

The Earth's Weather



Heating the Earth

- ◇ People who study weather are called meteorologists.

**You can
expect some
weather!**



Heating the Earth

- **Weather** is the daily condition of the Earth's atmosphere.
- 4 factors interact to cause weather on Earth

**Heat
Energy**



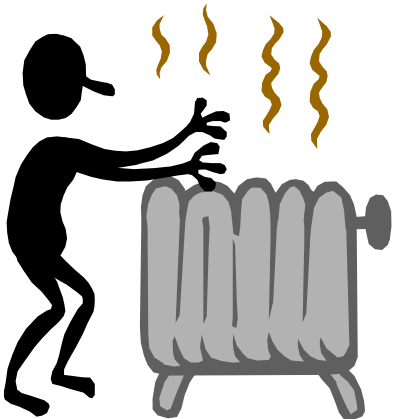
**Air
Pressure**

Winds

Moisture

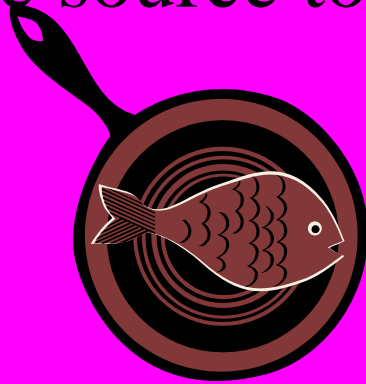
HEAT TRANSFER

- Heat energy is transferred in 3 main ways:
 - Conduction
 - Convection
 - Radiation (radiant heat energy)



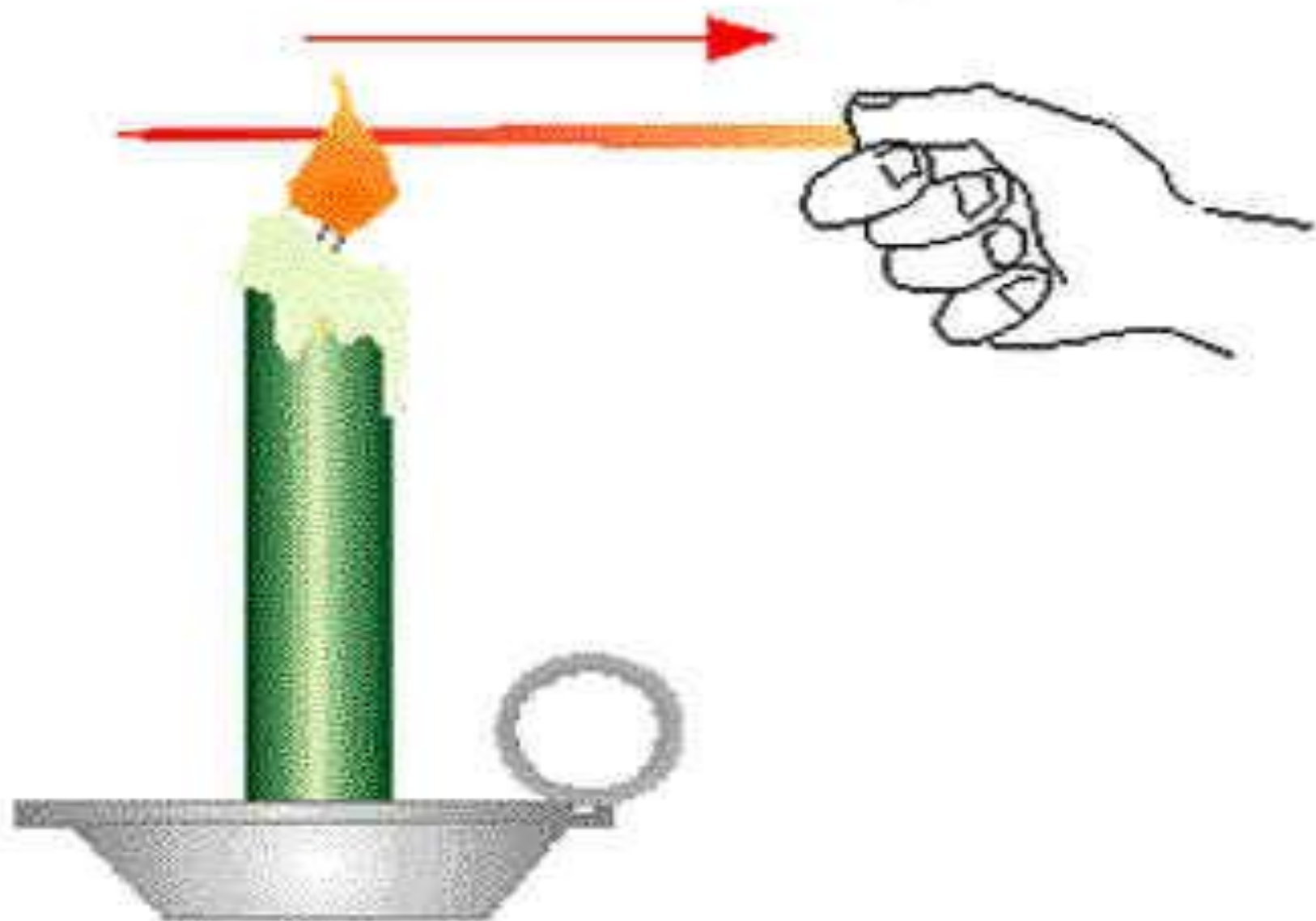
Conduction

- **Conduction** is the direct transfer of heat energy from one source to another through matter.



