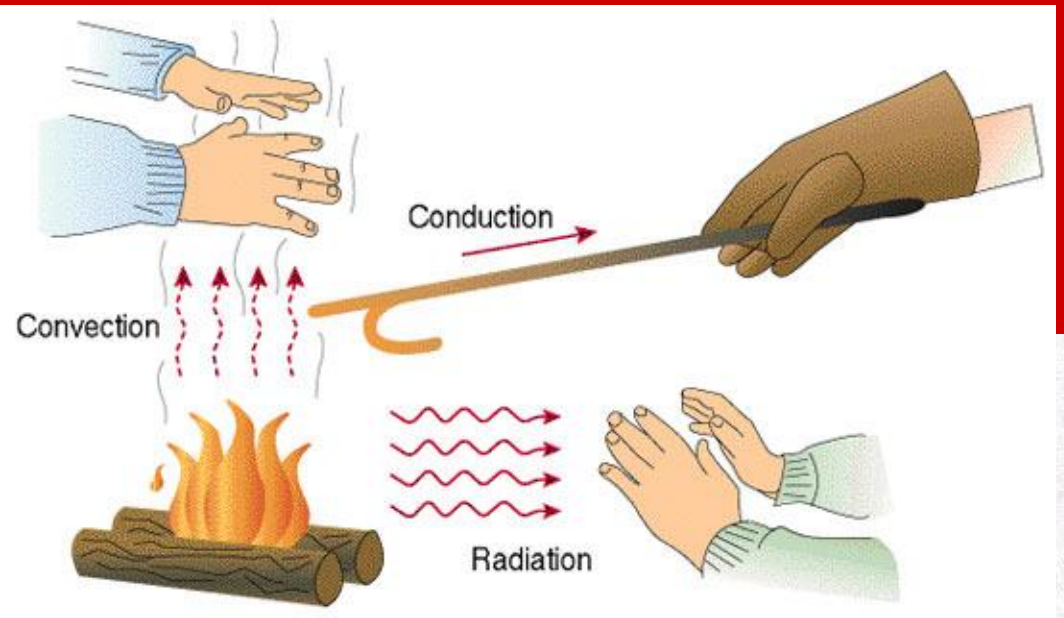
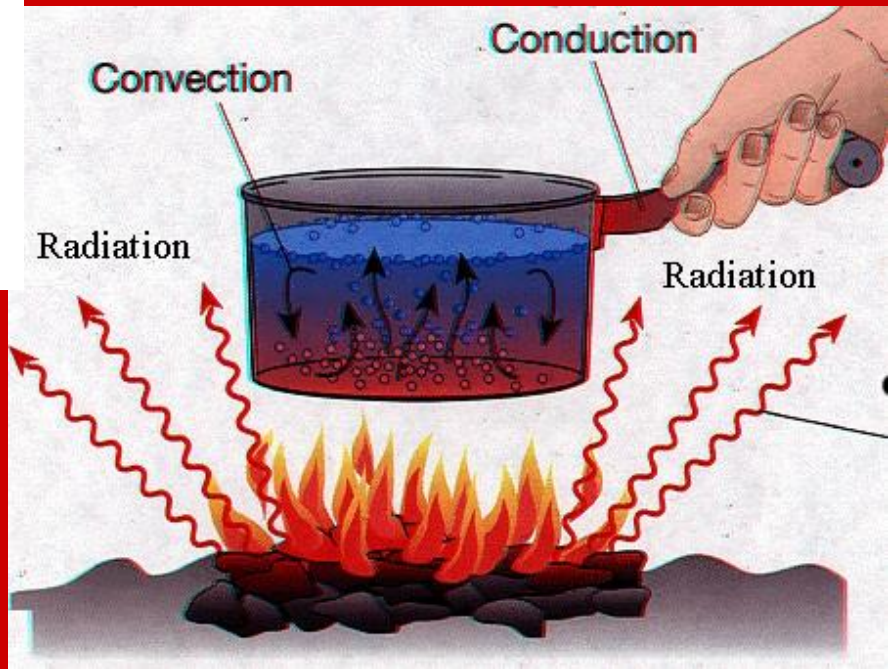
# Heat Transfer



