

Chapter 7 & 8

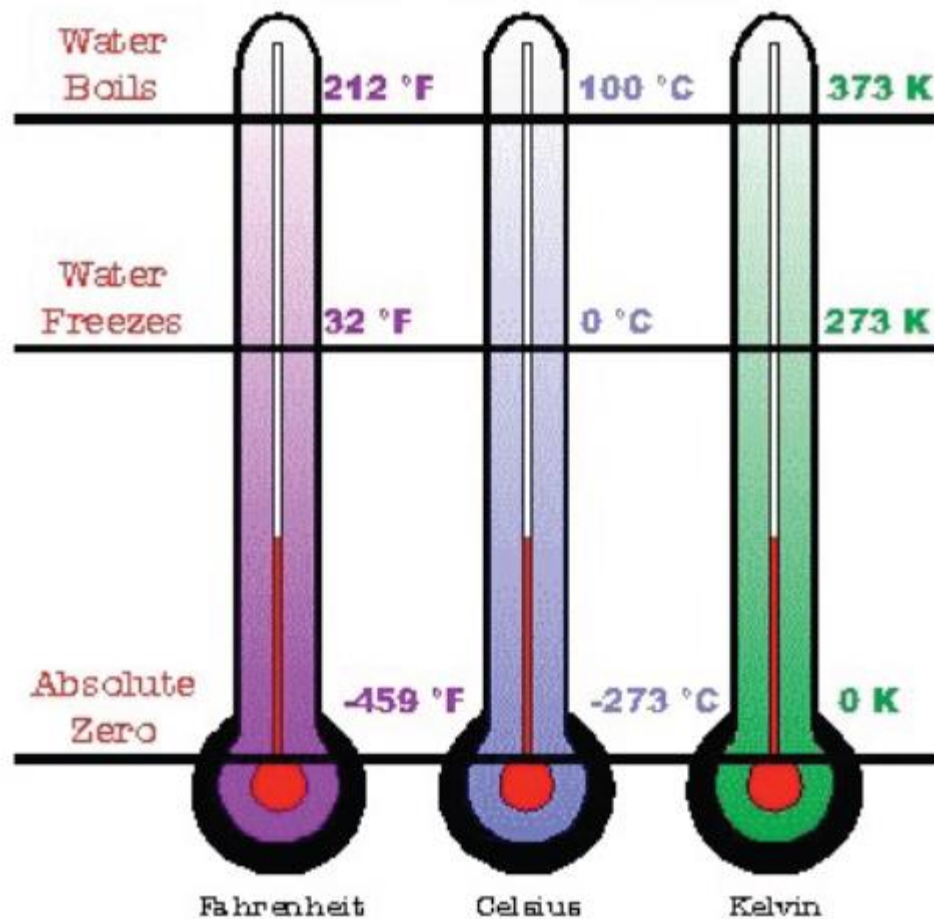
Meteorology

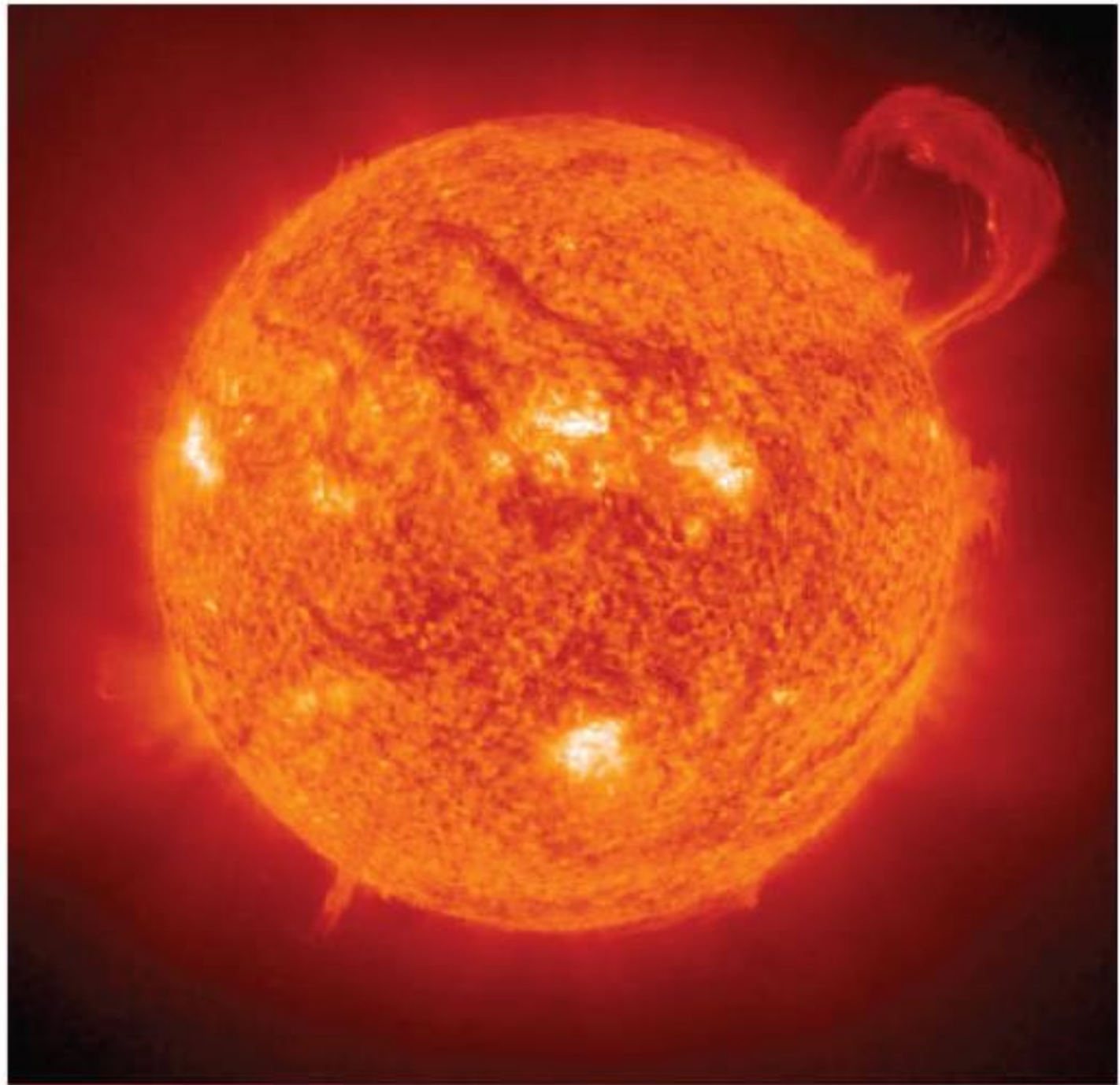
Atmospheric Energy

1. Sun (Radiation) is the main source of energy for weather changes.
2. Energy is the ability to do work.
3. Everything gives off electromagnetic energy above absolute zero (0 degrees K)
4. Warmer something is heated...more energy emitted
5. Colder something is cooled to...less energy emitted
6. Absolute Zero is lowest possible temperature at which all molecules cease to move (-273 C).

Absolute Zero

Thermometers compare Fahrenheit,
Celsius and Kevlin scales.



