

Handout 2 3-1 (yellow)

Properties of the Atmosphere

Solar Energy and the Atmosphere

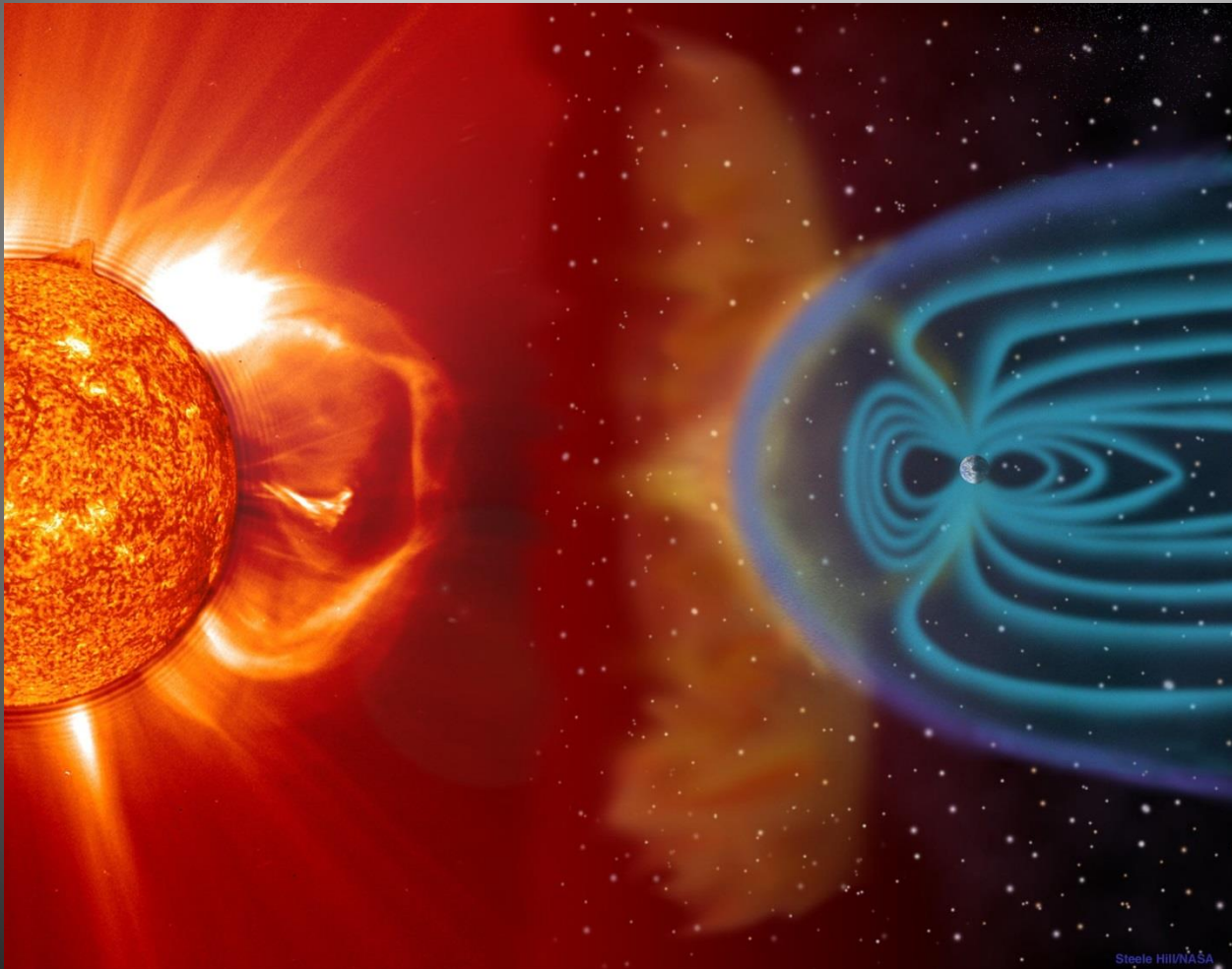
Standard 3 Objective 1 Indicators a, b, and c

Standard 2 Objectives 1, 2, and 3 Workbook

Pages 3, 4, and 5

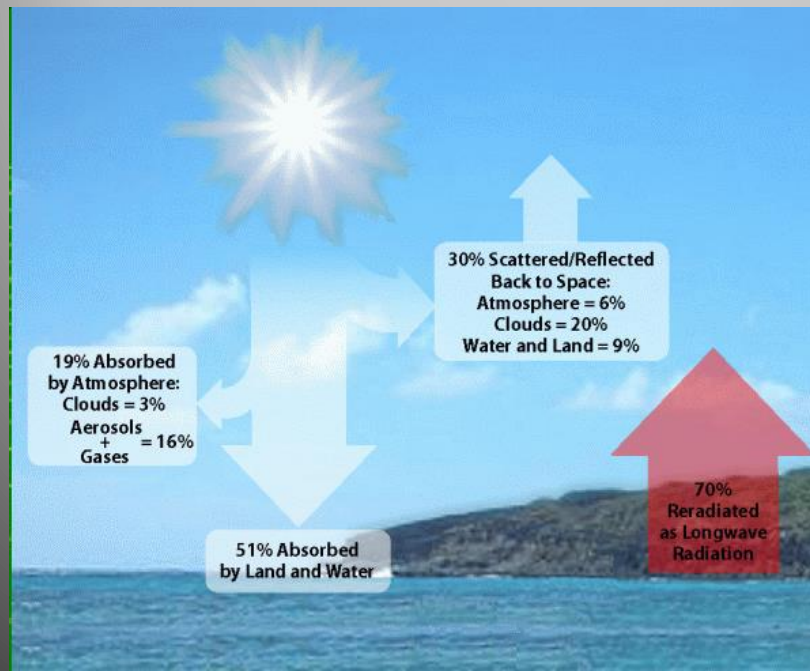
1. How is Earth's atmosphere heated?

- By the transfer of energy form the sun.



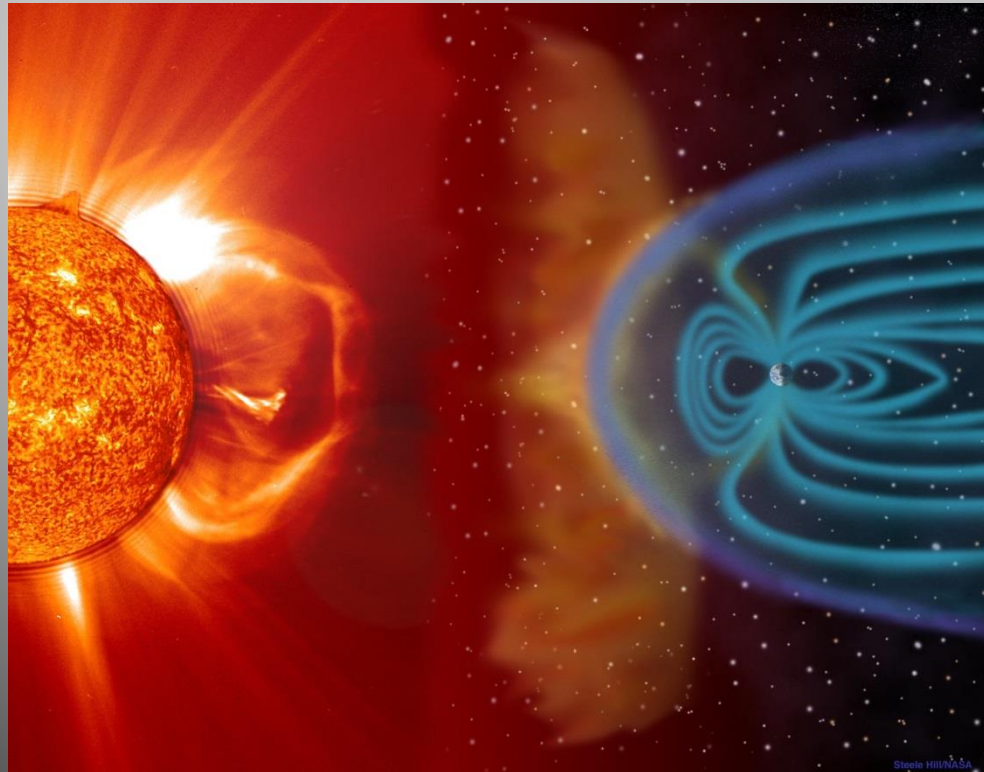
2. Name the two primary sources of heat in the atmosphere.

- The absorption of the sun's rays by gases in the atmosphere
- Ocean and land surfaces absorb energy and then give off that energy as heat



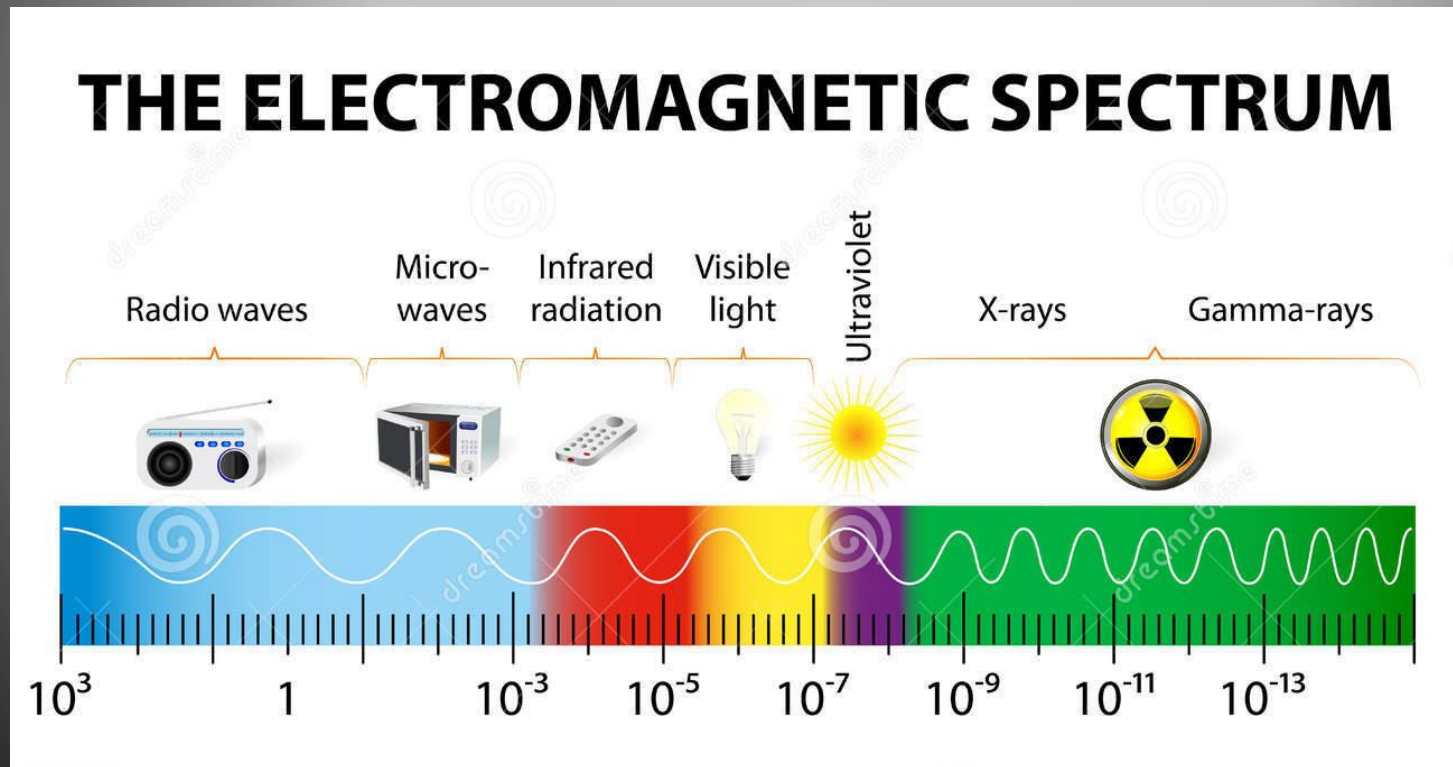
3. Define radiation:

- All forms of energy that travel through space as waves, including the energy that Earth receives from the sun.



