

Thermal
energy (Heat)

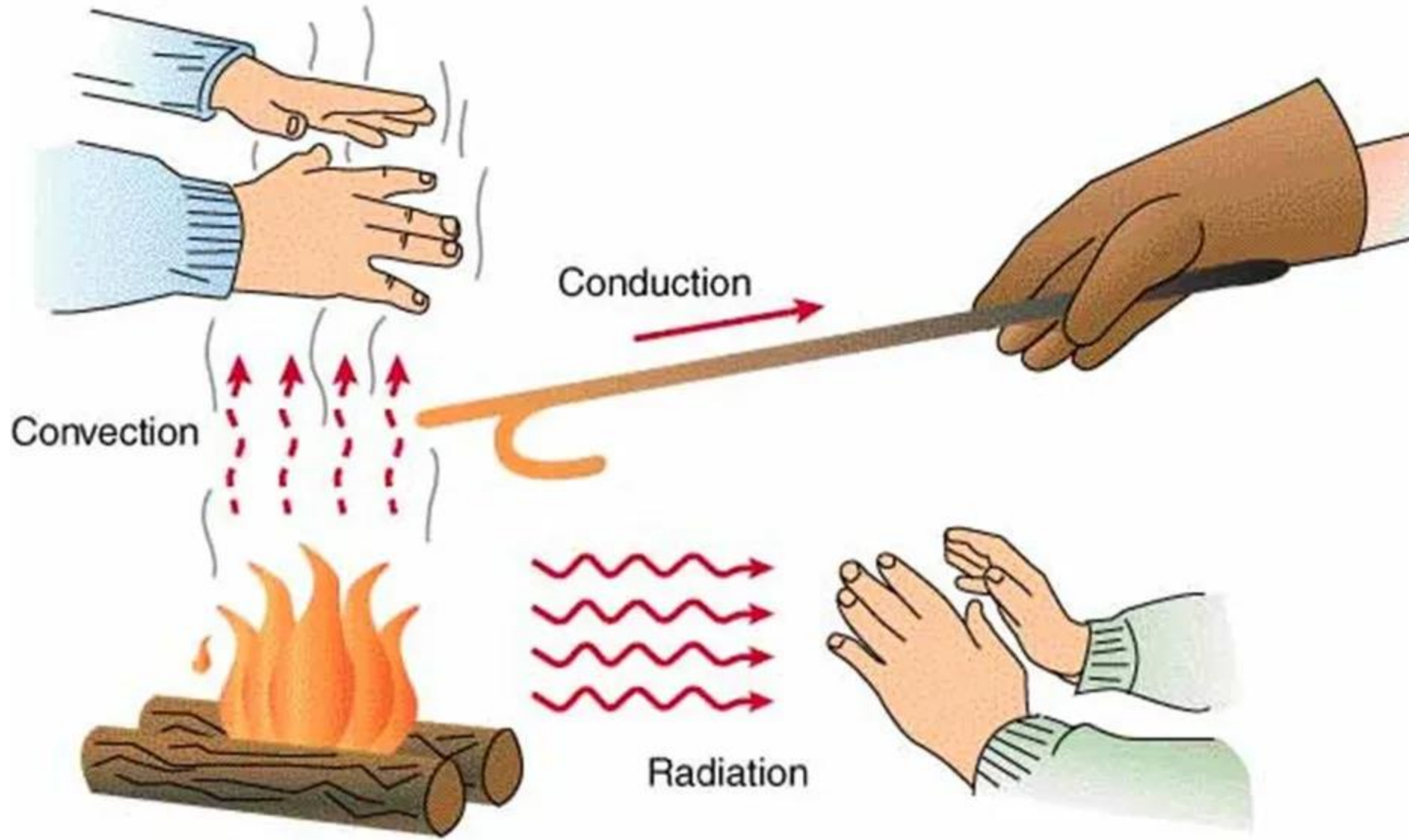
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Methods of heat transfer

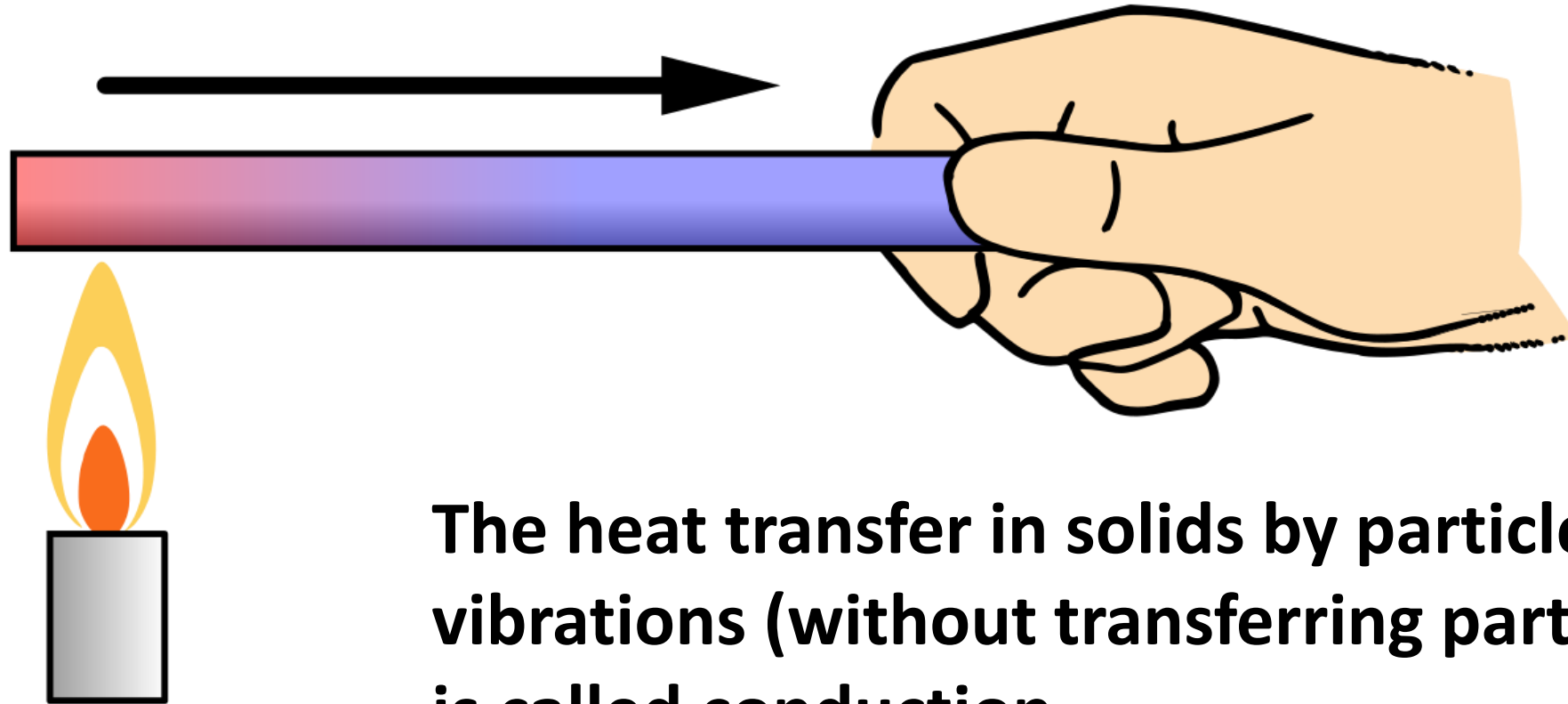
- ❑ Conduction –method of heat transfer in solids
- ❑ Convection- method of heat transfer in liquids and gases.
- ❑ Radiation – IR waves (medium not required)