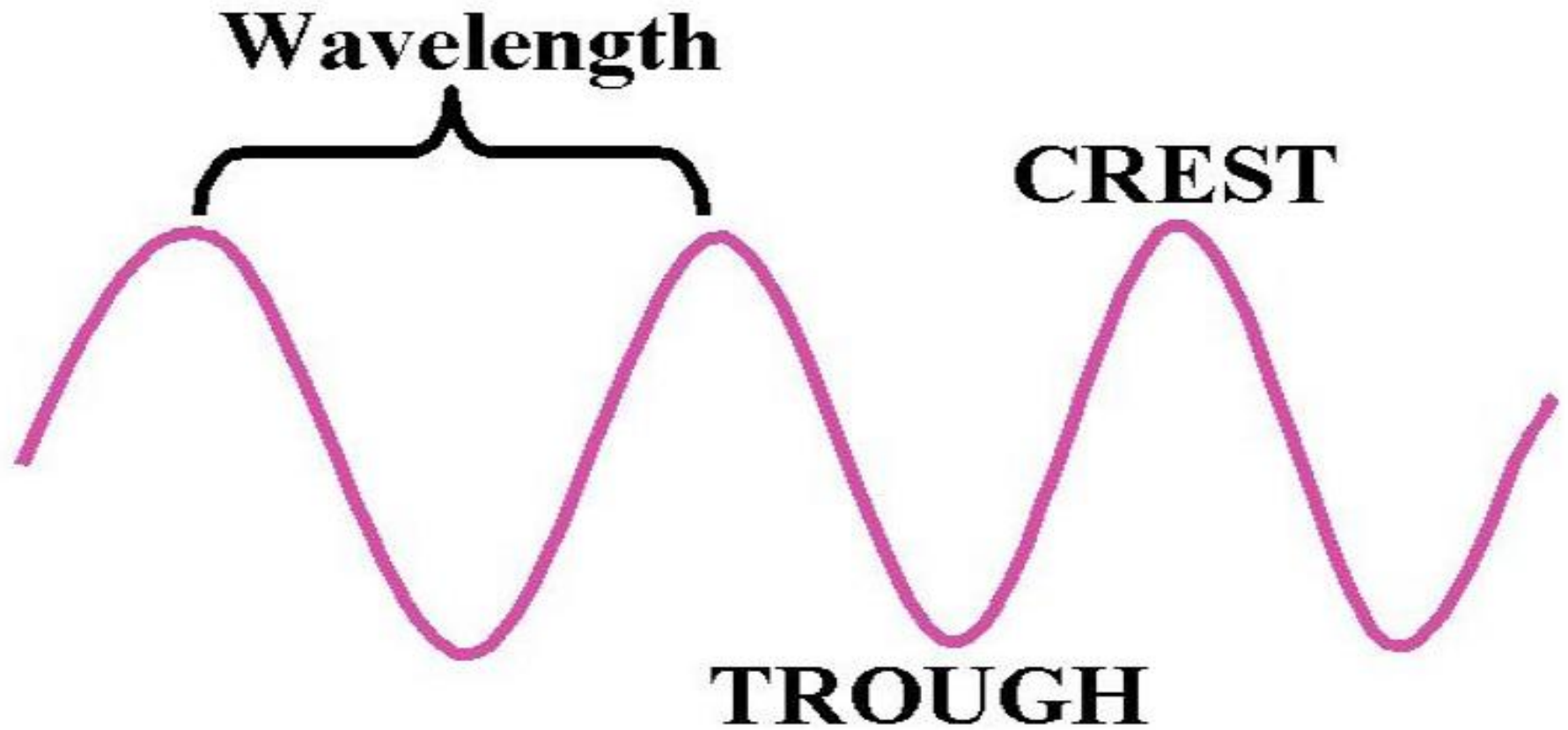


Solar Energy

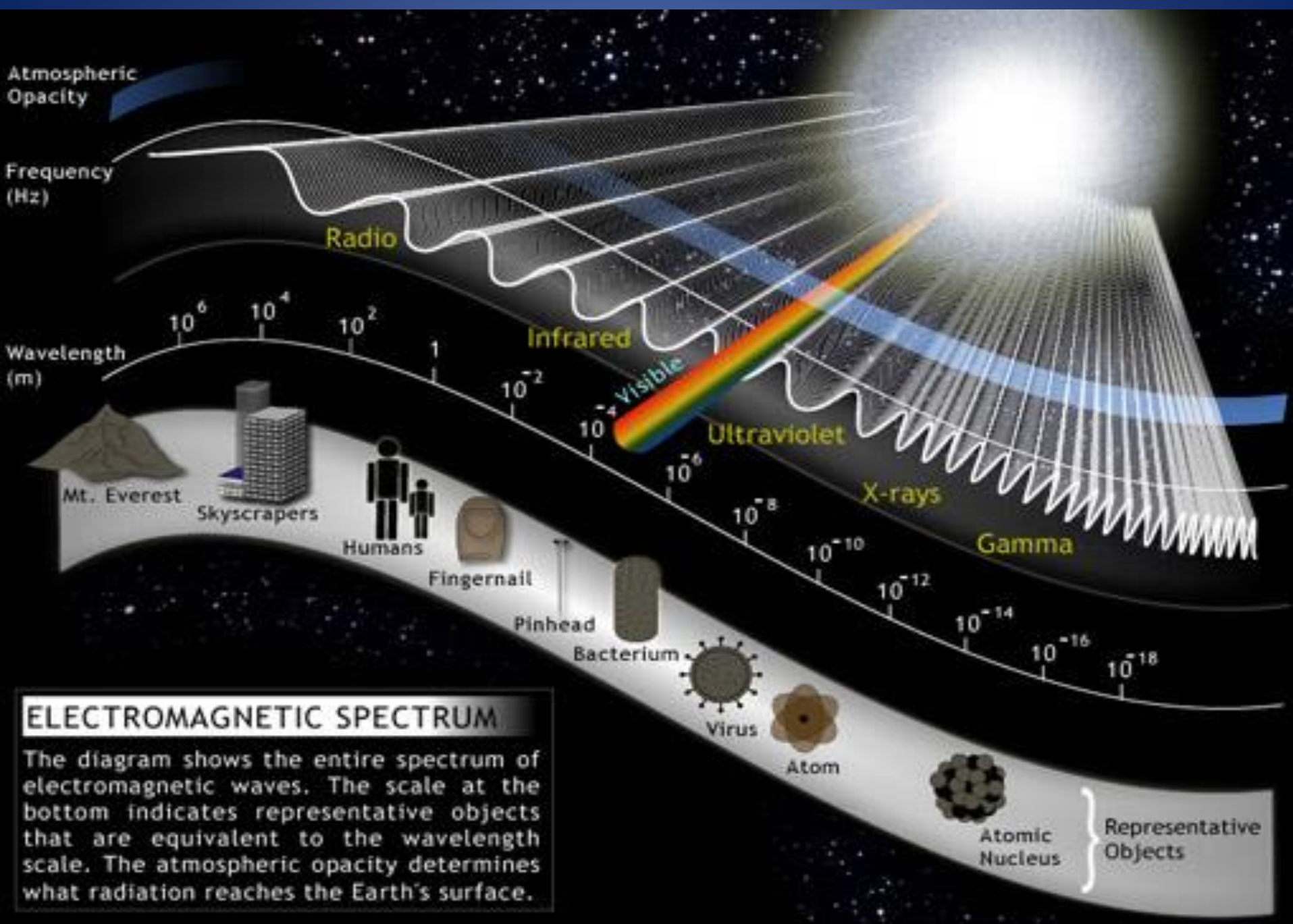
1. All stars (Sun) emit electromagnetic energy
2. Solar Energy is the major source of energy for the Earth
3. Most INTENSE form is visible light.
(MOST OF WHAT WE RECEIVE AT EARTH'S SURFACE IS VISIBLE LIGHT).
4. Visible light is broken up into different wavelength (different colors)
5. Red is the longest, Violet is the shortest
6. VISIBLE LIGHT HAS GREATEST INTENSITY OF ALL ENERGY FROM SUN!

Electromagnetic Energy

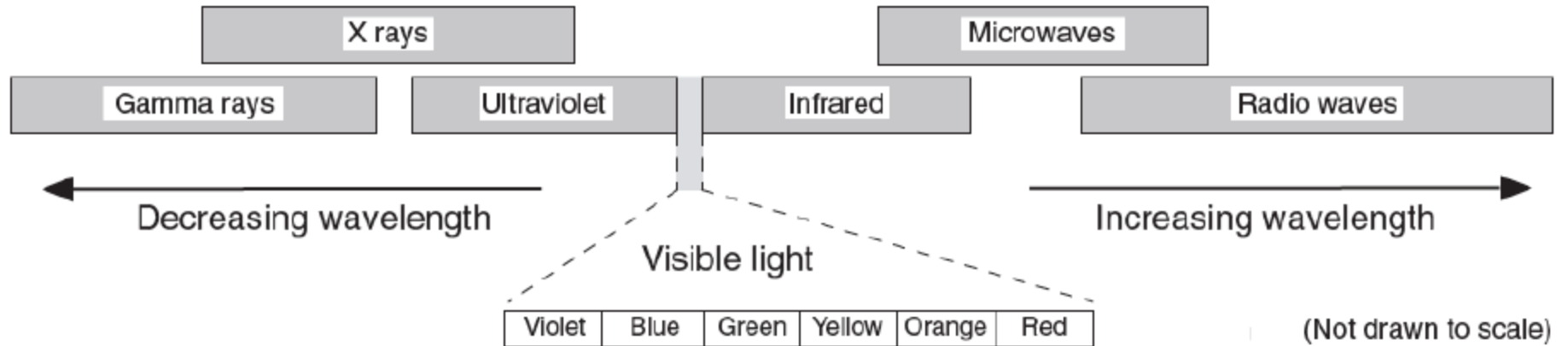
1. Crest-top of the wave.
2. Wavelength- horizontal distance between crests.
3. Frequency-time in between each successive wave
4. Electromagnetic energy is identified by wavelength.
5. Entire range of electromagnetic energy is called the electromagnetic spectrum.

