Severe Weather

Energy in the Atmosphere

Focus:

1) How does the Sun's energy create weather?

2) How is the Sun's energy transferred to create weather?

3) What is the structure of Earth's atmosphere?

Key Terms:

- radiation
- conduction
- convection
- thermometer

Energy in the Atmosphere

- The Sun's energy drives the weather.
  1) The Sun heats Earth's surface
  2) Earth's surface transfers that energy to the atmosphere.
  3) Differences in heat transfer drive the weather.

QuickTime™ and a
decompressor
are needed to see this picture.

Transferring Energy

- Energy is transferred in three different ways.
  1) Radiation
  2) Conduction
  3) Convection

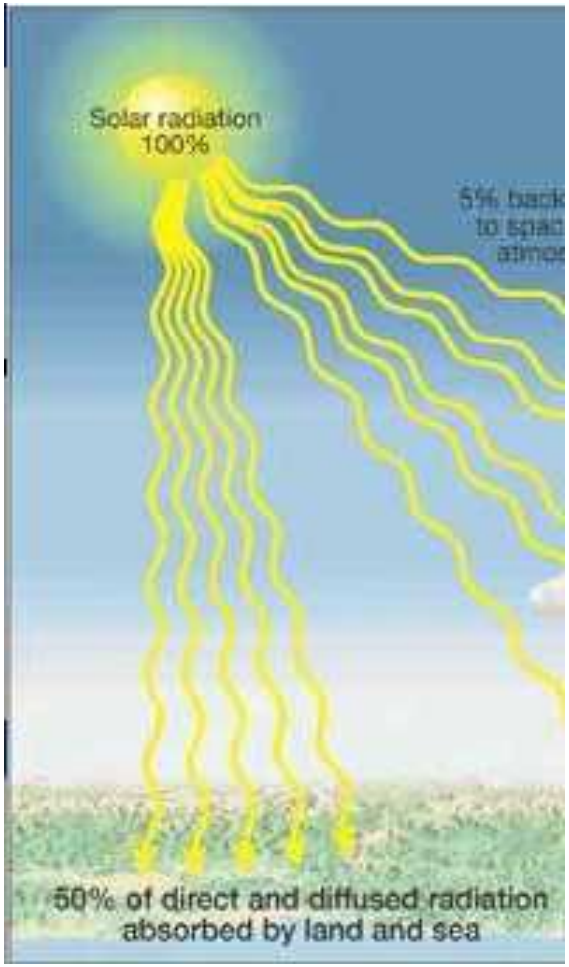
Transferring Energy

- Radiation - the transfer of energy through space.

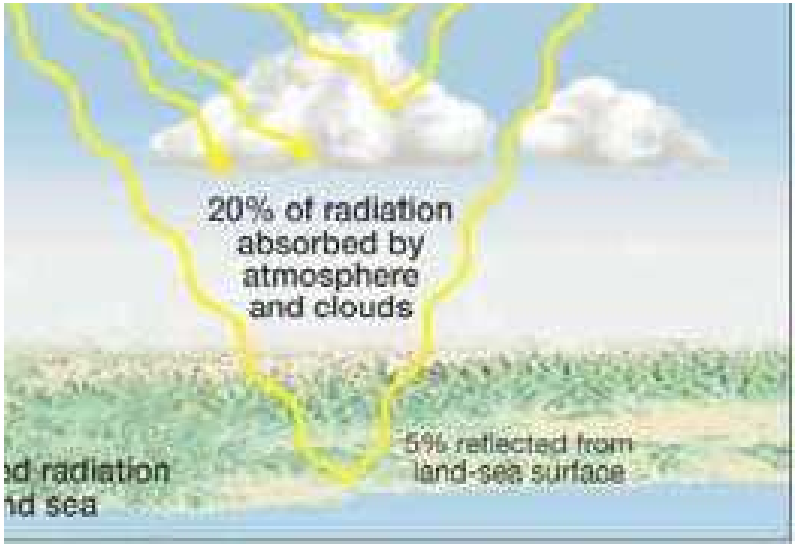
Example:

The Sun heating Earth's surface.

