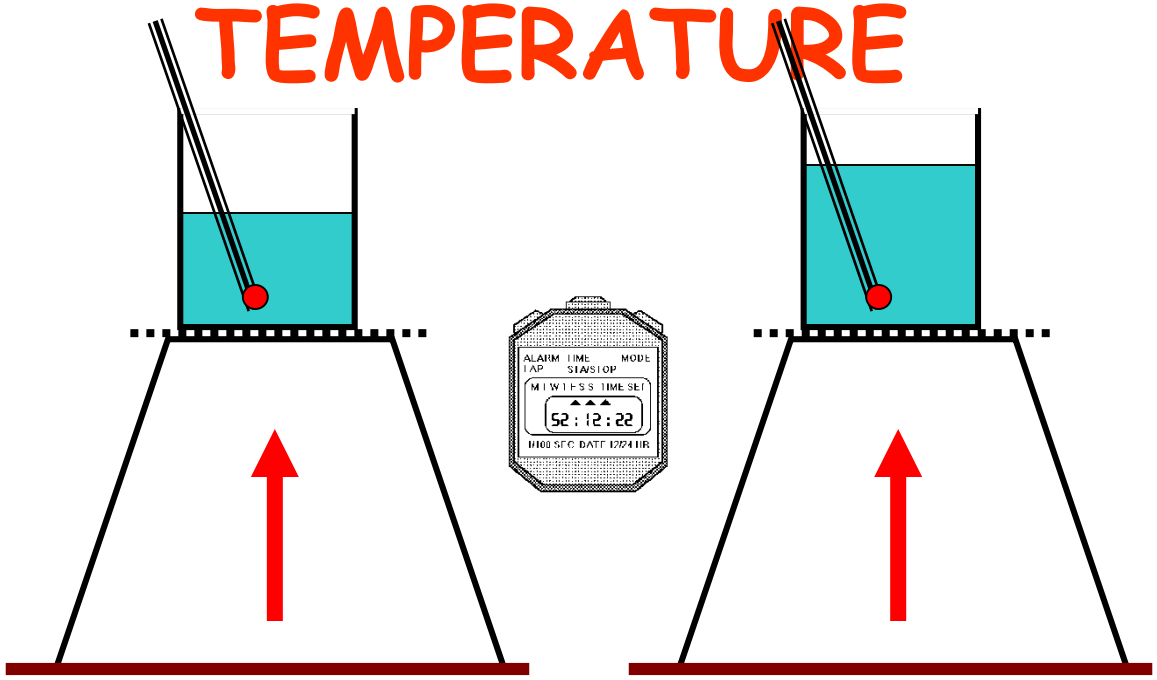
- HEAT TITLE PAGE
- Logic Problem Sheet
- Research on your topic
- Write up Your Experiment and Present to the rest of the class
- Read about u-values from e-boards (merit)
- Complete the evaluation sheet

Heat can be transferred in 3 ways

- CONDUCTION
- CONVECTION
- RADIATION

- Usually heat is transferred in all 3 ways at once.
- Heat travels from HOT places to COLD places

TEMPERATURE



- Temperature is how HOT or COLD something is.
- Temperature is measured in degrees Celsius (°C)

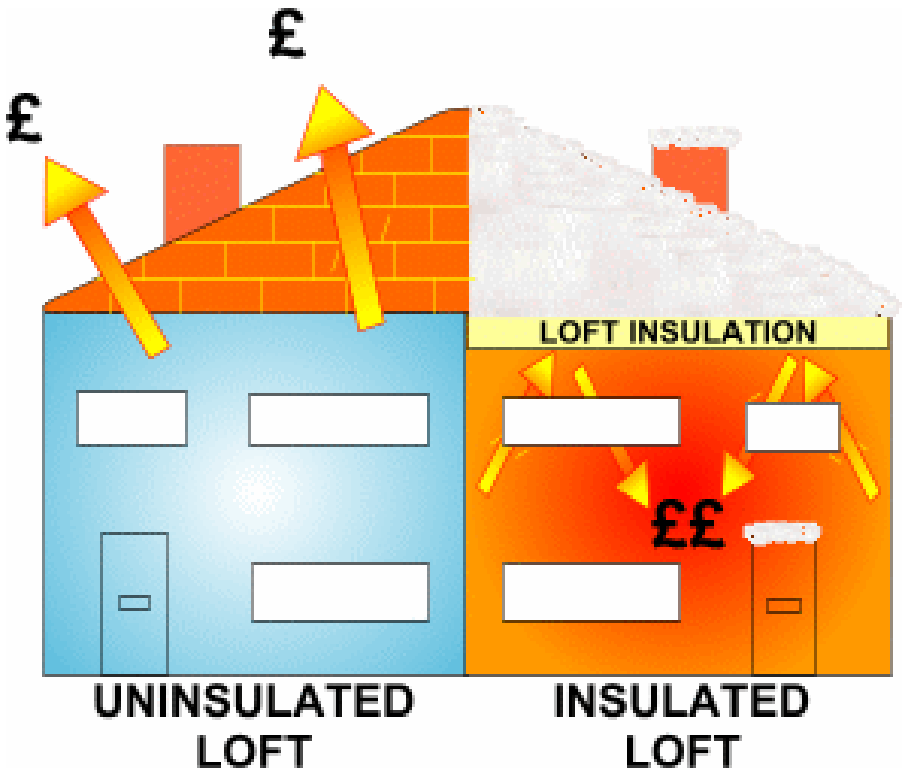
- HEAT is a form of ENERGY. Energy is measured in JOULES