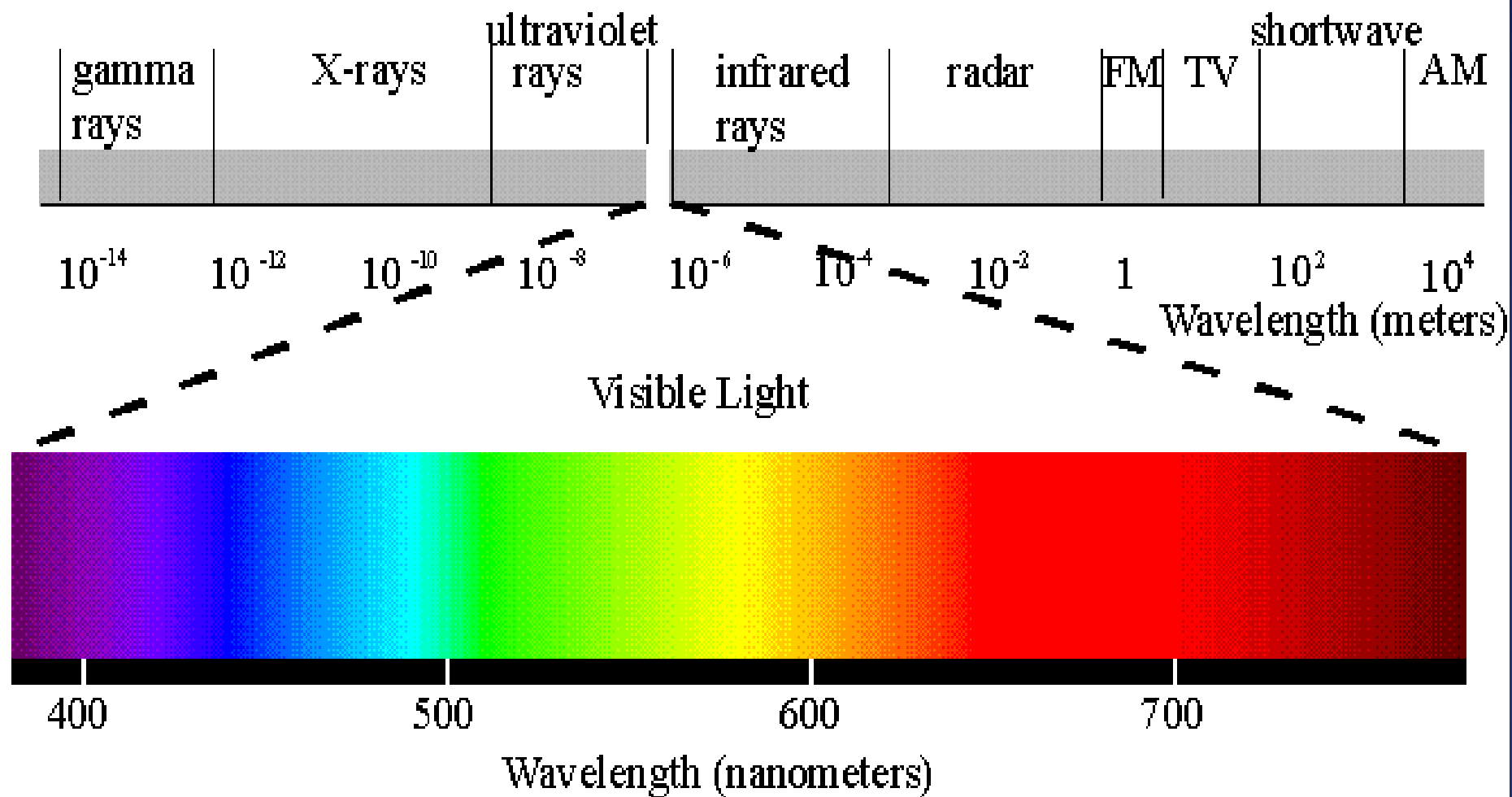


**Electromagnetic radiation
travels as waves.**



Electromagnetic Spectrum

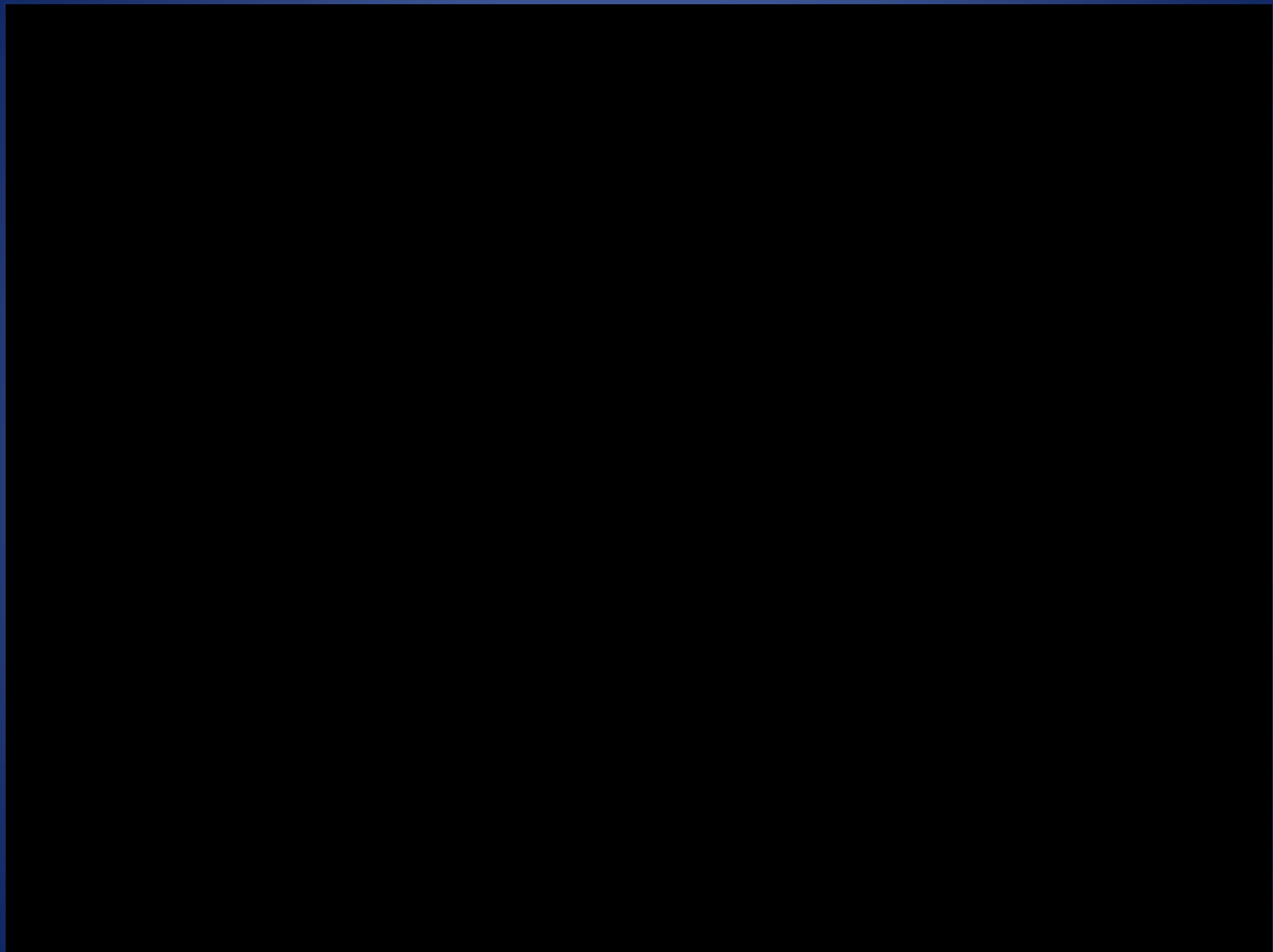




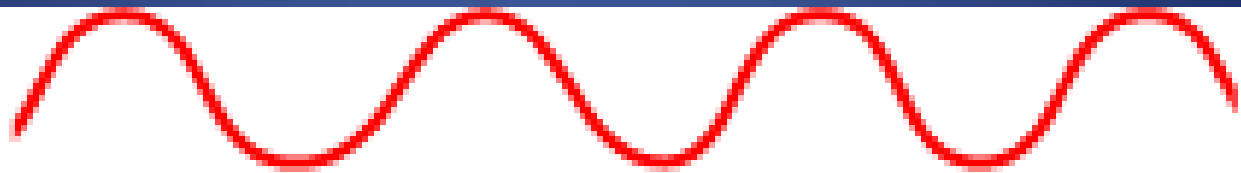
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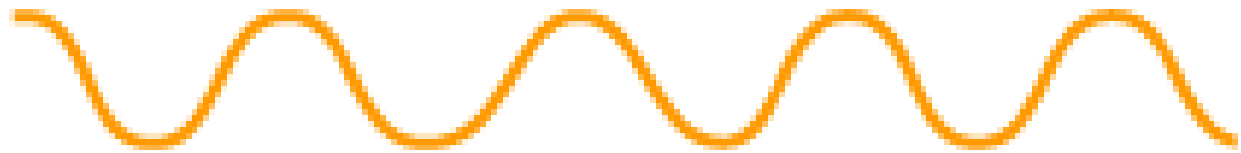
6. All electromagnetic energy from the sun travels at the speed of light (186,000 miles per second).
7. Frequency of the energy is how many wavelengths pass a point per unit of time
8. Long wavelength = low frequency meaning there is less energy...lower temperature
9. Short wavelength = high frequency meaning there is more energy...higher temperature



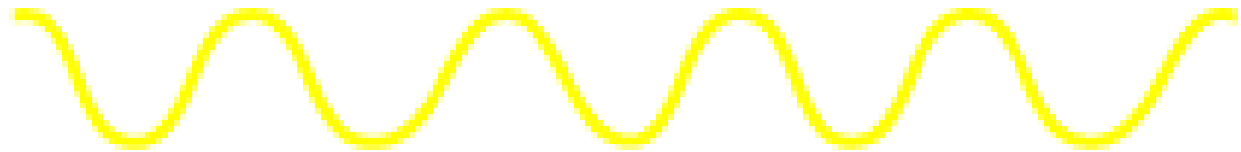
RED



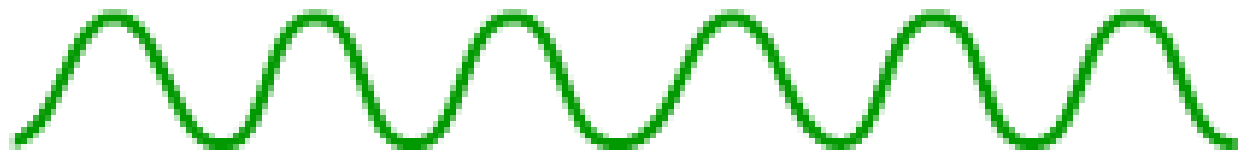
ORANGE



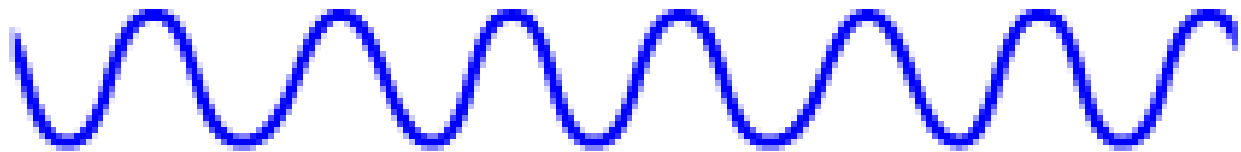
YELLOW



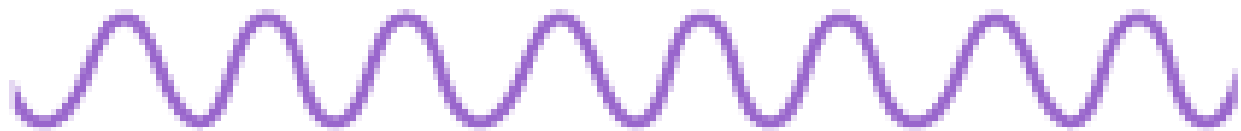
GREEN



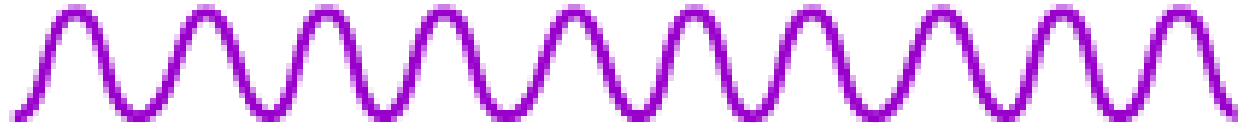
BLUE



INDIGO

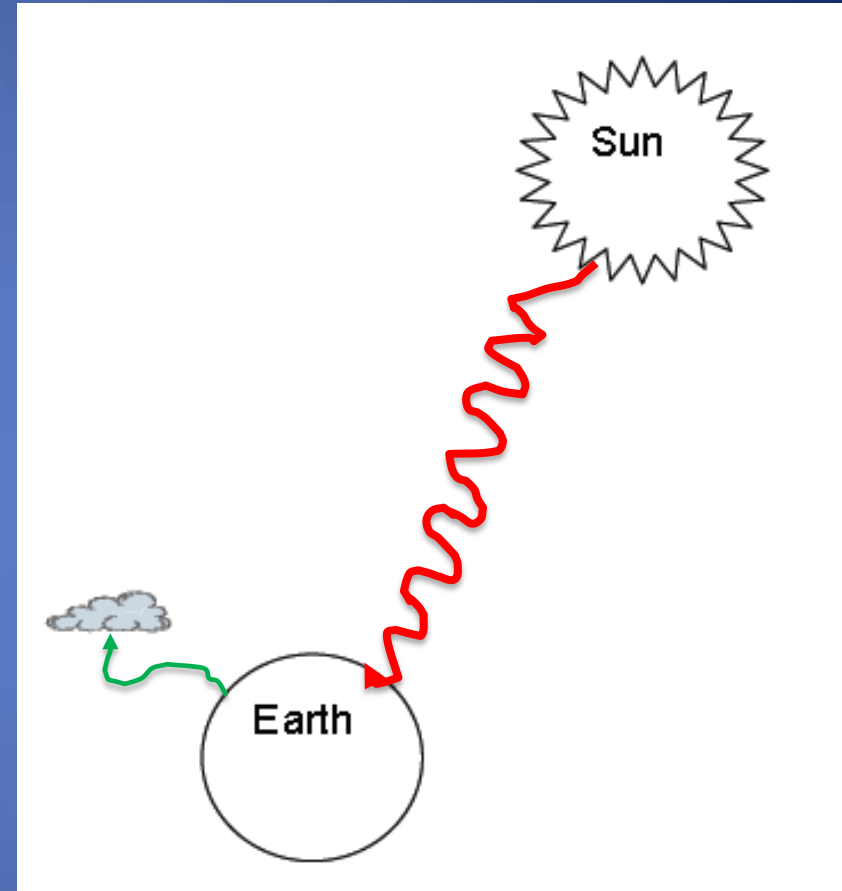


VIOLET



Insolation:

1. Incoming Solar Radiation (radiation from the Sun).
2. Main Source of energy for the Earth's atmosphere
3. Insolation interacts with the atmosphere.



