Chapter 10.2 (pg 436 - 443)

Energy Transfer in the Atmosphere

Atmosphere – layers of gases that extend above a planet's surface.

• Lower atmosphere "air" - 99% nitrogen and oxygen, 1% CO₂ and argon

Layers of the atmosphere

- 1. troposphere lowest, densest layer
 - where weather happens (contains water vapour)
 - temperature drops as altitude increases (15°C to -55°C)

2. Stratosphere

- dry air / few clouds (often where planes fly)
- contains the ozone layer (absorbs UV light from sun)

3. Mesosphere (Upper Atmosphere)

• burns up small pieces of dust and meteors (shooting stars at night)

4. Thermosphere

- extreme solar radiation (1500°C 3000°C)
- Where aurora borealis occurs
- 5. Exosphere merges with outer space



Figure 10.15 The five layers of Earth's atmosphere

Radiation and conduction in the Atmosphere

Almost all energy on Earth comes from the Sun

Insolation – amount of solar radiation that reaches a certain area

• water near the equator receives more insolation and is warmer than water near the pole

Angle of Incidence – affects the amount of solar radiation reaching the earth's surface



Figure 10.18 The angle of incidence of the Sun's rays is greater towards the poles than towards the equator. Therefore, solar radiation is more spread out at the poles.

Radiation and **Conduction** transfer heat to and from Earth's surface. **Convection** transfers heat throughout Earth's atmosphere.



Radiation Budget – keeps incoming and outgoing energy in balance

- 42% of incoming radiation is reflected / absorbed by clouds and dust
- 58% reaches Earth's surface (9% of that radiation is then reflected back to outer space)



Figure 10.20 The radiation budget is achieved partly because Earth does not absorb 100 percent of the radiation it receives. Earth's surface and atmosphere reflect some of the incoming solar radiation. Earth's surface also emits some of the radiation that it absorbs. The percentages shown here are estimates.

Albedo – Amount of radiation reflected by a surface

• snow / desert have high albedos, forest / soil have low albedos