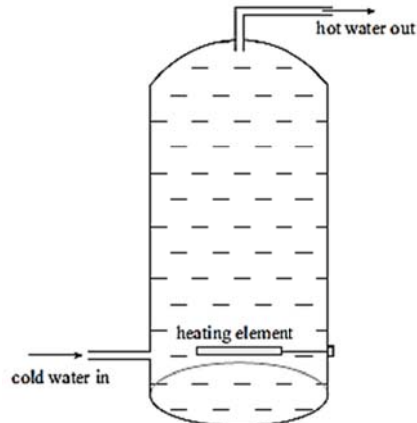


SCIENCE: PHYSICS 90191 HEAT TRANSFER

THE HOT-WATER CYLINDER (2009;4)

Water can be heated by a hot-water cylinder. The water in the cylinder is heated by an electric element made from metal, placed near the base of the cylinder as shown in the diagram.



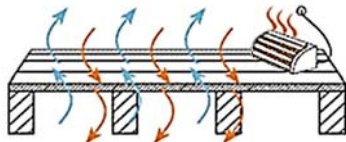
Discuss how the water heats in the water cylinder and why it is important to take the hot water out from the top of the cylinder rather than the bottom.

In your answer you should include:

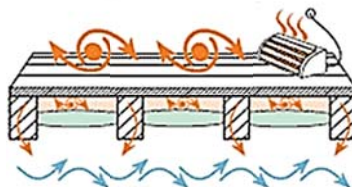
- A description of any heat transfer process(es) involved in terms of particles
- Named arrow(s) on the diagram above to show any heat transfer
- An explanation of why metal is used for the heating element
- An explanation of why the hot-water exit is placed at the top.

WARMER, DRYER HOMES (2008;3)

Older homes with wooden floors can lose a large amount of heat through the floor.



Underfloor insulation helps to reduce heat loss by conduction. One way of achieving this is to put insulation across the bottom of the floor joists, or in between them, as shown in the diagrams below.



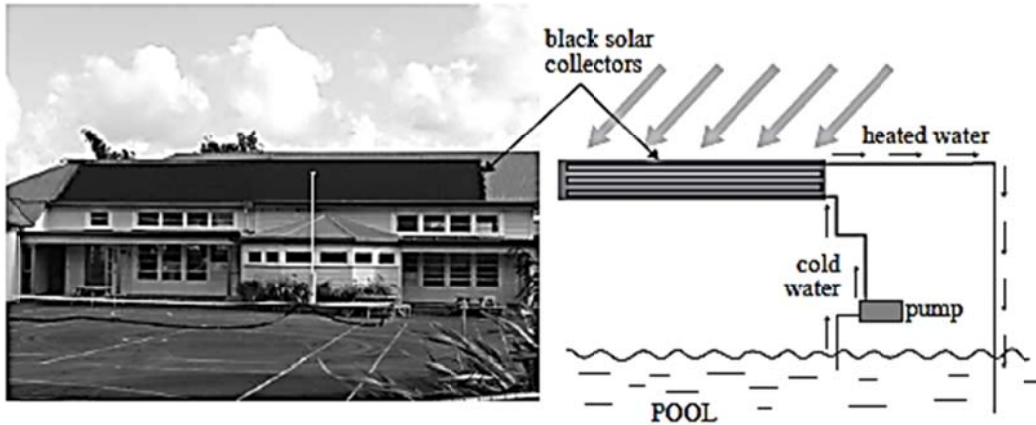
Discuss why placing insulation below the joists is more efficient at insulating the floor than placing it between the joists.

In your discussion you should:

- describe the process of conduction
- describe what insulation is
- explain why an air gap is needed.

SOLAR POOL HEATING (2008;3)

The photo and diagram below show a Solar Pool Heating System



The solar collectors on the Solar Pool Heating System are made from black plastic (polypropylene).

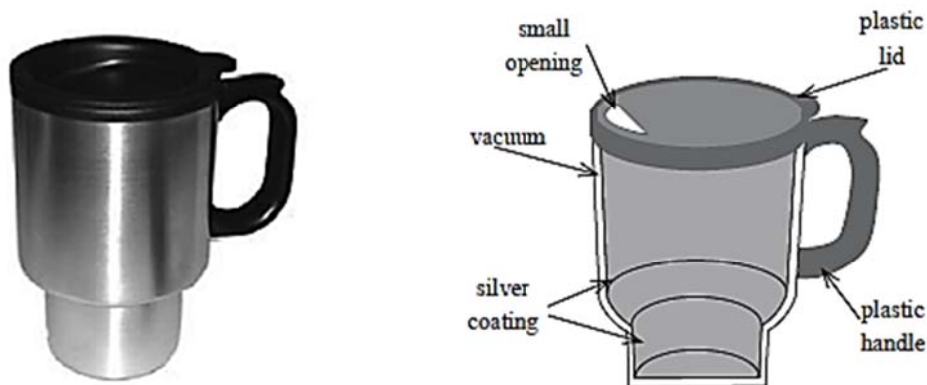
- Name the heat transfer process that transfers the Sun's solar energy into the solar collectors.
- Explain why the solar collectors are black.