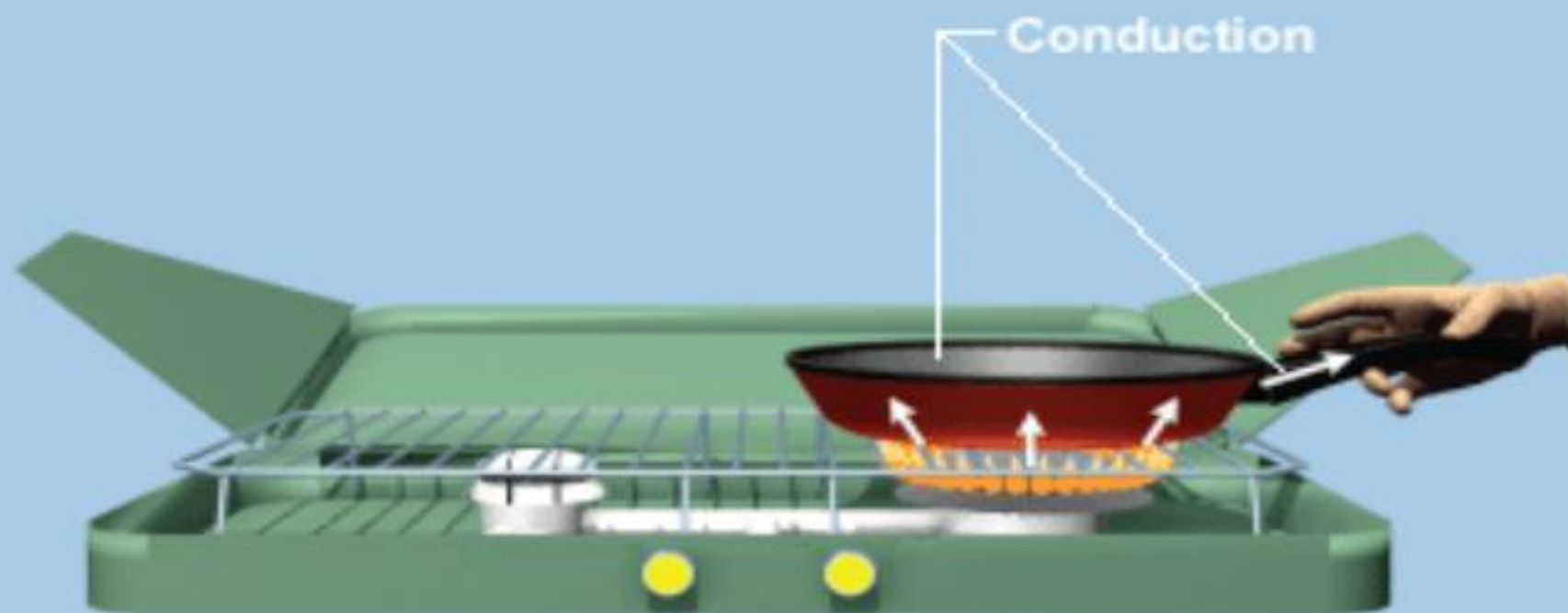
Energy Transfer– The transfer of energy in the atmosphere creates weather.

There are three forms of energy transfer:

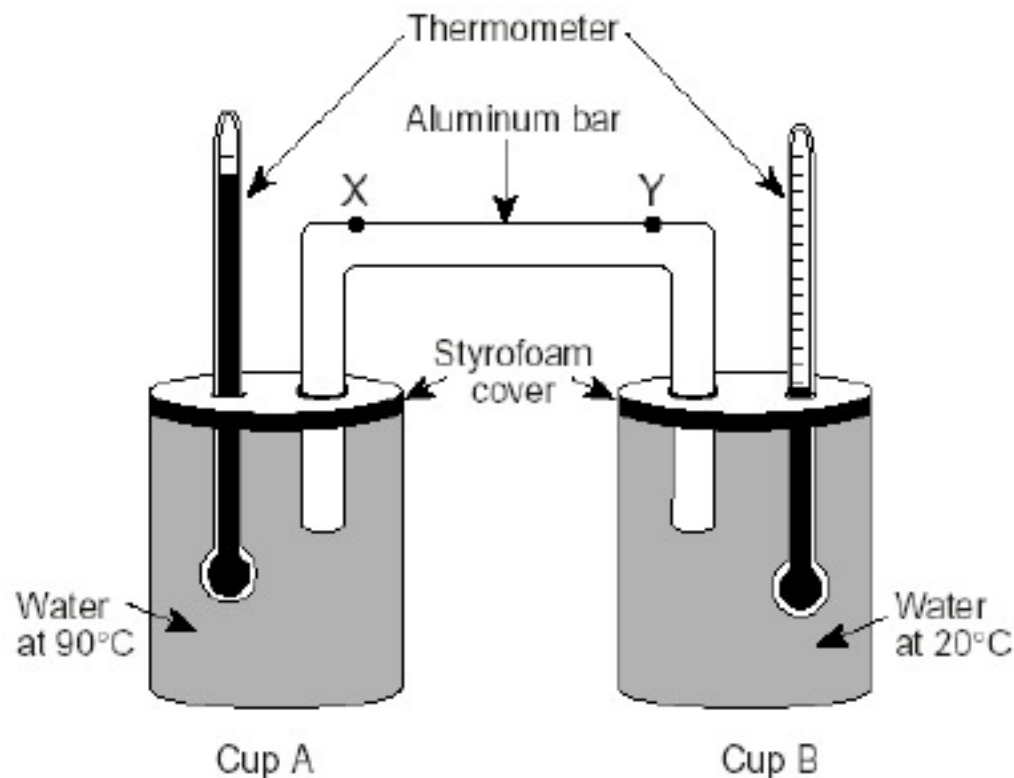
1. Conduction
2. Convection
3. Radiation

Conduction -

1. Heat transfer through solids (ex: dirt or rock).
2. A metal bar that is held over a hot flame will eventually become hot throughout.
3. Energy is passed from atom to atom (atomic collisions).