Heat Transfer

- Heat ALWAYS travels from **HOT** places to COLD places

INSULATION

- The opposite of conduction is INSULATION.
- We can put INSULATORS in the house to prevent HEAT TRANSFER



CONDUCTION

- Heat passing through a SOLID
- Heat is transferred by making the particles vibrate more passing the energy along the conducting material.
- http://www.echalk.co.uk/Science/physics/conduction/conduction.html

1. CONDUCTION – book passed from student to student.
2. CONVECTION – book taken a student to the back of the room.
3. RADIATION – book thrown to the back of the room.
4. EVAPORATION - ???

CONDUCTION

- Conduction occurs in solids.
- Metals are good conductors.
- Non-metals, liquids and gases are poor conductors.

- Bad conductors are good insulators.

How to summarize these slides

Do not copy this slide.

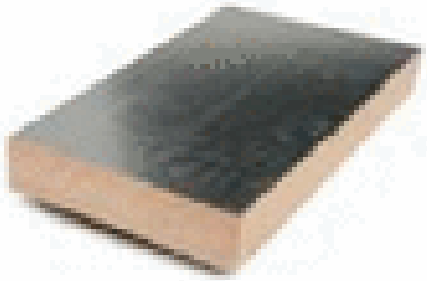
Copy the table on the next slide and record all the examples given in this PowerPoint to show what you can do to a house to reduce heat loss, how the method works and which type of heat transfer it reduces.

Reducing heat loss from houses

What	How	Heat Transfer
Paint radiators black	*Black surfaces emit more heat than shiny surfaces*	*Radiation*

INSULATION (Conduction)

- In loft: fibre glass, sheepskin, paper pulp.
- In walls: fibre glass, paper pulp, polystyrene and many new materials (e.g. celotex).

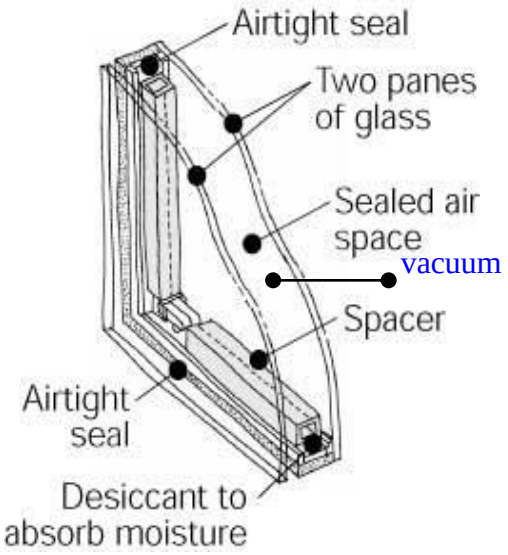


INSULATION (Conduction)

- Window frames: make them from plastic not metal.
- Under carpet: underlay (made by Gates Rubber in Dumfries).

INSULATION (Conduction)

- Floors: Use thick carpet.
- Windows: Close thick, lined curtains as soon as it is dark; double or triple glazed glass; Use glass with a good u-value.