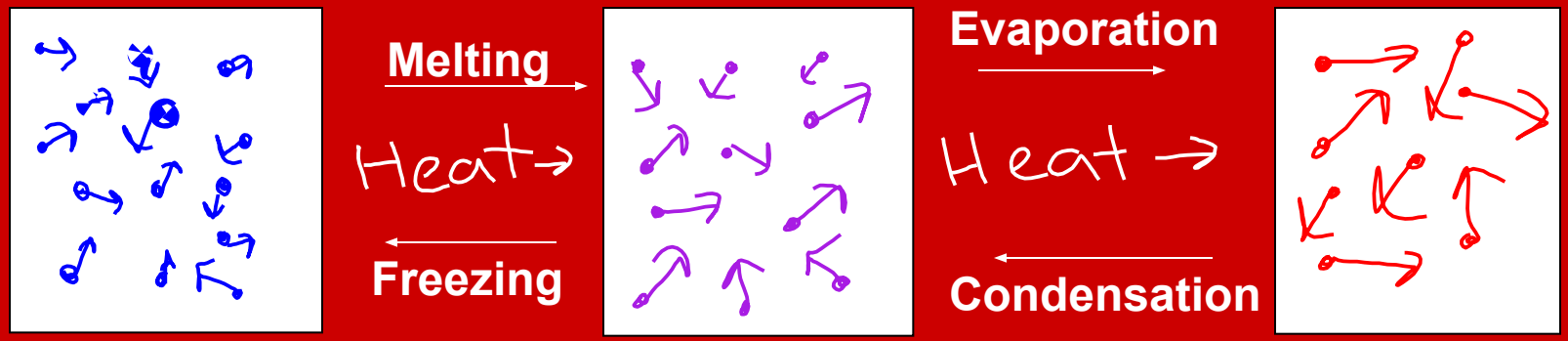



# Lesson Objectives:

- Compare different types of heat transfer;
- Tell examples of heat transfer in daily life and industry;
- Tell examples of adaptation of living organisms to different temperatures.

- Heat transfer

- Everything is made of molecules.
- When molecules gain energy they move faster and create more heat.
- (The faster the molecules move the hotter they are)




**Solid**

Molecules move very slowly! They are close together.

**liquid**

Molecules move faster and are more spread apart.

**Gas**

Molecules move very fast! They are very spread apart.

# Pair/Share

1. What happens to molecules as you add heat?
2. Are the molecules of water moving faster or slower in cold water? Why
3. Evaporation is when a _____turns into a _____.

4. Freezing is when a _____ turns into a _____.

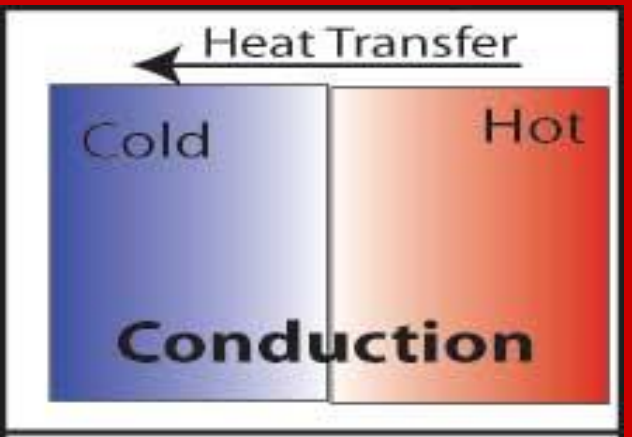
# Pair/Share

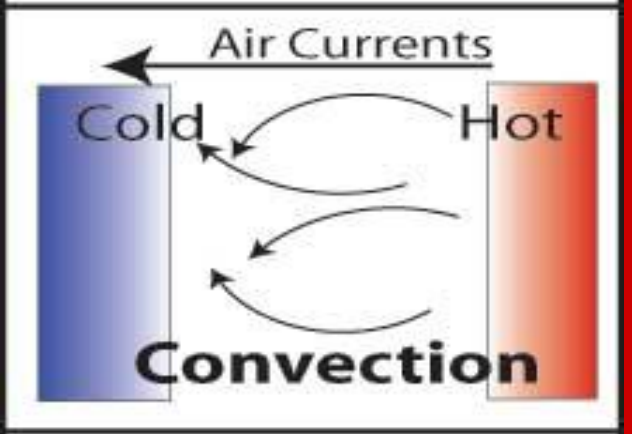
1. What happens to molecules as you add heat?

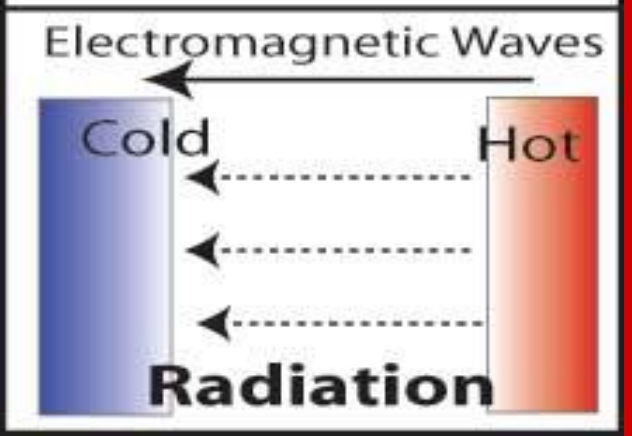
They move faster

2. Are the molecules of water moving faster or slower in cold water? Why? Slower. Because of temperature.
3. Evaporation is when a Liquid turns into a gas.
4. Freezing is when a liquid turns into a solid.