- Conduction occurs most readily in solid materials that transfer energy easily.

Conduction



Convection



- **Convection** is the transfer of energy in a fluid (gas or liquid).



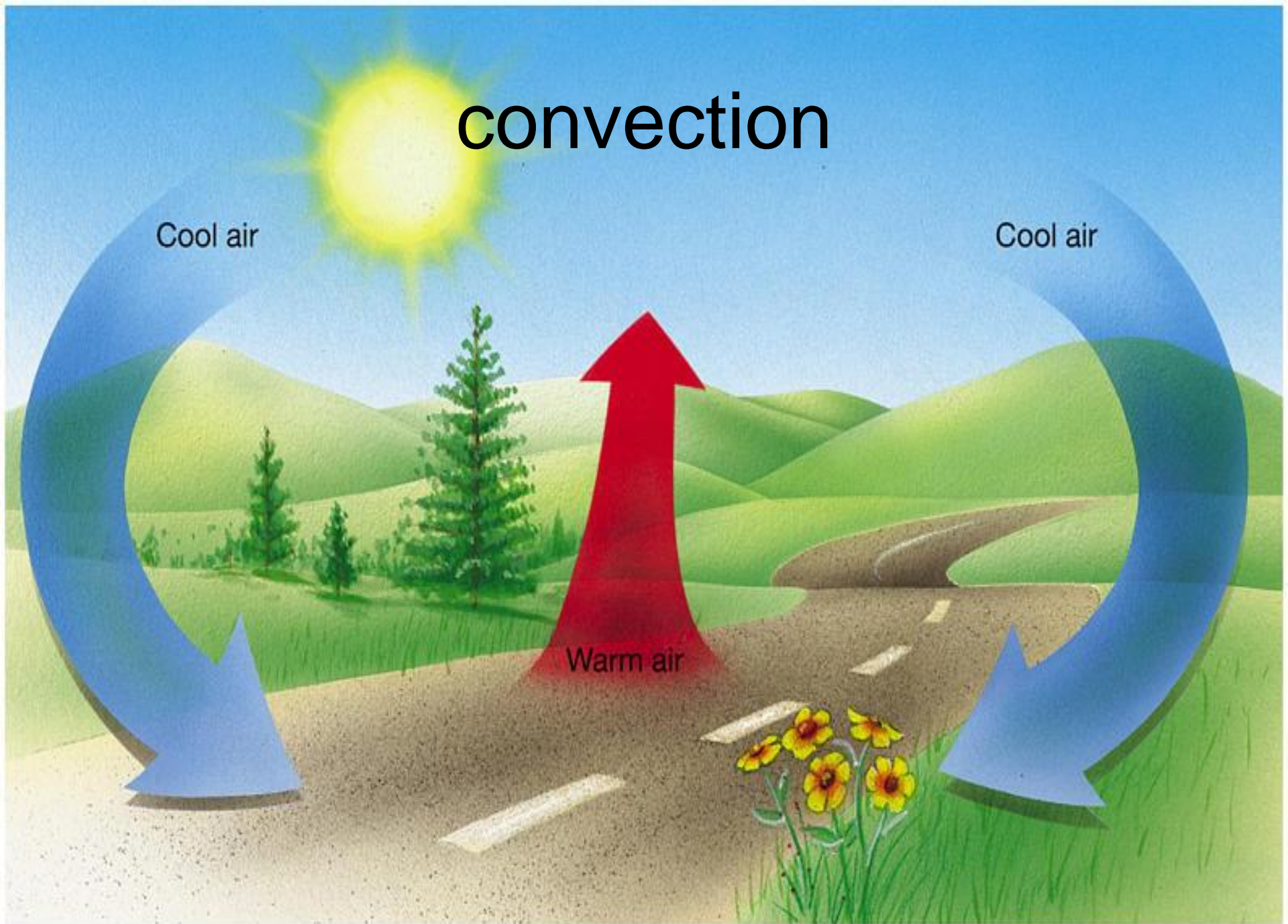
- Warm air or water rises because it is less dense than cool air or water. Cool air or water sinks because it has a greater density.