(Step 1)



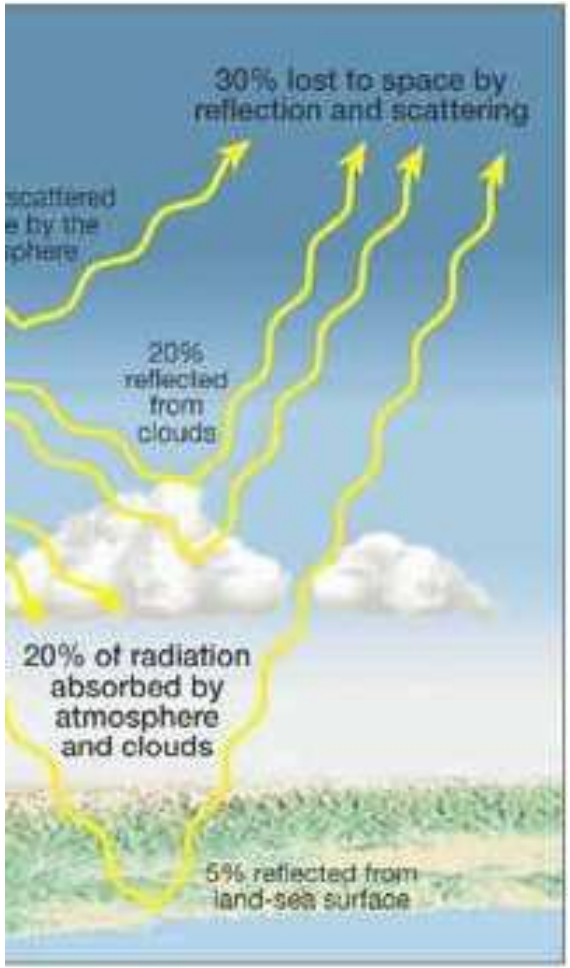
Transferring Energy



- Conduction - the transfer of energy through direct contact.
  - Heat always moves from warmer areas to cooler areas

Example:
Earth's surface heating the atmosphere.
(Step 2)

Transferring Energy



- Convection - the transfer of energy through a liquid or gas caused by differences in density.
  - As heat increases (⇑), density decreases (⇓).

Example:
Movement of heat through the atmosphere to create differences in heat.
(Step 3)

Measuring Energy

- Heat - the total movement (kinetic energy) within a substance.

- Temperature - the average movement (kinetic energy) within a substance.
  - Measured by a *thermometer*
  - Units: degrees Celsius (ºC)

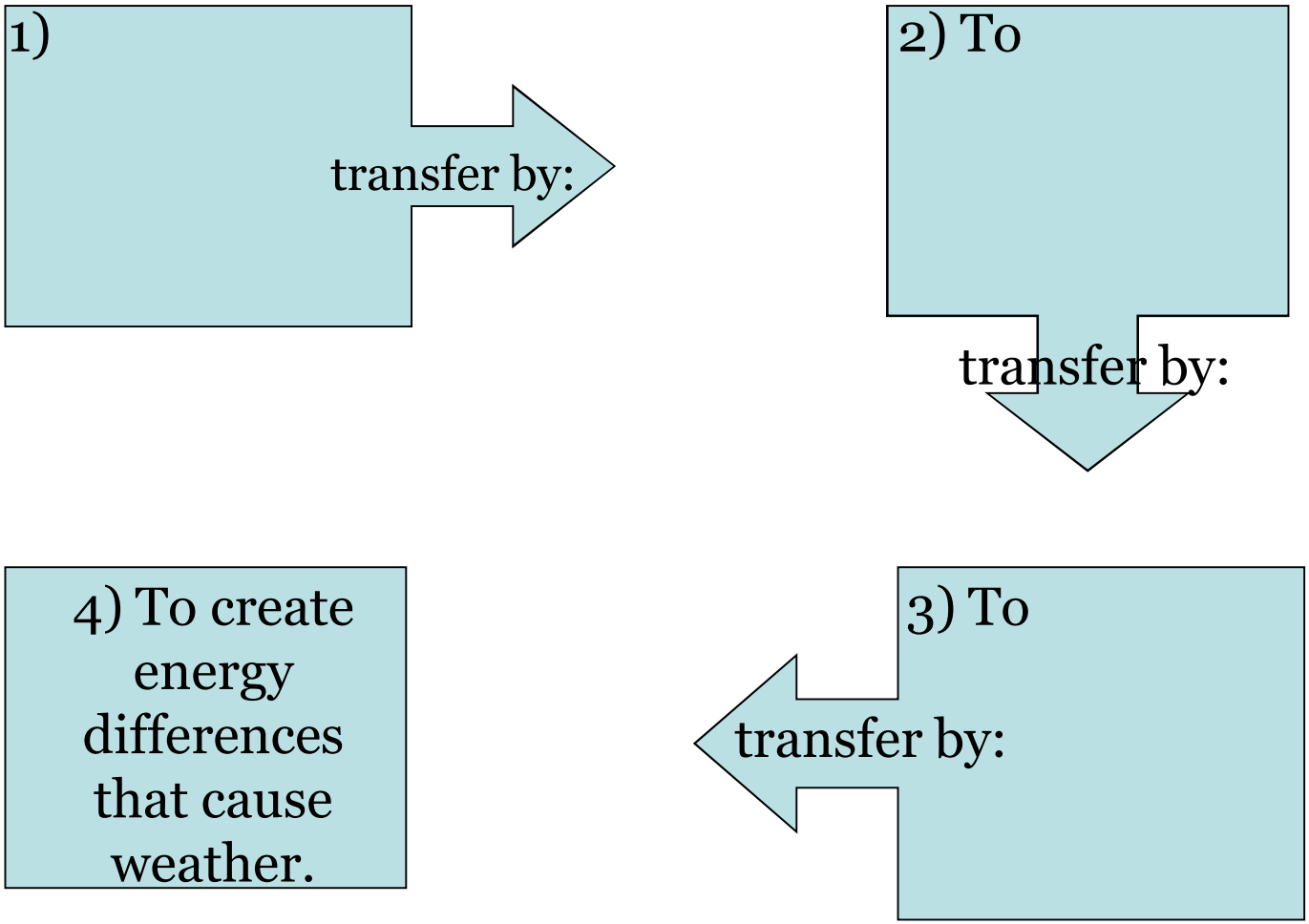
Q: Why does the mercury in a thermometer rise as temperature increases?