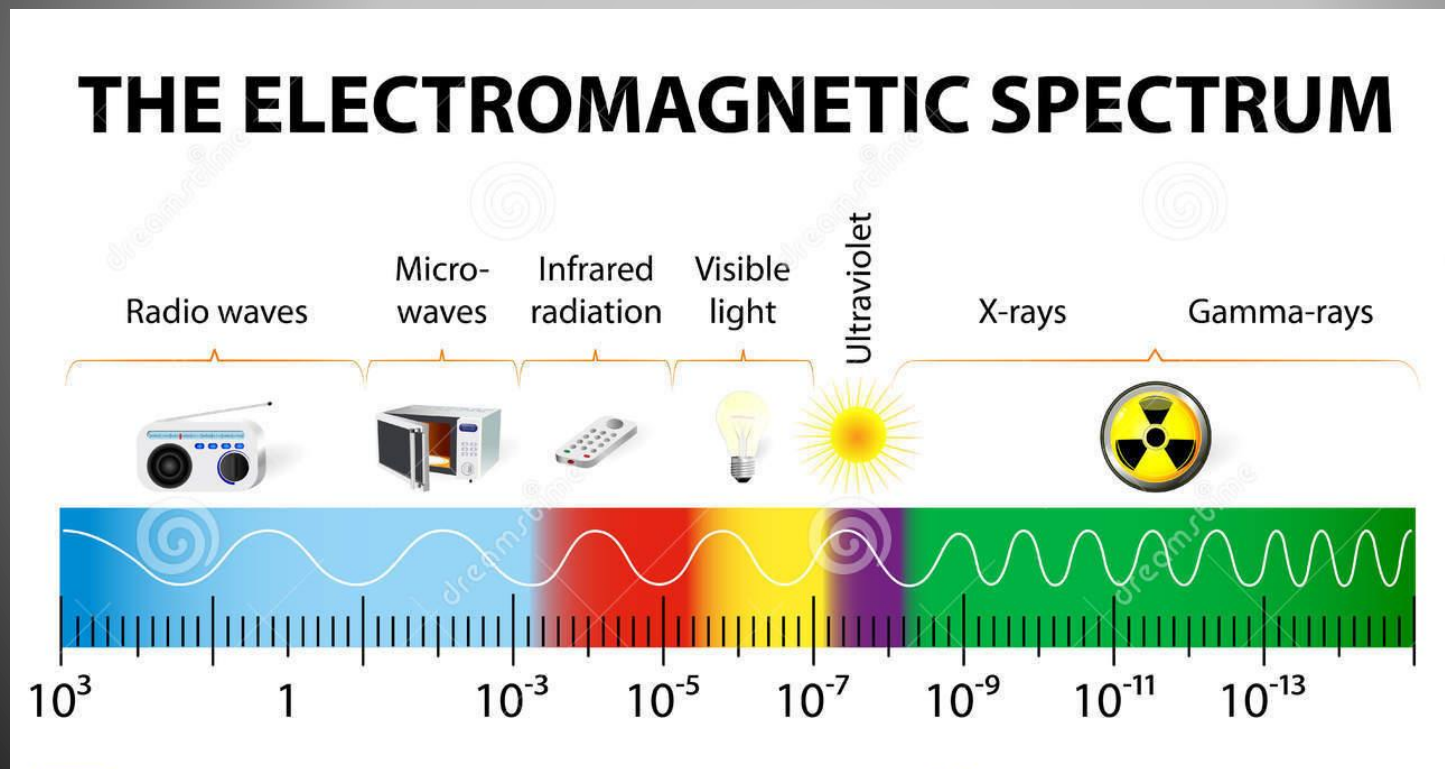
4. Define electromagnetic spectrum:

- All of the frequencies or wavelengths of electromagnetic radiation.



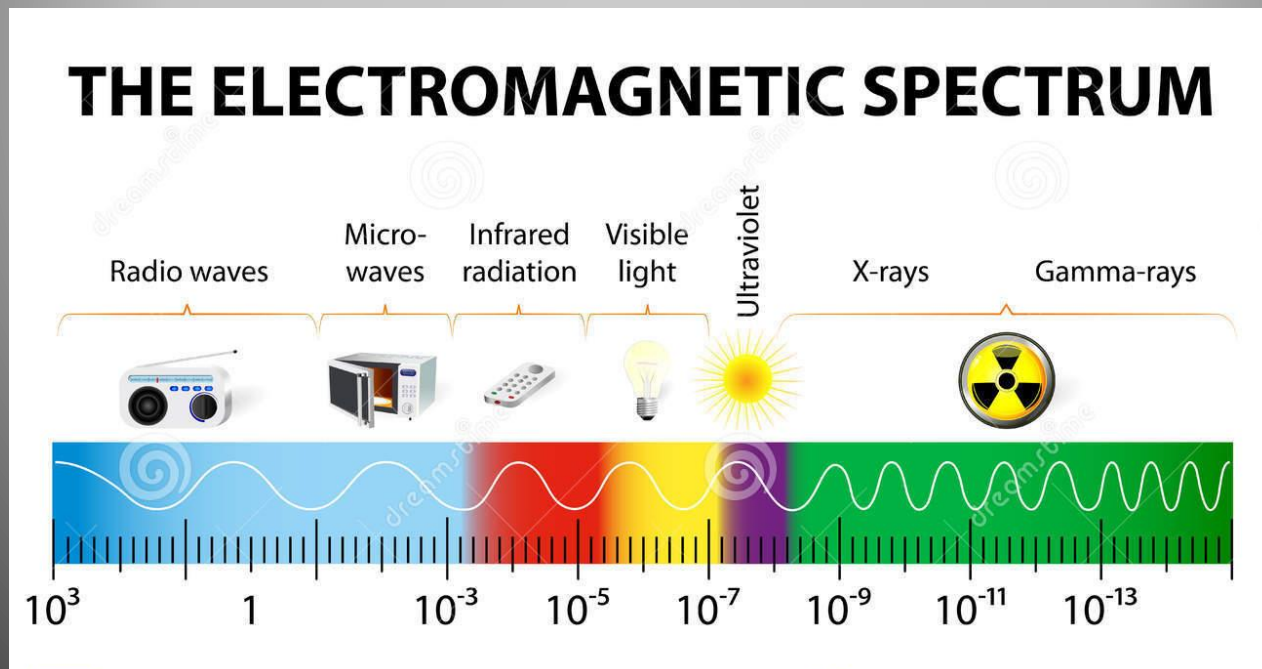
5. What form of radiation can humans see?

- Visible light



6. Which wavelengths are shorter than visible light? Which are longer?

- Shorter: ultraviolet rays, X rays, and gamma rays
- Longer: infrared rays and radio rays



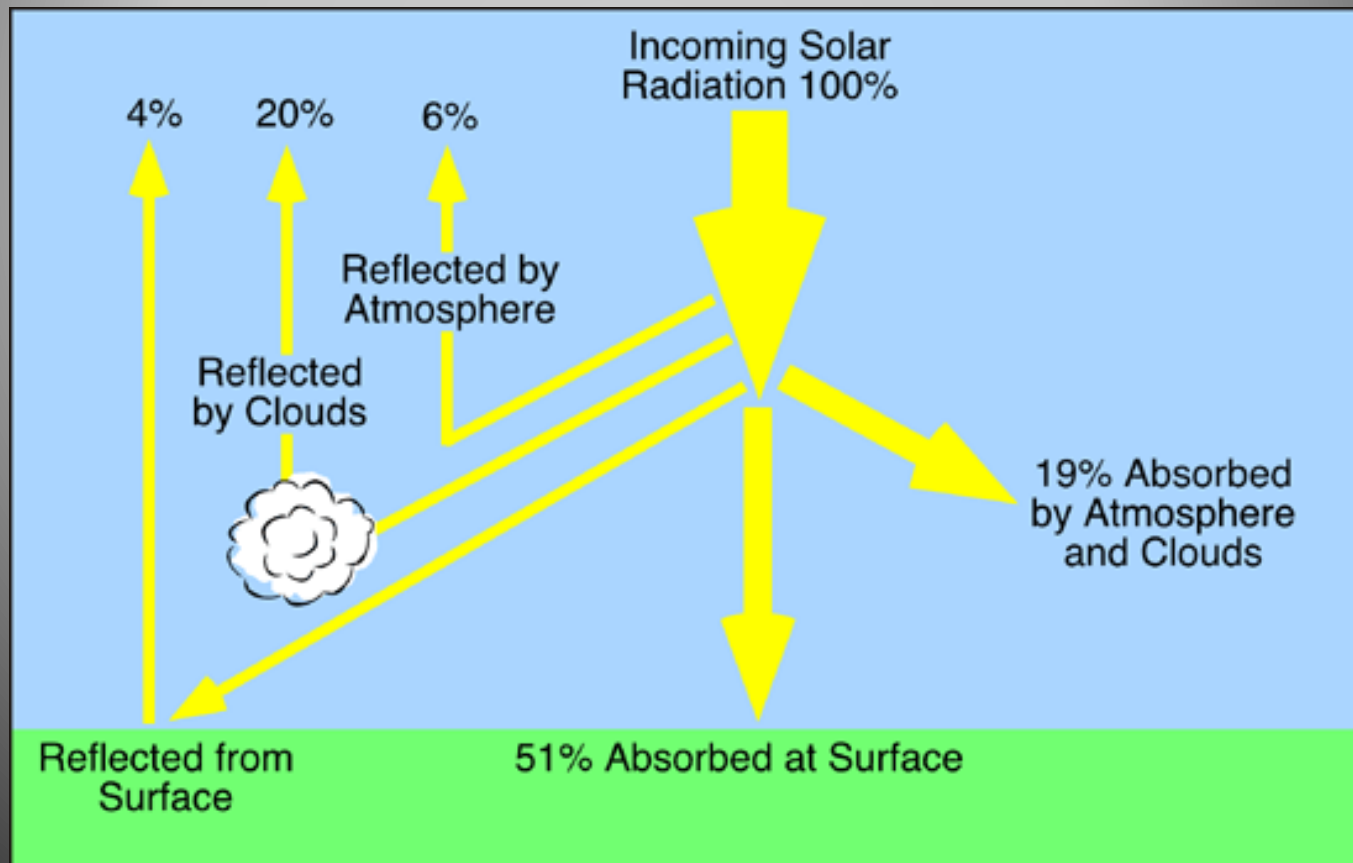
7. How much of the radiation from visible light waves is absorbed as they pass through the atmosphere?