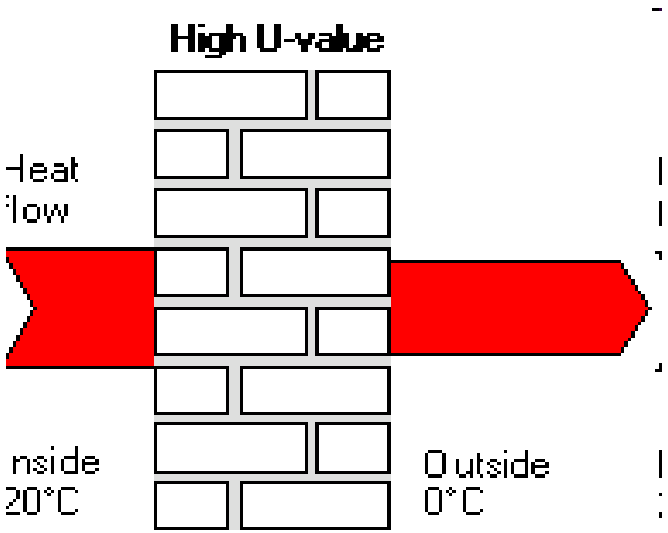


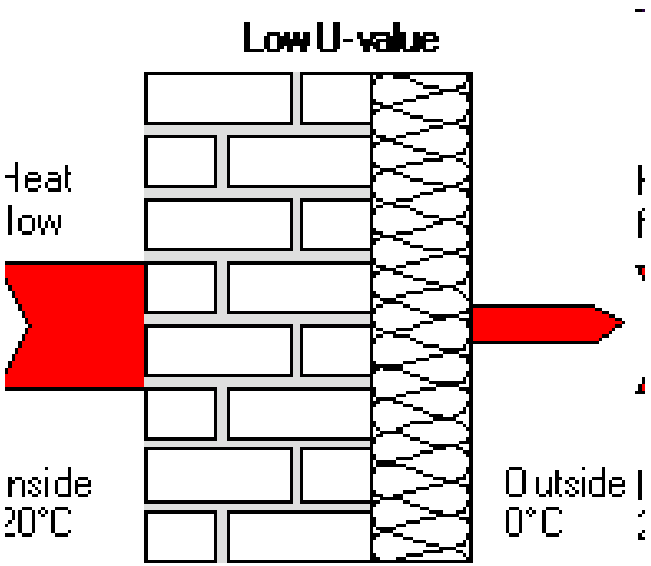
INSULATION (Conduction)

- Roof: Slates are better insulators than metal.
- Thatched rooves are better than slate.
- Turf rooves can be used as a great insulator.
- House walls can also be made of straw.

INSULATION (Conduction)

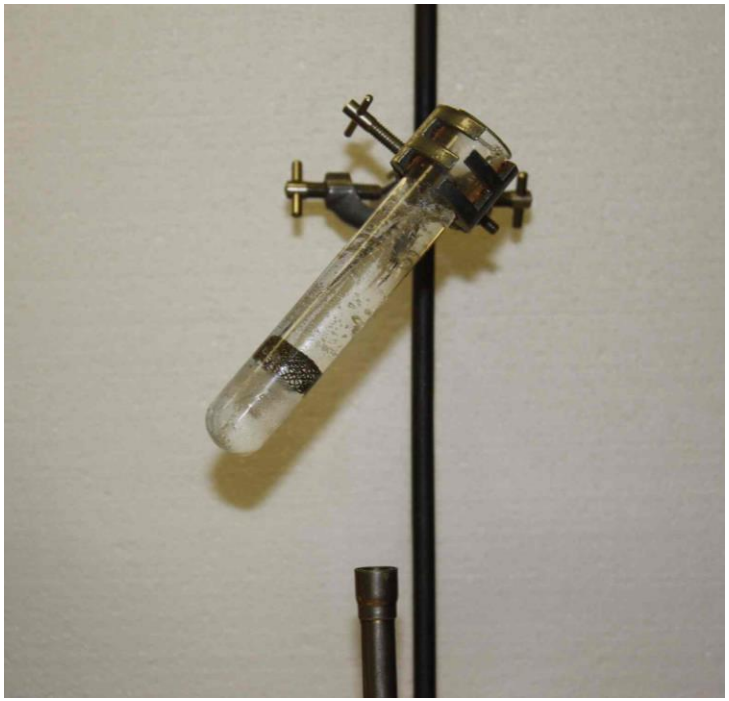
- Low u-values are good, less heat is lost through the walls.





CONVECTION

- Only occurs in liquids and gases (fluids).
- Here the molecules carry the energy with them. The molecules spread out and become less dense.
- This is why warm fluids rise and cool fluids sink.



