

# GRADE 7 SCIENCE

Unit 2: Heat

Chapter 6: *“Heat is transferred from one place to another by three different processes.”*

# HEAT TRANSFER

Heat transfers from a **hot** object to a **cold** object.

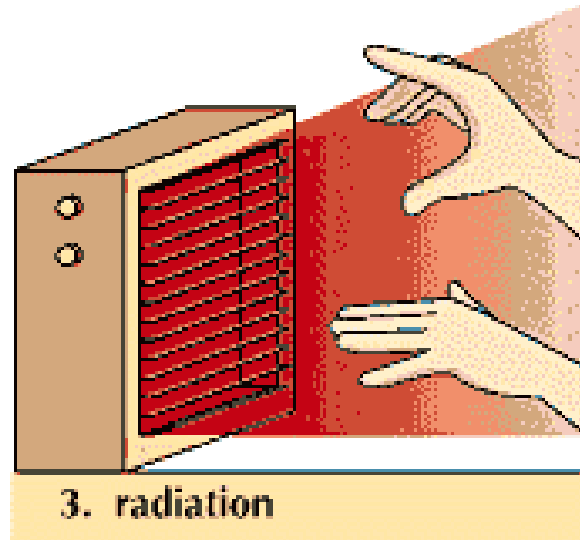
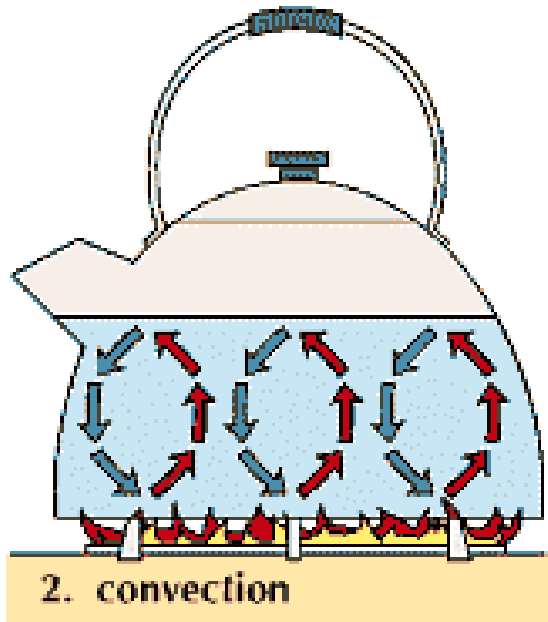
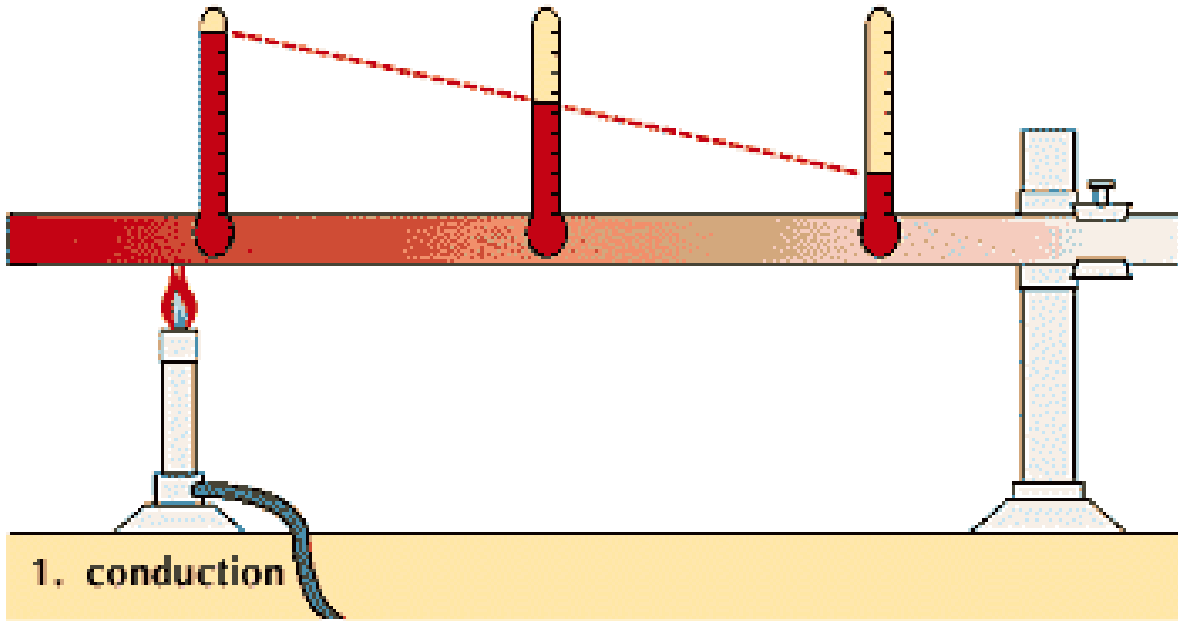
- Warm water
- Cool water



# THREE TYPES OF HEAT TRANSFER...

1. **Conduction**
2. **Convection**
3. **Radiation**

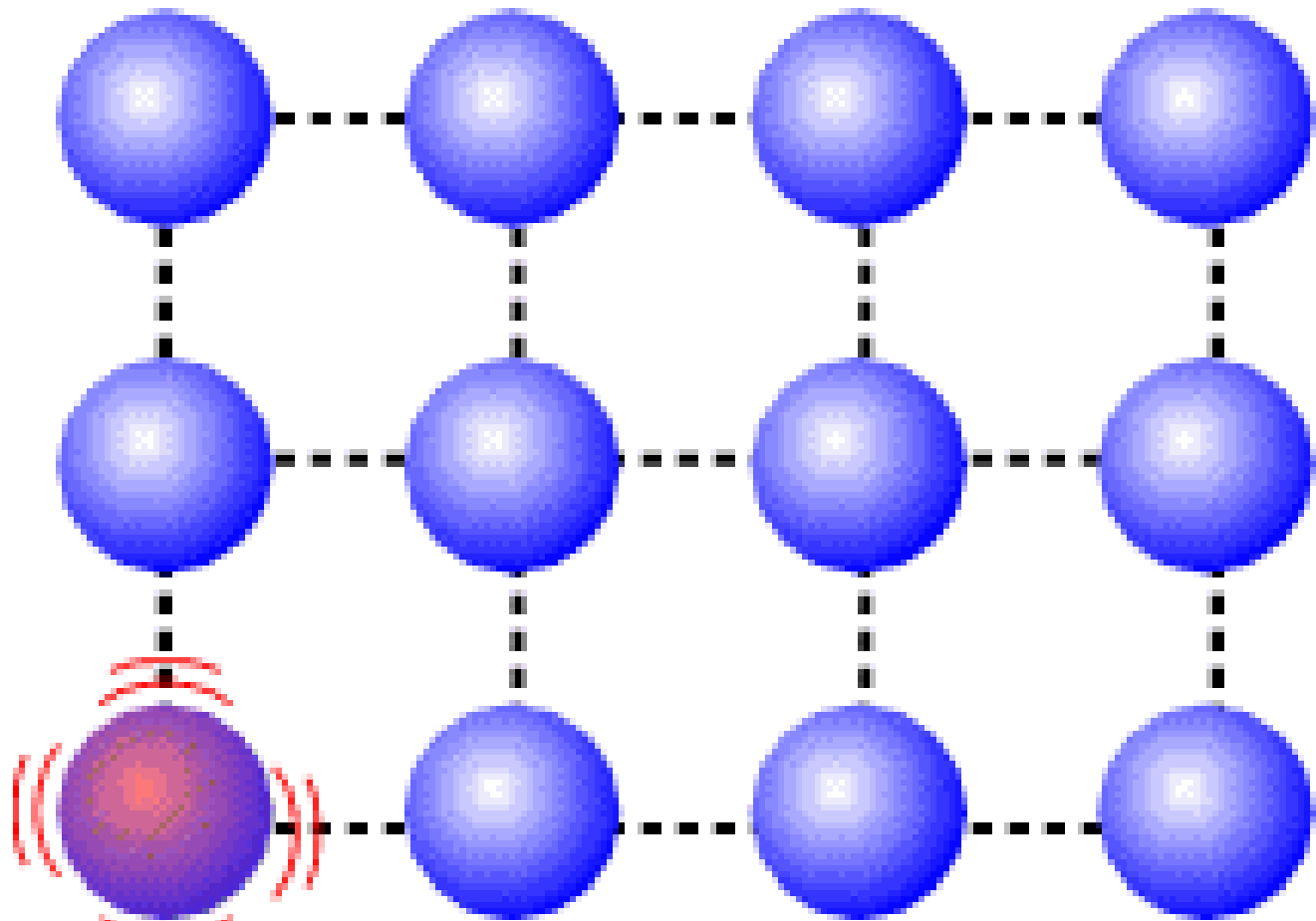
## Three Methods of Heat Transfer



# 1. CONDUCTION

- Occurs when the particles in an object **vibrate** in place but **collide** with neighbouring particles passing kinetic energy to them.