- A small amount



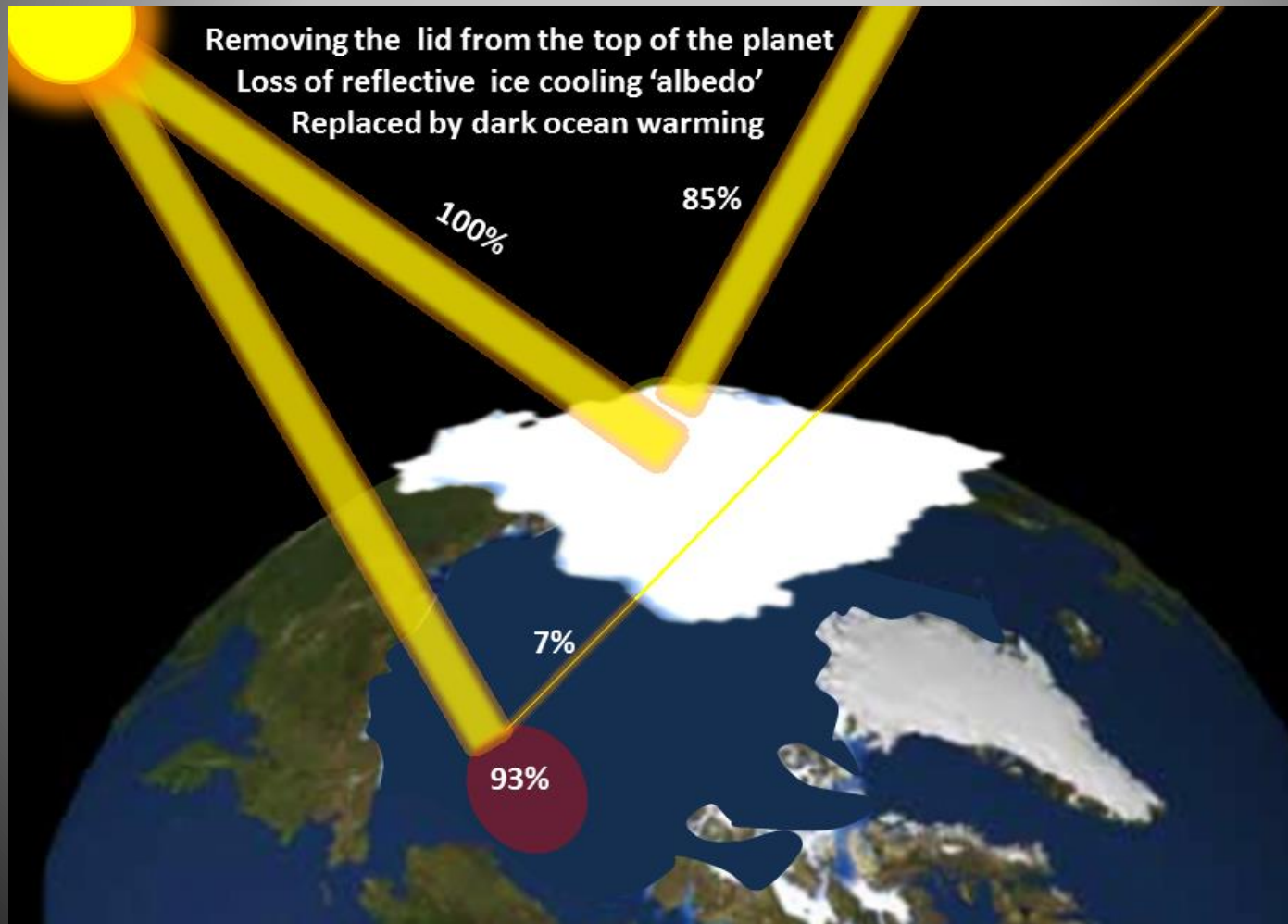
8. What happens to solar energy that reaches Earth's surface? Pg. 3

- The surface either absorbs or reflects the energy.



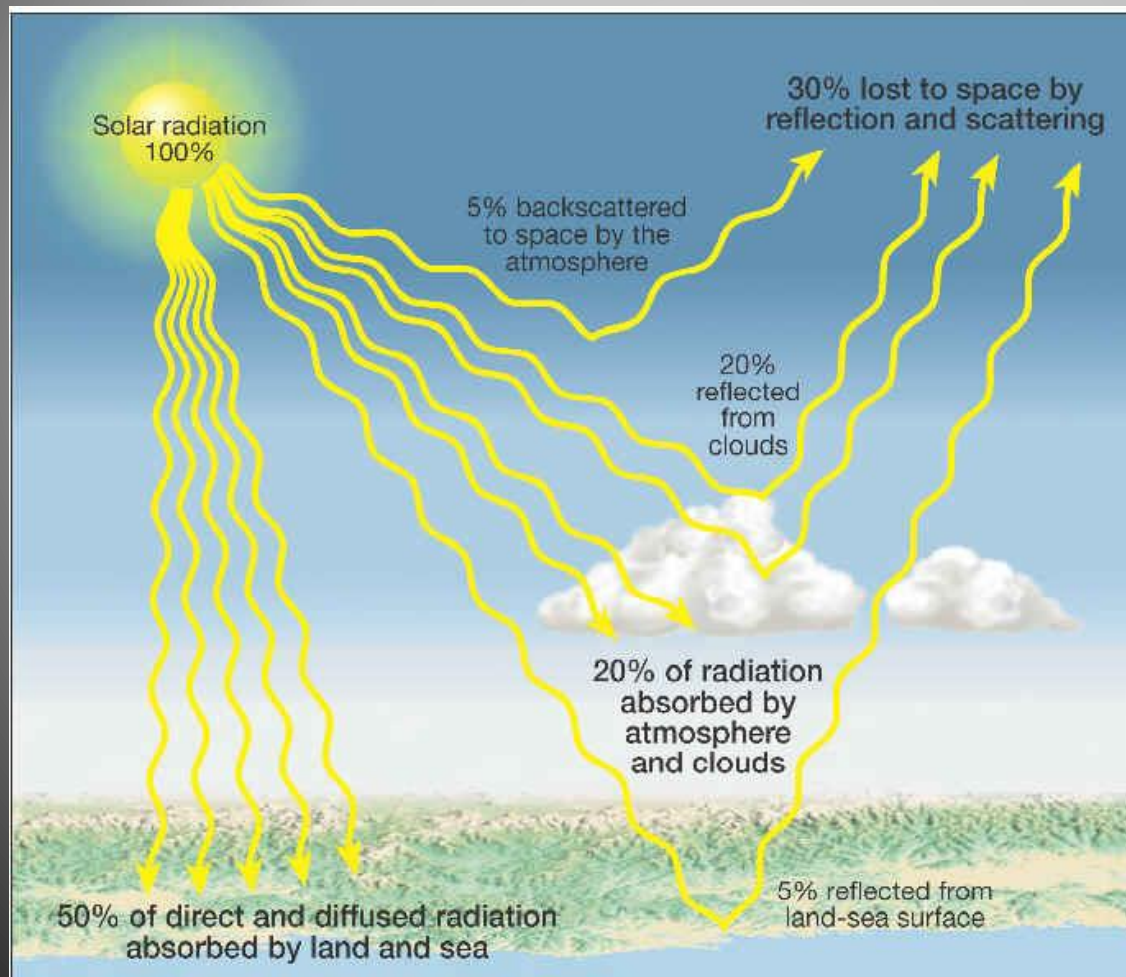
9. What is the fraction of solar radiation that is reflected off a particular surface called?