CONVECTION
(not required)

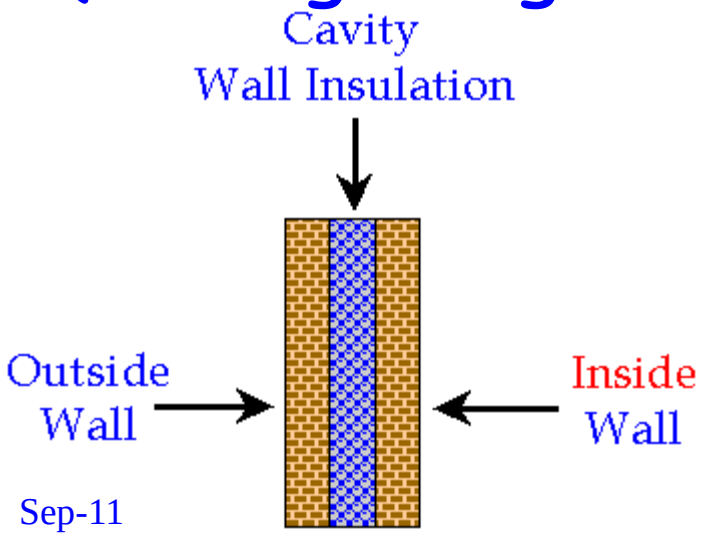
- Hot air balloons are an example of convection currents.
- Thermals (the warm currents that birds and glider pilots use) are also an example of convection currents.

INSULATION (Convection)

- Loft: Insulating this is really important because hot air rises so lots of heat can be lost out of the roof if it is not well insulated.
- Convection can only happen in fluids. If you put in a solid convection cannot occur.

INSULATION (Convection)

- Walls: Insulating the cavity helps to stop convection.
- Convection currents are often responsible for draughts.
- Fit draught excluders around doors (sausage dogs etc.)



INSULATION (Convection)

- Fit draught strips around windows and doors.

INSULATION (Convection)

- Fit "postman catchers" – draught excluders on letter boxes.

INSULATION (Convection)

- Chimneys: Since hot air rises by convection lots of heat can be lost up the chimney when not in use.
- This can be prevented covering the fire opening or using blow-up chimney pillows stuck up the chimney.

INSULATION (Convection)

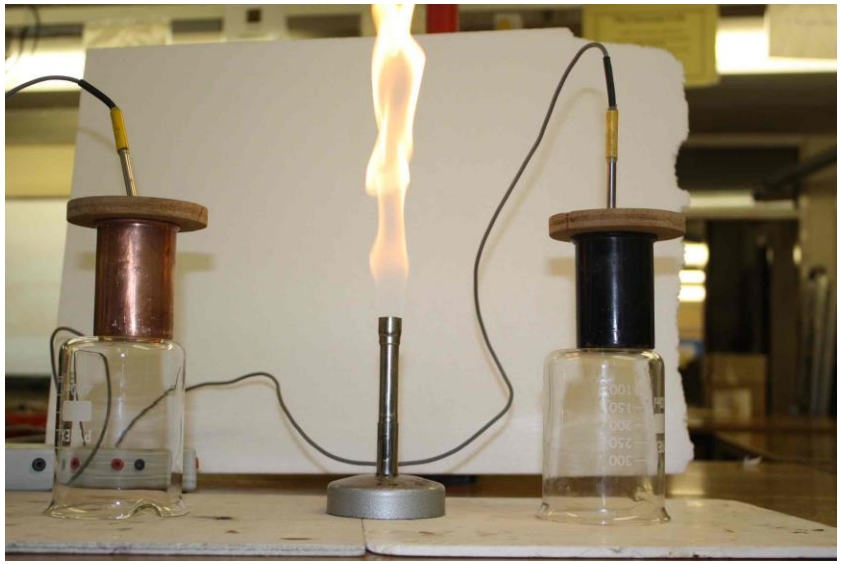
- If you don't use an open fire, seal it up (but left a little gap so it doesn't get damp).
- WARNING: Don't block up all the draughts, you might suffocate!

RADIATION

- This is also called infra-red radiation and travels just like light but has a lower frequency.
- Heat travels from the Sun to Earth as radiation and these waves can travel through a vacuum.
- Anything that is hotter than its surroundings will radiate heat.

RADIATION

- Radiation is affected by colour and surface finish. Black surfaces absorb (take in) more radiation but also emit (give out) more.
- Shiny surfaces reflect more radiation than matt (dull) ones.



RADIATION

- Infra-red cameras show where heat is lost.

INSULATION (Radiation)

- Use foil behind radiators. The foil will reflect radiation back into the room.
- Use foil-backed plasterboard. This reflects the radiation back into the room although there will be a little more conduction.
- Painting radiators black will make them emit more radiation.