convection

Cool air

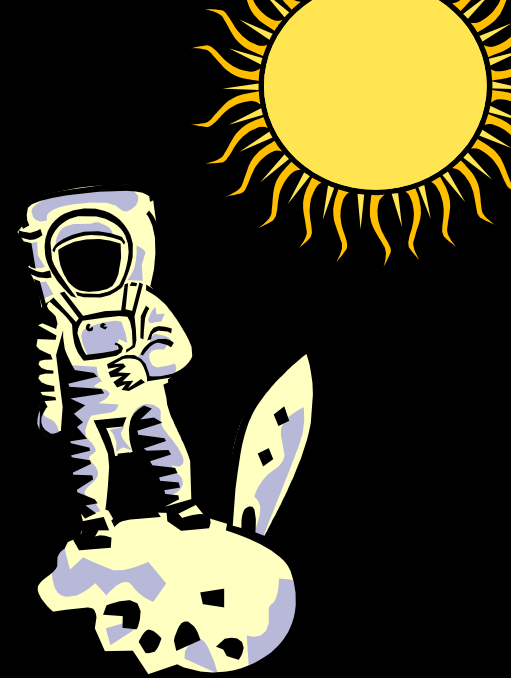
Cool air

Warm air

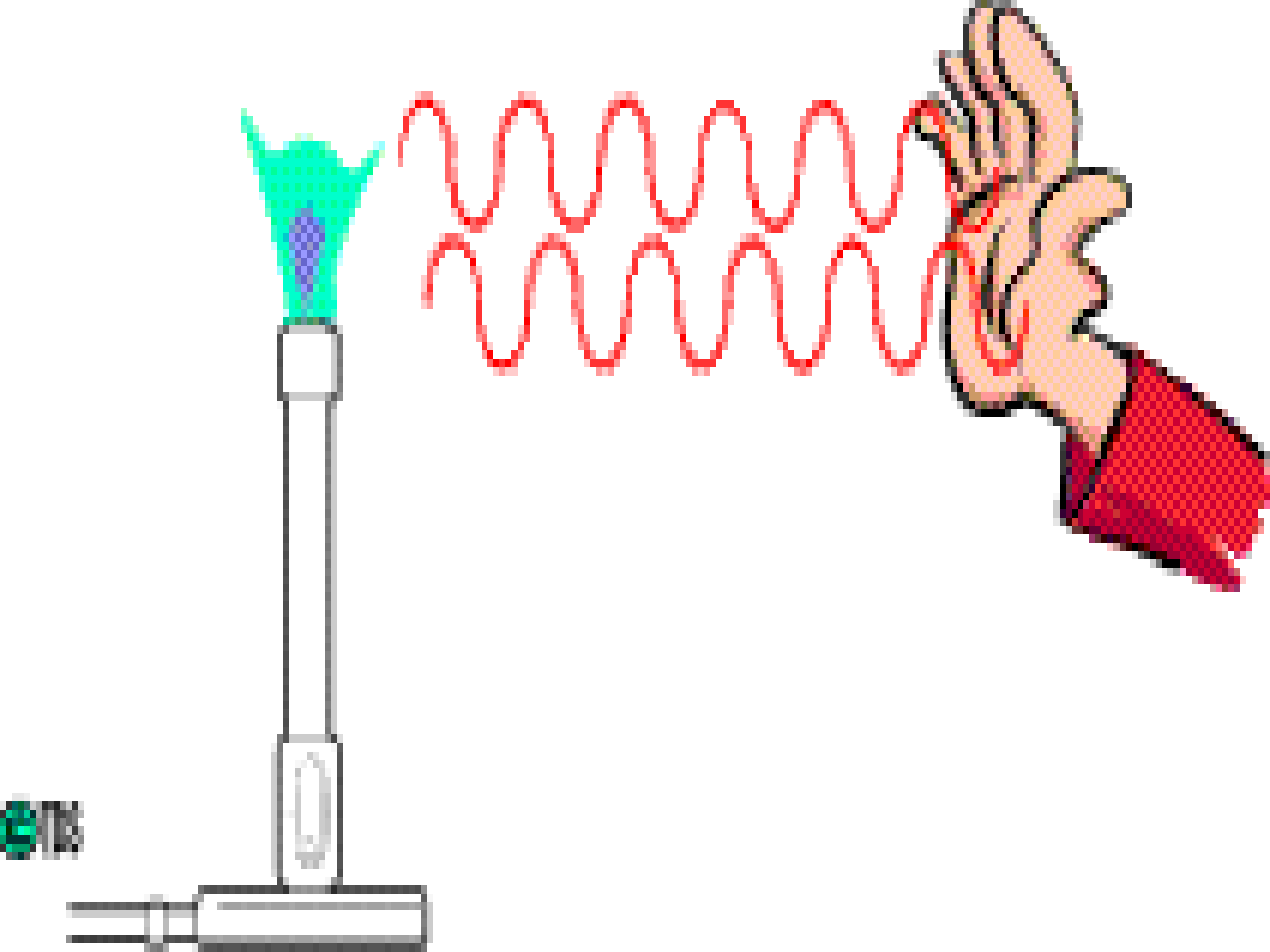


Radiation

- **Radiation** is the transfer of energy through empty space.