The heated water is pumped back into the bottom of the pool. After 'some time' the heated water spreads through the whole pool.

- Name the heat transfer process that causes the heated water to spread through the whole pool.
- Discuss why it is important that the heated water enter at the bottom rather than the top of the pool.

COFFEE TO GO! (2006;3)

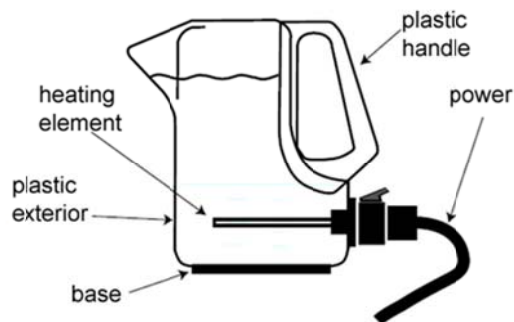
The photo and diagram below show a travel mug used to keep coffee warm for up to an hour.



- A vacuum exists between the outer layers. Describe the term vacuum.
- Discuss, in terms of heat transfer, TWO features of the travel mug that would help to keep the coffee warm.

AN ELECTRIC JUG (2005;2)

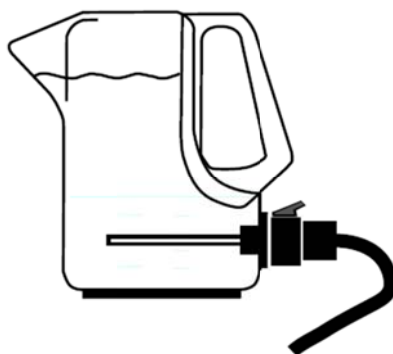
The diagram below shows the parts of an electric jug.



(a) Name the process by which heat energy is transferred from the heating element to the water.

Heat energy is then spread through the rest of the water by the process of convection.

(b) Draw in arrows on the diagram below to show the convection currents occurring.

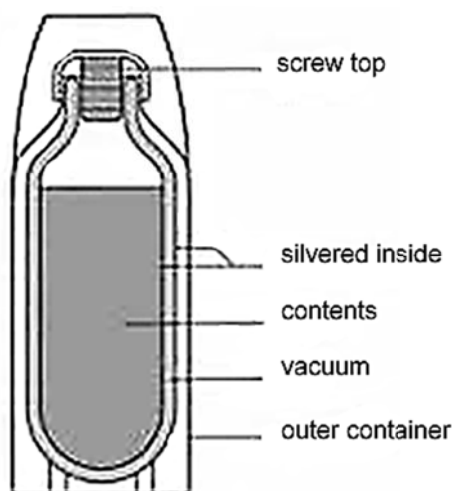


(c) Discuss, in terms of water particles, how the process of convection heats the water in the electric jug.

(d) Explain, in terms of heat transfer, why the outside of the jug is made from plastic.

REFRESHMENTS (2004;4)

Marty brings a vacuum flask of hot coffee with him to the game. A simplified diagram of a vacuum (or thermos) flask is shown.



(a) Name the process by which heat travels through a metal.

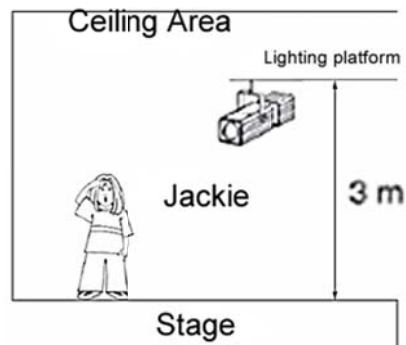
(b) Name the process by which heat travels through a vacuum.

(c) Explain how a plastic stopper in the top of the flask stops heat transfer better than a metal stopper.

(d) A vacuum flask is made to keep drinks hot. Discuss how the flask shown above is able to keep the drink hot.

QUESTION ONE (2003;1)

A group of friends have decided to help in the school stage production.



Jackie notices that it gets very hot on the stage soon after the lights are switched on.

- What type of heat transfer is heating the stage area?
- Explain why the air is hotter in the ceiling area above the lights than on the stage.
- Sometimes the lights need to be moved. Explain why the handles of the lights are made of plastic.
- The director and an actor were standing on the stage under the lights. The actor was dressed in black and felt hot. The director was dressed in white and felt cool. Discuss how the colour of their clothing made the temperature appear different to each of them.