The COMET Program

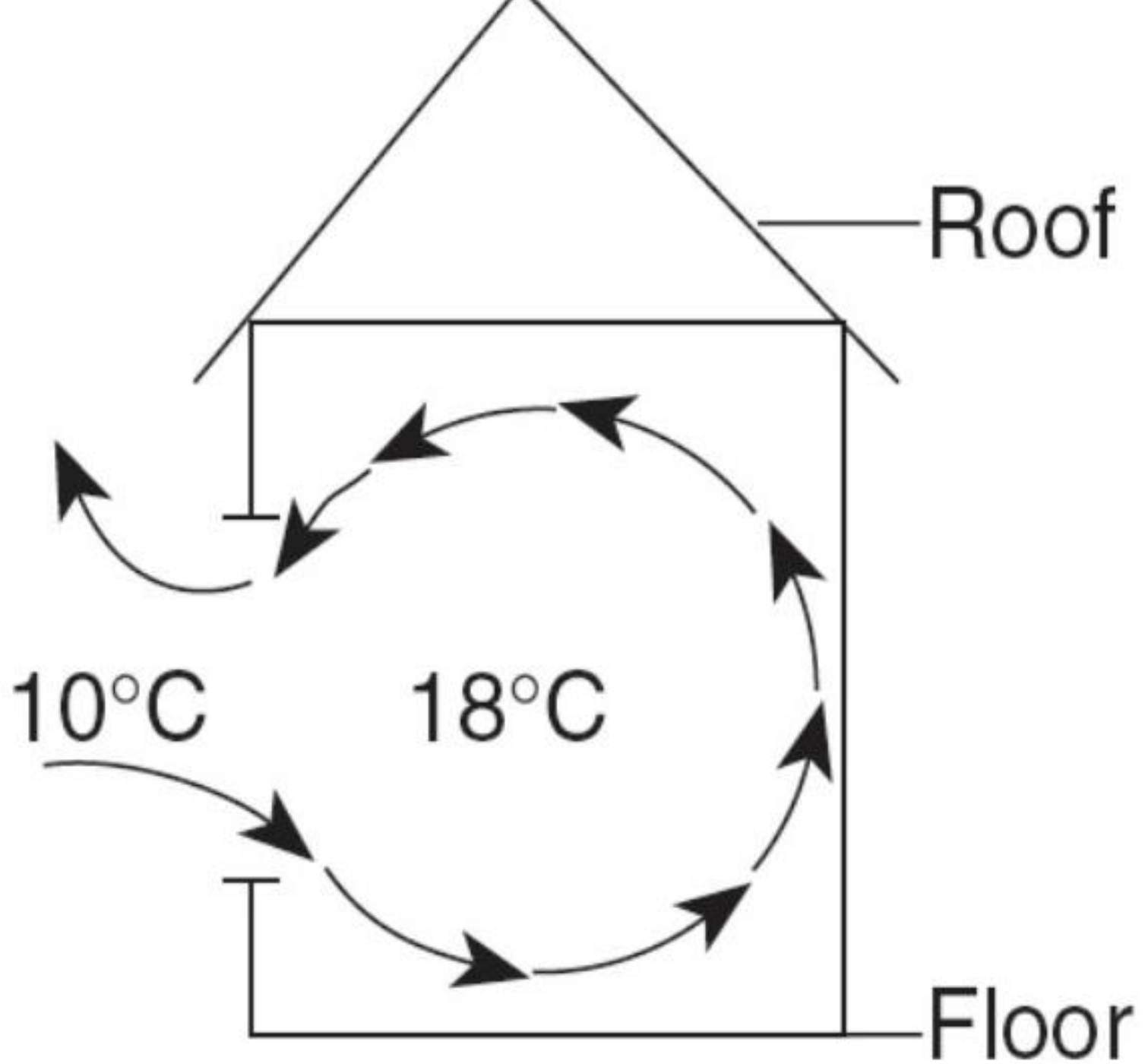


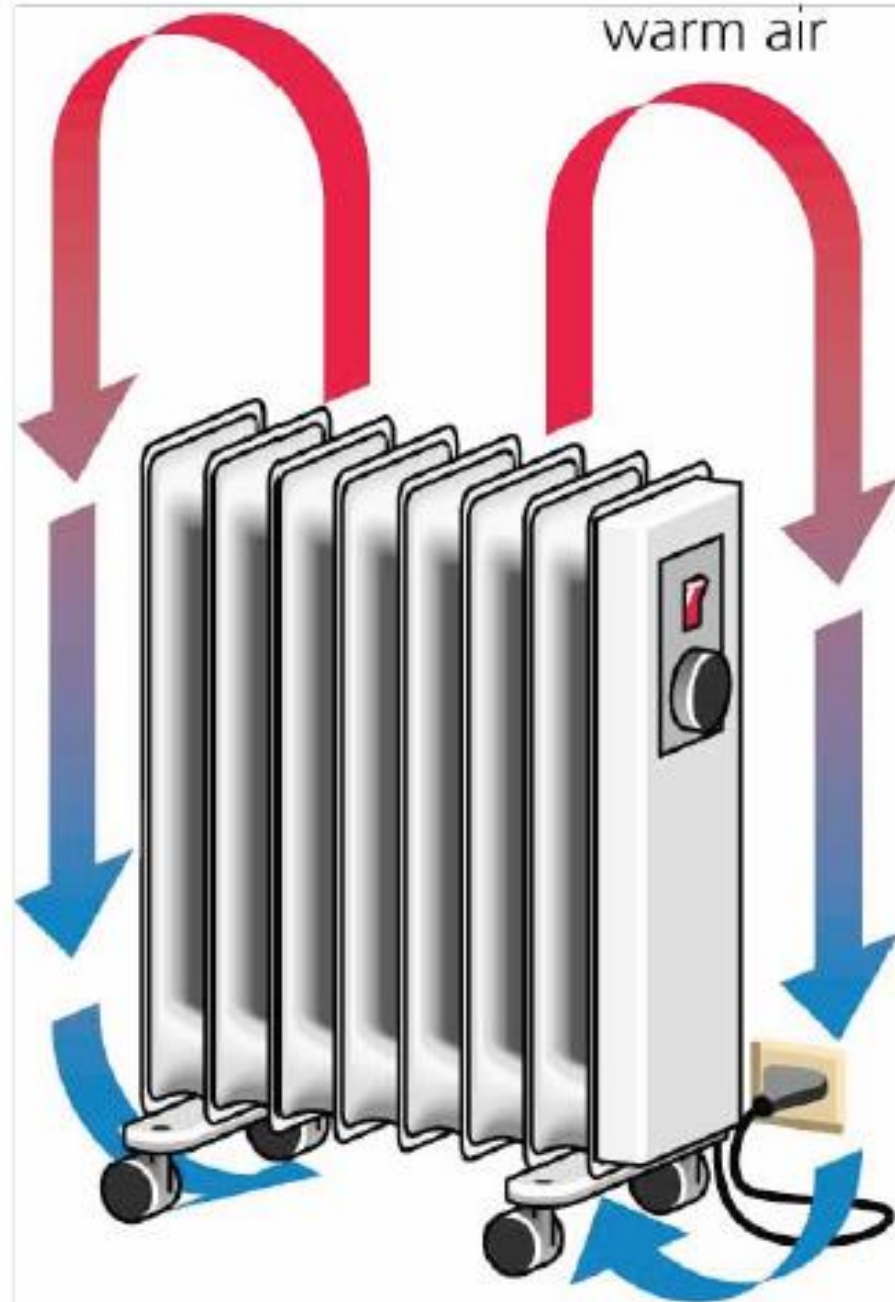
	Temperature of Water (°C)	
Minute	Cup A	Cup B
0	90	20
1	88	20
2	86	20
3	85	21
4	83	21
5	82	22
6	81	22
7	80	22
8	79	22
9	78	23
10	77	23
11	76	23
12	75	23
13	74	23
14	73	23
15	72	24
16	71	24
17	70	24
18	69	24
19	68	25
20	67	25

Convection -

1. Heat transfer through fluids (gases and liquids).
2. Water in the bottom of a pot is heated, it expands and becomes less dense and rises.
3. Water at the top is cooler, contracts and becomes denser and sinks.
4. Constant circulation is called a convection cell.
5. Convection occurs in oceans, atmospheres, and asthenosphere.
6. Works due to Density Differences!!!!!!