- Heat




- Is the transfer of thermal energy from a **hotter object to a cooler one until both objects are the same temperature.**

(You can not transfer cold or give someone cold)

# Pair/Share

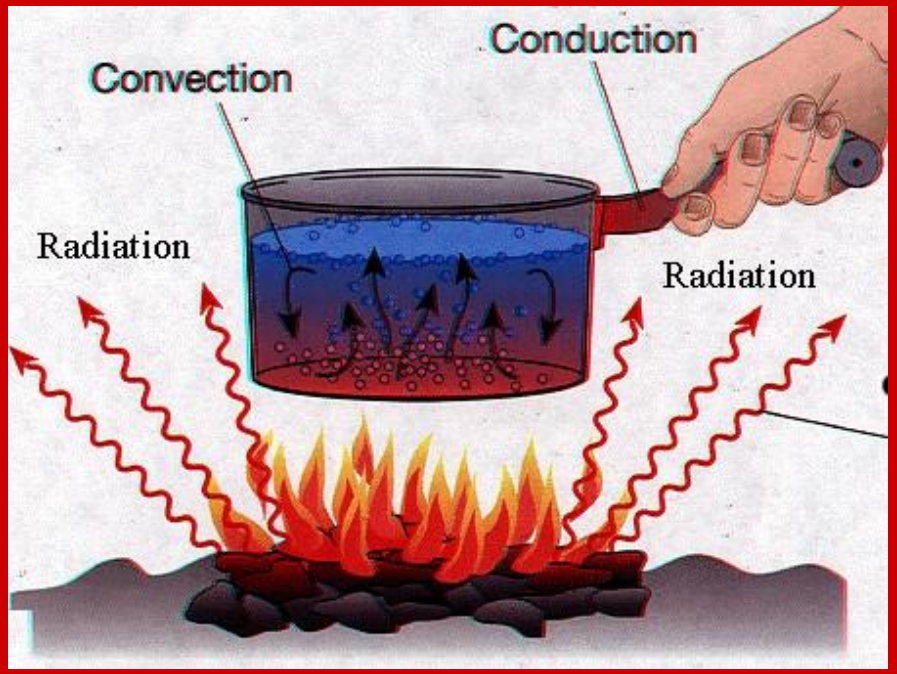
1. Which direction does heat transfer?
   A. From warmer to cooler
   B. From cooler to warmer
   C. both directions
2. When you touch something cold which direction is heat being transferred? Why?
3. Explain why you feel cold when you touch something that is cold.

# Pair/Share

1. Which direction does heat transfer? From warmer to cooler
2. When you touch something cold which direction is heat being transferred? Why? From object to hand, because the object is cooler.
3. Explain why you feel cold when you touch something that is cold. Because of heat transfer.

# 3 ways that heat is transferred within the atmosphere

- Radiation
- Conduction
- Convection



# The first method of heat transfer

How does heat energy get from the Sun to the Earth?

?