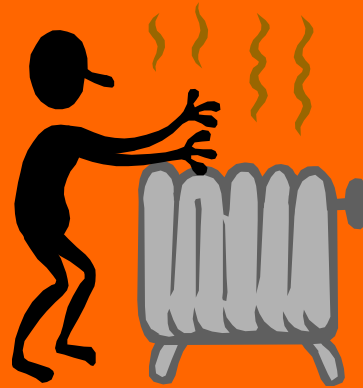


- Radiation *does not need* the presence of a solid, liquid, or gas. It can travel through a vacuum. When radiant energy is absorbed, it changes into heat energy.



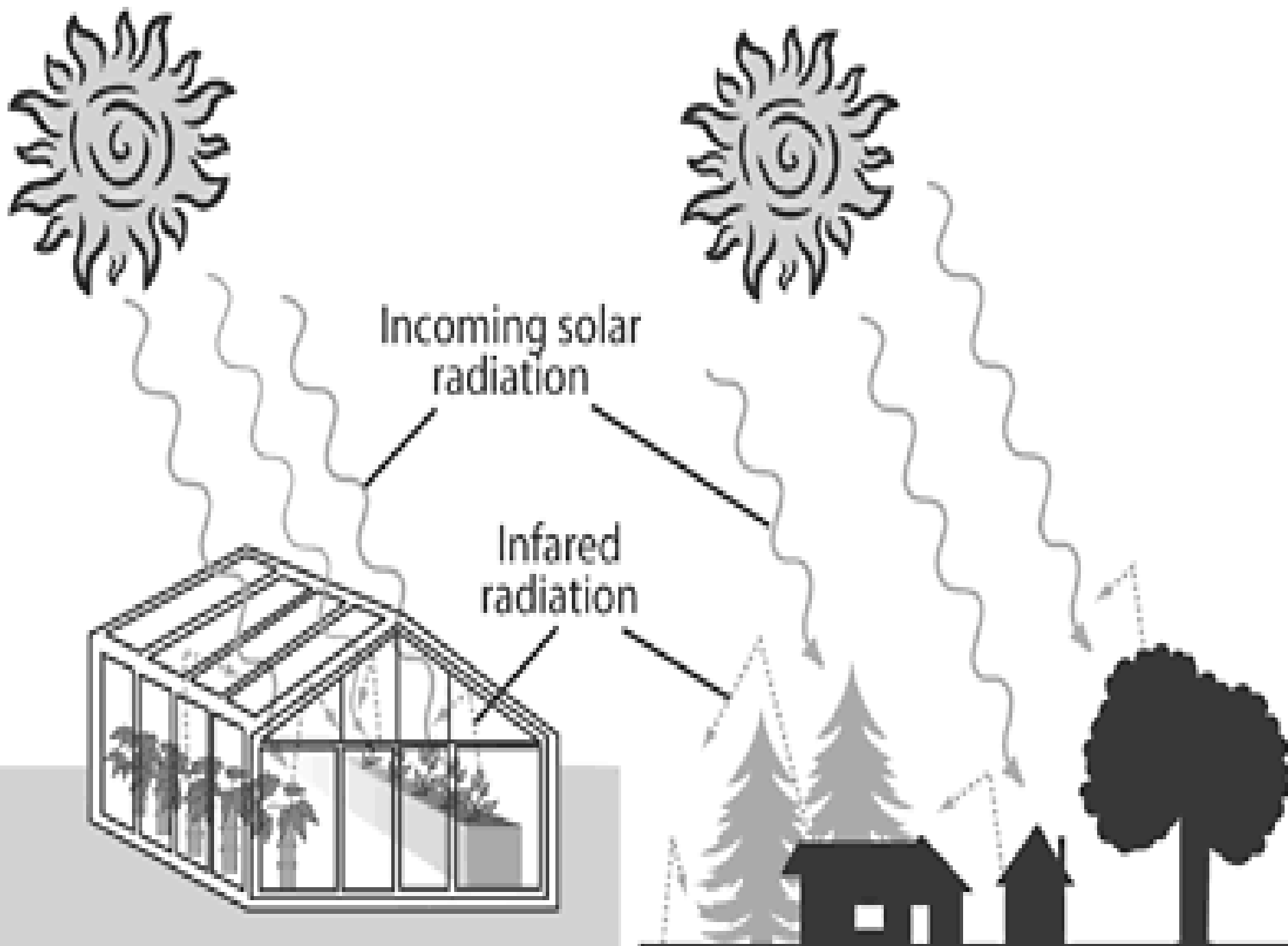
Heat Energy and the Atmosphere

- The sun's energy comes to us as **radiant** energy.