- ◎ The particles do not leave their original position.
- ◎ Conduction occurs in most **solids**.

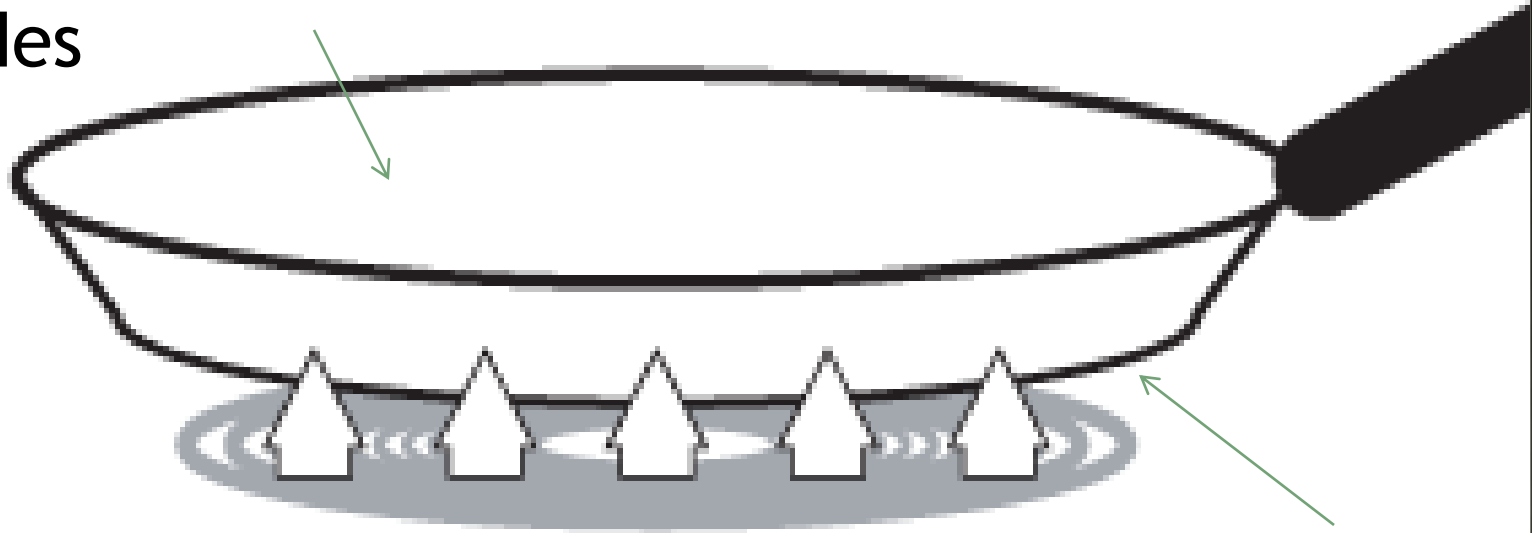


↑ HEAT

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Stainless Steel  
Sides



*Heat Source*

Copper Bottom

**COOKING BY CONDUCTION**

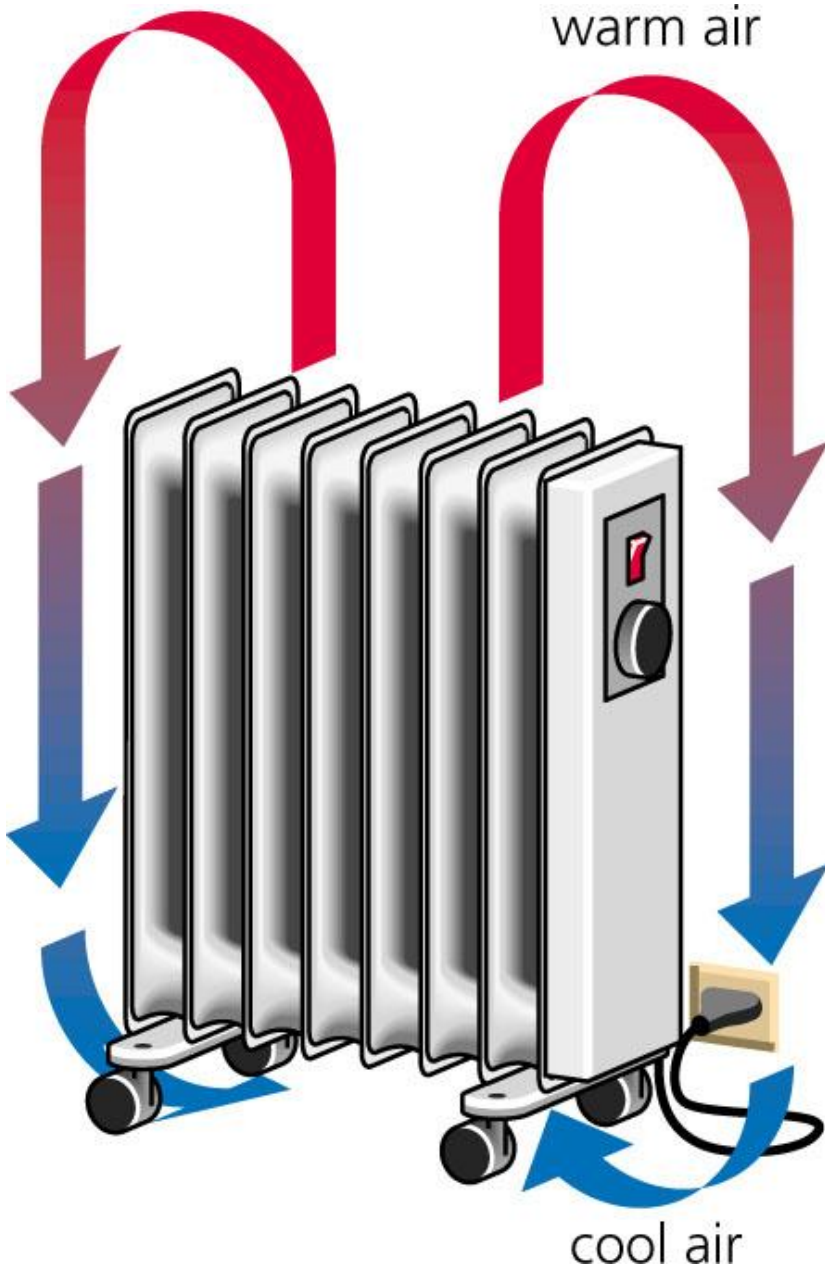
# Ice Packs



© [www.sports-injury-info.com](http://www.sports-injury-info.com)

