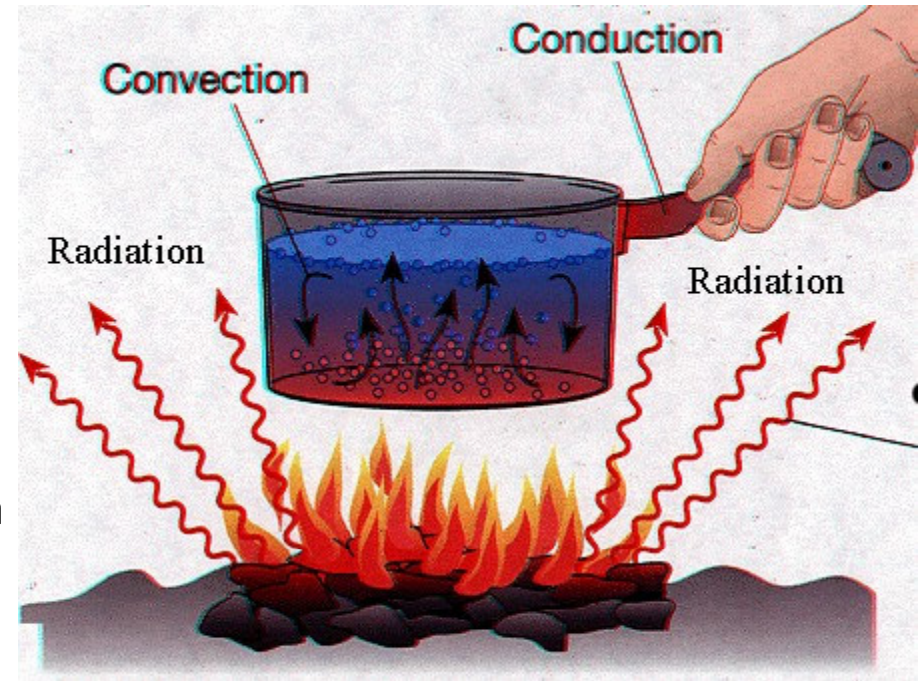


Ch 17.2 Heating the Atmosphere

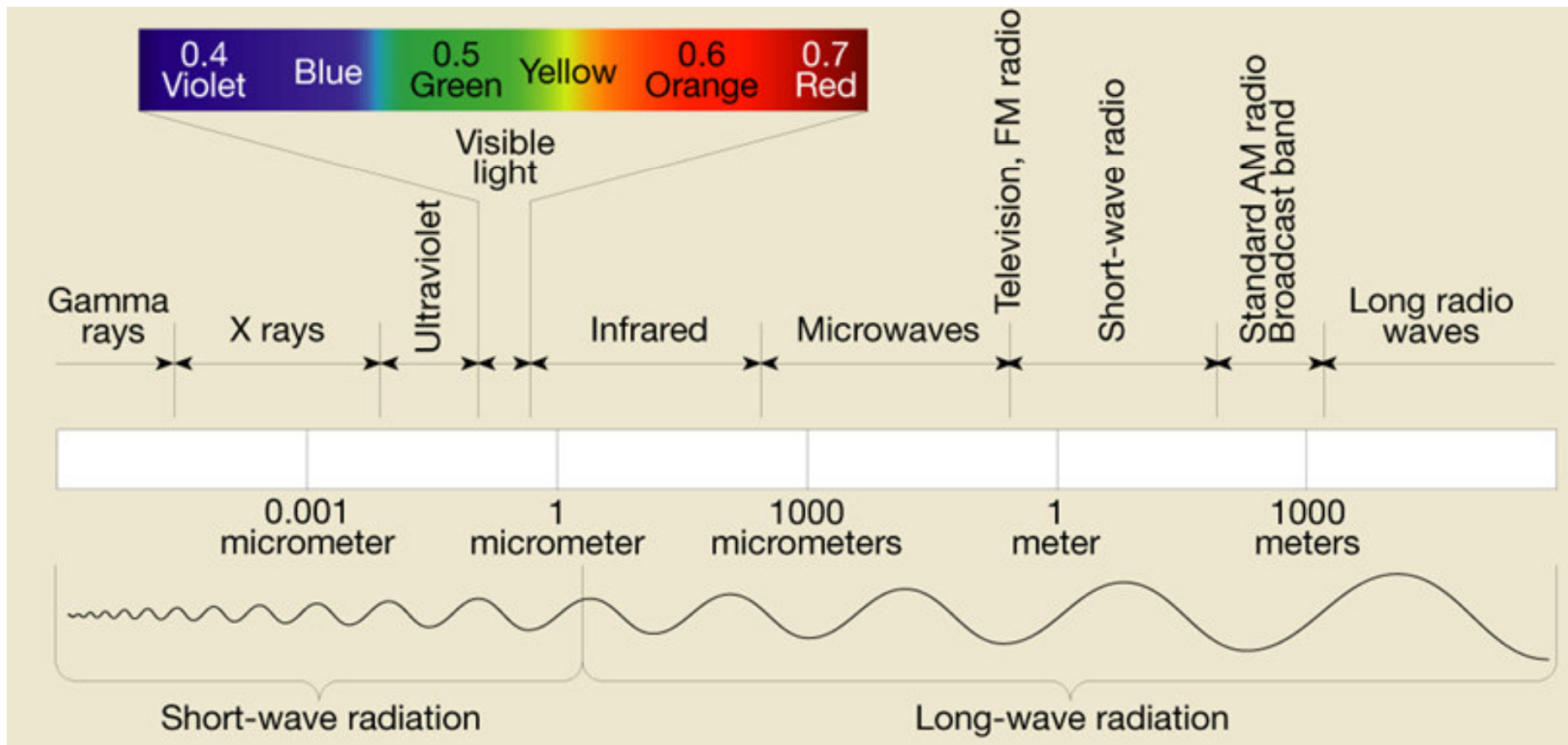
Energy Transfer as Heat

- There are three mechanisms of energy transfer as heat.
 - 1) **Conduction** – the transfer of heat through matter by molecular activity. Touching a hot handle of pan that has been heated.
 - 2) **Convection** – the transfer of heat by mass movement of circulation within a substance. Water/air is heated, expands and becomes less dense because of its buoyancy . At the same time cooler, denser water/air sinks, where it is reheated. This unequal heating & cooling causes water/air to circulate.
 - 3) **Radiation** – is the heat that is felt coming off a fire. It is also the heat that is felt coming off a surface when it has absorbed sunlight.



Electromagnetic Waves

- The sun is the ultimate source of energy that creates our weather.
- All of this energy the sun emits is called the **electromagnetic spectrum**.