- The *atmosphere* absorbs, stores, and recycles the sun's radiant energy.



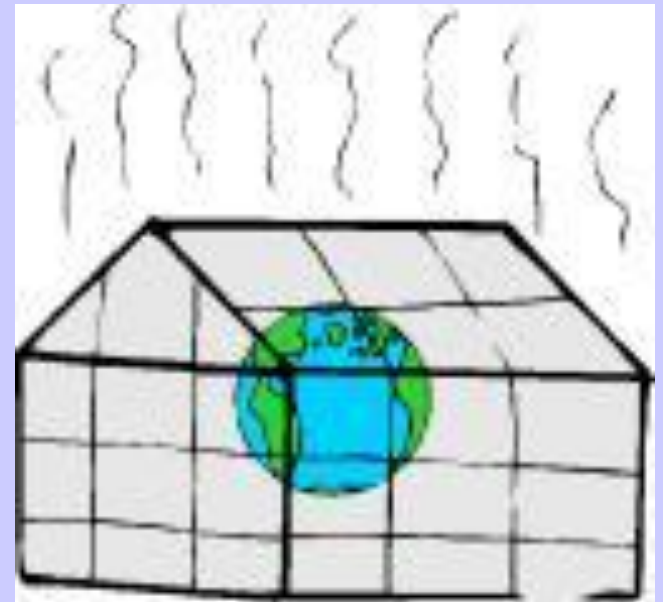


Incoming solar radiation

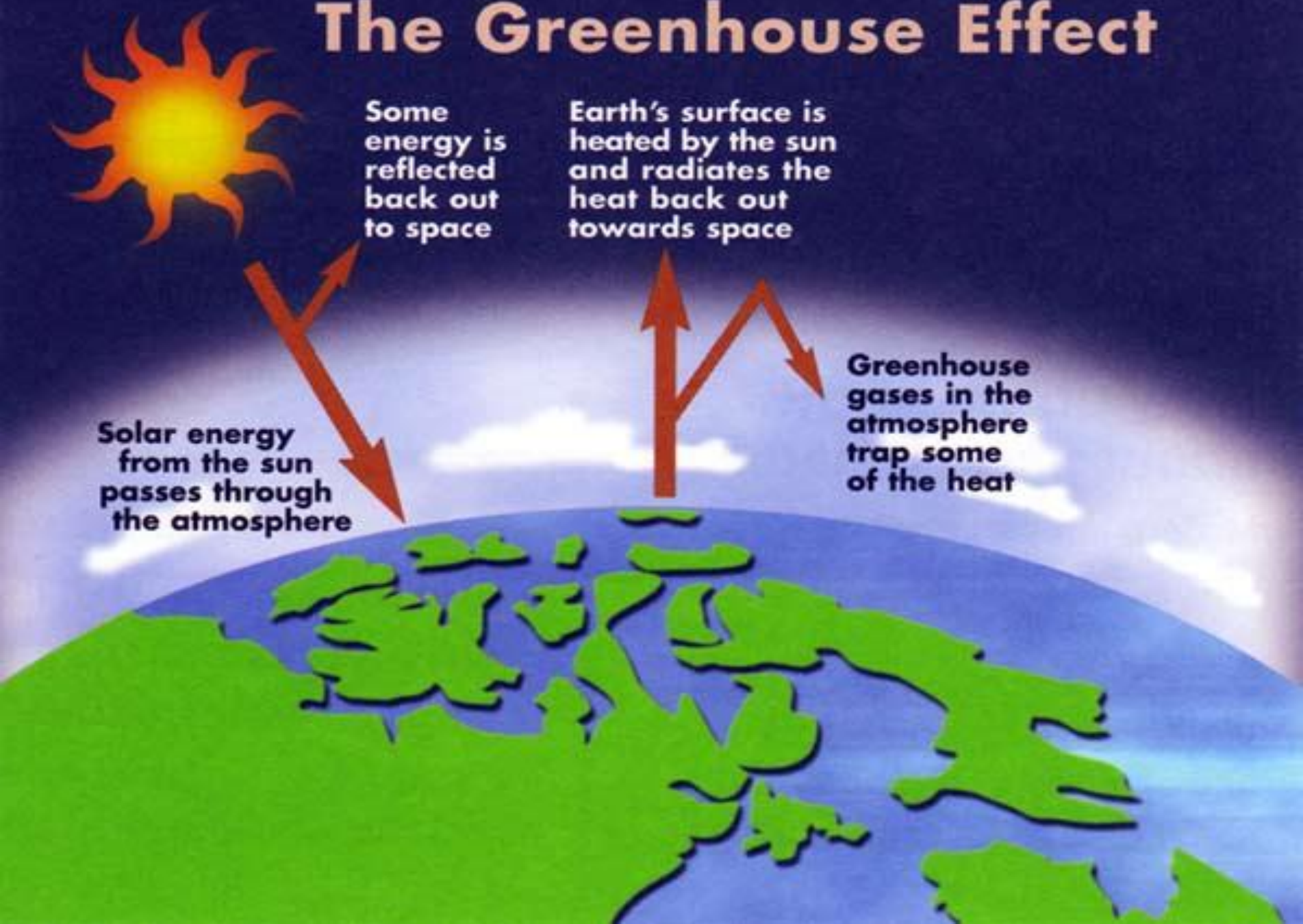
Infrared radiation

The Greenhouse Effect

- Process in which carbon dioxide and other gases in the atmosphere absorb infrared radiation from the sun, forming a “heat blanket” around the Earth.