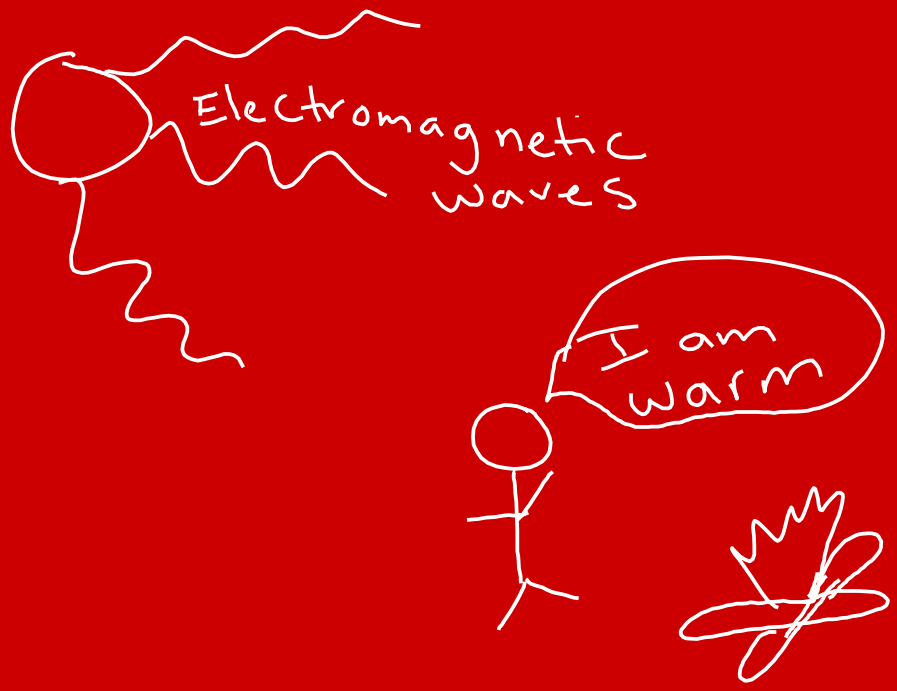
RADIATION

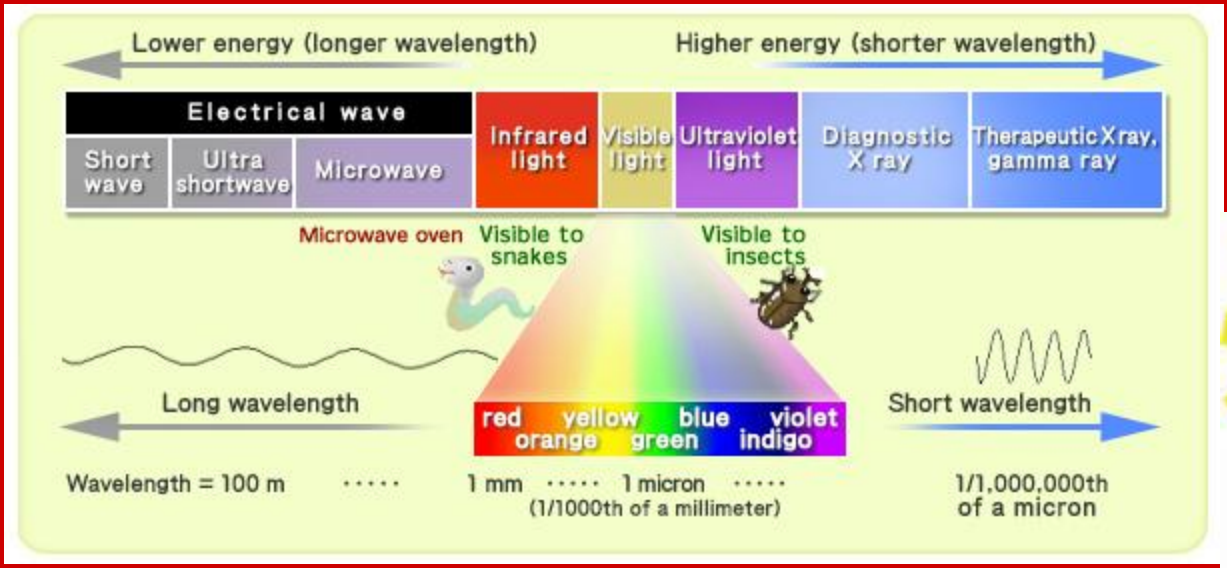
- Radiation

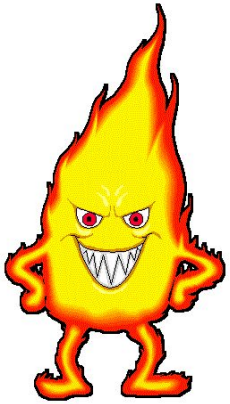
- The direct transfer of energy by infrared electromagnetic Waves.

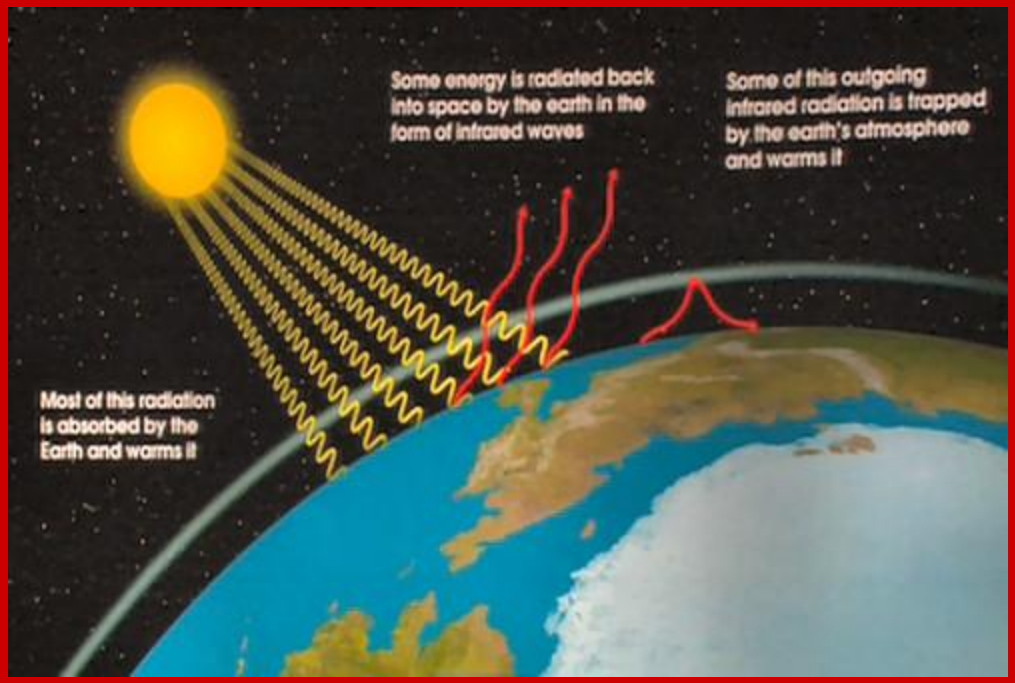
What creates electromagnetic waves?