Demo: Heating Water

Identify where *radiation*, *conduction*, and *convection* occur when boiling water in a flask.

Review: Energy Transfer

Complete the flowchart describing how energy transfers affect the weather



Vocabulary Review

Space *Motion* *Direct Contact*

Radiation - the transfer of energy through _____.

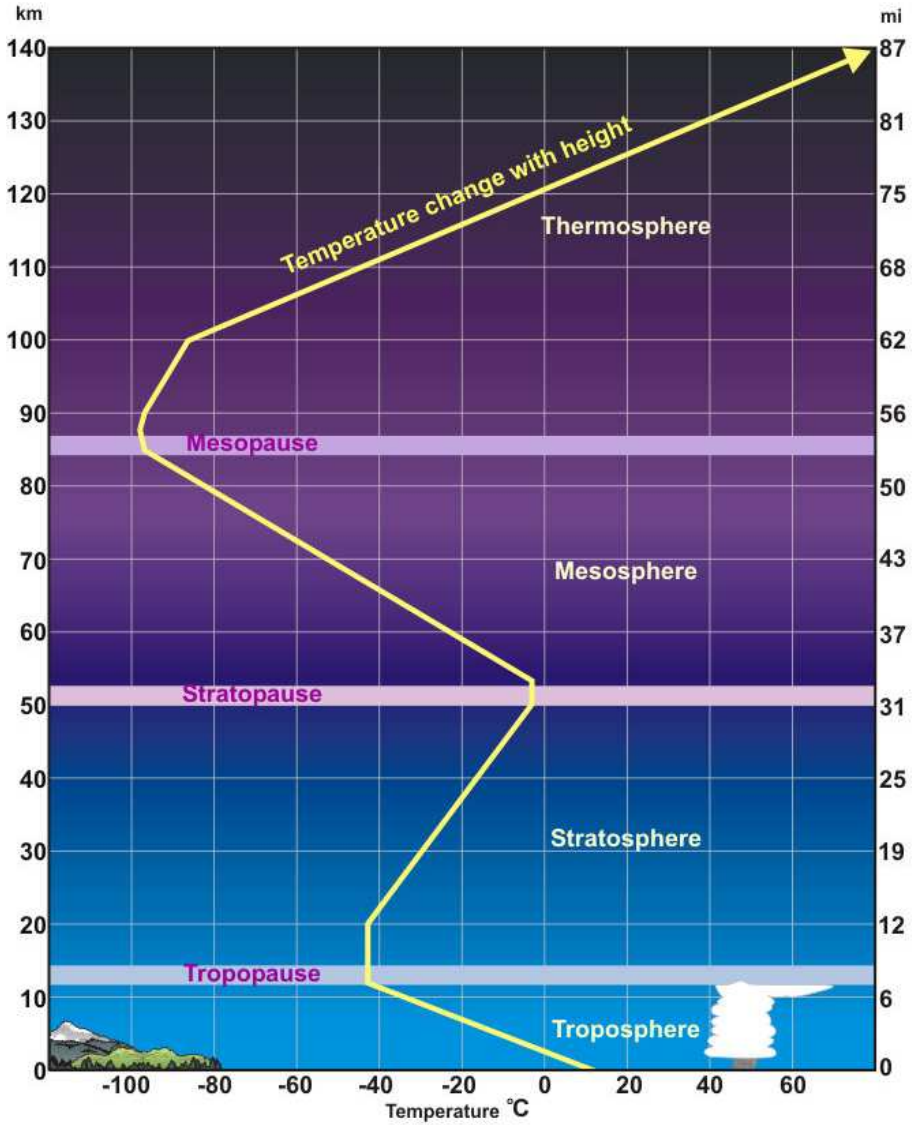
Conduction - the transfer of energy through _____.