The Greenhouse Effect



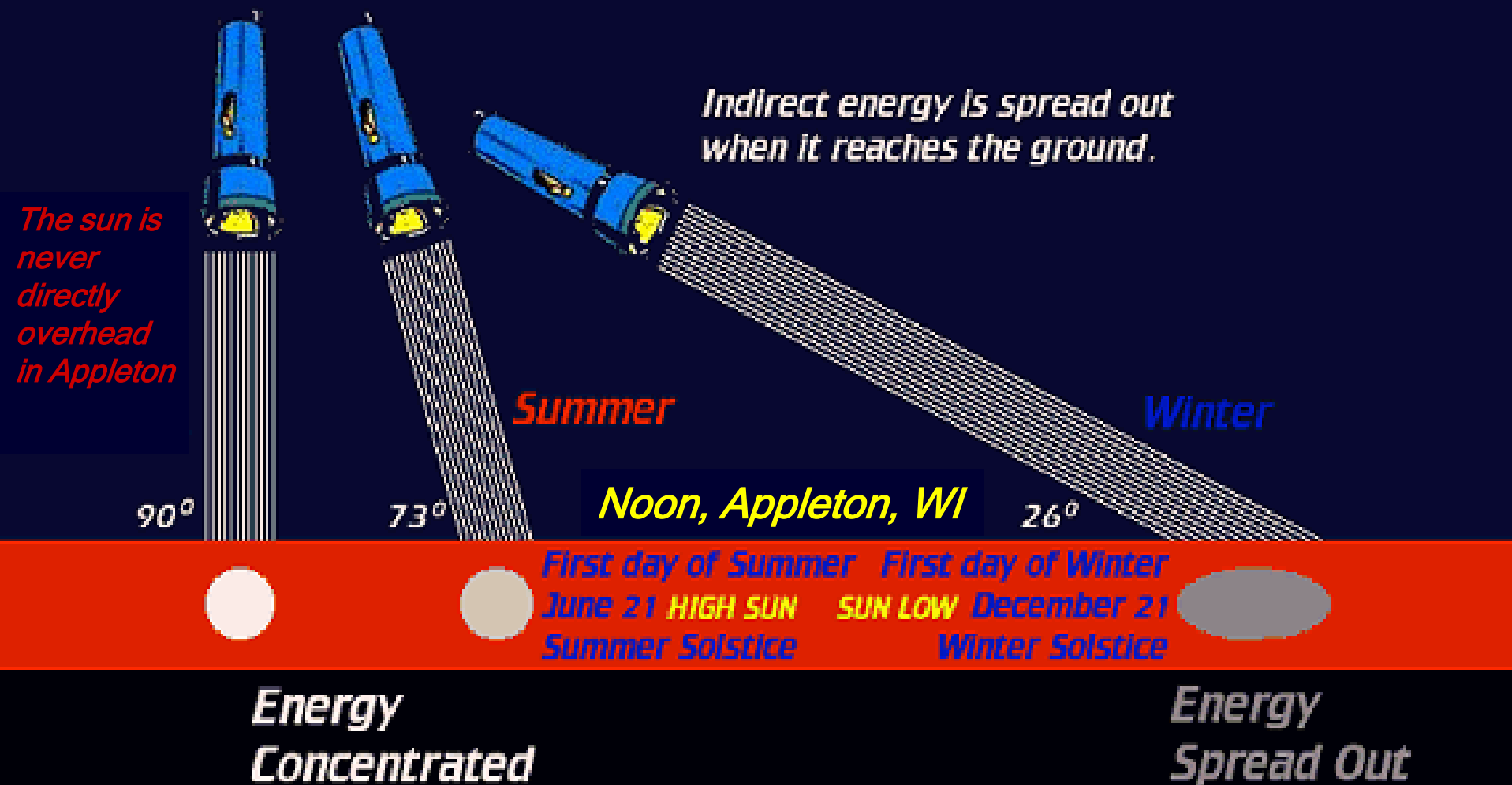
Direct and Indirect sunlight

- Areas closest to the equator receive the most direct sunlight throughout the year.
- Farther north and south the light is indirect.
 - This is especially apparent during the winter months in which the sun is not as high in the sky.