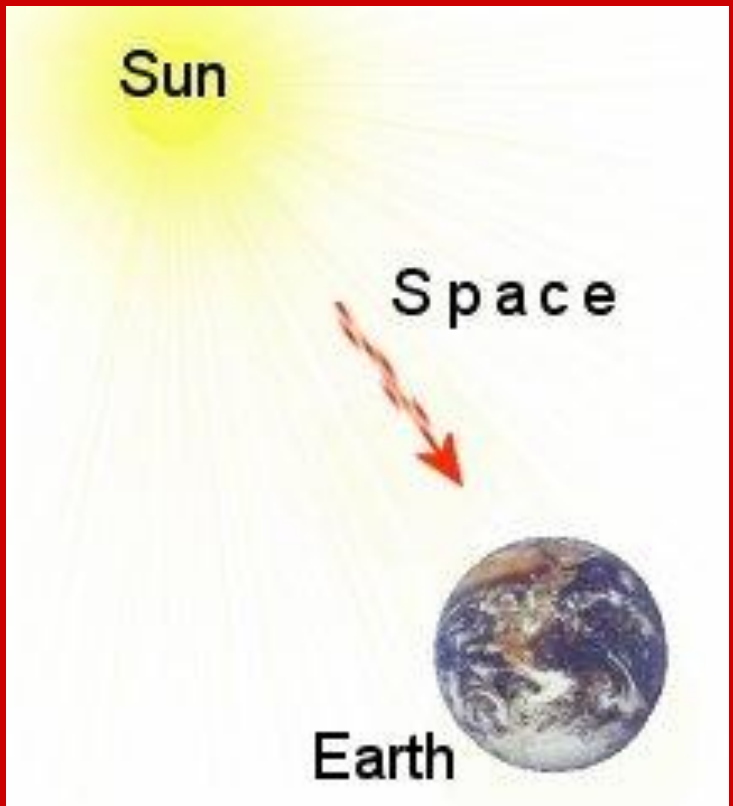
- Sun, fire, light bulbs




Lower energy (longer wavelength)
Higher energy (shorter wavelength)
Electrical wave
Short wave
Ultra shortwave
Microwave
Infrared light
Visible light
Ultraviolet light
Diagnostic X ray
Therapeutic X ray, gamma ray
Microwave oven
Visible to snakes
Visible to insects
Long wavelength
red orange yellow green blue indigo violet
Short wavelength
Wavelength = 100 m
1 mm
1 micron
(1/1000th of a millimeter)
1/1,000,000th of a micron



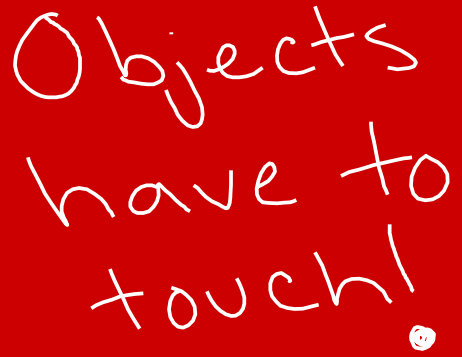

Some energy is radiated back into space by the earth in the form of infrared waves
Some of this outgoing infrared radiation is trapped by the earth's atmosphere and warms it
Most of this radiation is absorbed by the Earth and warms it

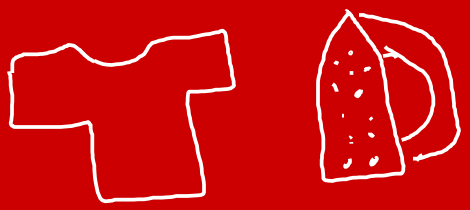

Sun
Space
Earth

# Pair Share

- Partner A: What is radiation and where does it come from.
- Partner B: What are three different things that create electromagnetic radiation?

- Conduction
- The direct transfer of heat from one substance to another substance that is touching.