IMPORTANT

Methods of heat transfer



Conduction



The heat transfer in solids by particle vibrations (without transferring particles) is called conduction.

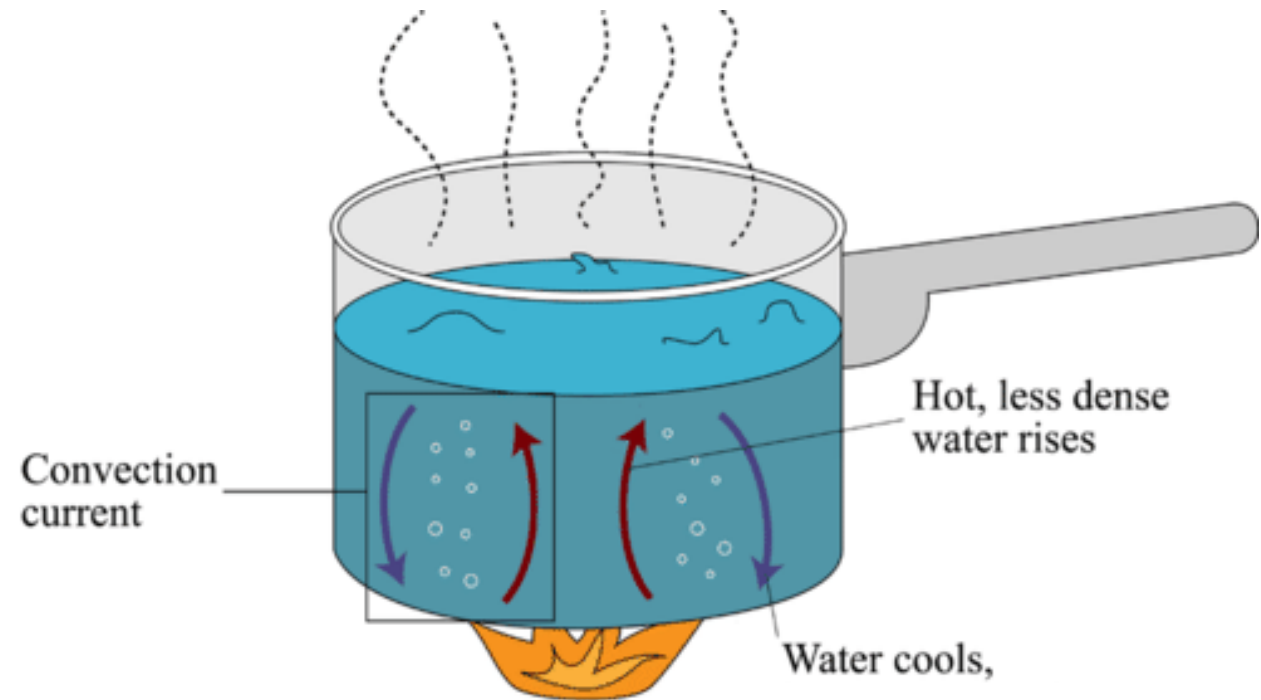
Require a medium to transfer heat by conduction.