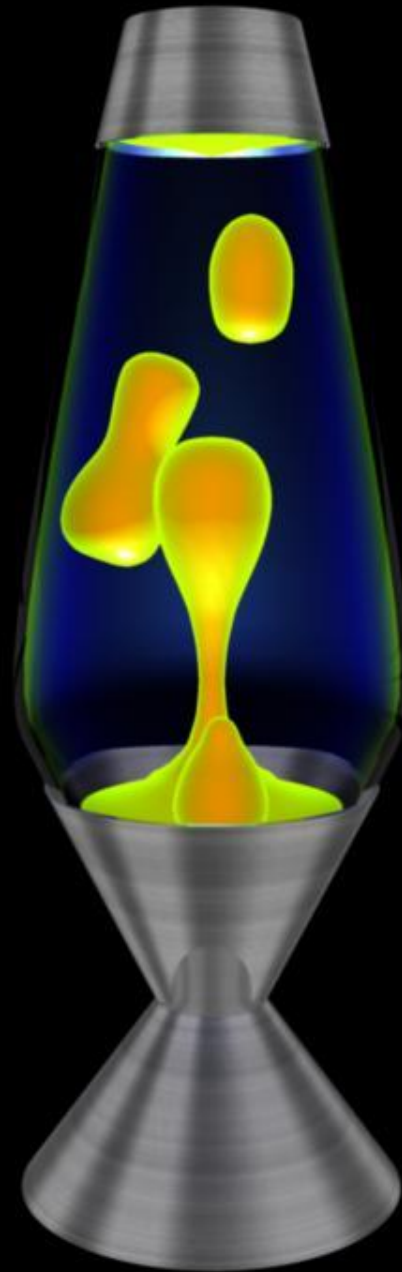
Direct vs, Indirect Energy

Direct energy
reaches the ground
in a concentrated form.

Indirect energy is spread out
when it reaches the ground.