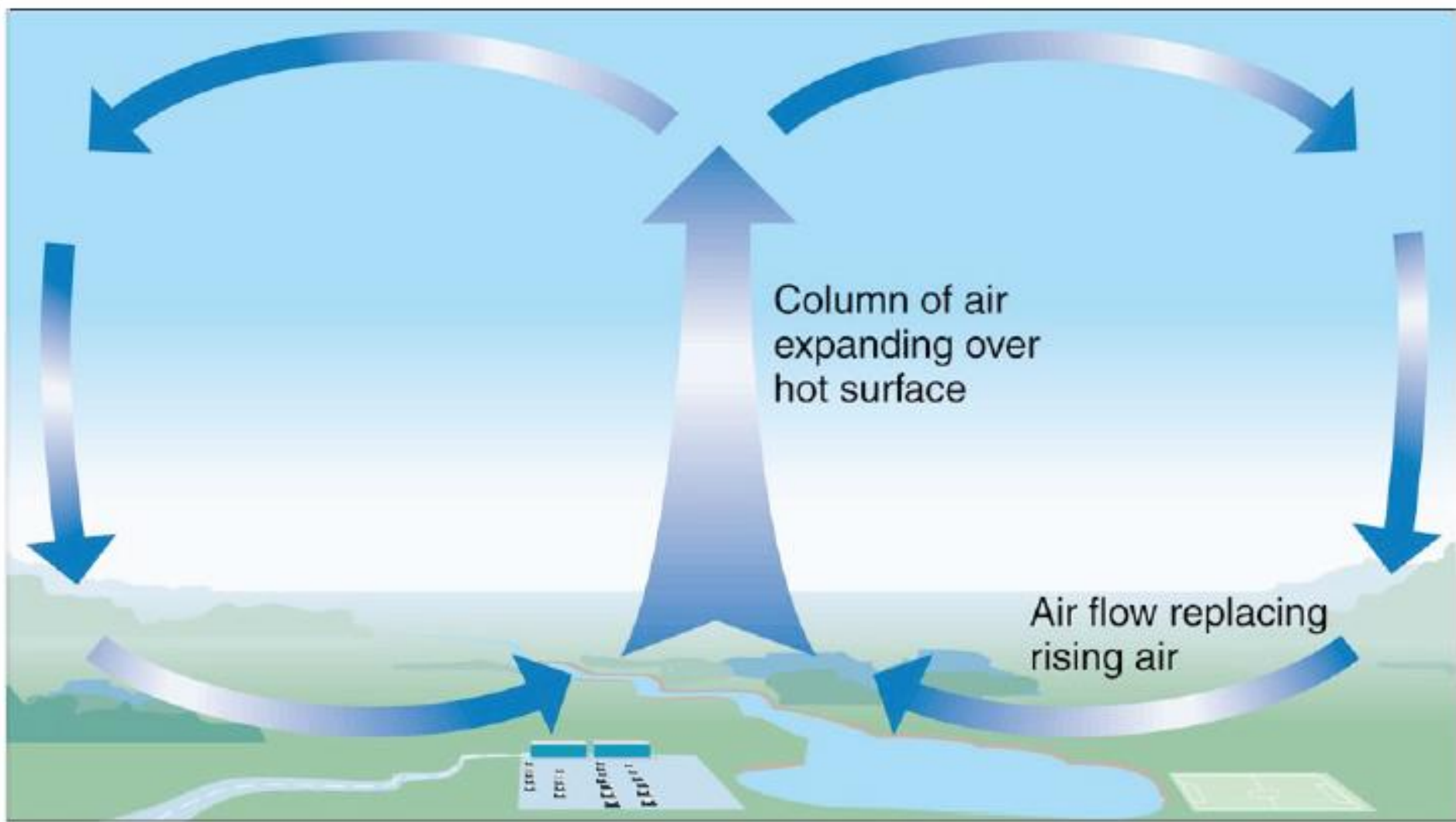


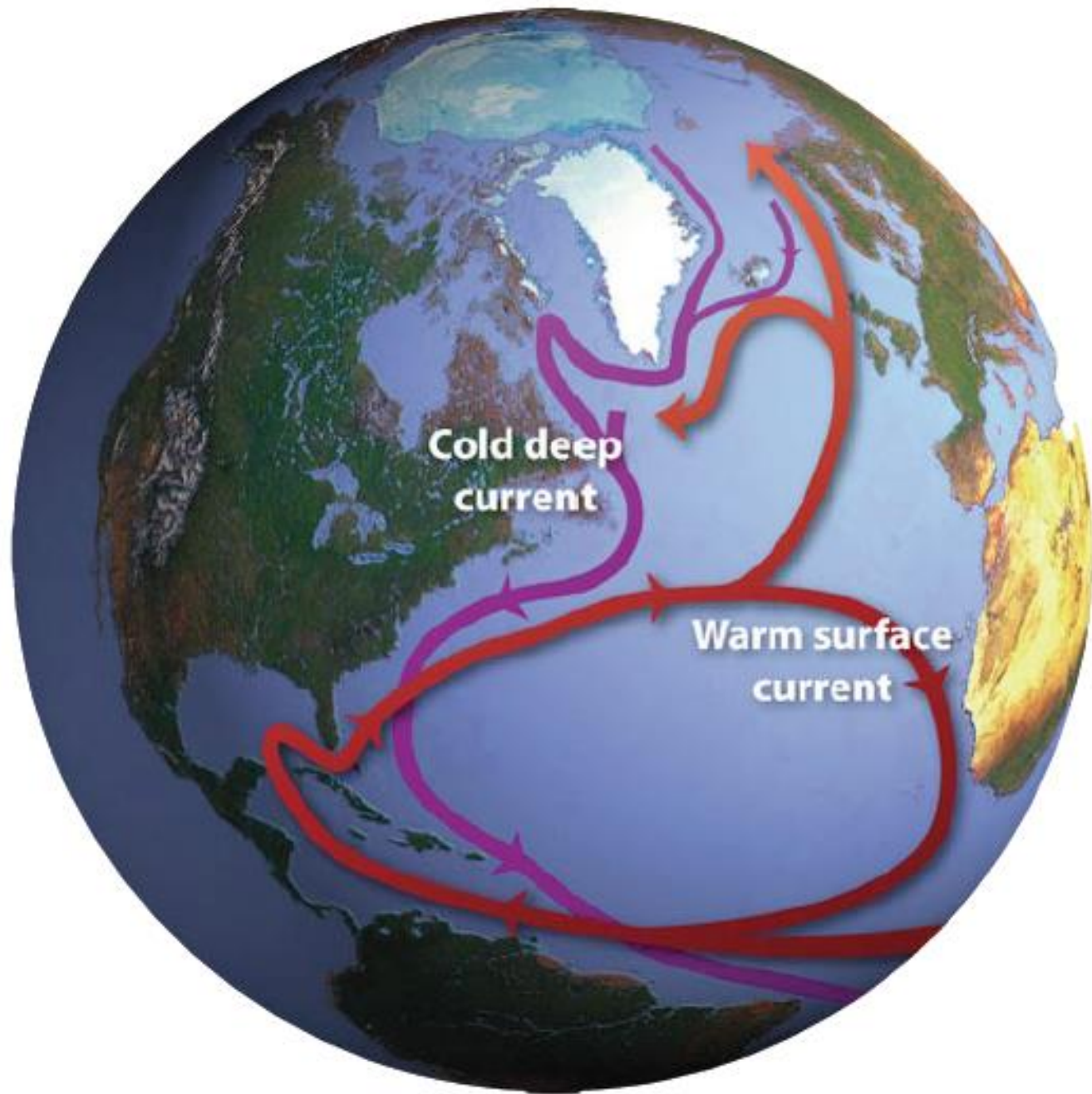


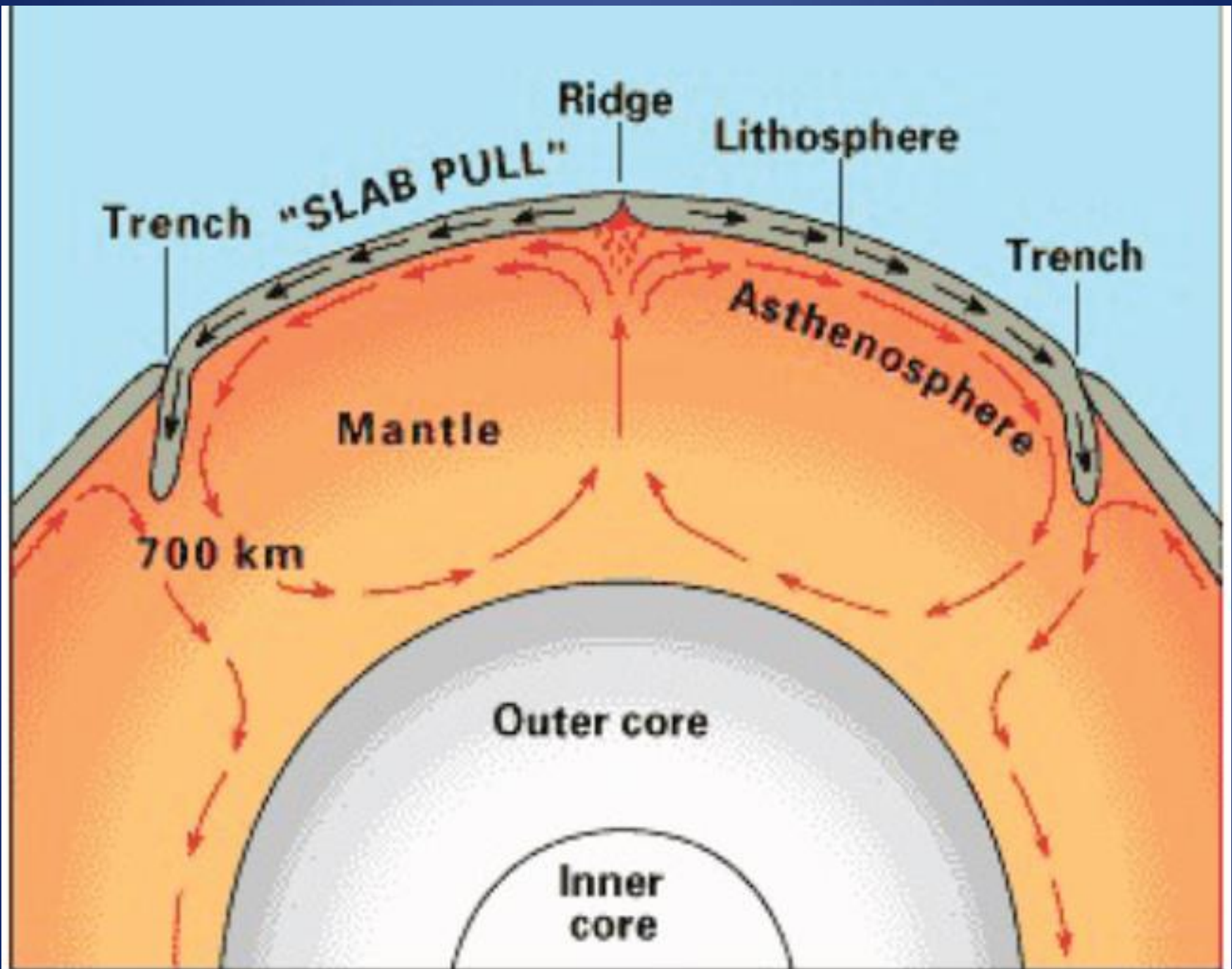
warm air

cool air

Precision Graphics





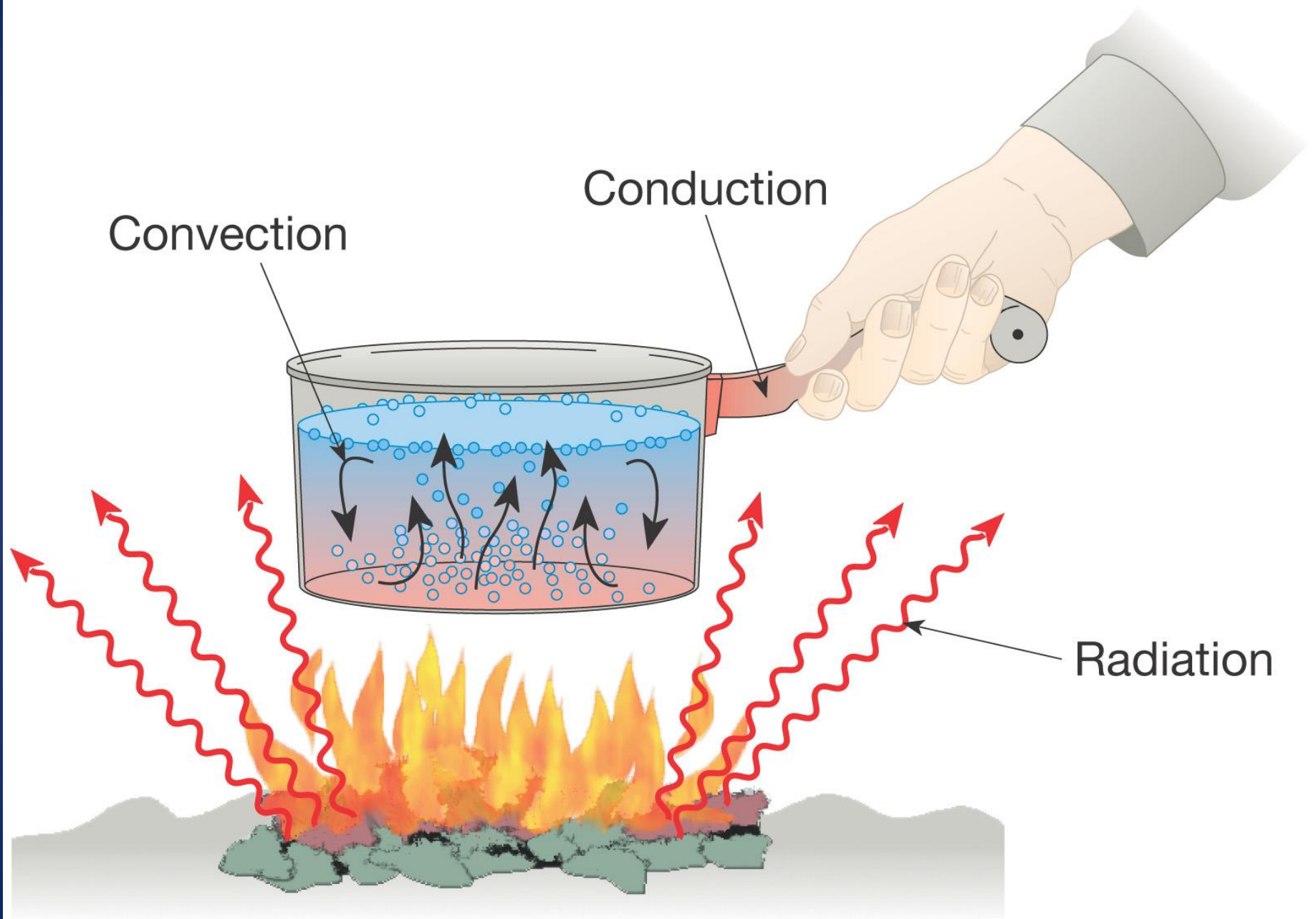


Convection is caused by
density differences!!!

Driving Force Behind
Weather!

Radiation -

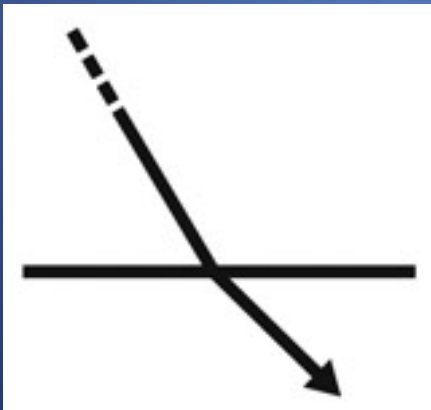
1. Heat transfer through EMPTY SPACE and is caused by the electromagnetic waves.
2. This occurs in solids, liquids and gases.
3. All objects are absorbing, reflecting, scattering, refracting and radiating energy.