Convection

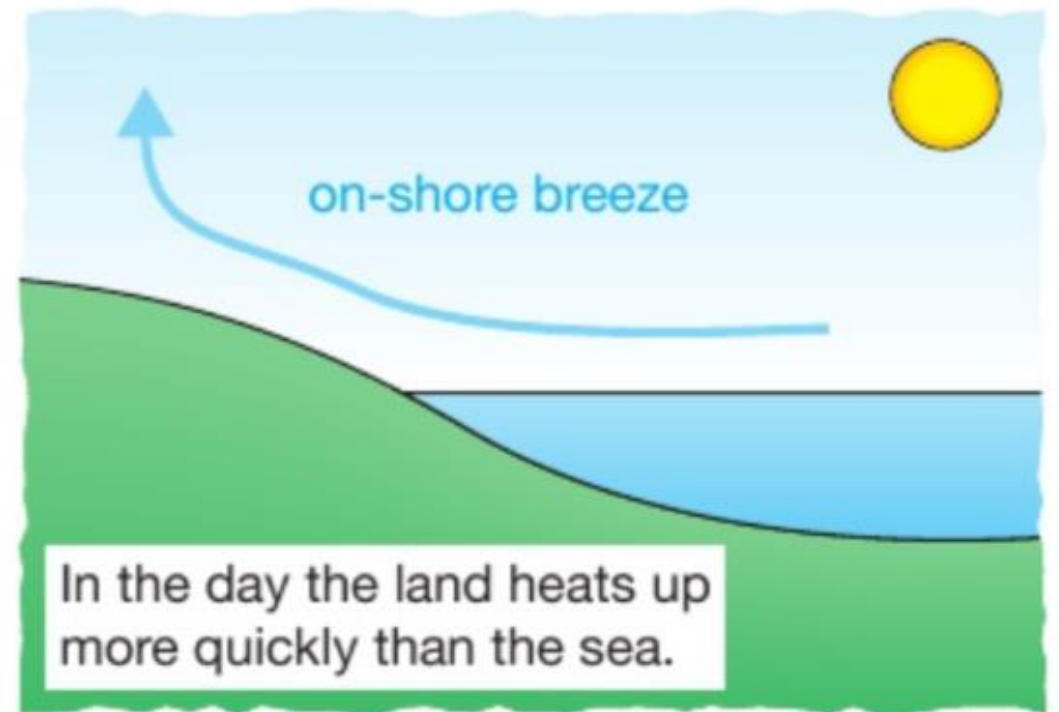
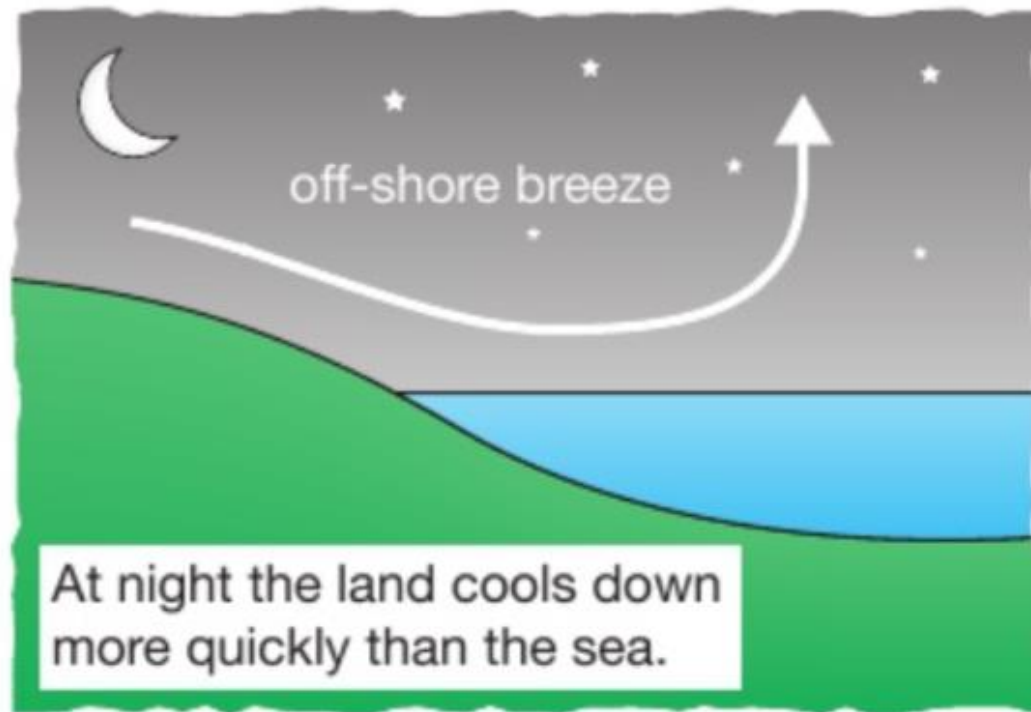
The heat transfer in fluids by transferring less dense hot regions of particles upward and cold high dense regions of particles downward as a cycle is called convection.

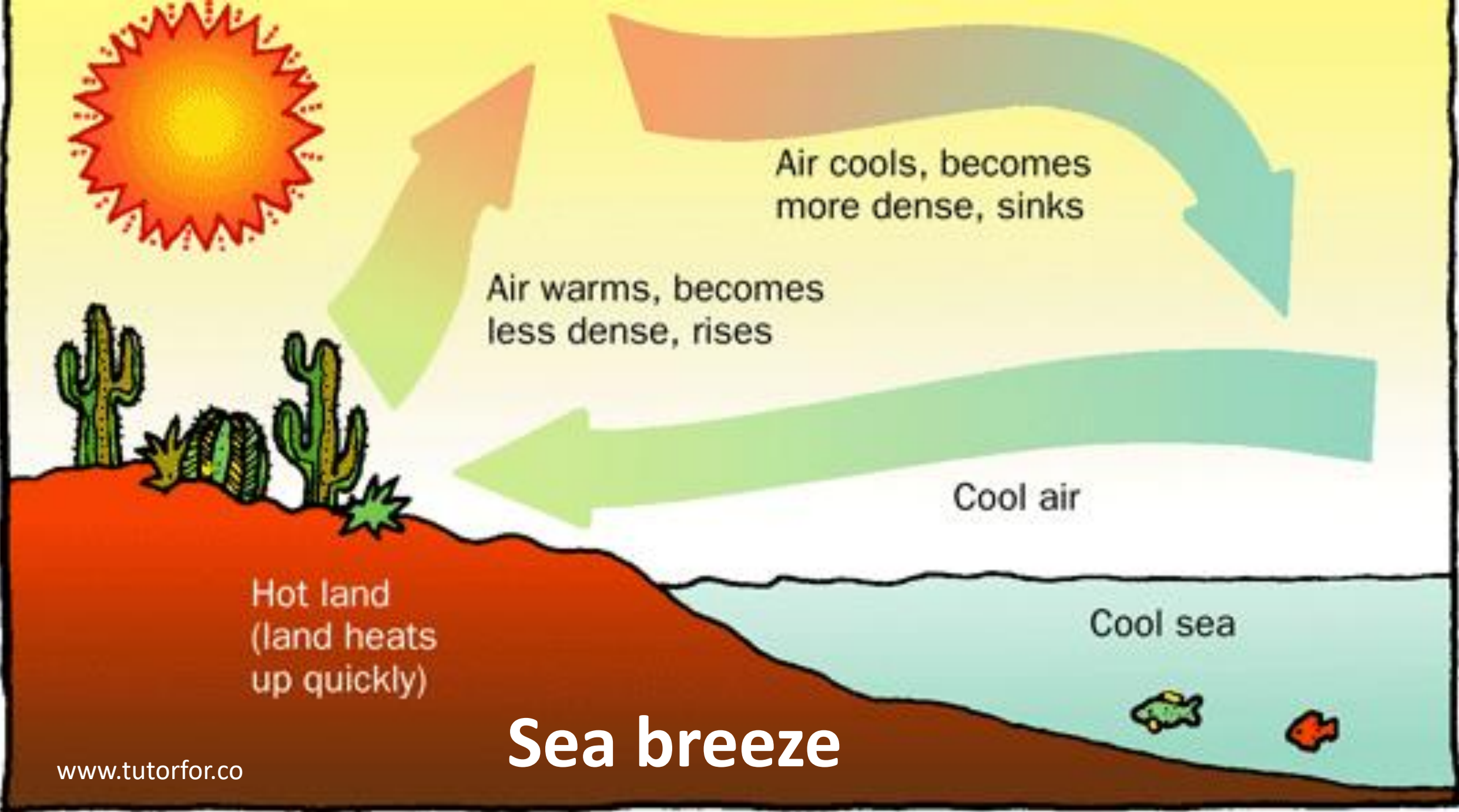
Require a medium to transfer heat by convection.