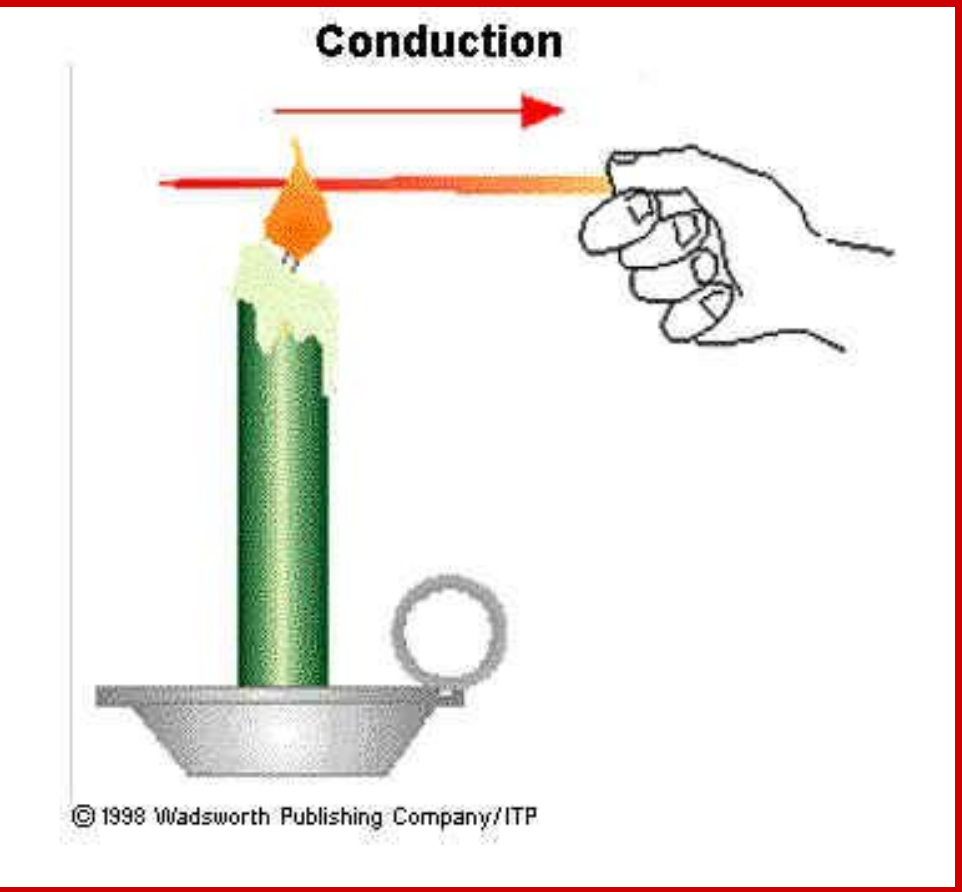


**Ironing Clothes**

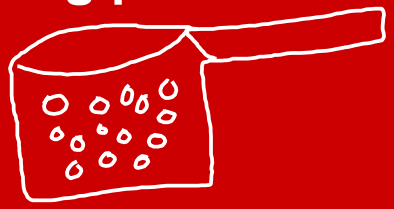
**Stepping on hot sand.**

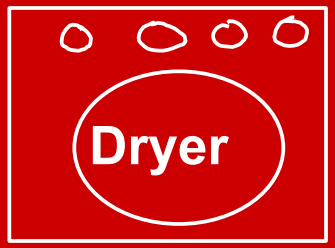
**That's Hot**


Conduction
© 1998 Wadsworth Publishing Company/ITP

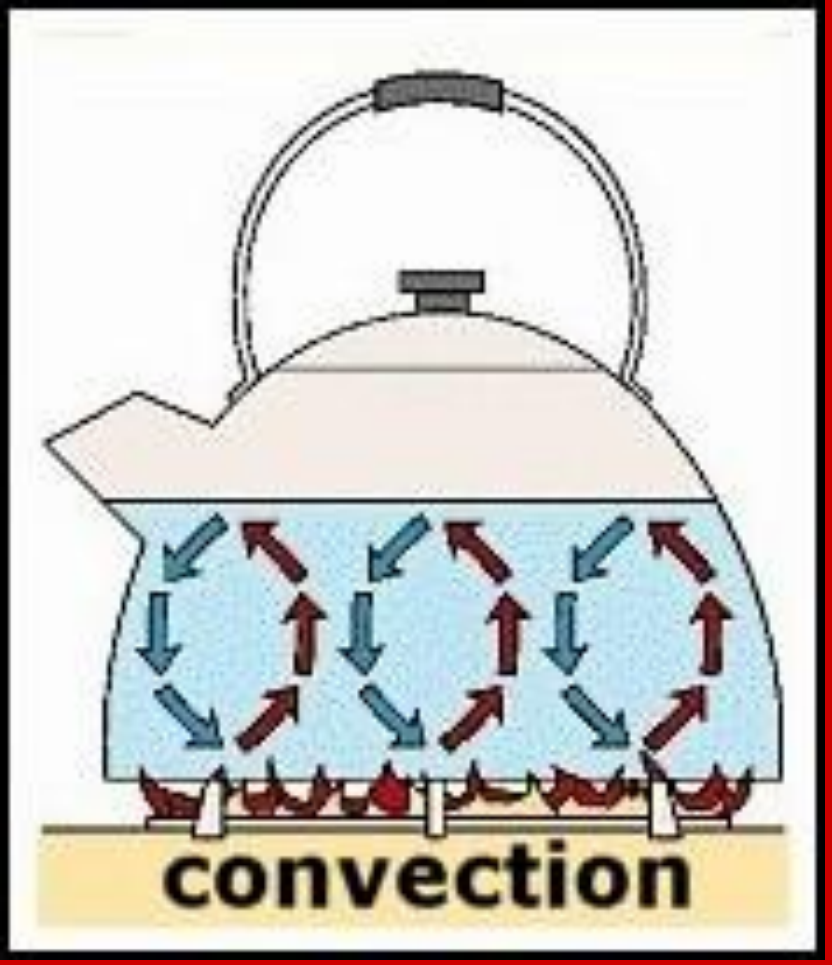
- Convection
- The transfer of heat by movement of a fluid (liquids and gases).