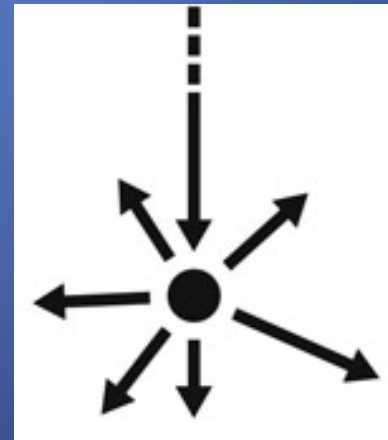
How Energy Interacts With Atmosphere:

When Energy from the Sun (electromagnetic energy) enters the atmosphere, it can do a couple of things.....

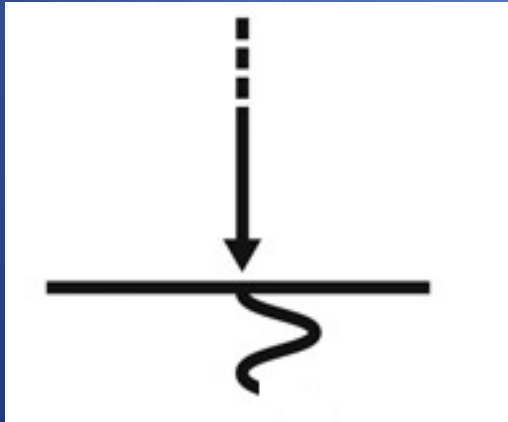
1. Refract - bent waves as it passes through material



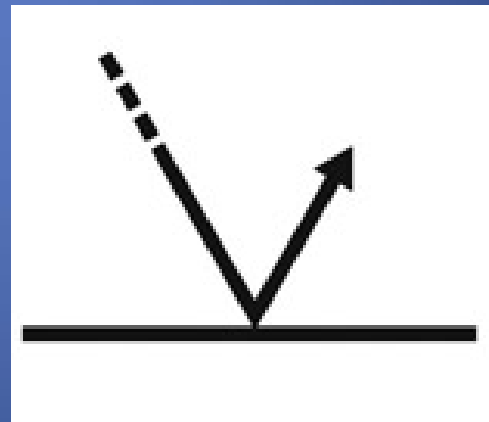
2. Scatter - in several different directions-dust and pollution.



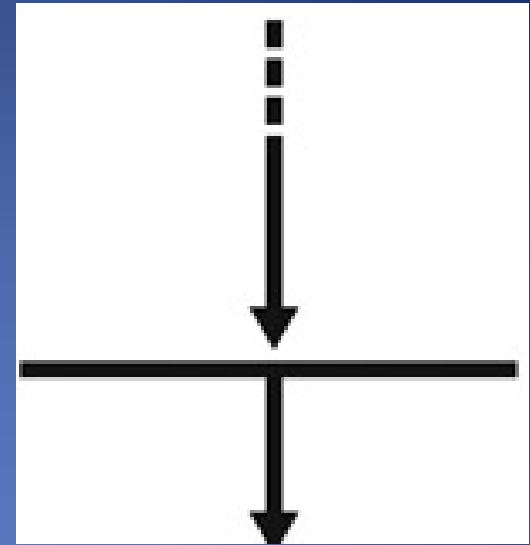
3. Absorbed -
taken in by
material-dark,
dull, rough
material are
great
absorbers.



4. Reflect -
redirected by
shiny, smooth,
light colors-
Water and
glaciers.



5. Transmitted -
waves pass through
without interacting.

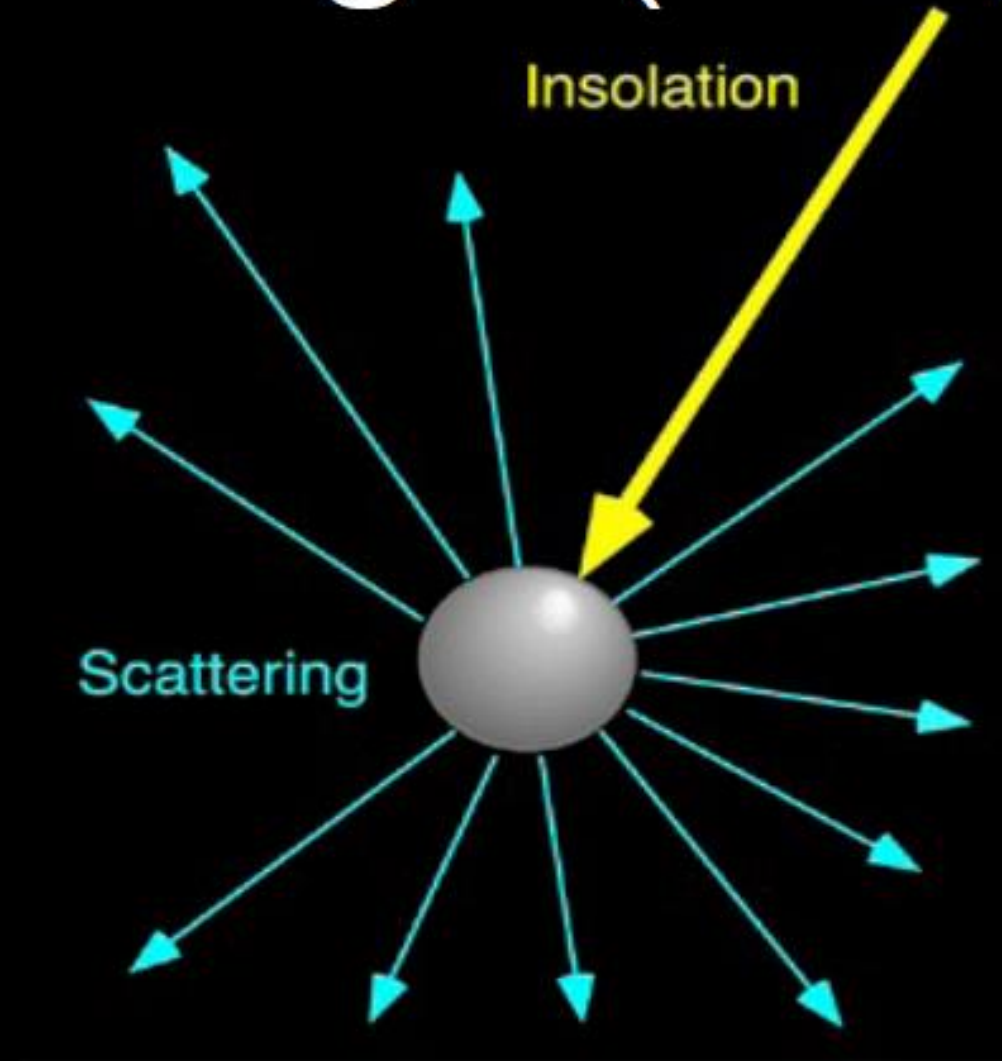


6. Radiate- Energy given off by object
(dark colors)
7. ***Good Absorbers are Good
Radiators.





Scattered Light (energy)



Dark, Dull, Rough surfaces are a great absorber (dark shirts in summer time are real hot!!!)

Good absorbers are also great radiators of heat!!!! (Continents take in and give off energy!!)

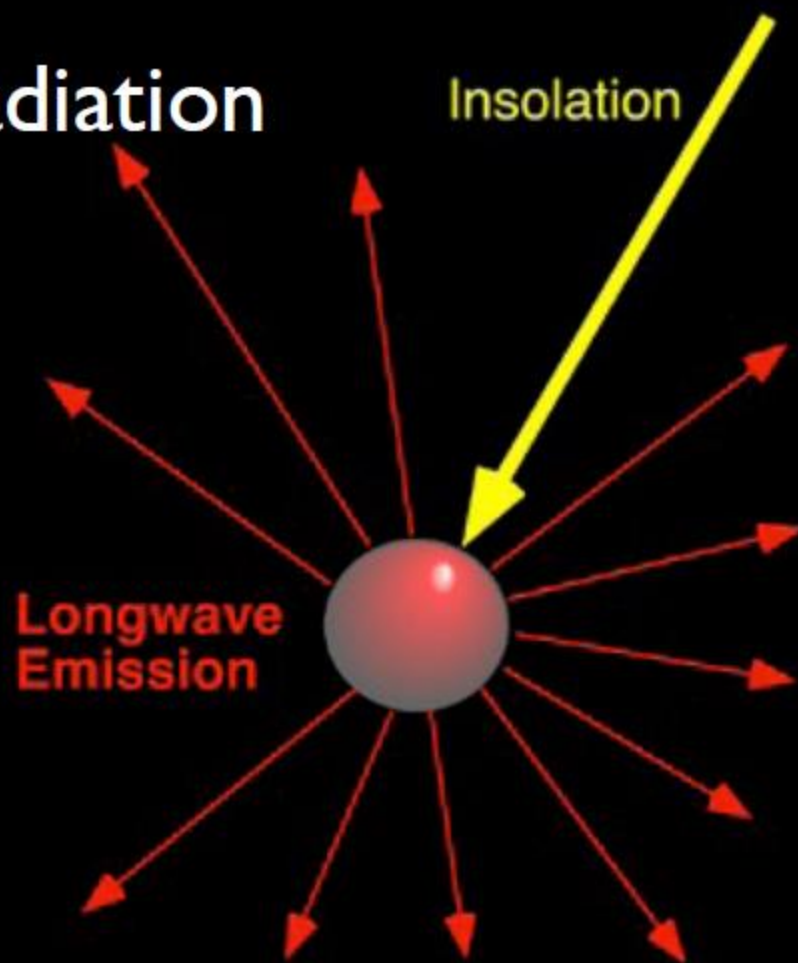
Dark Color, Dull, Rough Surface-Good
Absorber and Radiator