IMPORTANT

Sea breeze





Air cools, becomes more dense, sinks

Air warms, becomes less dense, rises

Cool air

Hot land
(land heats up quickly)

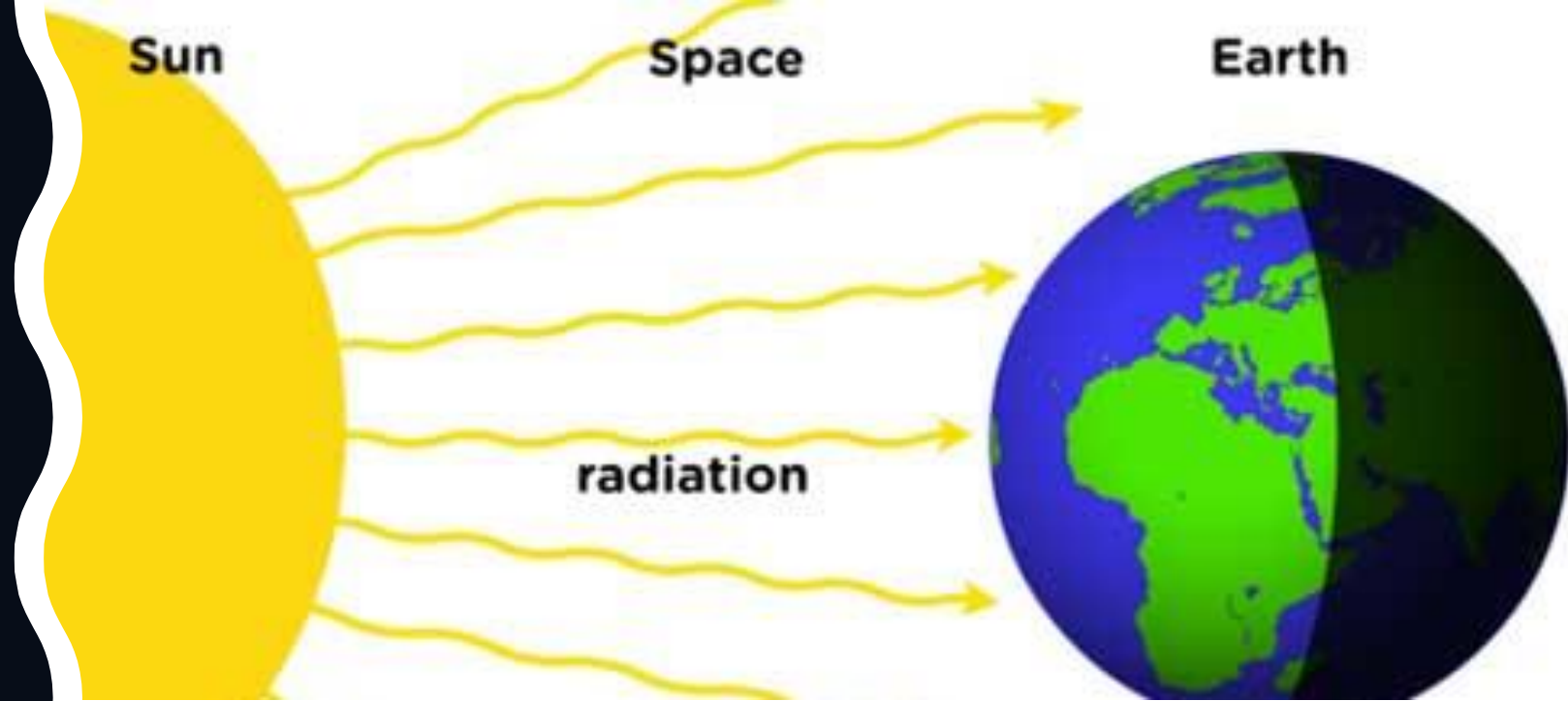
Cool sea

Sea breeze

Radiation

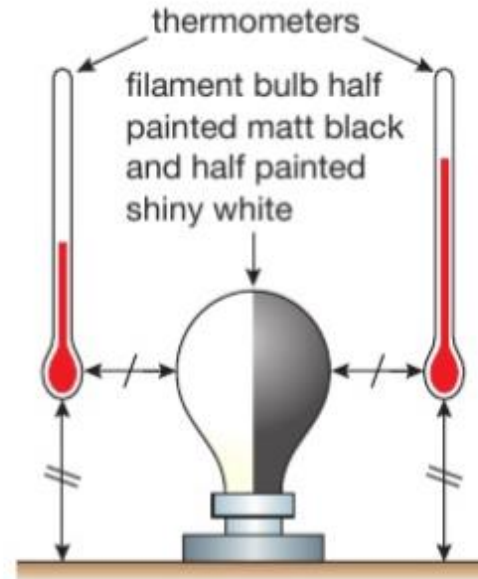
The heat transfer as Infra-red waves is called radiation.

This method of heat transfer doesn't require a medium.



▼ PRACTICAL: INVESTIGATE HOW WELL DIFFERENT SURFACES RADIATE HEAT

This experiment shows that matt black surfaces radiate heat better than shiny white surfaces.



▲ Figure 15.11 Demonstrating that matt black surfaces radiate heat better than shiny white surfaces

Figure 15.11 shows the experiment. Put two identical (same type) thermometers on either side of a filament bulb that has been painted matt black on one side and shiny white on the other.

When you turn on the bulb you will notice that the temperature starts to rise more quickly on the thermometer facing the black side than on the other.