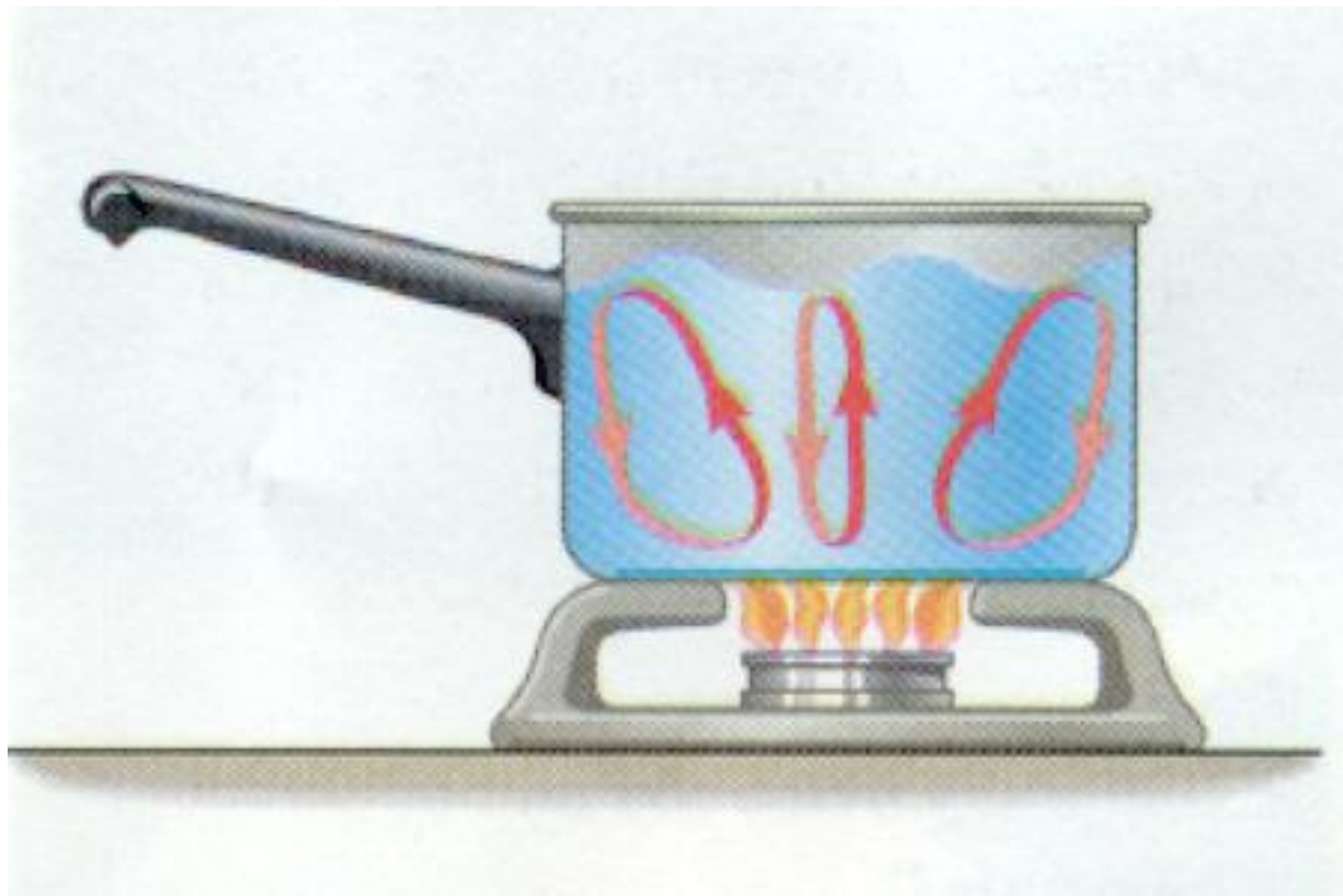
## 2. CONVECTION

- Occurs when warm fluids move from one place to another.
- Occurs in **liquids** and **gases**.



When air warms, the particles gain energy, spread out, become less dense and rise. As it cools, the particles lose energy, get closer together, become more dense and sink.

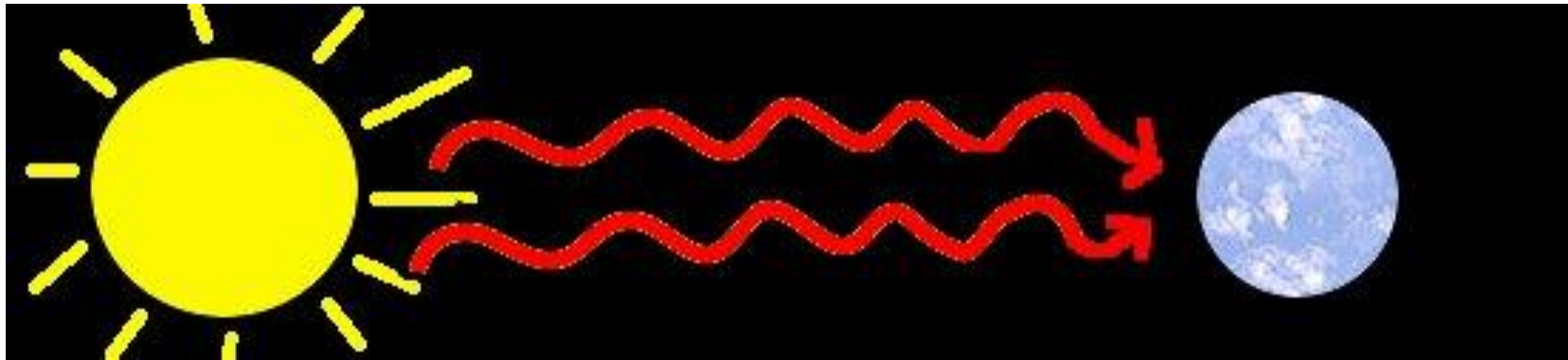
# Convection Currents



### 3. RADIATION

- Occurs when electromagnetic **waves** carry energy from a source to another object. The object absorbs the energy of the electromagnetic wave.

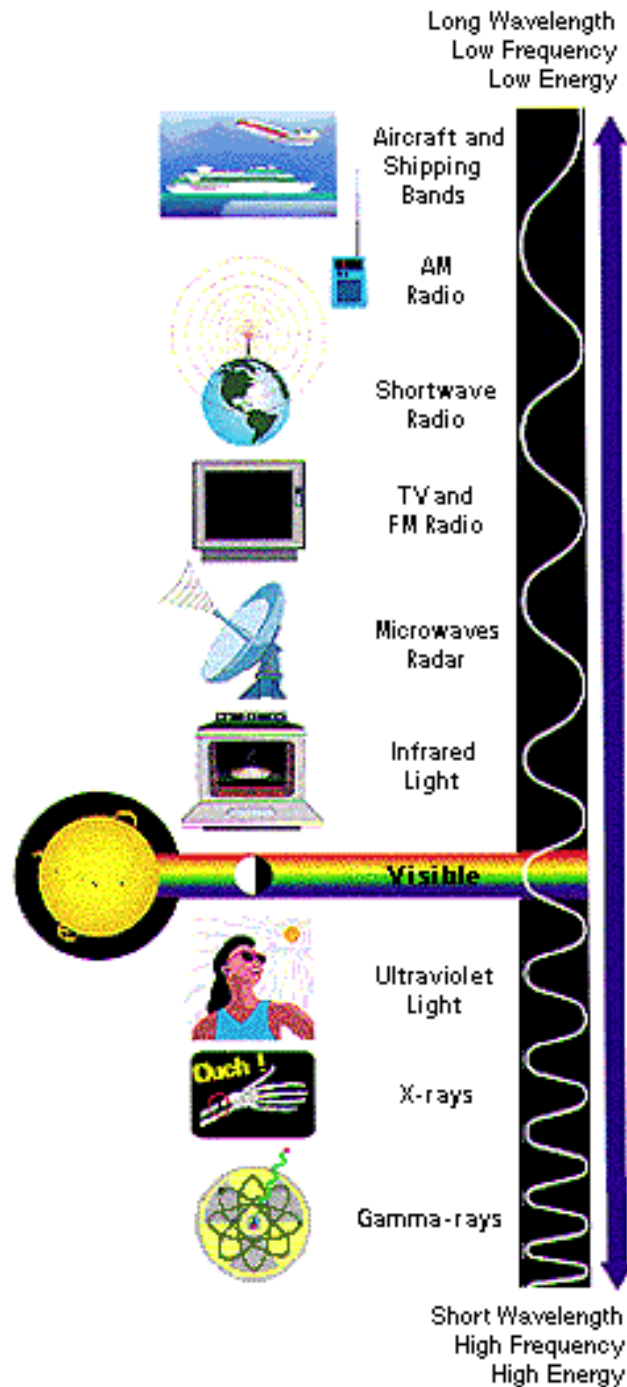
- ⦿ There are **no** particles involved.
- ⦿ The waves can travel in a vacuum.











# Types of Electromagnetic Waves

# RADIANT ENERGY CAN BE...

1. Reflected  
Shiny, smooth,  
light-colored  
surfaces.



## 2. Absorbed

Dull, rough,  
dark-colored  
surfaces.

Object will  
become  
warmer.