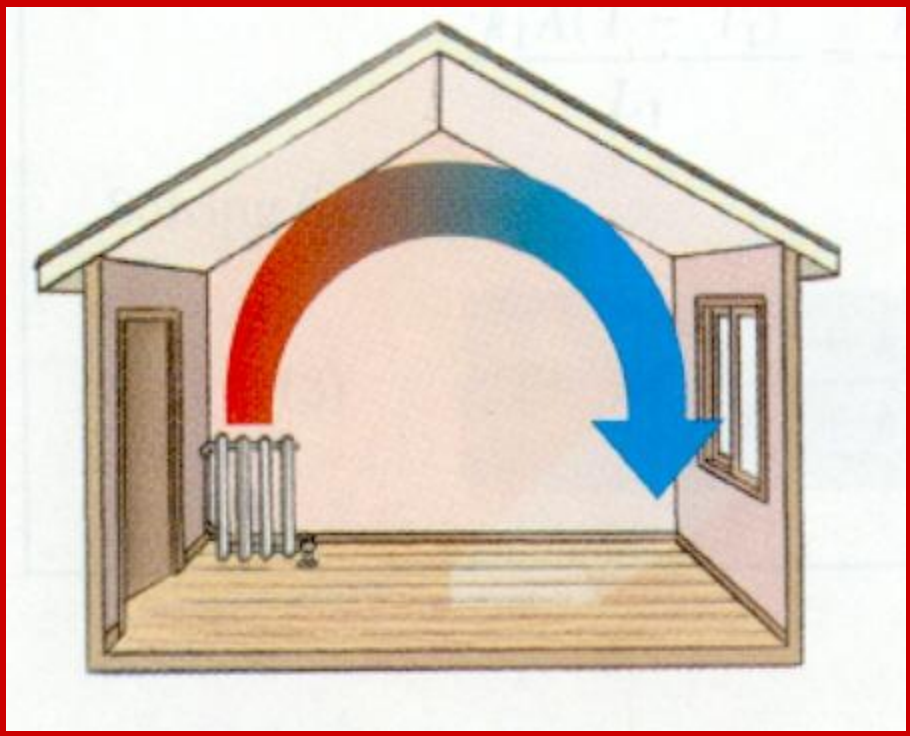

Cooking peas in water



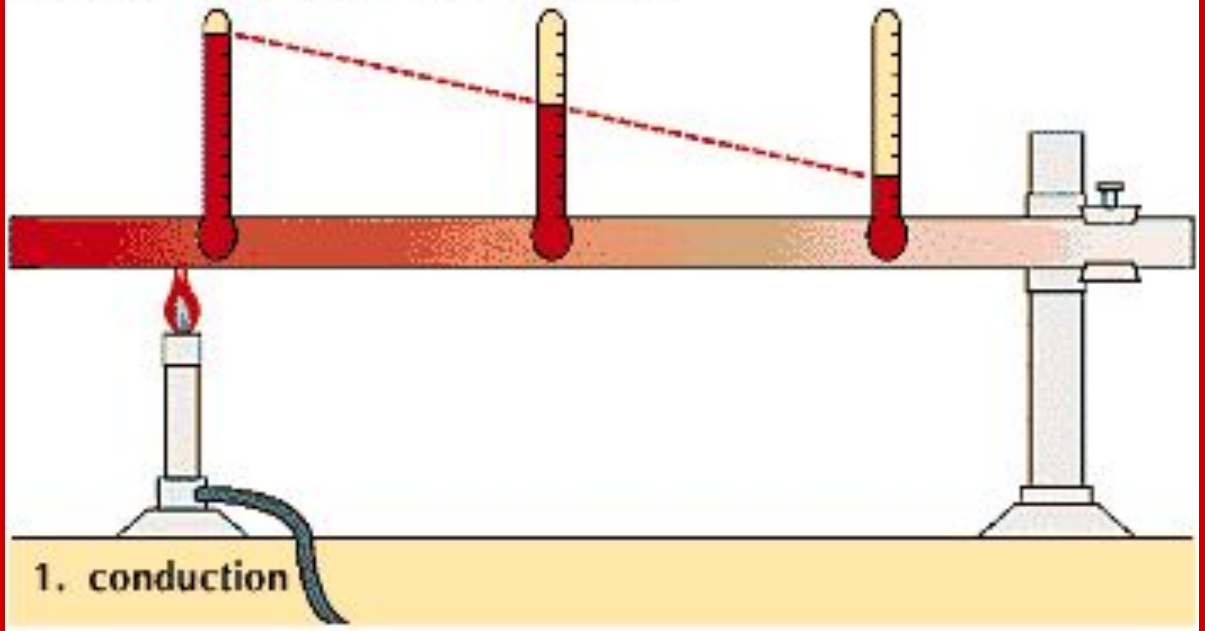



Blow Drying your Hair.

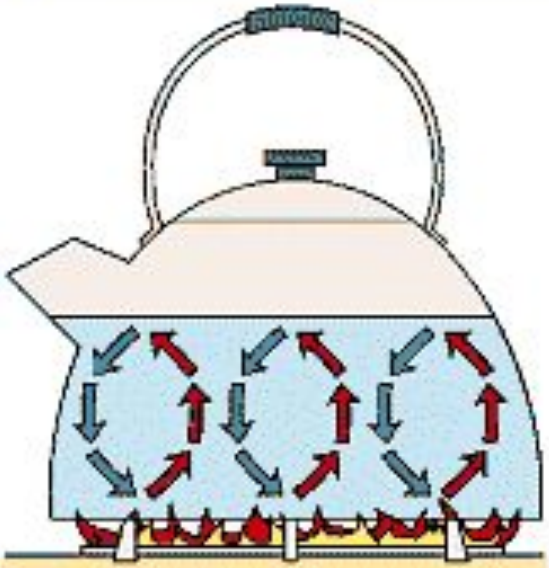

convection



## Three Methods of Heat Transfer



1. conduction



2. convection

3. radiation

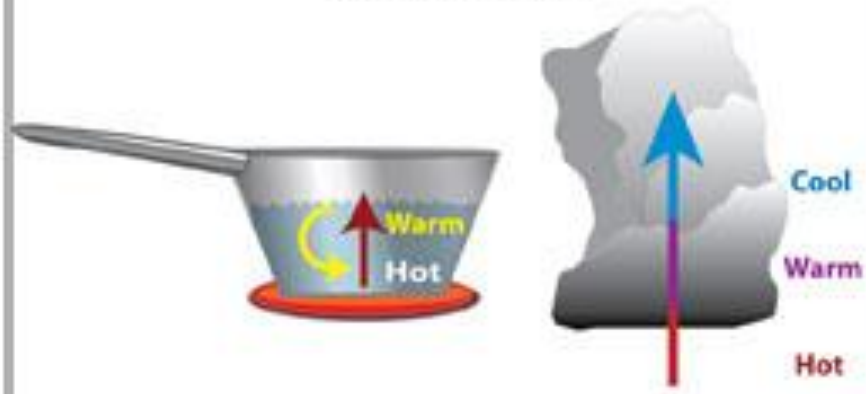
# Figure 2--Conduction, Convection, and Radiation

## Conduction

Energy is transferred by direct contact.

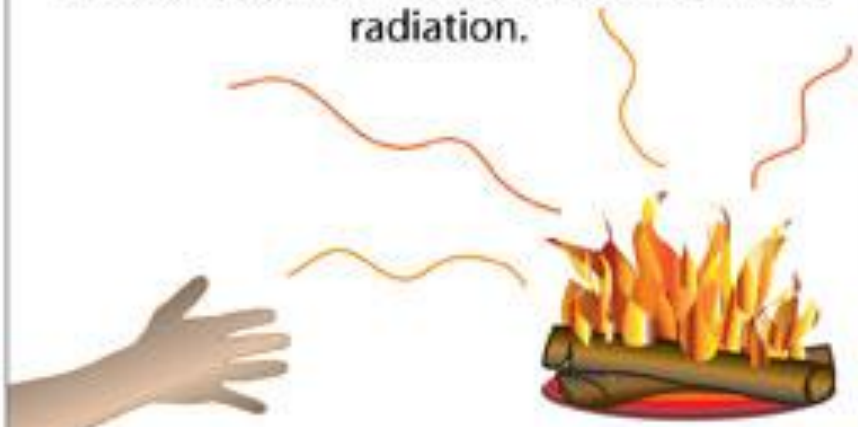
## Convection

Energy is transferred by the mass motion of molecules.




## Radiation

Energy is transferred by electromagnetic radiation.



# Review

Heat transfer from a hotter object to a cooler object until both objects are the same temperature.

3 types of heat transfer

- Radiation – electromagnetic waves
- Conduction – touching
- Convection- through a fluid (liquid or gas)
- All 3 work together to heat the troposphere but Convection causes most of the heating.