

Heating the Atmosphere



I. Heat vs. Temp.

Heat = Total Energy in Molecules measured in
Joules - Calories
Temp. = Average Kinetic energy of particles
(motion) measured in °C °F °K

II. Two ways to change Temp.

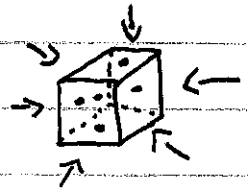
1. Add/Remove heat energy



flame -  Radiant En.
Chem. En.
wood -  Stored En.

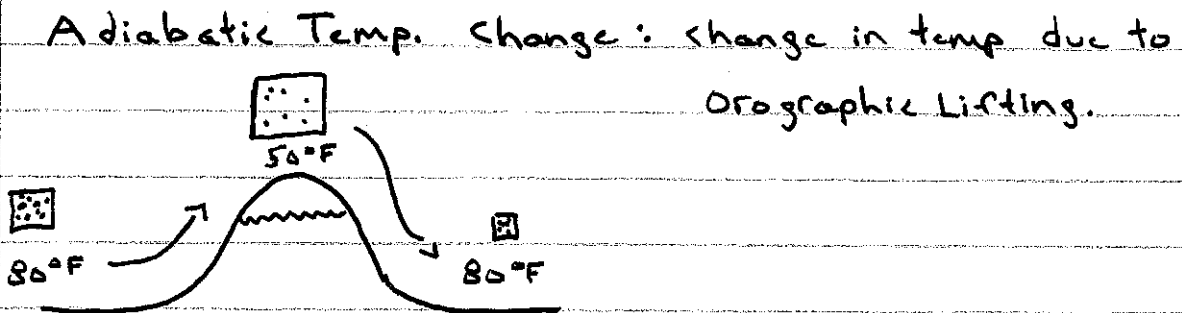
2. Reduce/Increase Volume.

- change in Pressure = change in Temp.



III. Energy Transfer w/ PRESSURE CHANGE

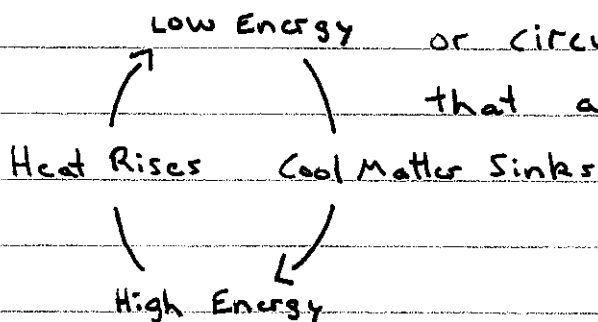
↑ altitude = ↓ pressure = ↓ Temp.



IV Energy Transfer from Heat

1. Conduction: Transfer of heat by direct contact
 - Heat flows from high temp. matter to low temp.
 - Insulator = does NOT conduct heat well

Good Conductors \longleftrightarrow Good Insulators
metals - glass - stone wood - air - water

2. Convection: Transfer of heat by mass movement or circulation within substances that act like fluids.


The diagram illustrates a convection cycle. At the top, it says 'Low Energy' and 'or circulation within substances that act like fluids.' Below this, 'Heat Rises' is written on the left, with an upward-pointing arrow. On the right, 'Cool Matter Sinks' is written, with a downward-pointing arrow. At the bottom, 'High Energy' is written, with an upward-pointing arrow. The arrows form a continuous loop: up on the left, down on the right, and up on the bottom.

3. Radiation: Transfer of heat in all directions

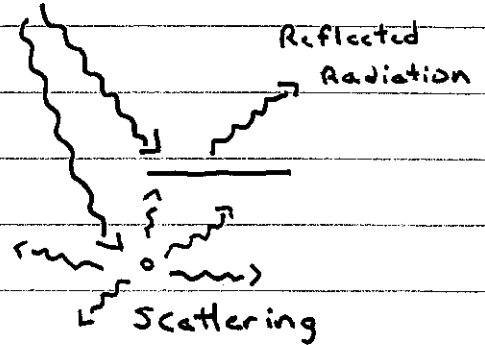
- All objects emit radiant energy
- radiant energy can travel through vacuum of space
- Hotter object radiate more energy per unit area
- Objects that are good emitters are good absorbers

V. SOLAR RADIATION (p. 486)

- Reflection: electromagnetic waves bounce off objects
 - reflected radiation has same energy as incident radiation

- Scattering: electromagnetic waves break up into many weaker waves.

Incident Radiation



- * Half the radiation that makes it to Earth's surface is from scattered electromagnetic waves.

- Albedo: measure of reflectiveness
 - white objects have high albedo
 - dark objects have low albedo

▢ Two Main Contributors to Earth's Albedo

1. Polar Ice Caps
2. Clouds

VI Greenhouse Effect

Warming of Earth's atmosphere due to absorption and re-radiation of electromagnetic heat energy.

- From gases in Earth's Atmosphere.

▢ Two main Greenhouse Gases

1. H_2O
2. CO_2