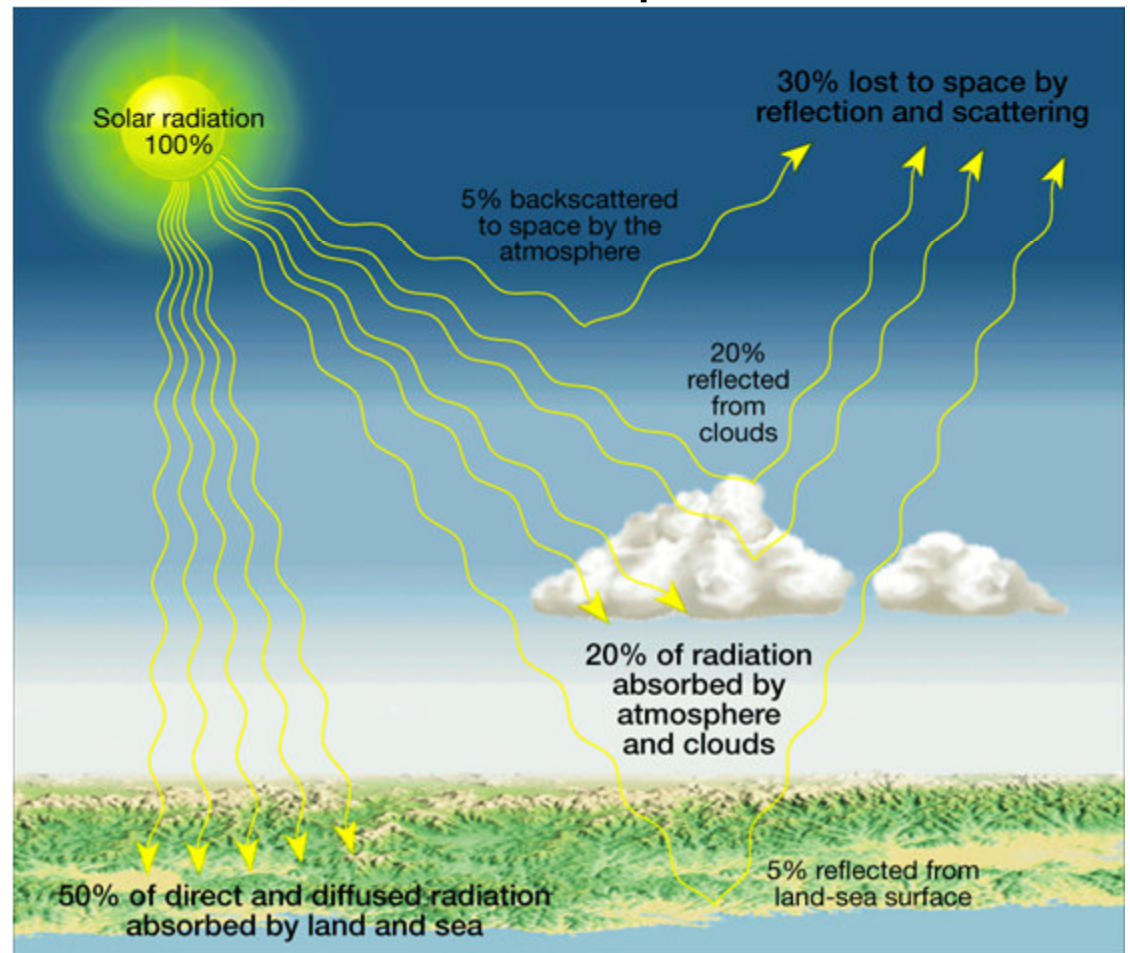
Radiation

- **Radiation** is the transfer of energy (heat) through space by electromagnetic waves that travel out in all directions.
- Unlike conduction and convection, which need material to travel through, radiant energy can travel through the vacuum of space.
- All objects, at any temperature, emit radiant energy.
- Hotter objects radiate more total energy per unit area than colder objects do.

What Happens to Solar Radiation?

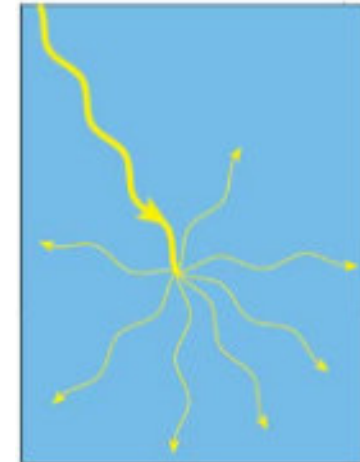
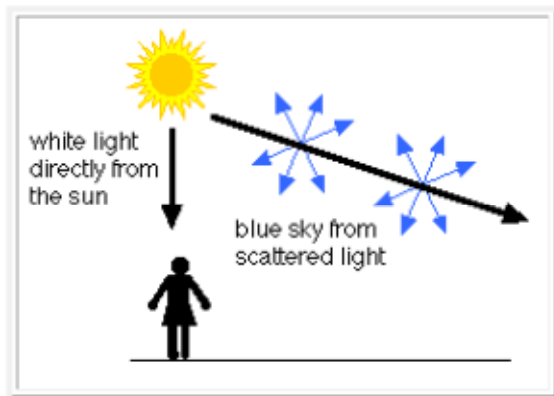
When radiation strikes an object, there usually are three different results.