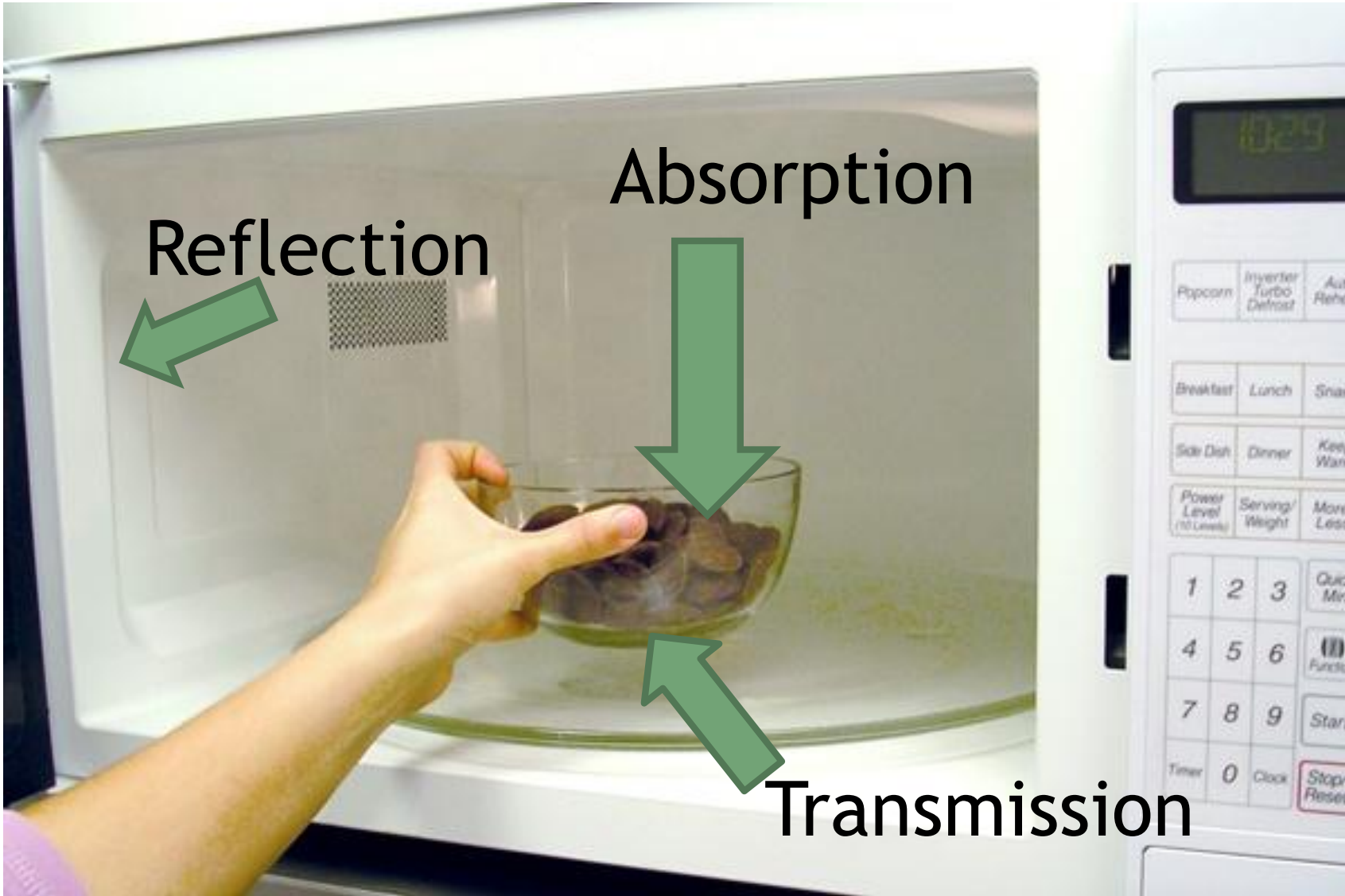
### 3. Transmission

The radiant energy passes through.

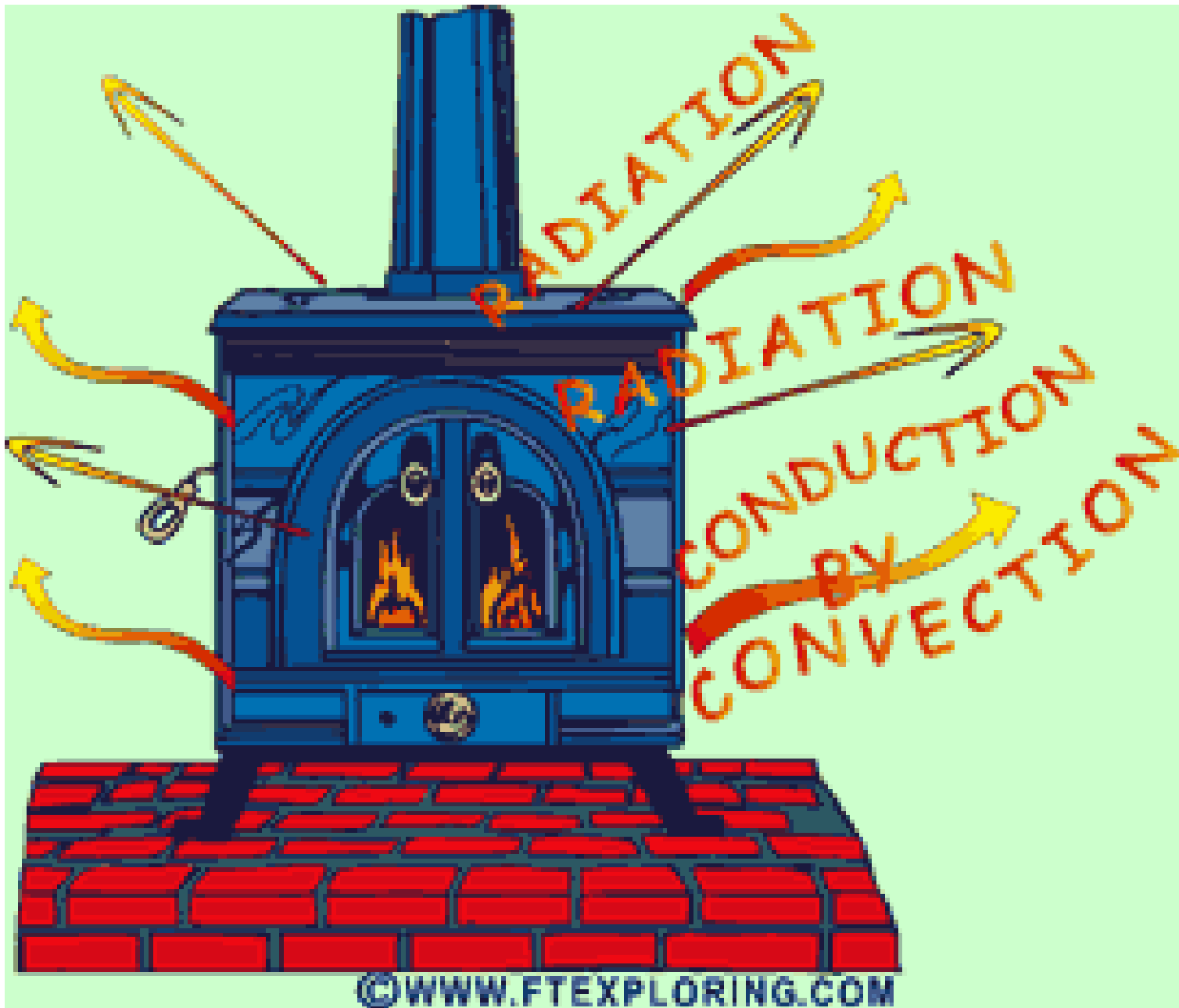
Ex. Plastic, glass, paper, etc.