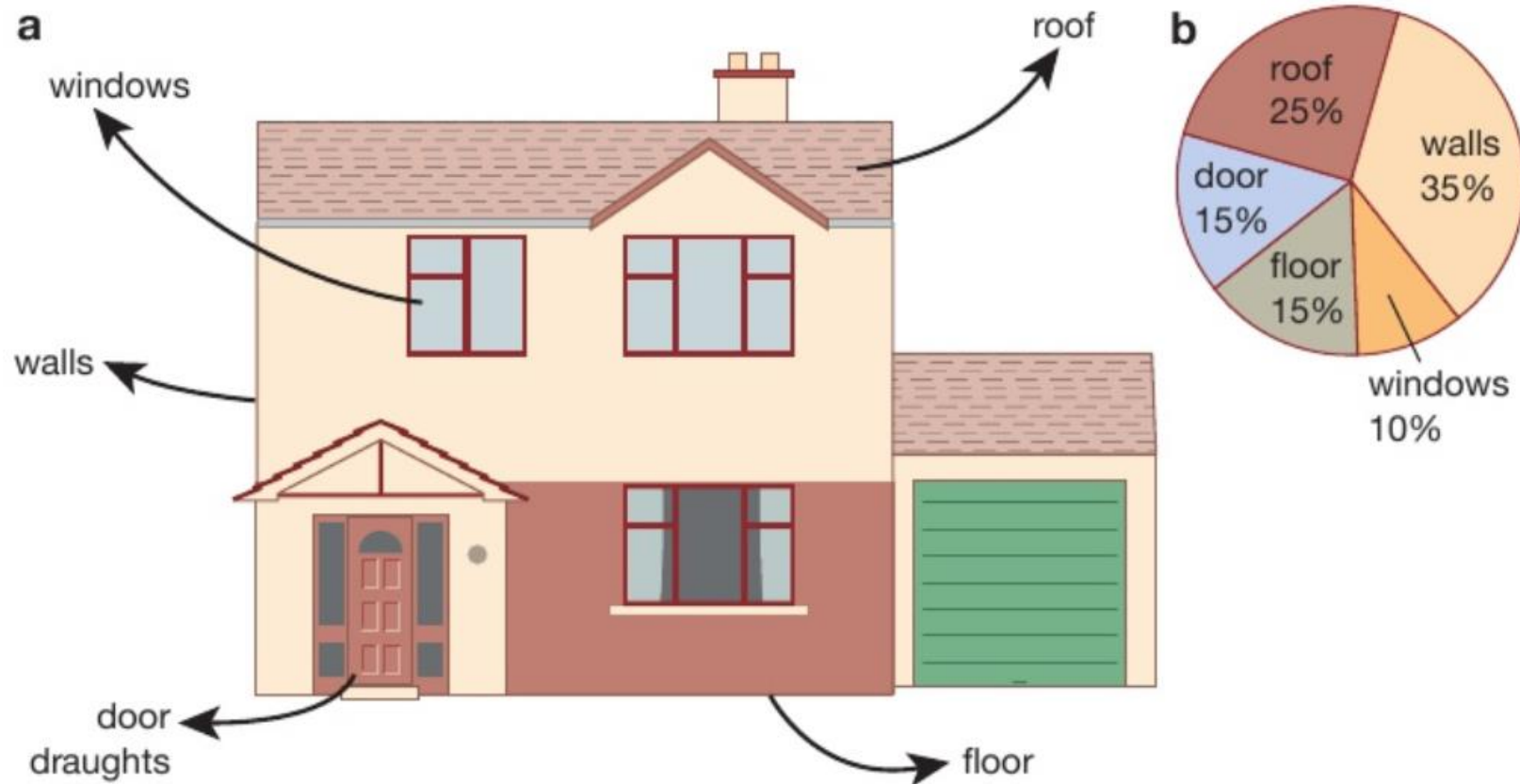
It is important that the thermometers are fixed at the same height and distance from the filament bulb.

Types of surfaces, temperature and heat radiation

- Matt black surfaces can absorb large amount of heat radiation.
- Shiny white(or silver coated) surfaces can reflect large amount of heat radiation.
- Objects with high temperatures emit more infra-red waves than the objects with low temperatures.



Energy efficient houses



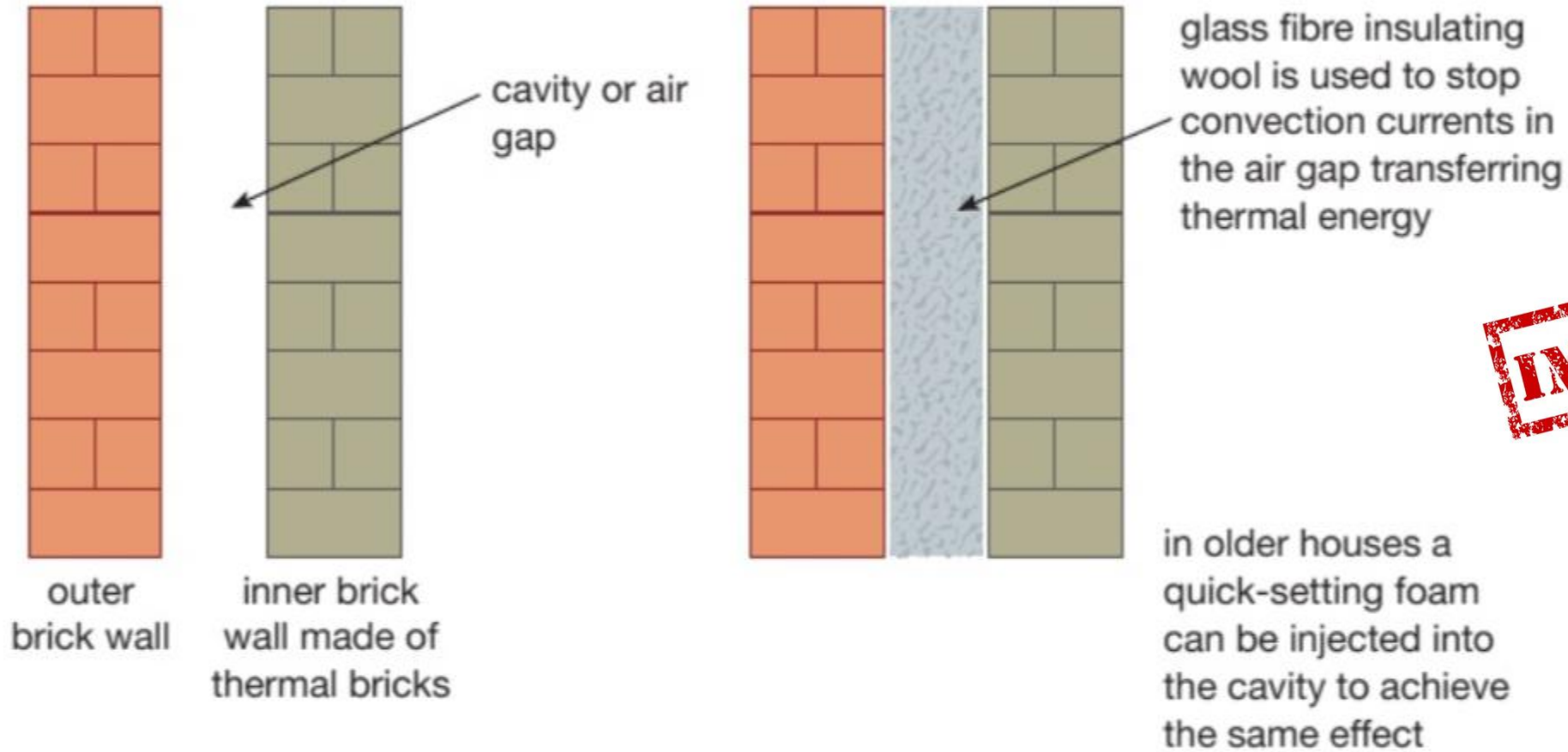
Energy efficiency

- Energy efficiency means using as much as possible of the energy we produced for the desired purpose.
- The houses are specially designed to prevent heat loss during the winter season.