- Albedo

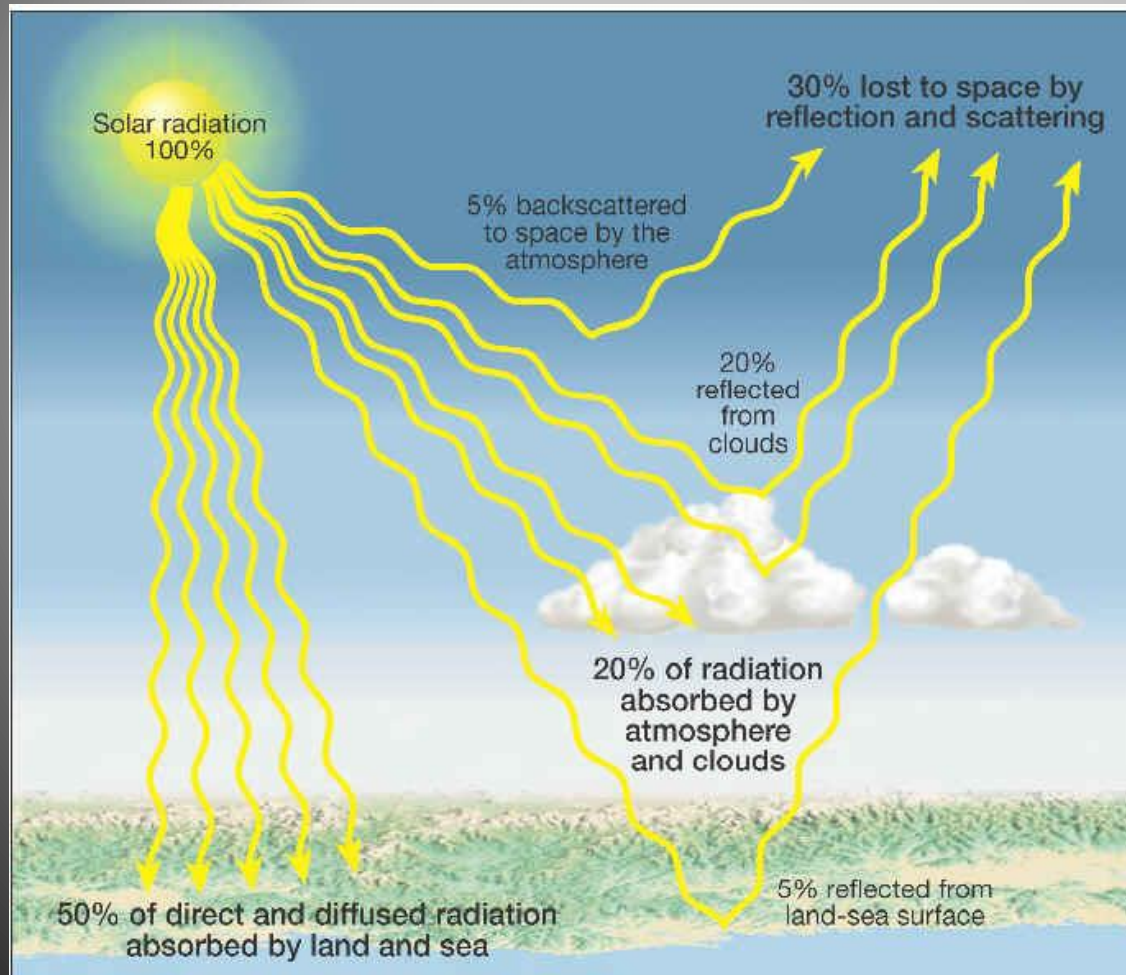


10. What percent of solar energy that reaches Earth's atmosphere is either reflected or scattered?

- 30%

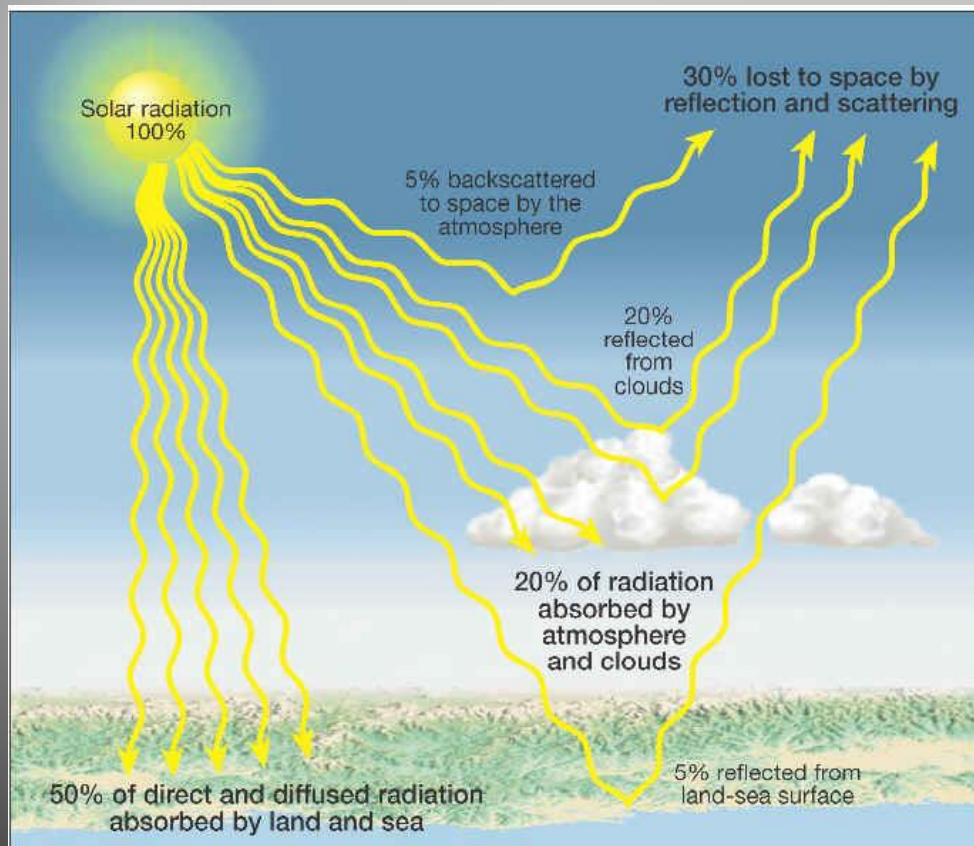


11. Solar radiation that is not reflected is absorbed.



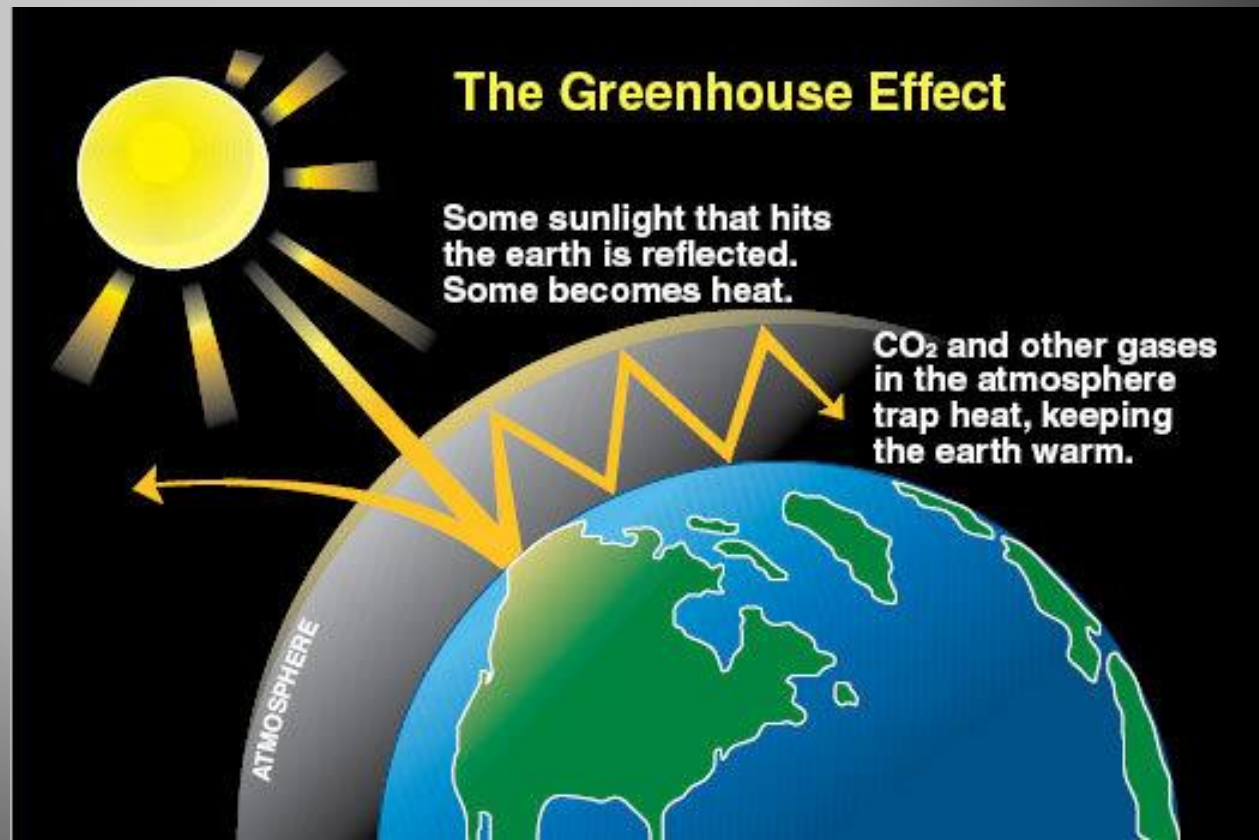
12. When Earth's surface absorbs solar radiation, what are surface materials heated by?

- Short-wave length infrared rays and visible light.



13. What happens to the infrared rays that are reemitted into the atmosphere?

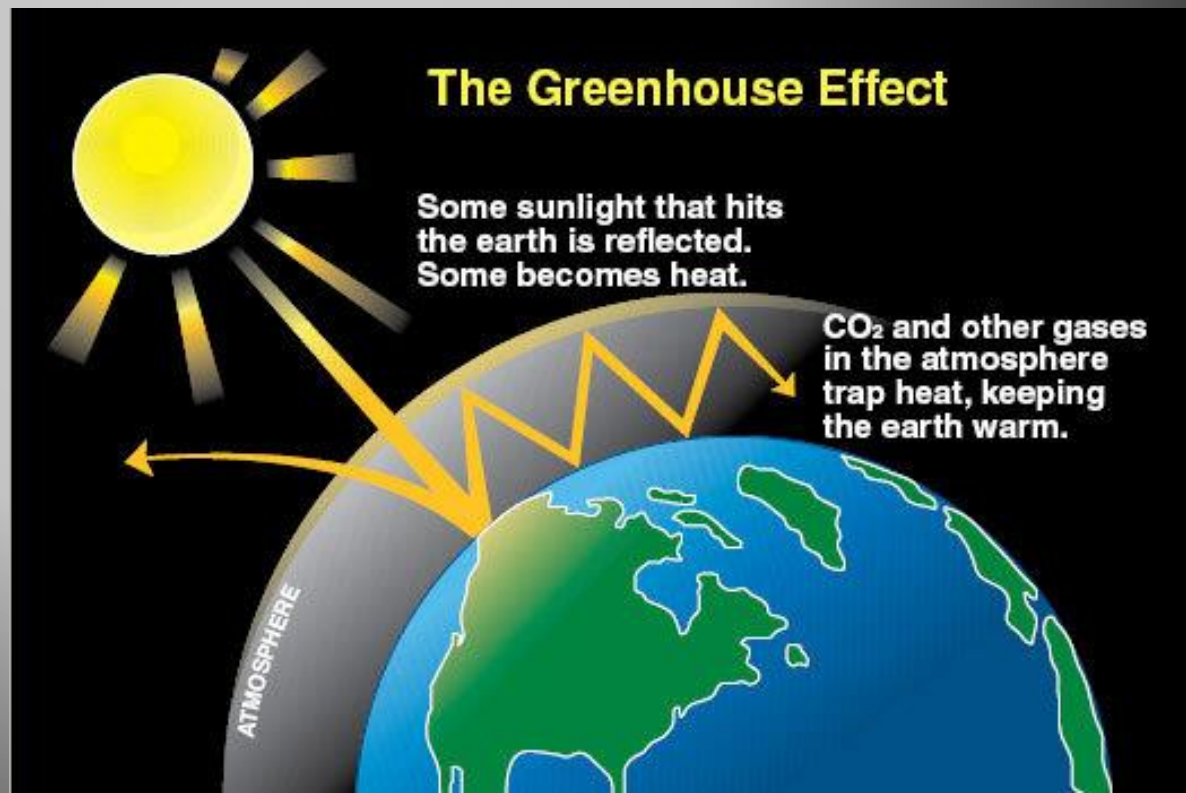
- Gas molecules in the atmosphere, such as water vapor and carbon dioxide, absorb the infrared rays.