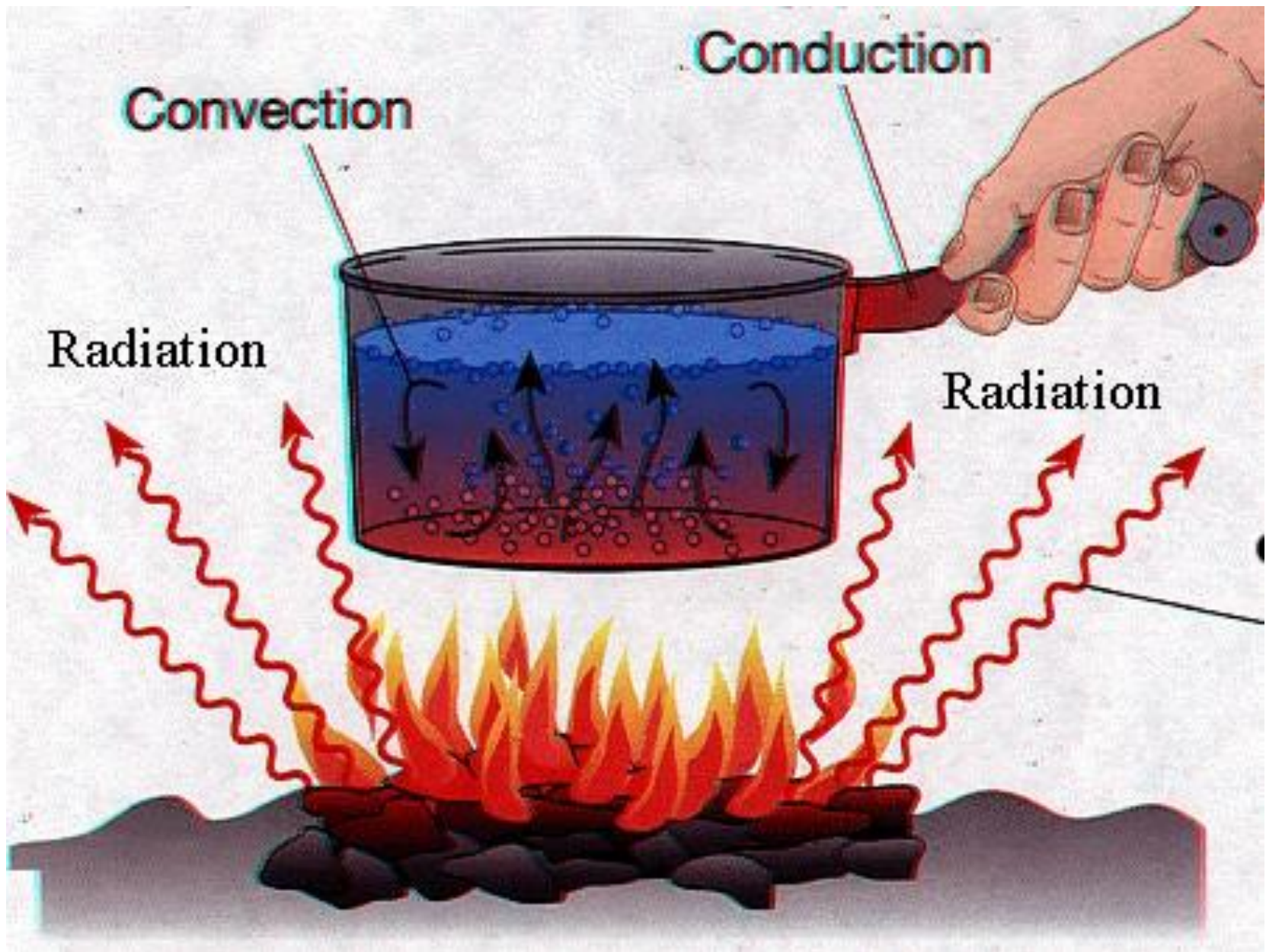
# The Microwave



The three types of heat transfer, conduction, convection and radiation, can occur at the same time. For Example...



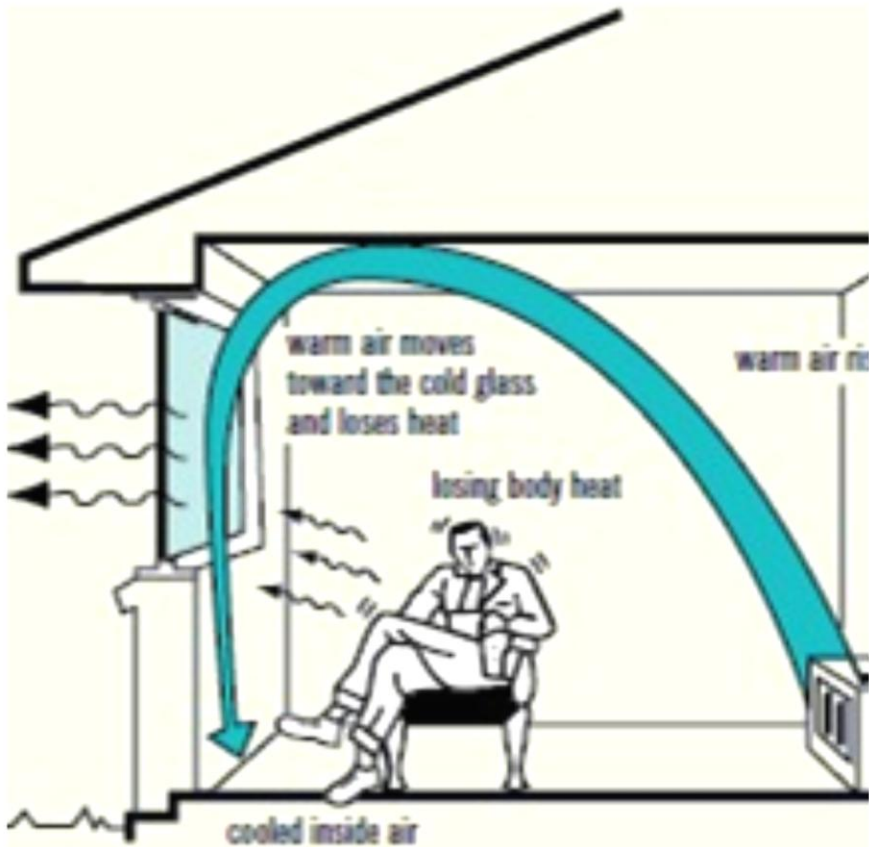






# ACTIVITY 6-1 C

## PAGE 182



# Energy Transfers and Home Heating Systems

CORE LAB  
ACTIVITY

Activity 6-1D  
“Absorb That  
Energy”  
Page 184

# HOME HEATING TECHNOLOGIES...

## 1. Open Fireplace

- Radiant heat from the fire and convection currents in the air spread the heat.

## 2. Wood Stove

- ◎ Efficient radiators due to the black color.