Convection - the transfer of energy through _____ of particles.

The Atmosphere

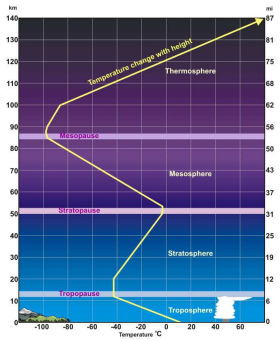
- Earth's atmosphere has four layers.
  1) Troposphere
  2) Stratosphere
  3) Mesosphere
  4) Thermosphere

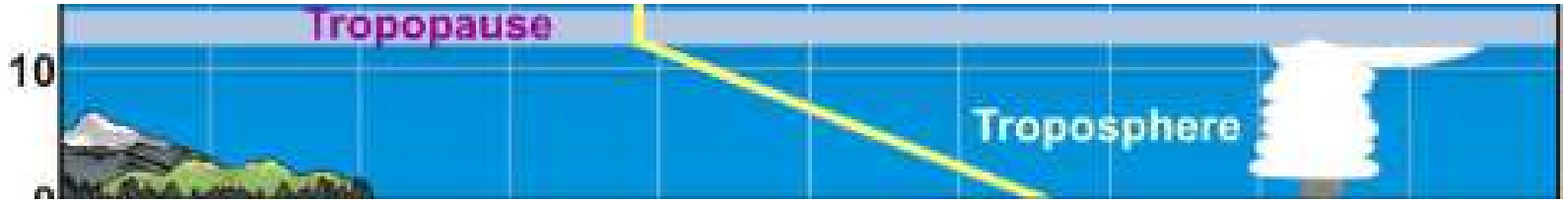
- Layers are identified by changes in temperature.



Troposphere

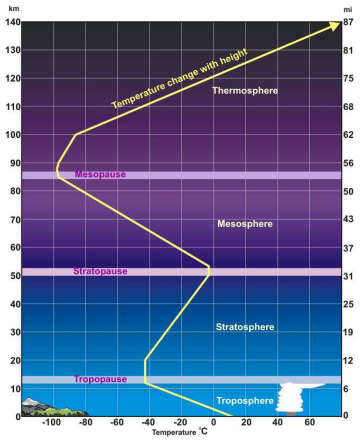
- The layer closest to Earth's surface.
  - Height : 0 - 12 km
- Temperature decreases (⇓) with increasing altitude.
- Air pressure decreases (⇓) with increasing altitude.
- Atmospheric layer where weather occurs.