1. Some energy is absorbed by the object.
2. Substances such as water and air are transparent to certain wavelengths of radiation.
3. Some radiation may bounce off the object without being absorbed or transmitted.



Reflection and Scattering

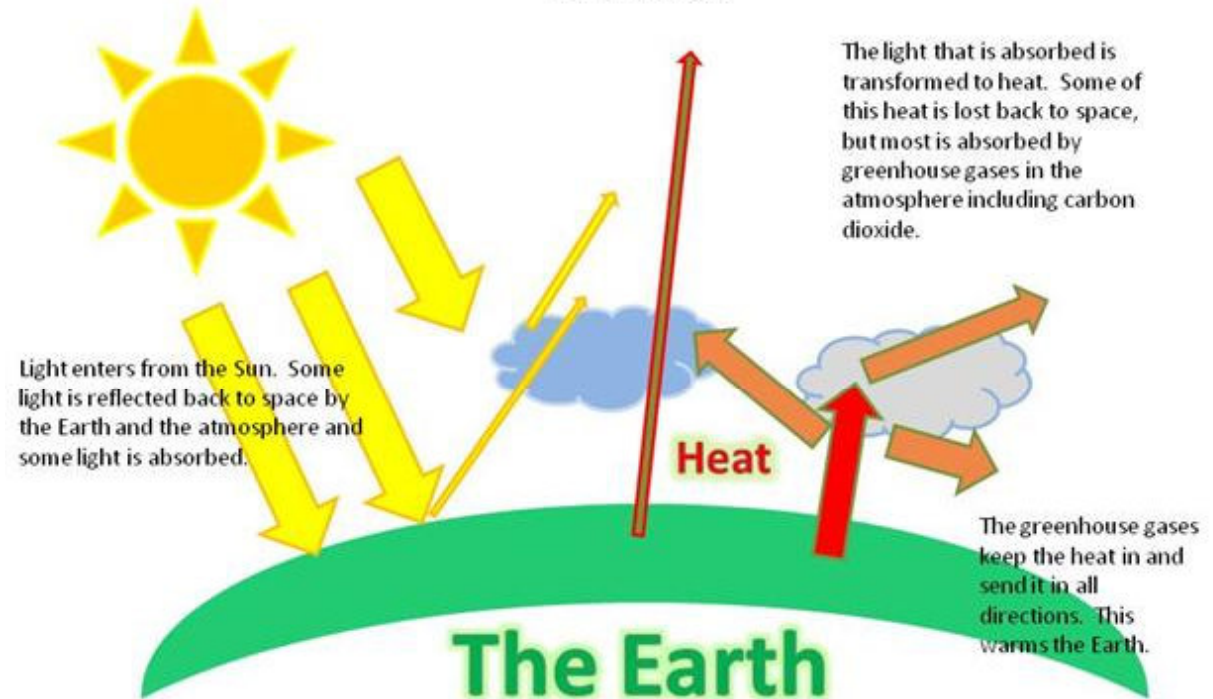
- **Reflection** occurs when light bounces off an object. Reflection radiation has the same intensity as incident radiation.
- **Scattering** produces a larger number of weaker rays that travel in different directions. Scattering is the reason why the sky is blue.
- As light moves through the atmosphere, most of the longer wavelengths pass straight through. Little of the red, orange and yellow light is affected by the air.
- However, much of the shorter wavelength light is absorbed by the gas molecules. The absorbed blue light is then radiated in different directions.



Absorption

- About 50 percent of the solar energy that strikes the top of the atmosphere reaches Earth's surface and is absorbed.
- The **greenhouse effect** is the heating of Earth's surface and atmosphere from solar radiation being absorbed and emitted by the atmosphere, mainly by water vapor and carbon dioxide.

Show me a model of the Greenhouse Effect.



Photosynthesis

- Not all of the incoming solar radiation is absorbed and reradiated.
- Instead, it is absorbed by the chlorophyll in green plants.
- Plants use the energy from light in photosynthesis.