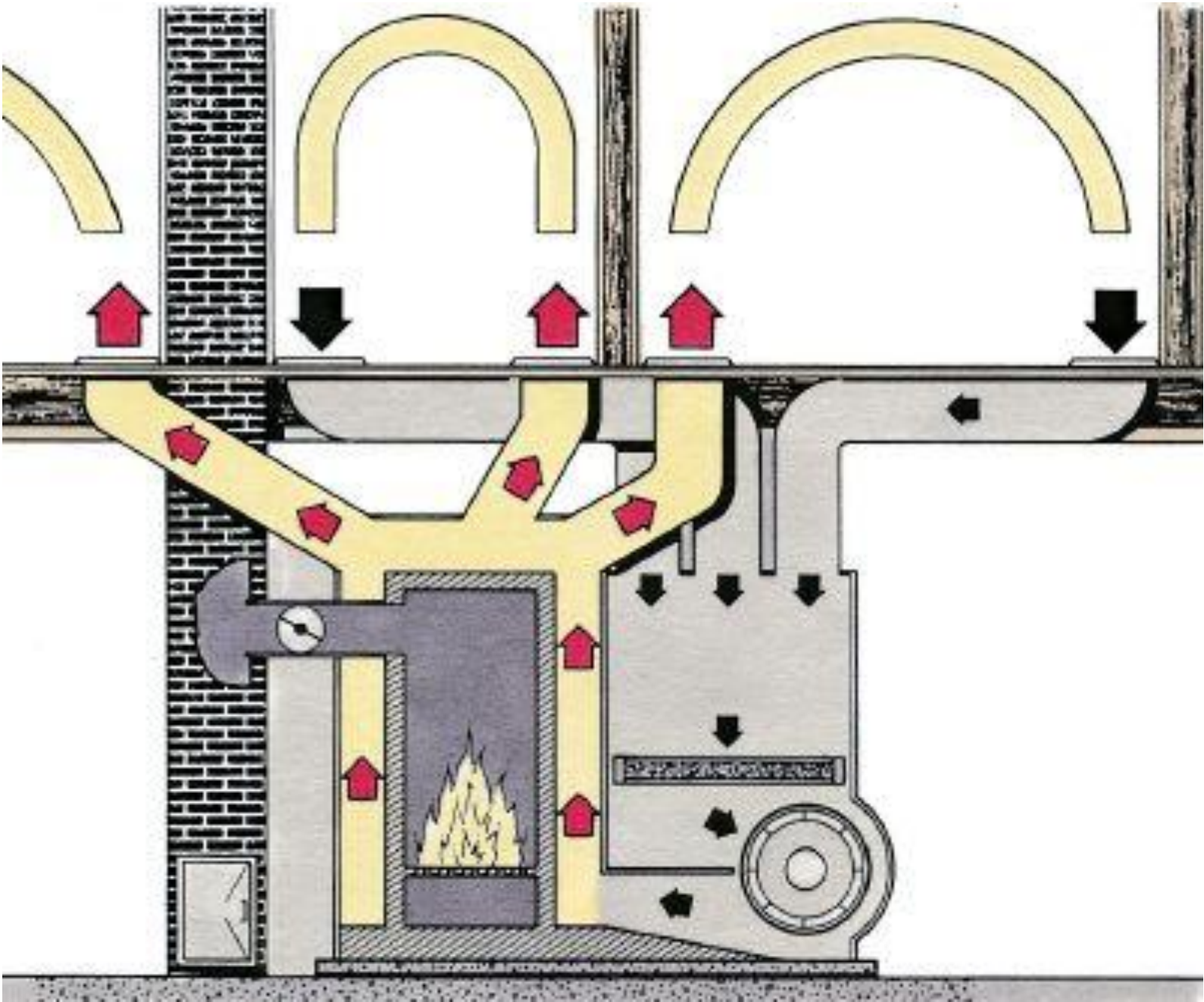
## 2. Electric Heaters



### 3. Oil Furnace

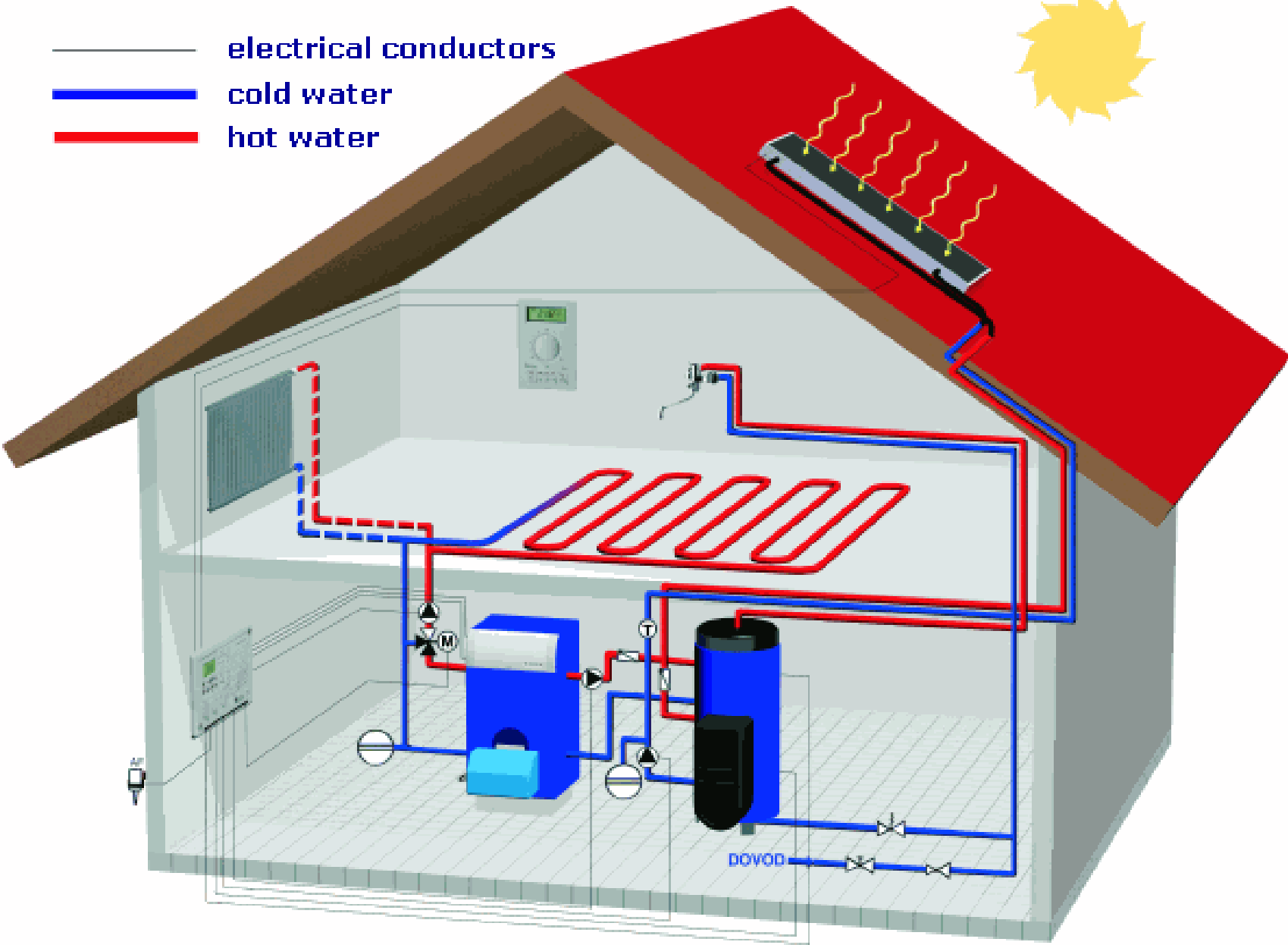
- Air is drawn into the furnace and heated and fans would blow the warm air through the ducts into the rooms.
- Water carried in a system of pipes can be used instead of air. (**Hot water radiation**)





Forced-air furnace

- electrical conductors
- cold water
- hot water



# Hot Water Radiation



# 4. Air to Air Heat Pump

- Can be used to cool the home in the summer and heat the home in the winter.

*Heat is exchanged with the outside air.*



A heat pump heats your home in the winter...

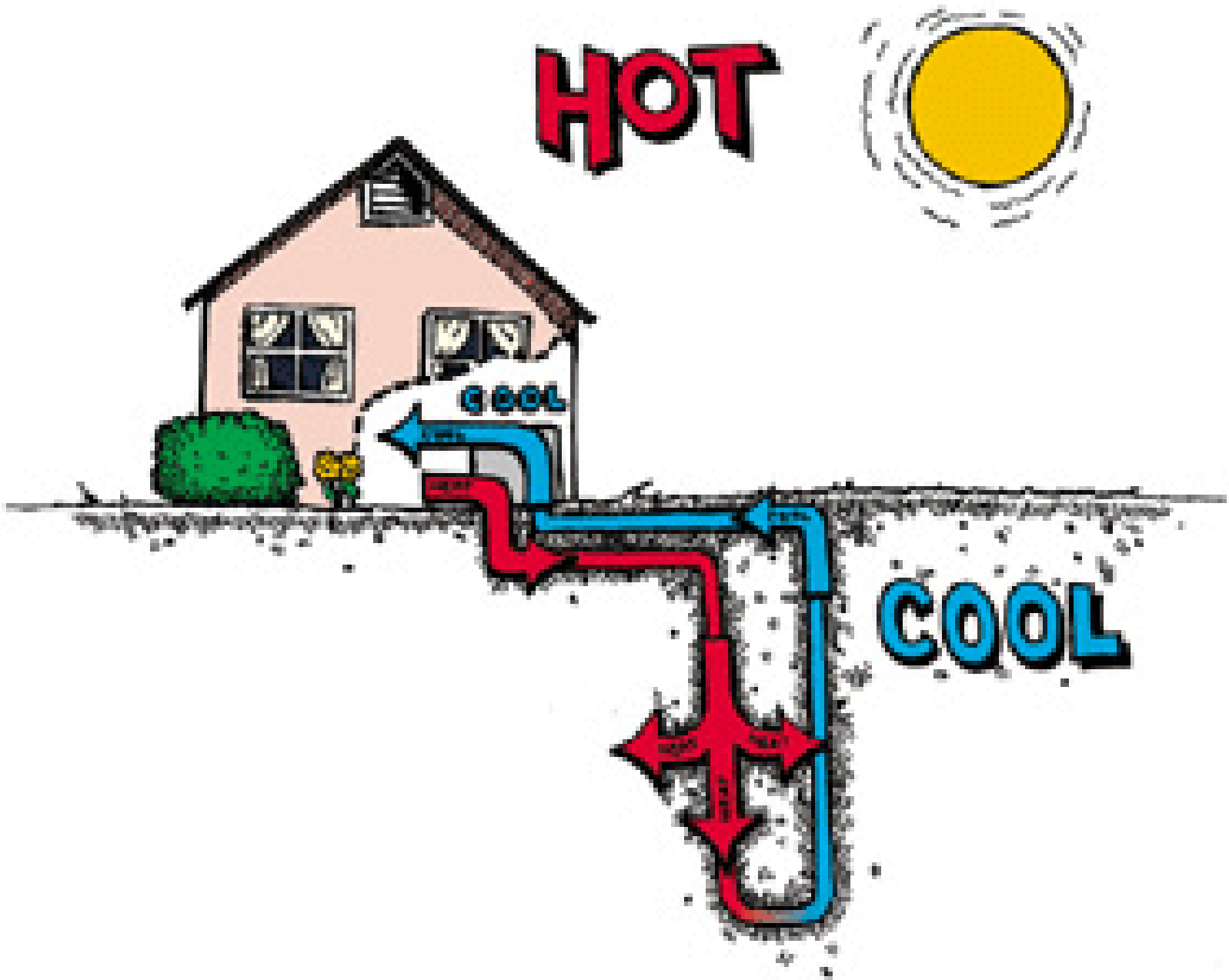


and cools your home in the summer.

## 5. Geothermal

- Heat is exchanged with the ground.
- In the summer, heat is pumped into the ground and in winter it is pumped up from the ground.

# Geothermal



## 6. Solar

- Converts light energy to electrical energy.