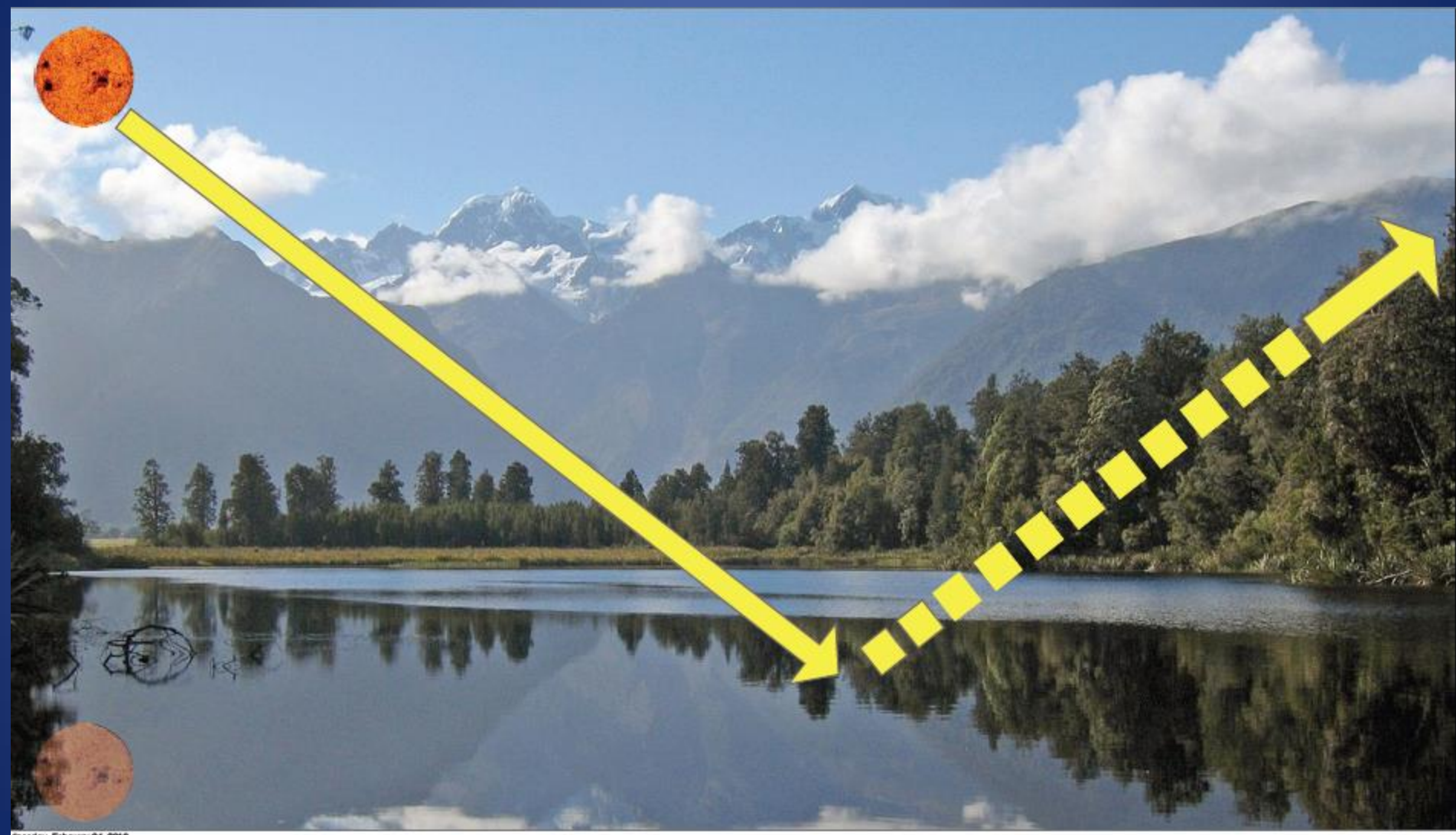


Absorption and Radiation

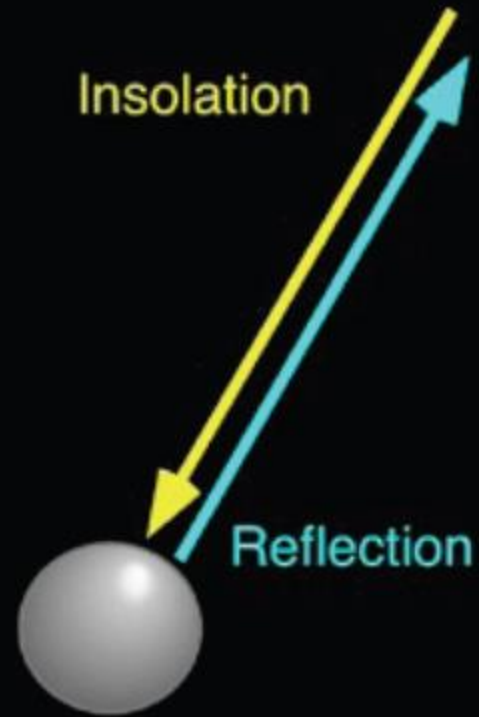


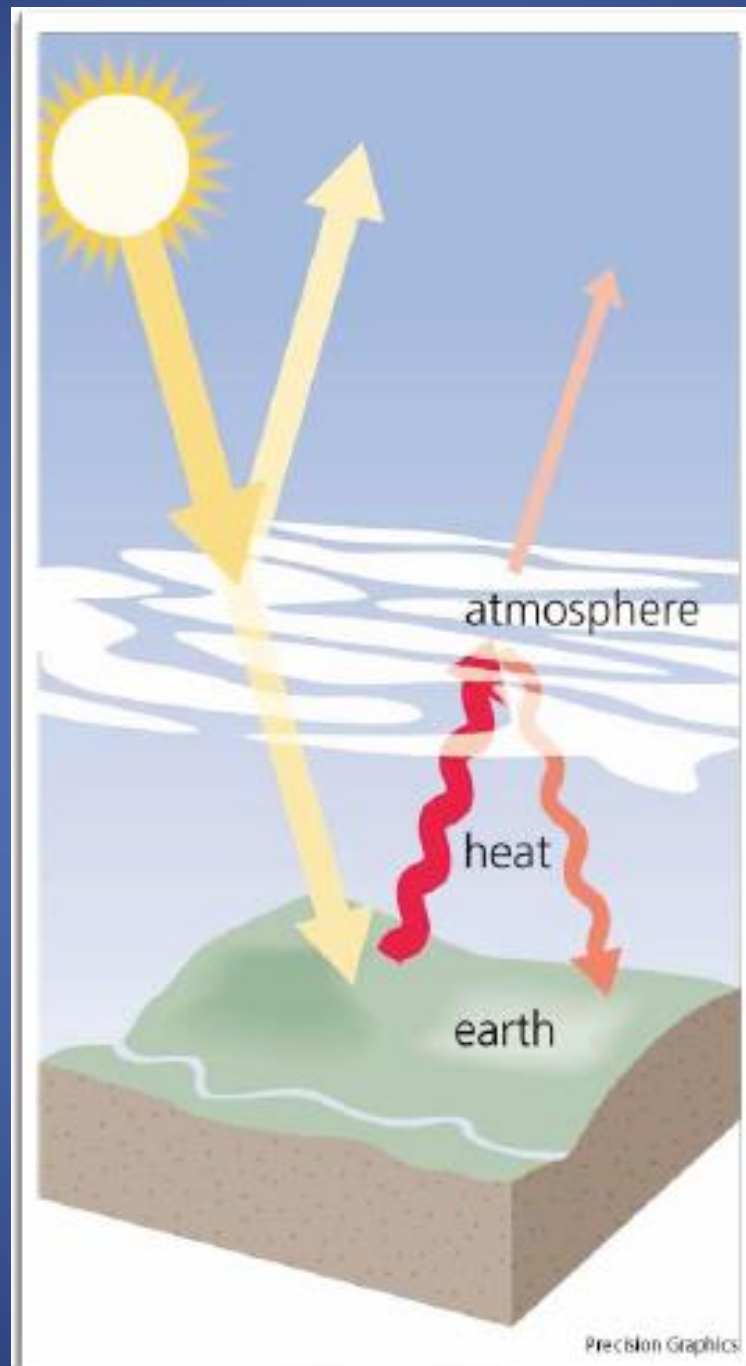
Light Color-Shiny, Smooth
Surface-Great at Reflecting

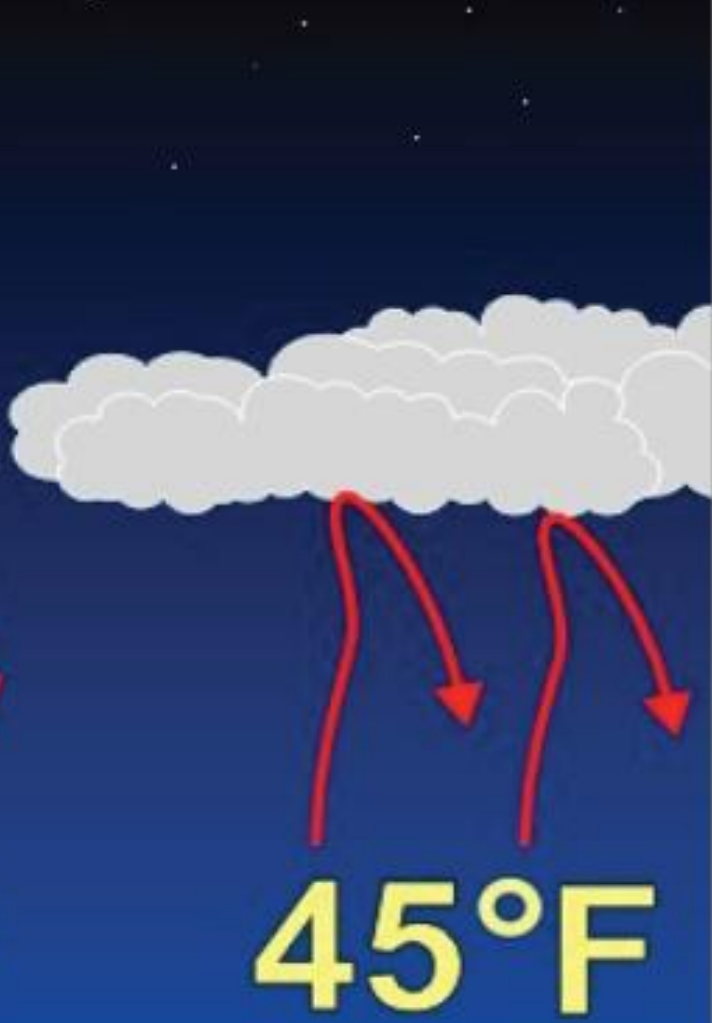




Reflection







Specific Heat

1. The amount of heat (in Joules) required to raise the temperature of 1 gram of a substance by 1 degree Celsius.

2. HIGH SPECIFIC HEAT

- a. Substance heats up / cools down slowly.
- b. Needs a lot of heat energy added to raise the temperature

Example: liquid water

3. LOW SPECIFIC HEAT

- a. Substance heats up / cools down quickly.
- b. Needs just a little heat energy added to raise the temperature

Example: lead

Phase Change of Water

1. Water exists on Earth in three phases: solid, liquid, and gas.
2. Adding or removing energy from the water will result in a phase change.
3. Latent Heat:
 - a. Energy exchanged during a phase change.
 - b. "hidden energy" because there is no temperature change during a phase change.
 - c. The energy being added is used to change the phase.

4. Phase changes:

solid to liquid: melting

liquid to gas: evaporation

gas to liquid: condensation

liquid to solid: freezing

solid to gas: sublimation

gas to a solid: deposition