Ex: Two layered walls

Double glazing

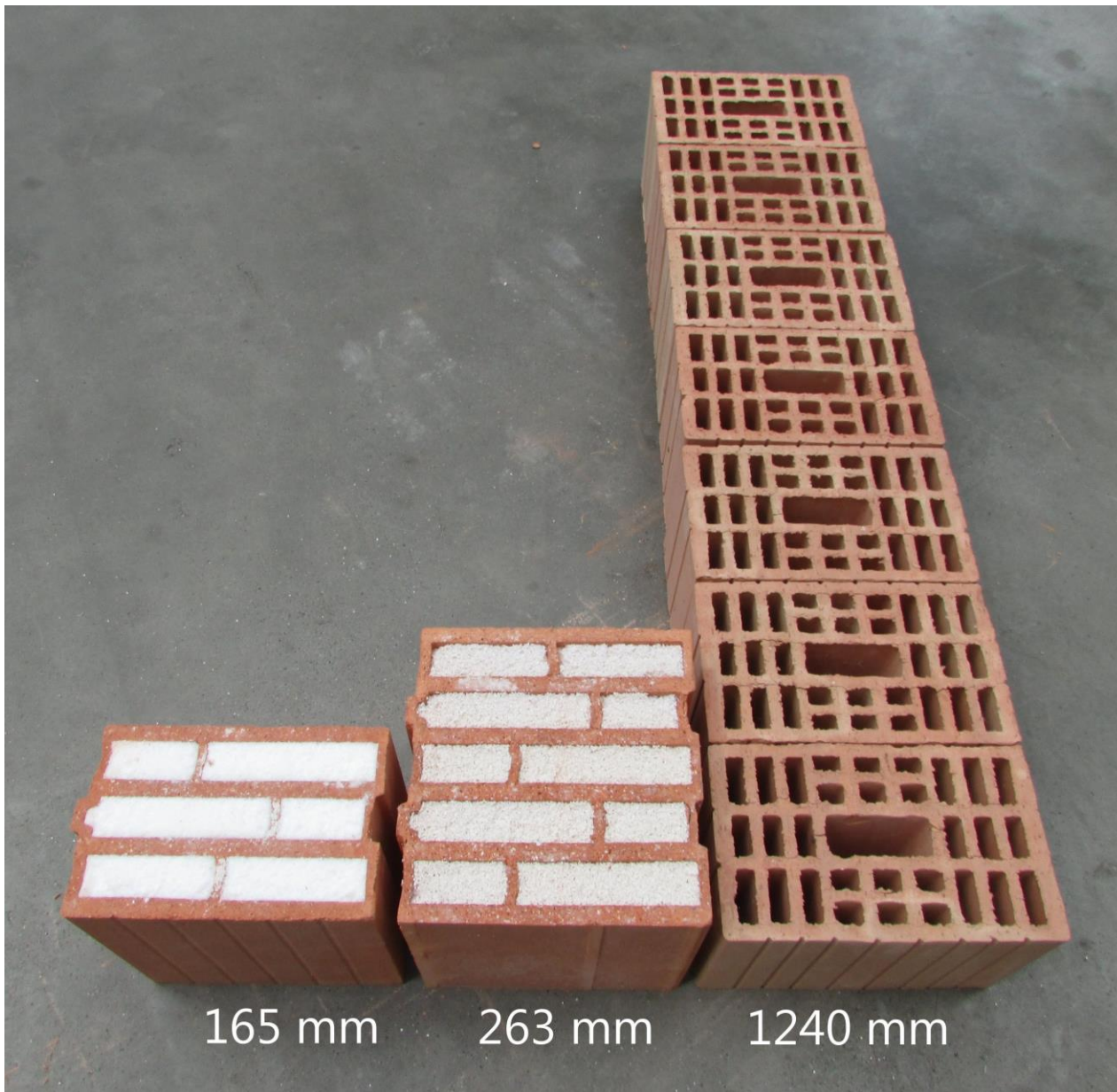
Two-layered walls



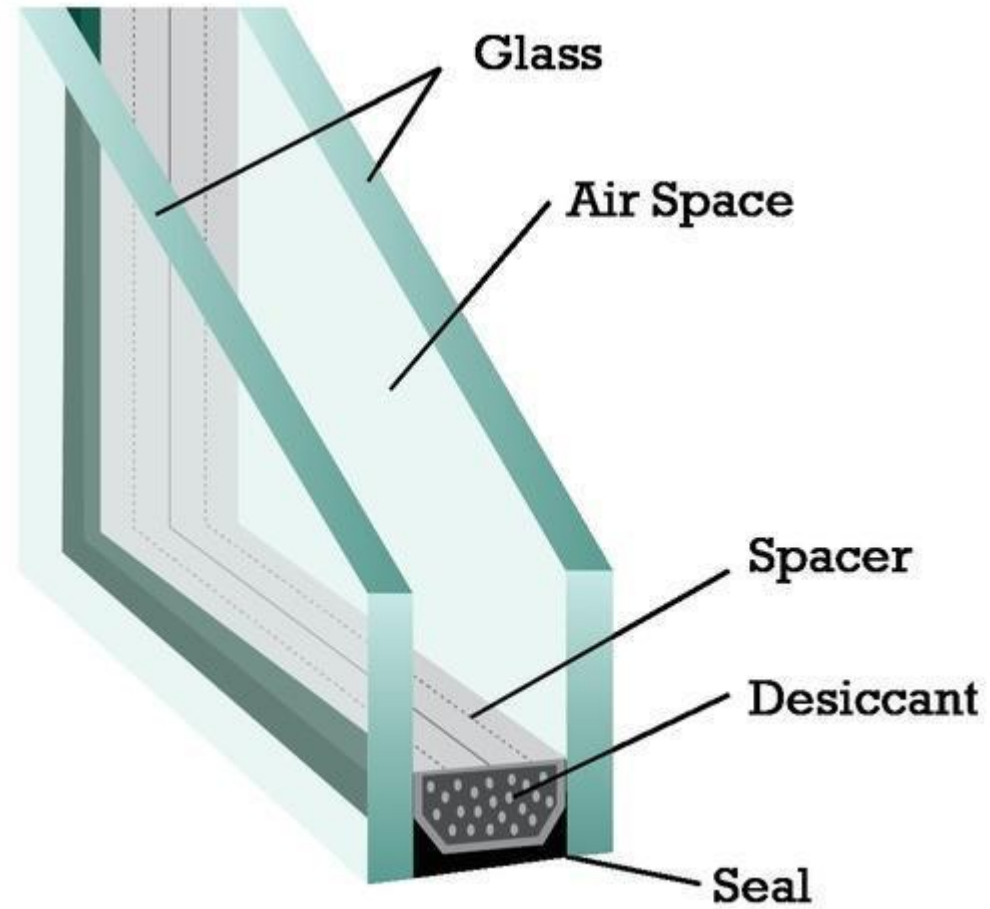
IMPORTANT

▲ Figure 15.15 Two-layered wall construction, with the gap filled with insulation panels, helps to reduce heat loss by conduction, convection and even radiation.

Thermal bricks



Double glazing



How it Works:

Example: 4mm Solar Neutral Tough / Gas / 4mm Elite Tough

Outside

Light
Transmission
100%

Reflection 11%

Solar Transmission
100%

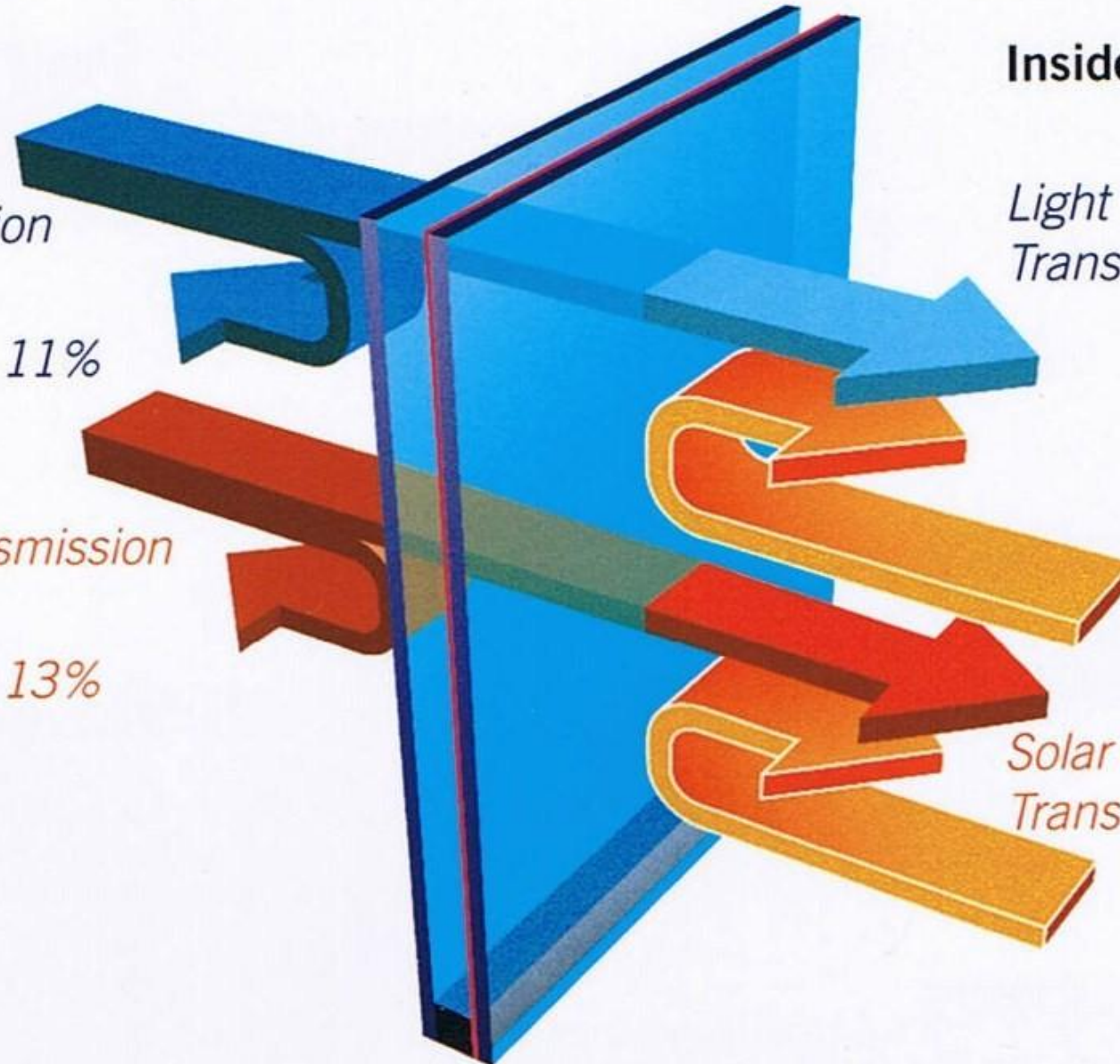
Reflection 13%

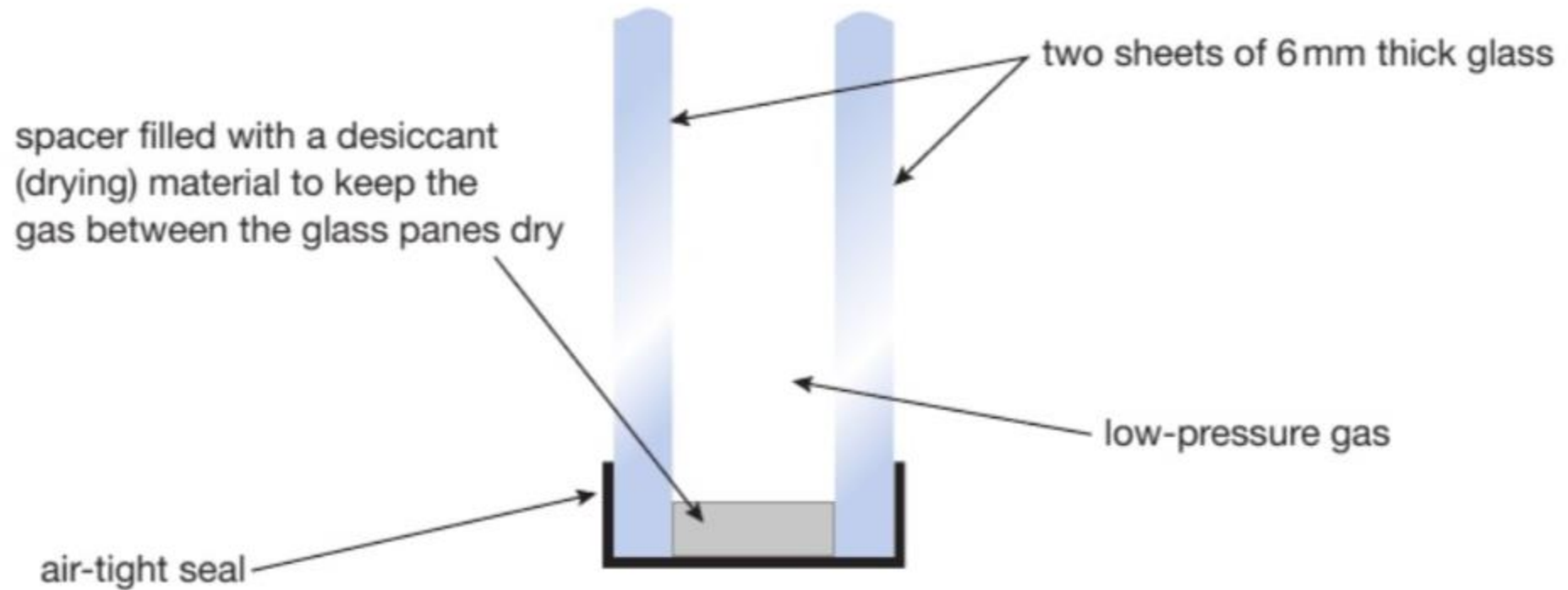
Inside

Light
Transmission 61%

Heat
generated