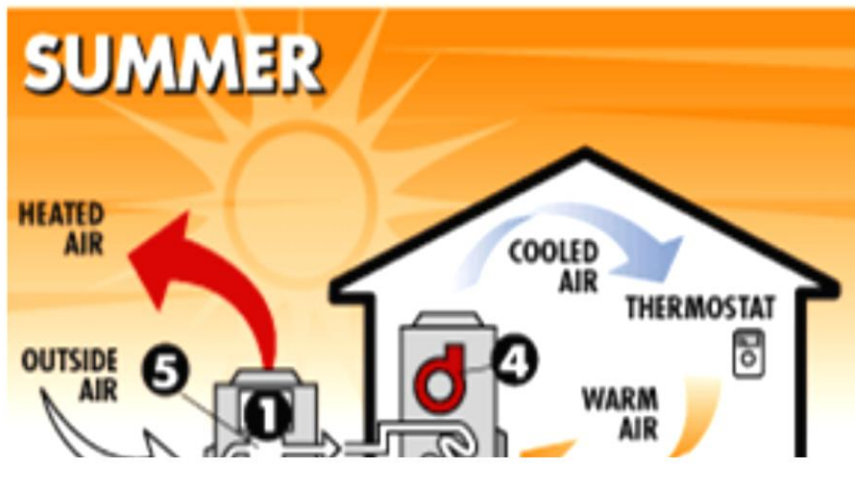
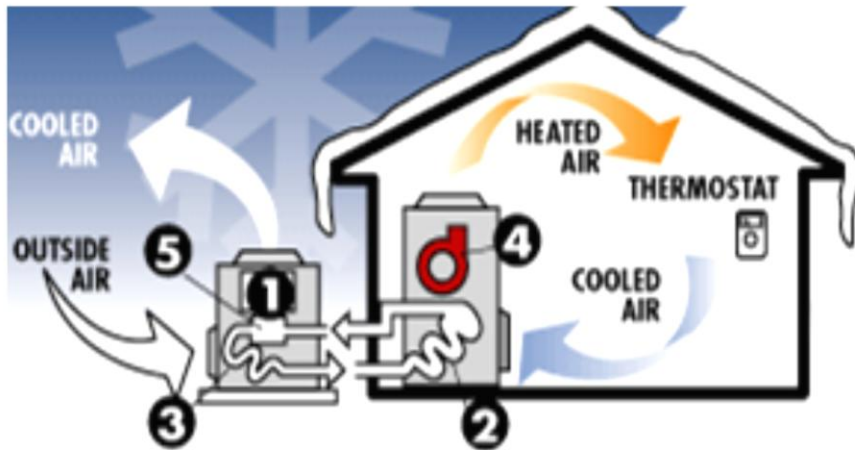




# Solar Panels

# CORE STSE

*“Heat Pumps: An Alternative Way to Heat Homes”*





# CONDUCTORS VS. INSULATORS

## Conductors

- ⦿ Allow heat transfer
- ⦿ Ex. Metal  
*(some metal are better than others)*

## Insulators

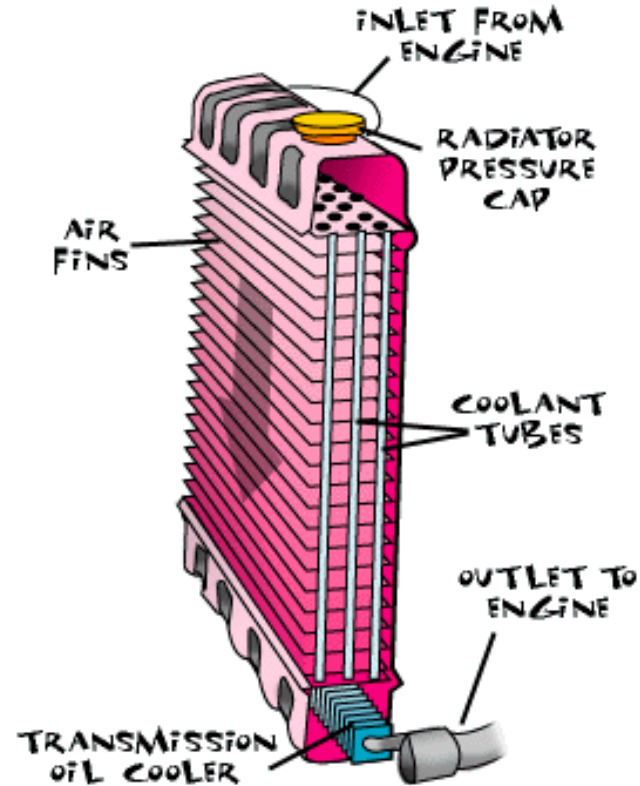
- ⦿ “Prevents” heat transfer
- ⦿ Ex. Wood, plastic

# USES OF CONDUCTORS

## Cookware



## Car Radiator





# USE OF INSULATORS

## Animal Fur

## Sod

Bizarro

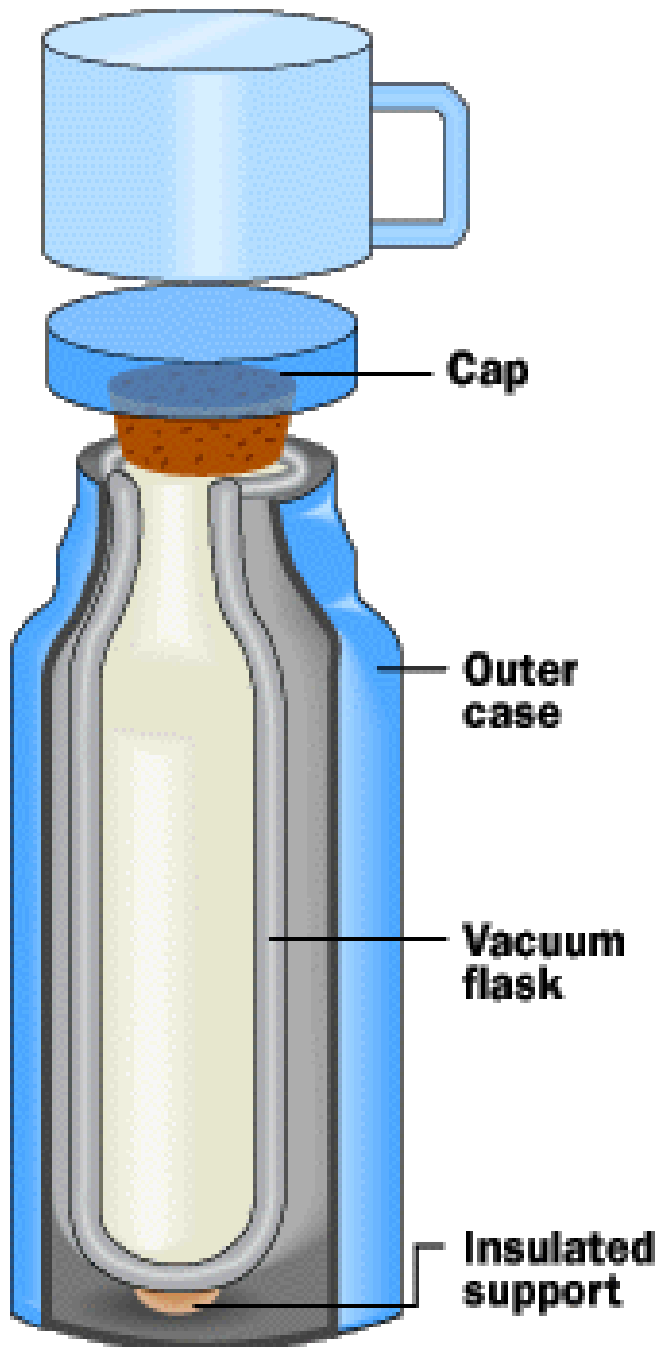


# Fibreglass



# Thermos





The vacuum layer has **no** particles which prevents heat transfer.

*Note: It is impossible to create a perfect vacuum.*

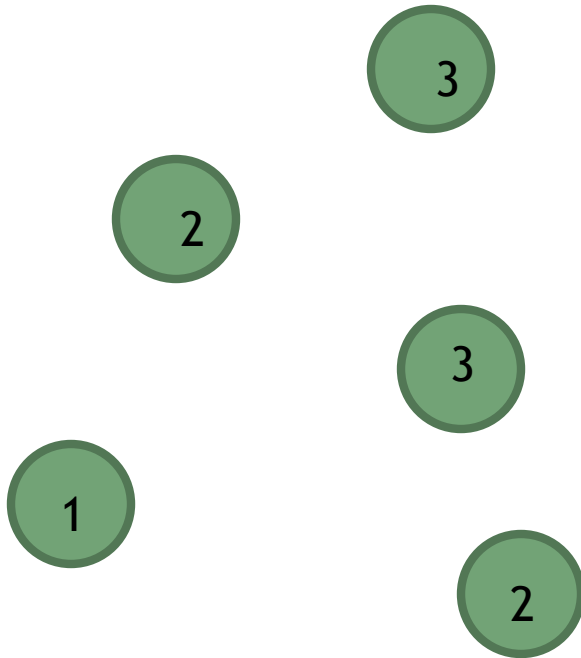
# HEAT VS. TEMPERATURE

Heat is the energy which is transferred from hotter substances to colder substances.