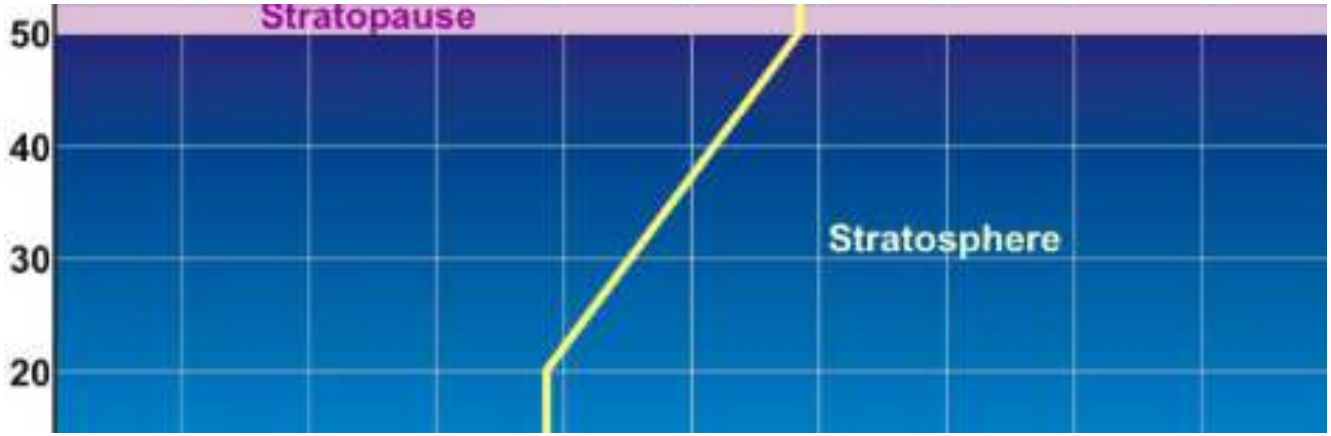




Stratosphere

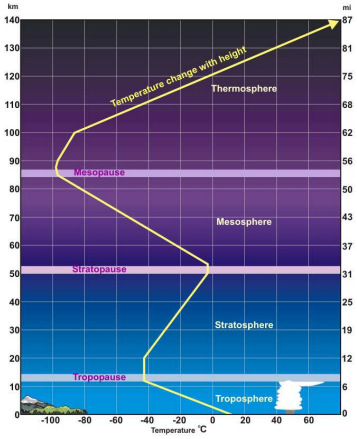
- The 2nd layer from Earth's surface.
  - Height : 12 - 50 km
- Temperature increases (⇑) with increasing altitude.
  - Due to the presence of the ozone layer
- Air pressure decreases (⇓) with increasing altitude.





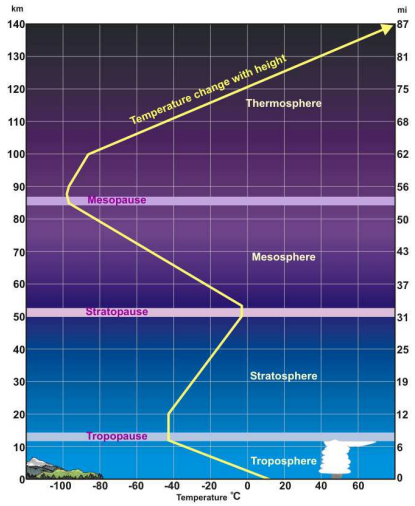
Mesosphere

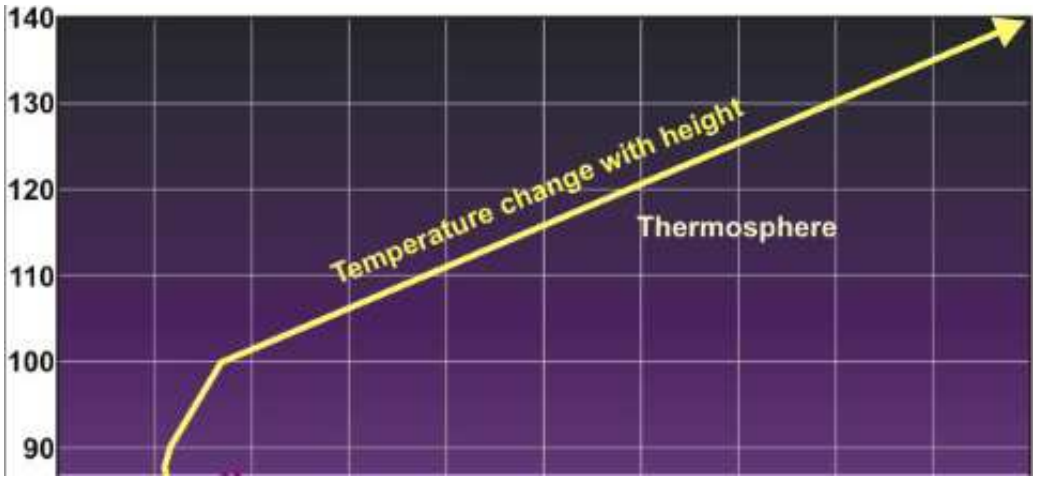
- The 3rd layer from Earth's surface.
  - Height : 50 - 90 km
- Temperature decreases (⇓) with increasing altitude.
  - Ozone layer not present.
- Air pressure decreases (⇓) with increasing altitude.



Thermosphere

- The 4th layer from Earth's surface.
  - Height : > 90 km
- Temperature decreases (⇑) with increasing altitude.
  - Due to intense solar radiation
- Gases are layered from heaviest to lightest.





Review

- How does temperature change with increasing altitude?

- How does air pressure change with increasing altitude?