internally is
reflected back
into the room

Solar
Transmission 49%





▲ Figure 15.16 Double glazing helps to stop heat escaping from the home.

IMPORTANT

Hot/Cold water flask

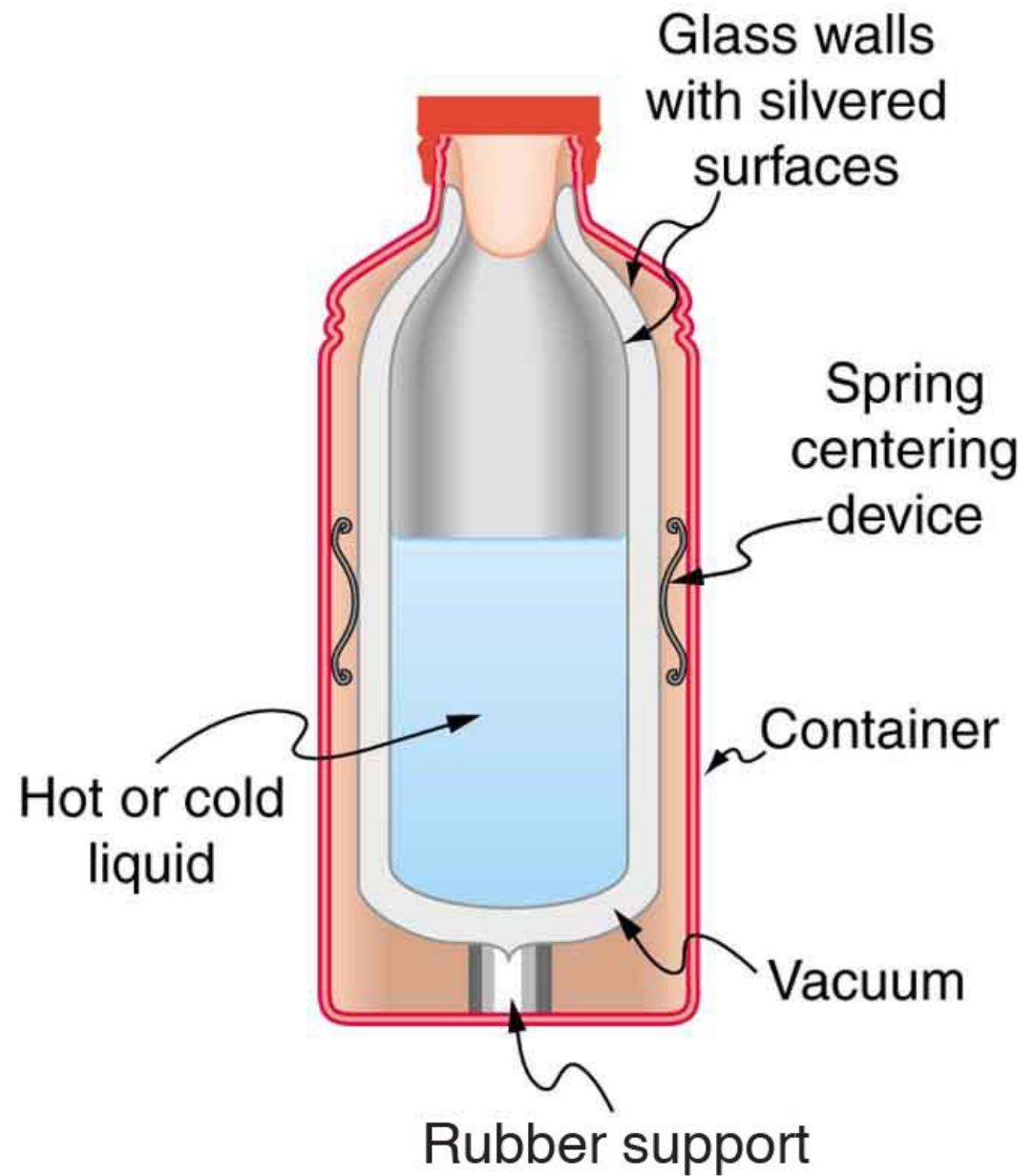




Figure 15.19 Penguins stand close together for warmth.