It is the sum total of the energies of the particles in a substance. (Thermal energy)

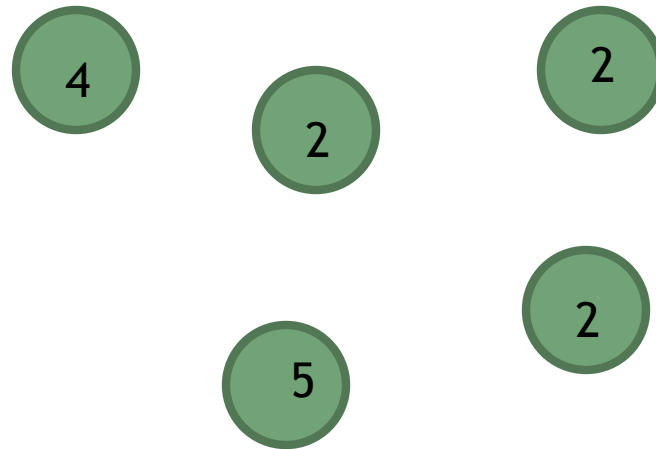
# Heat

$$1+2+3+3+2+4$$
$$+2+5+2+2$$
$$= 26\text{J}$$



# Temperature

$$26 \div 10 = 2.6 \text{ } ^\circ\text{C}$$



# SPECIFIC HEAT CAPACITY

The amount of heat needed to raise the temperature of 1.00 g of the substance by 1.00°C.

Used to measure the amount of heat transfer.



Different materials have different capacities for storing heat. This depends on:

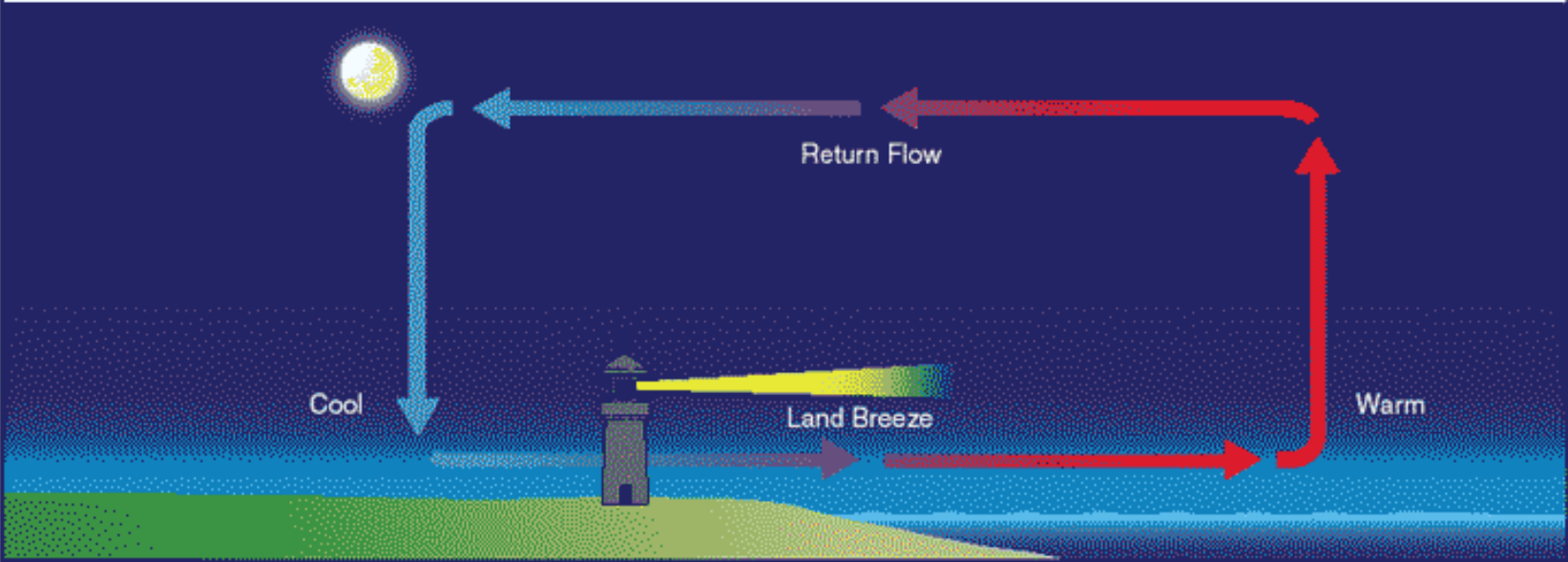
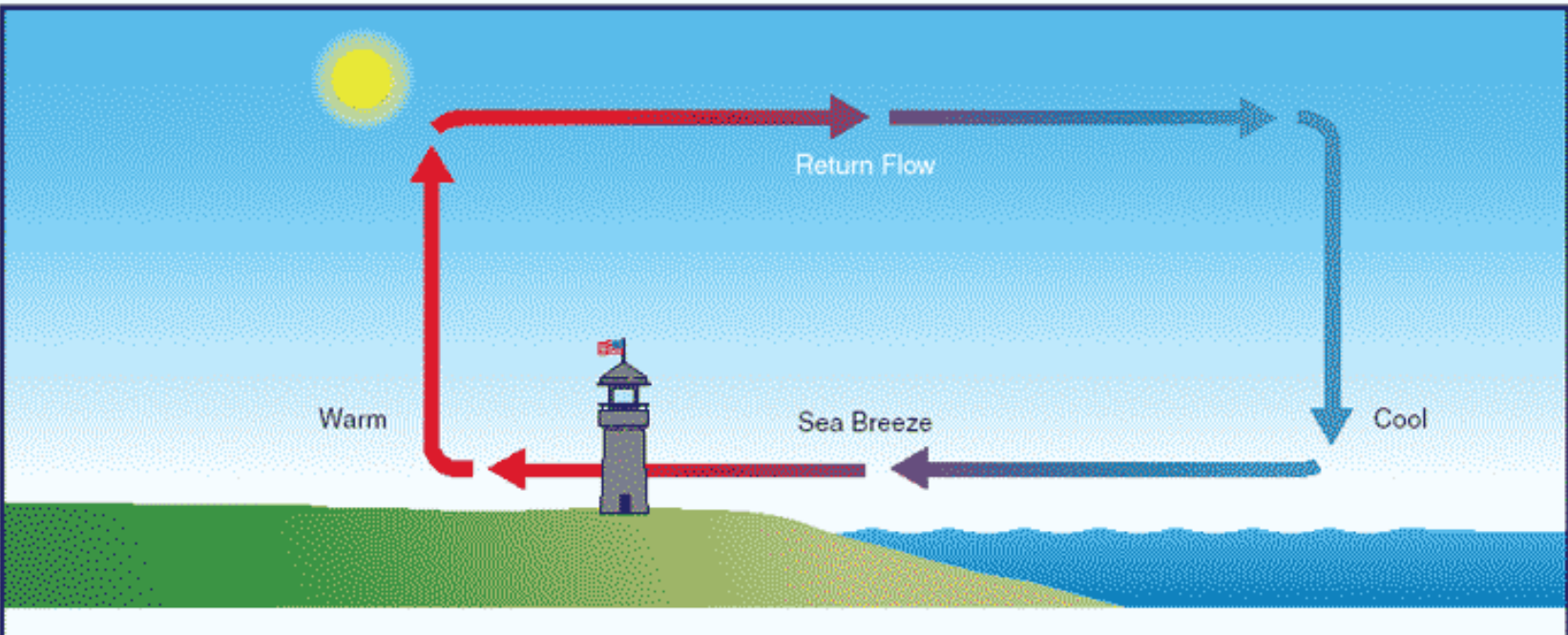
- Molecular structure
- Phase
- Molecular mass
- Shape
- Surface area

# Specific Heat Capacities

Substance	Specific Heat (J/ g °C)
copper	0.3845
granite	0.7953
lead	0.1276
ice	2.06
water	4.184

# Specific Heat Capacity An

Example...





# TEMPERATURE HEAT & TECHNOLOGY

With a partner, list as many technologies that deal with the idea of temperature and heat.