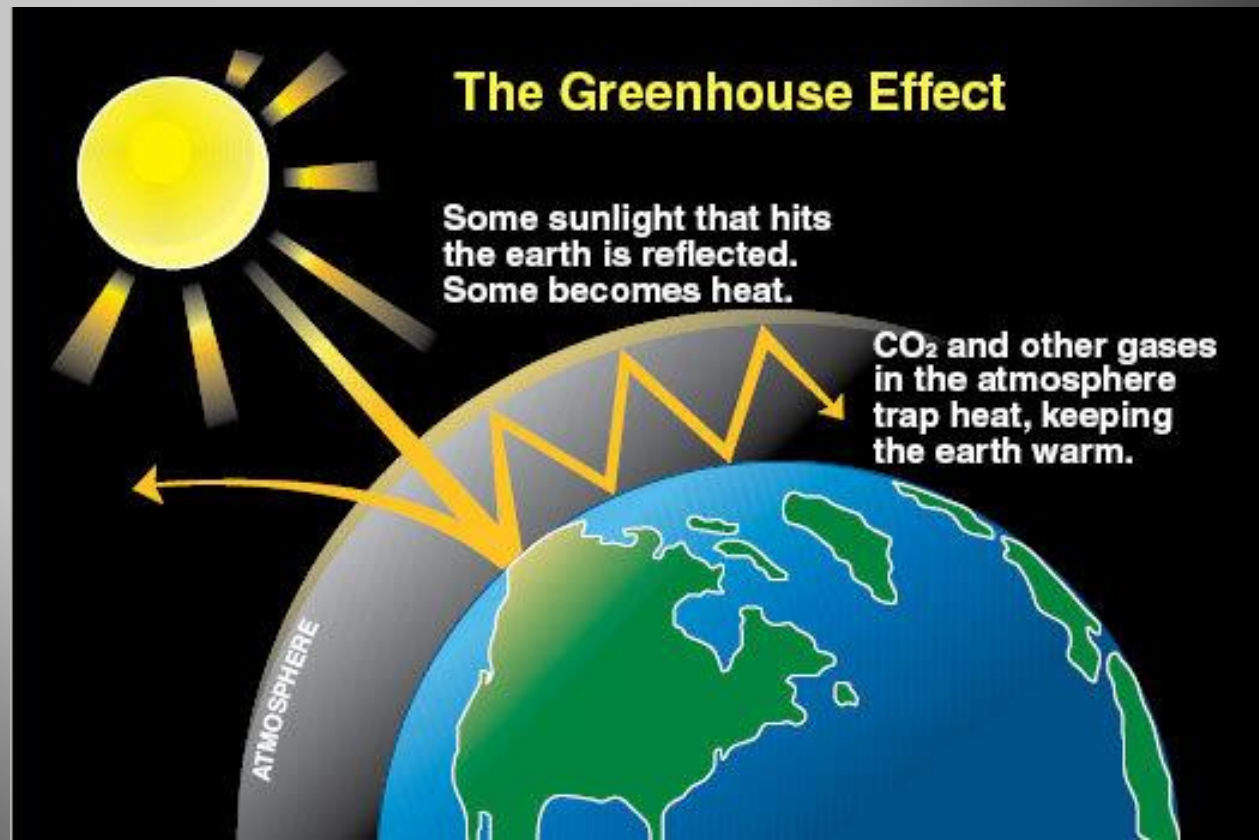
14. What does the absorption of thermal energy from the ground do to Earth's surface?

Pg. 3 & 4

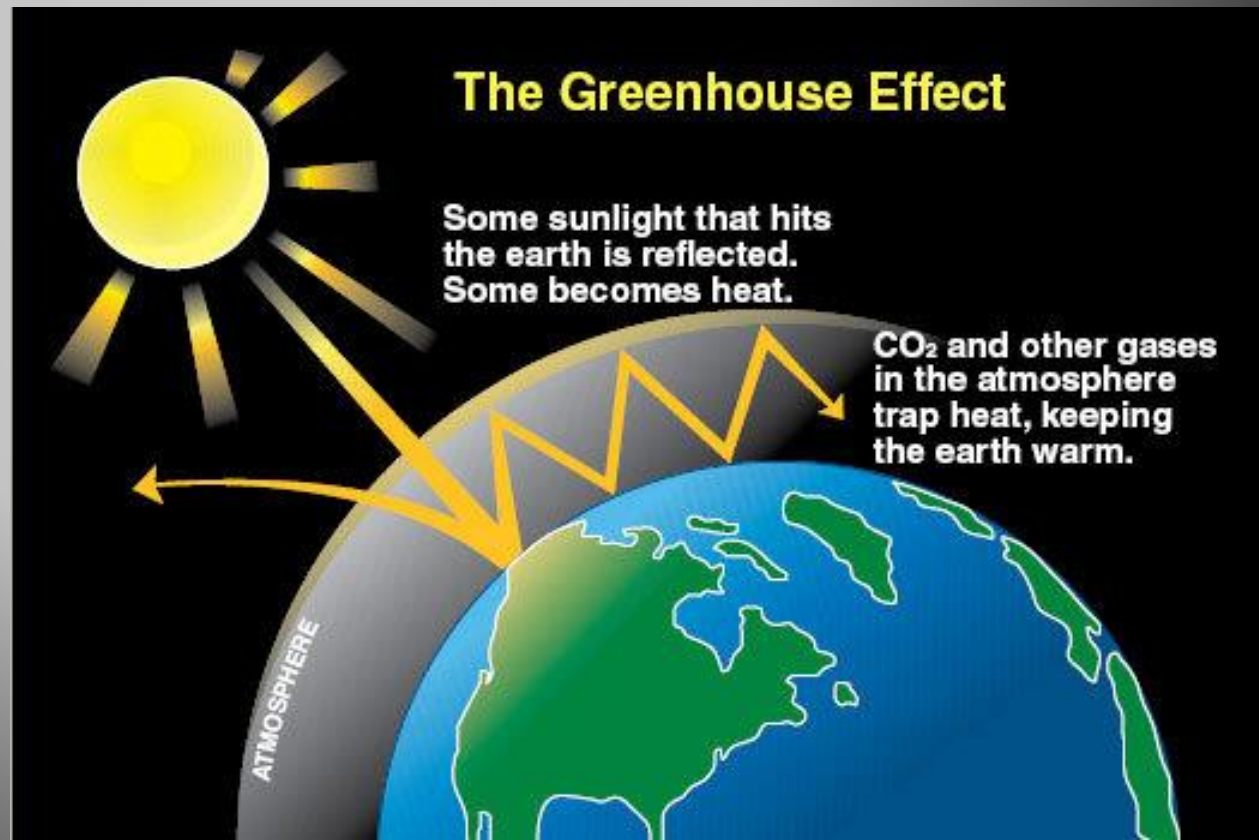
- Absorption of thermal energy heats the lower atmosphere and keeps Earth's surface warmer than it would be if there were no atmosphere.



15. One process that helps heat Earth's atmosphere that is similar to the process that heats a greenhouse is called the greenhouse effect.

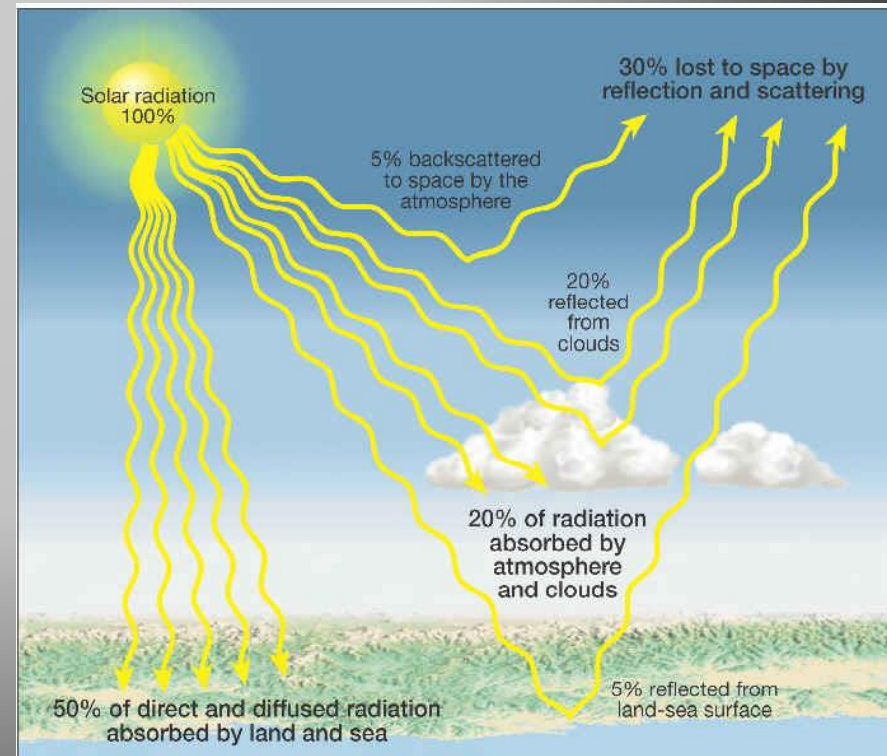


16. The warming of the surface and lower atmosphere of Earth that occurs when carbon dioxide, water vapor, and other gases in the air absorb and reradiate infrared radiation is called the greenhouse effect.



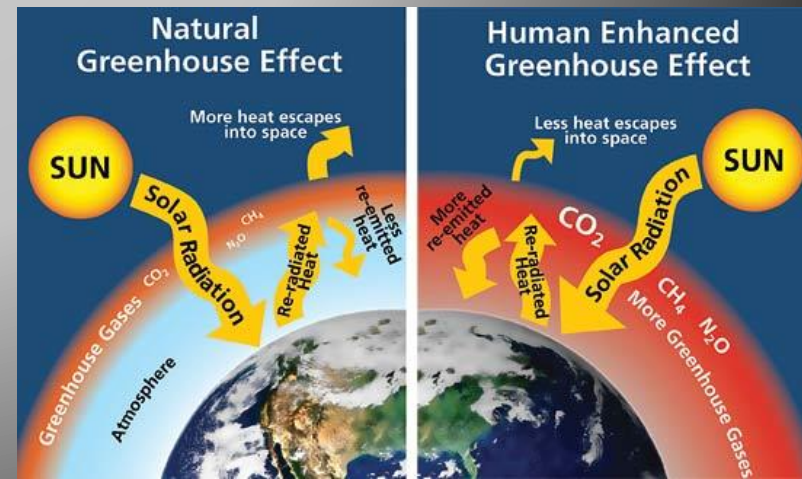
17. How does the amount of solar energy Pg. 3 that enters Earth's atmosphere generally compare to the amount that escapes into space?

- The amount of solar energy that enters Earth's atmosphere is about equal to the amount that escapes into space.