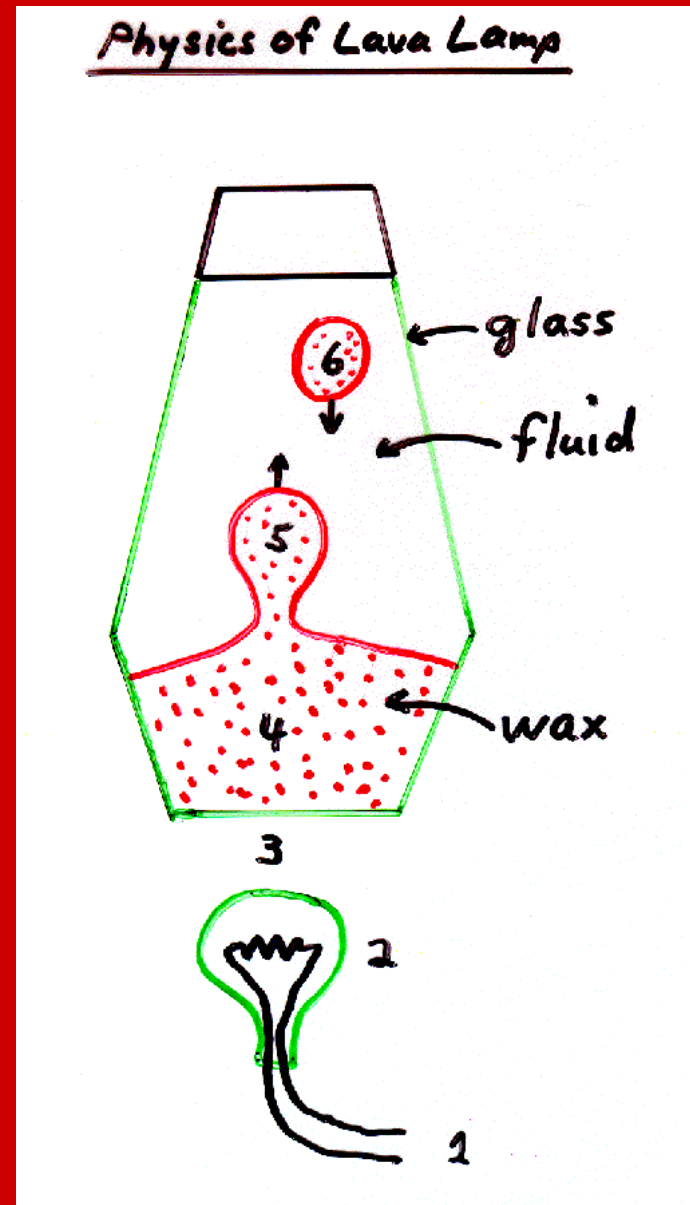


Lava motion

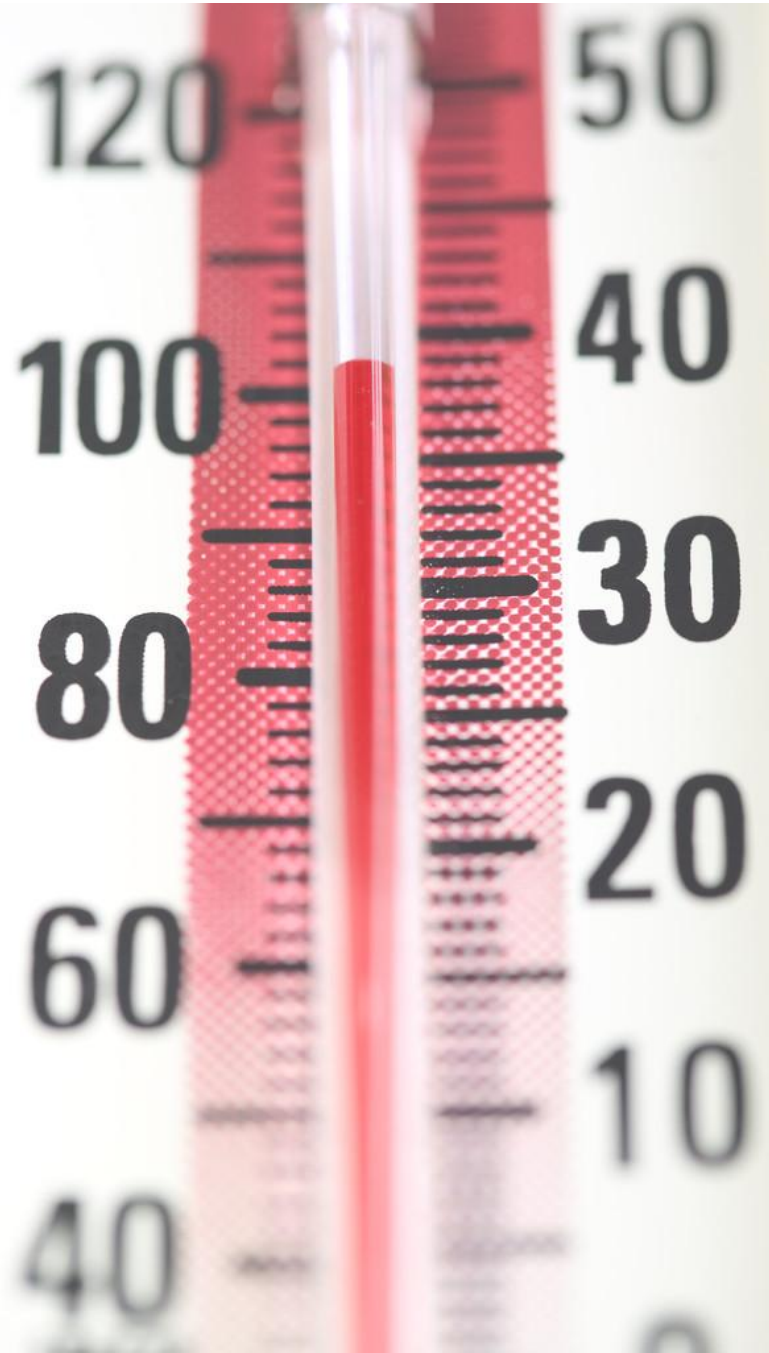


Lava lamps

- Convection causes the “lava” in lava lamps to move up and back down.



- Record inside temp in Fahrenheit and Celcius
- Record outside temp in the shade
- Record outside temp in the sun



Measuring TEMPERATURE

- When a liquid is heated, it expands. Likewise, when a liquid is cooled, it contracts (or takes up *less* space).
- Thermometers measure the changes in the expansion of a liquid in units called *degrees*.
- On the *Celsius* scale, 0 degrees is freezing, 100 is boiling, and 37 is normal body temperature for humans.

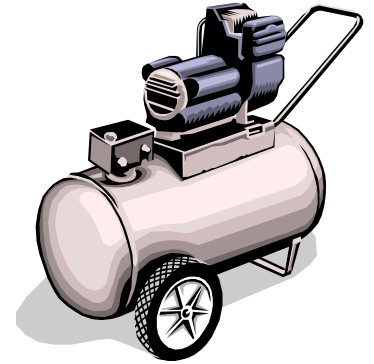
To estimate Fahrenheit to Celsius (or vice versa):

$$(F - 32) \times 5/9 = C$$

$$C \times 9/5 + 32 = F$$



Air Pressure



- Atmospheric pressure – or **air pressure** is the measure of the force of air pressing down on the Earth's surface.
- Air pressure is affected by:
 - Temperature (lower temperatures *increase* air pressure)
 - Water vapor (dry air exerts more pressure than moist air)
 - More moisture in the air = *lower* air pressure
 - Elevation (elevations high above sea level have lower air pressure than places at or below sea level, which have a higher air pressure)
- Air pressure is measured with a barometer

Isobar

- A line on a weather map connecting points of equal atmospheric pressure.