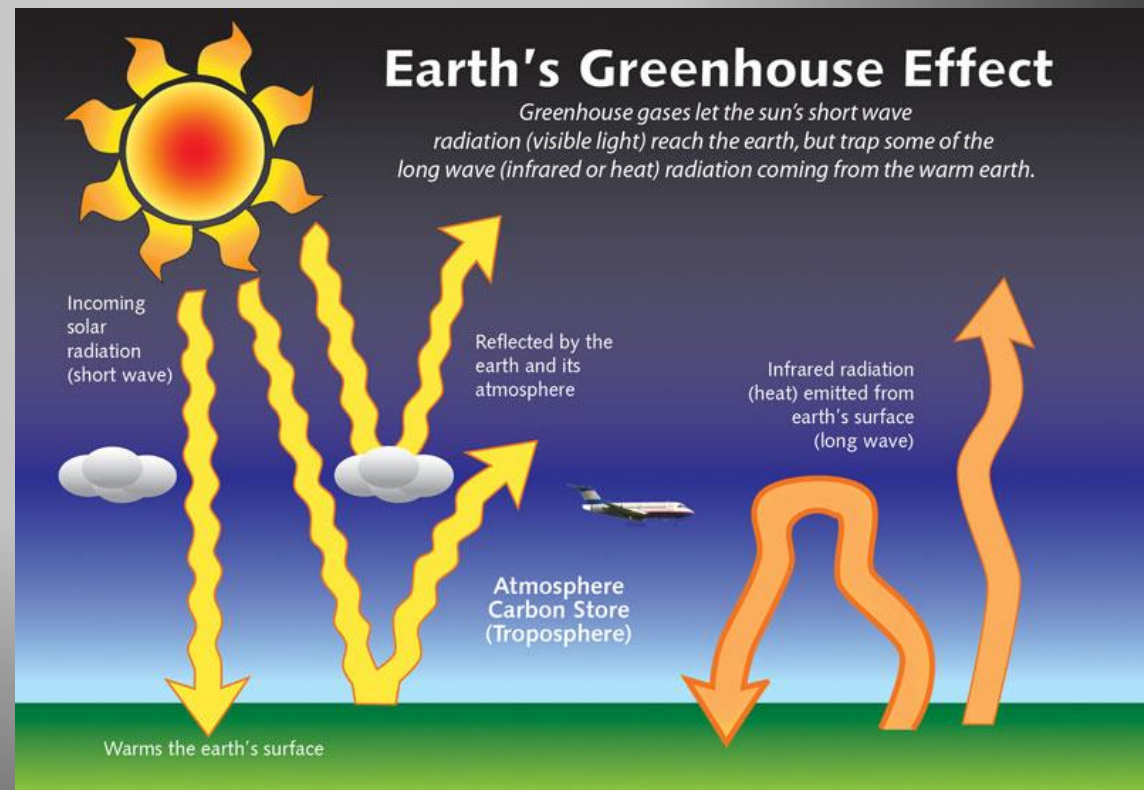
18. What is one human activity that may have caused the average temperature of the atmosphere to increase in recent years?

- The burning of fossil fuels **has** increased **the amount of** carbon dioxide **in the atmosphere,** **which may** intensify the greenhouse affect **and** cause Earth to become warmer **in some areas and cooler in others.**



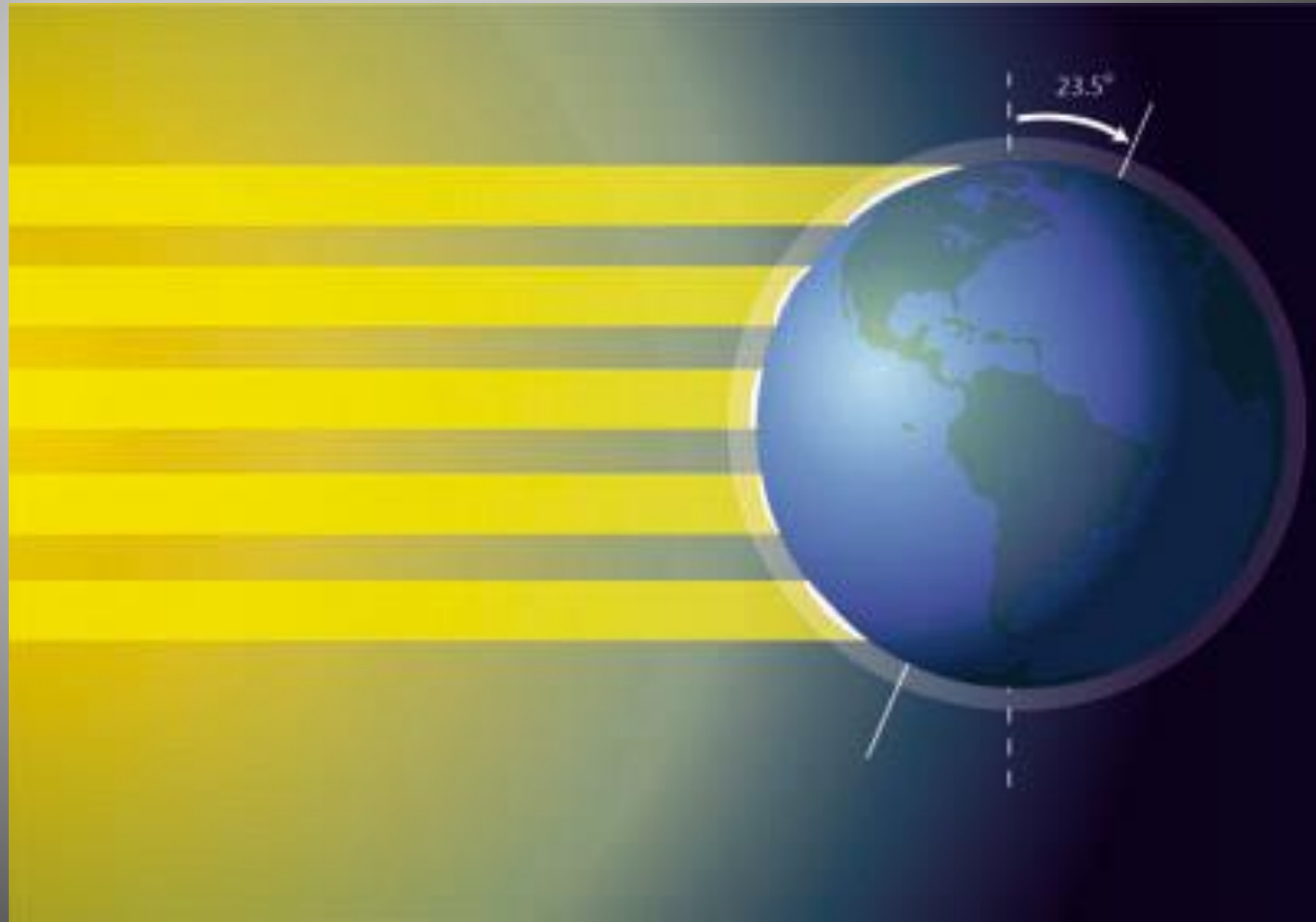
19. Why are the warmest hours of the day usually mid- to late afternoon? Pg. 3 & 4

- Earth's surface must absorb energy for awhile before enough heat has been absorbed and reradiated to raise the temperature of the atmosphere.

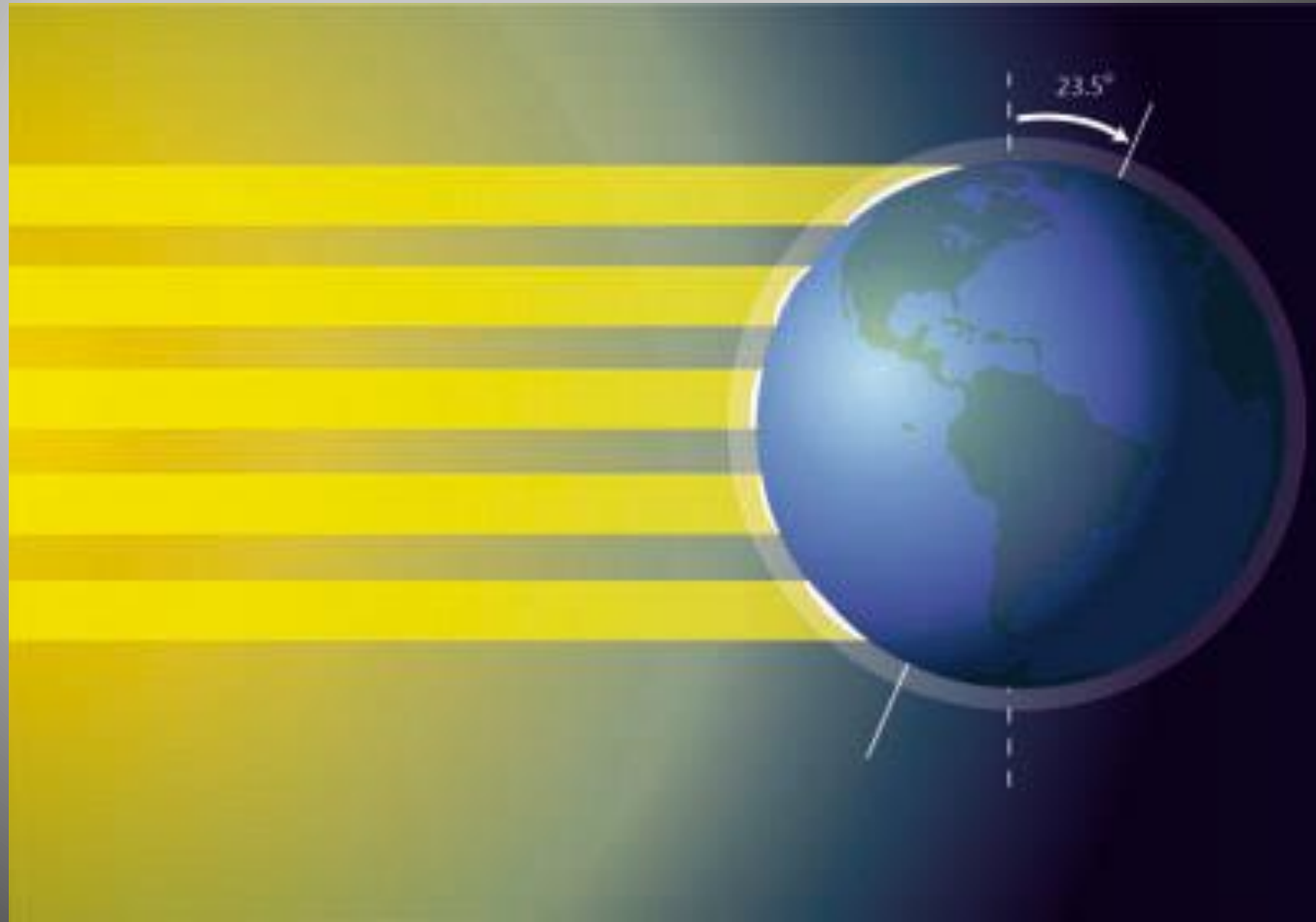


20. What is the primary factor that affects how much solar energy reaches any point on Earth's surface?

- latitude

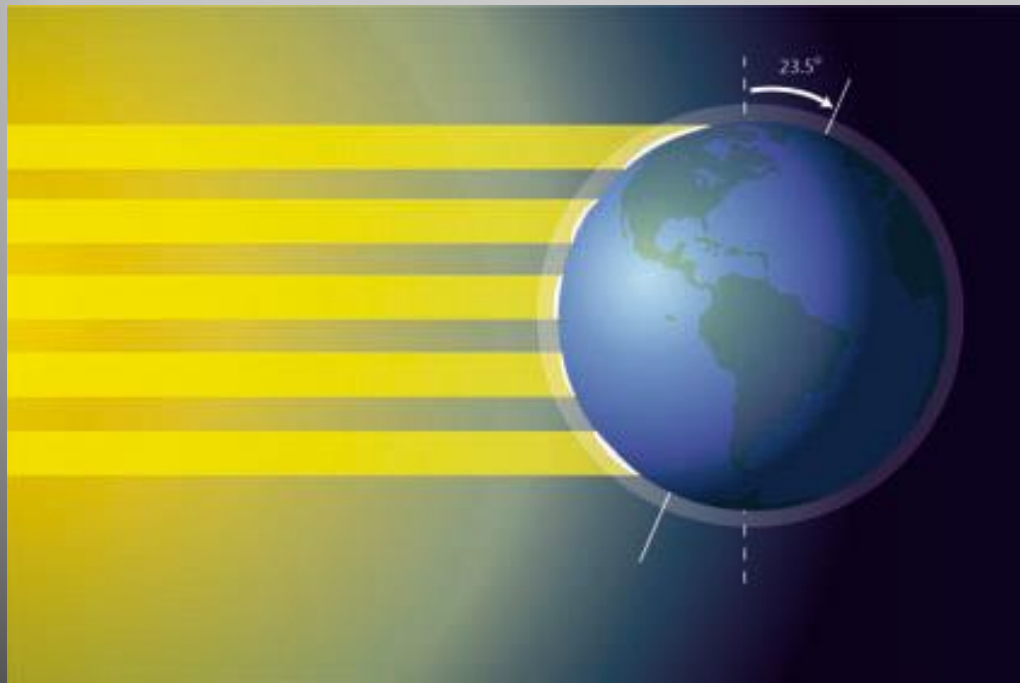


21. Near the equator, the rays of the sun strike the ground at an angle of about 90°.



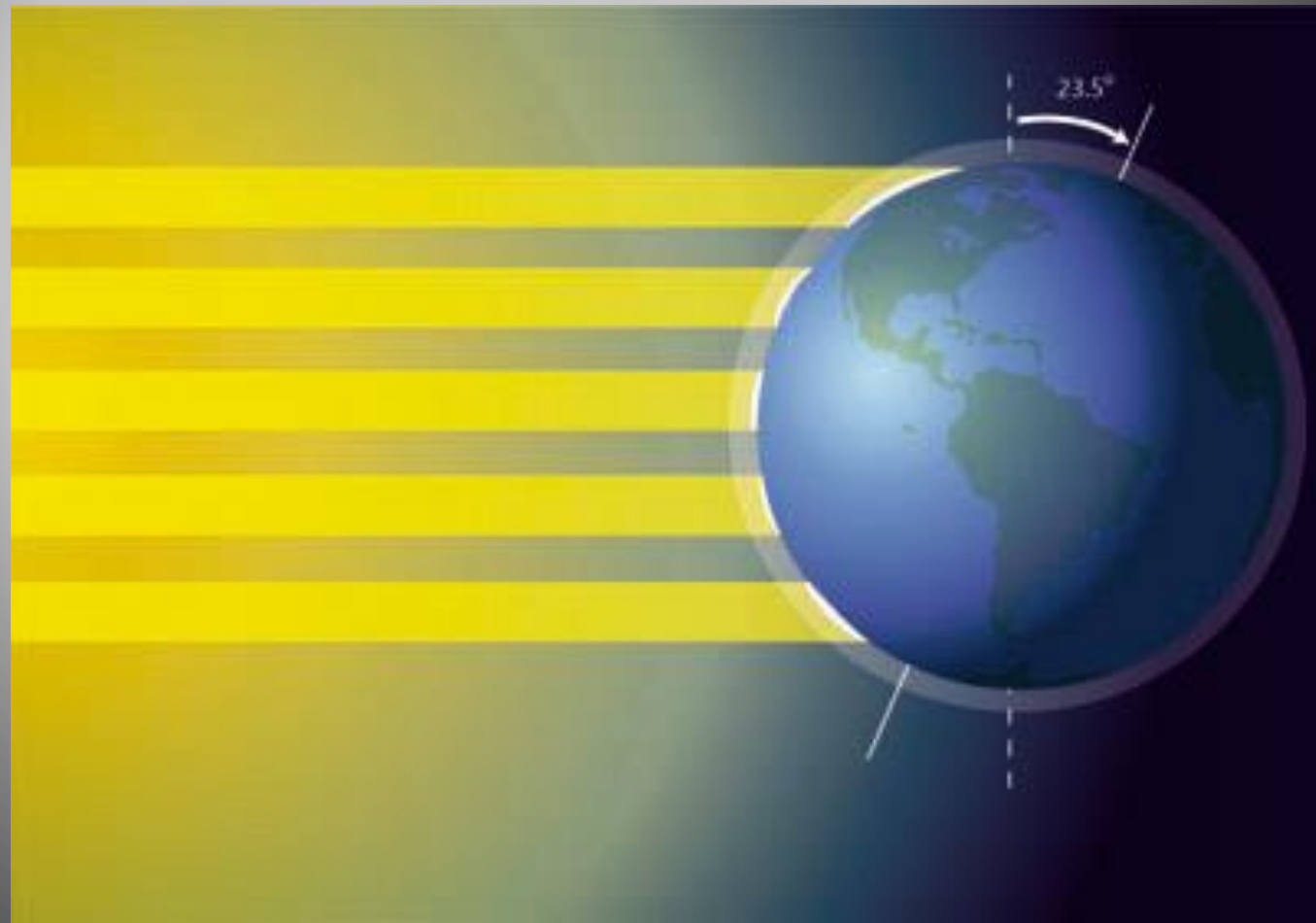
22. Why are average temperatures higher at the equator than near the poles? Pg. 5

- Energy at the equator reaches Earth's surface at an angle near 90° and is more intense. Energy reaches the poles at an angle smaller than 90° and is less intense.



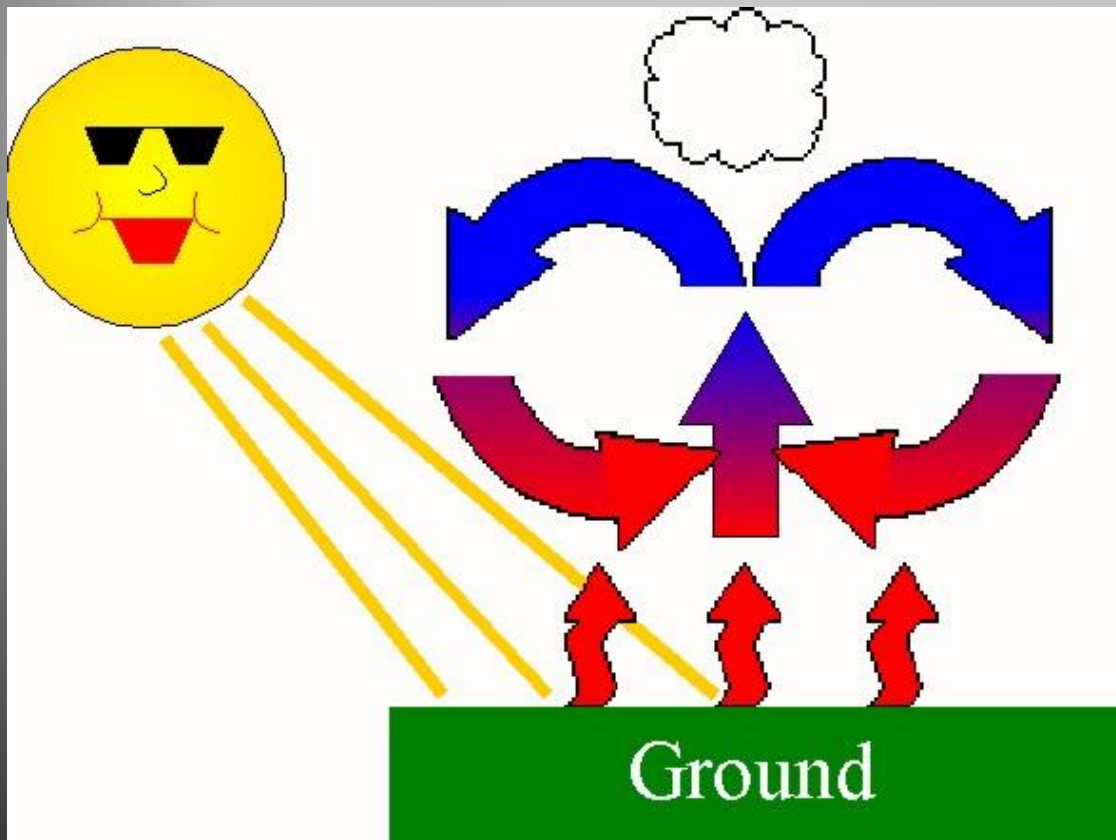
23. Why do Seasonal variations in temperature occur?

- The tilt of Earth's axis



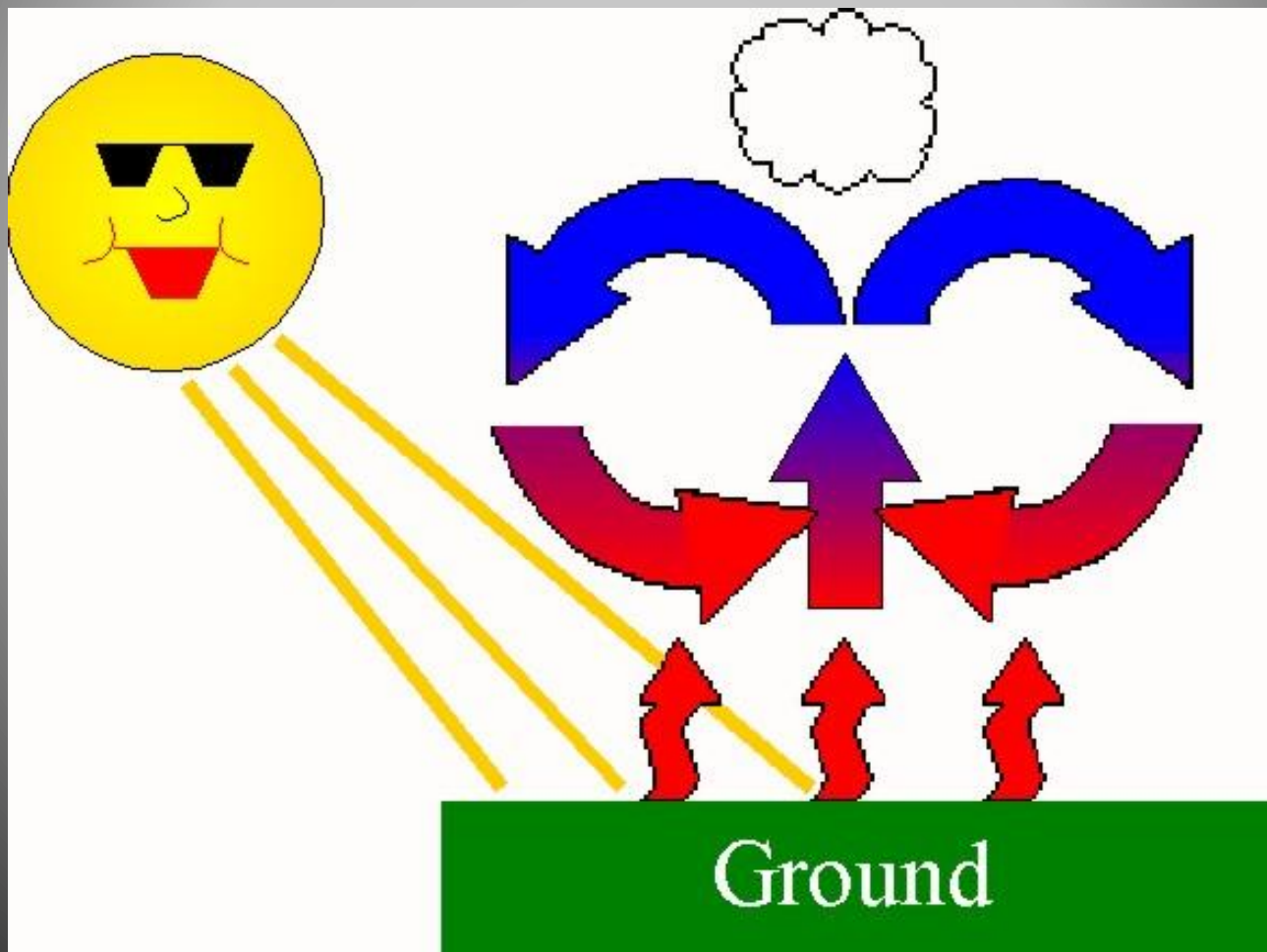
24. What is the primary cause of the heating of the lower atmosphere?

- The distribution of heat through the troposphere by convection



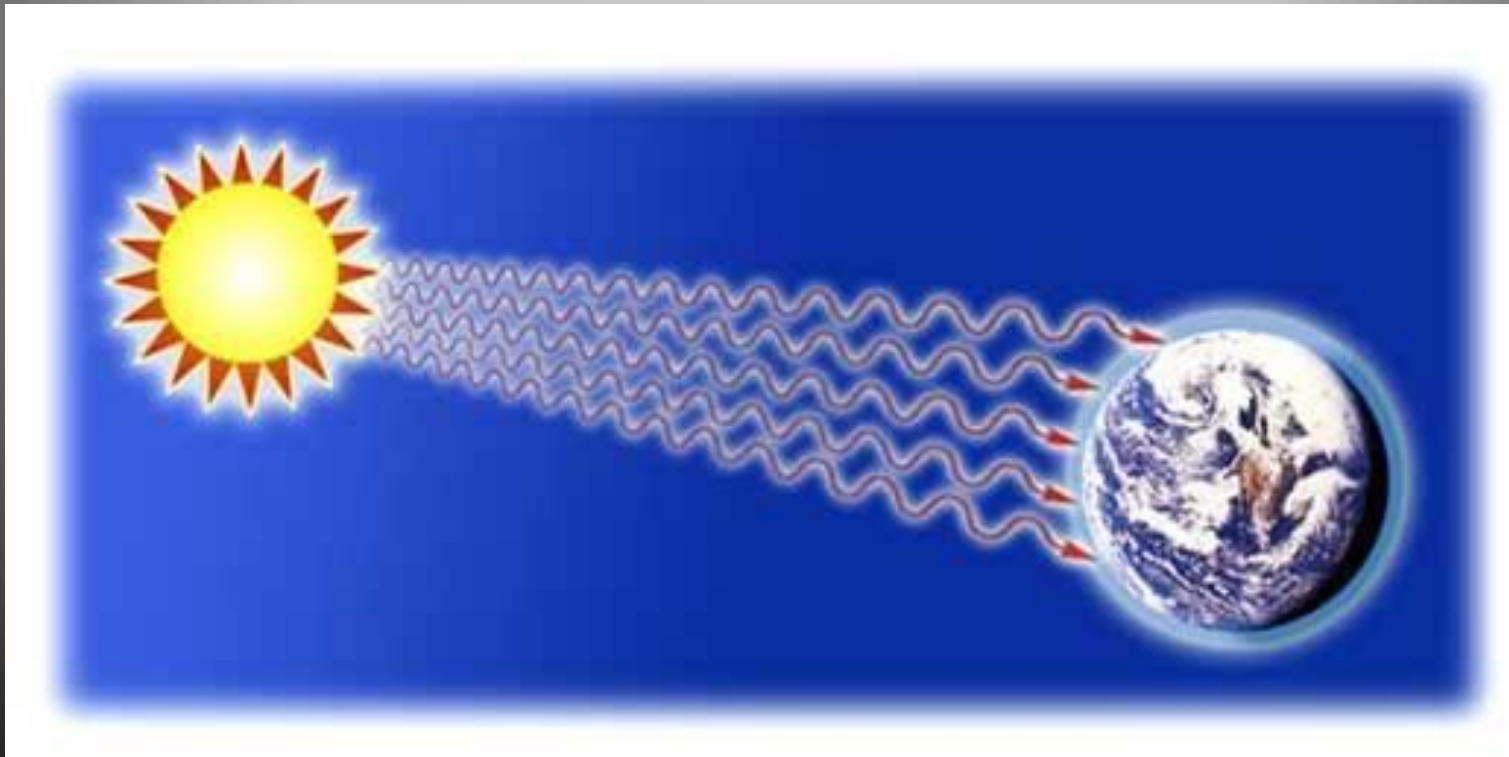
25. The movement of matter due to differences in density caused by temperature variations resulting in the transfer of heat is called convection .

Pg. 6



26. Explain how radiant energy reaches Earth.

- Radiation from the sun travels through space in the form of electromagnetic waves.

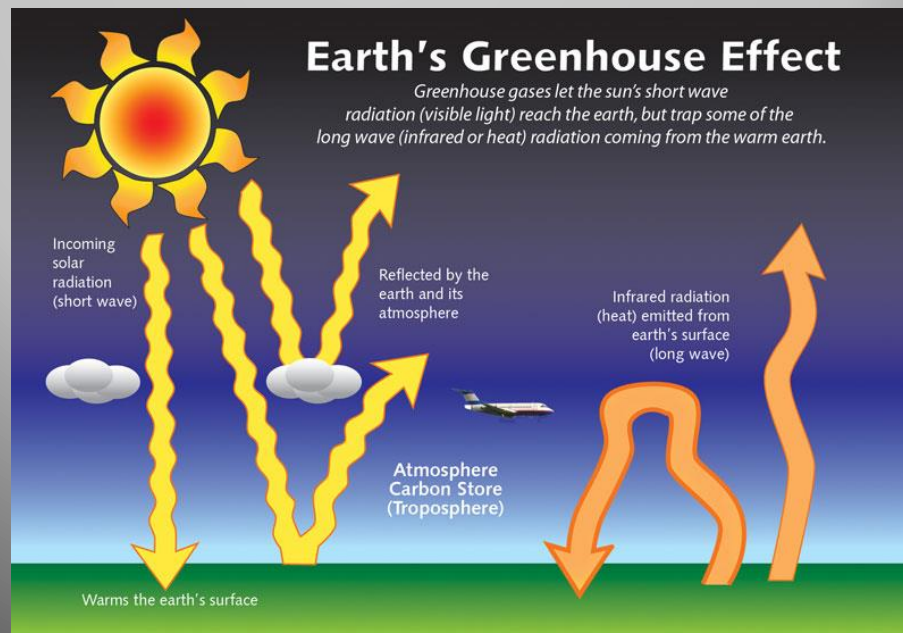


27. Describe how gases and particles in the atmosphere interact with light rays. Pg. 3

- Nitrogen, oxygen, and ozone in the upper atmosphere absorb most short wavelength radiation
- CO₂ and water vapor absorb infrared radiation in the lower atmosphere.
- About 50% of solar radiation reaches Earth's surface. Clouds, particulates and gases scatter and reflect much of the light.

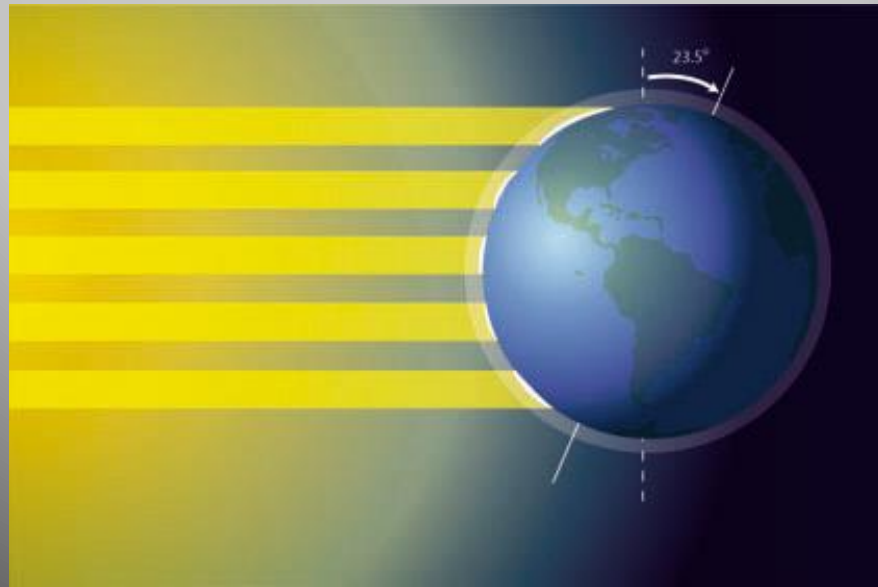
28. Describe how visible light and infrared energy warm Earth.

- Infrared and visible light that reach Earth's surface are absorbed. Heated surfaces radiate heat back into the air where greenhouse gases absorb some of the heat.



29. Explain how variations in intensity Pg. 5
of sunlight can cause temperature
differences on Earth's surface.

- Concentrated sunlight at the equator makes the surface hotter and at higher latitudes where sunlight is spread over a larger area the surface is cooler.



30. You decide not to be outside during the hottest hours of a summer day. When will the hottest hours probably be? How do you know?

Pg. 5

- The hottest hours will probably be in the late afternoon when Earth's surface has had time to absorb and reradiate energy. This is also when convection reaches its peak.

The End!!!

