Topic 5 - Environment

Conditions for life
Body Core Temperature

Definition: Temperature of internal organs (liver, heart, intestines, etc.)

Human core temperature: 37.5°C

Regulation of body core temperature

Radiation: heat lost directly through skin

Perspiration: evaporation cools body
Hyperthermia

40°C (104°F) – dysfunction of temperature regulating system
dehydration, blood pressure drop (dizziness)

41°C (106°F) – cessation of enzyme function
unconsciousness, coma, death
Hypothermia

35°C (95°F) – clumsiness, forgetfulness, slurring of speech

32°C (90°F) – uncontrollable shivering, tremors, accelerated heartbeat and breathing

28°C (80°F) – major organ failure, brain damage, death
Mercury 333 F
Venus 867 F
Earth 59 F
Mars -81 F
Jupiter -162 F
Saturn -218 F
Uranus -320 F
Neptune -320 F
Pluto -359 F
Earth’s Astronomical Position

Life as we know it exists in only 1 place
Narrow temperature range

100 million miles from the sun
1 million miles closer - water vapor only
1 million miles farther – ice only

What controls our climate?
Milankovitch Theory

Milutin Milankovitch 1938

Shape of Earth’s orbit around sun (Eccentricity)

Tilt of its axis of rotation (23.5°)

Wobble during rotation (Precession)

**Milankovitch Cycles**
Earth’s Climate

Other factors:
- Ozone layer (protects from UV radiation)
- Clouds (reflect and absorb sunlight)
- Oceans (distribute heat)
- Topography (shape of the land)

rain shadow
Earth’s Environments

Relevance to organisms

Lithosphere: soil, rocks, substrate
Hydrosphere: contains water
Atmosphere: contains important gases, protection from ultraviolet rays
Biosphere: biomass (Organism section)
Lithosphere

From the upper most layer of the mantle to the crust

Thickness
- 1 mile in mid-ocean ridges
- 80 miles beneath older ocean crusts
- 93 miles at continental plates

Soil
- Particles from Earth’s crust (from weathering)
- Organic materials

http://www.uwsp.edu/geo/faculty/ritter/images/lithosphere/tectonics/earth_structure.jpg
Hydrosphere

Ocean water – 97%
Polar ice cap – 2%
All others – 1%

Ground water
Atmosphere
Streams, Lakes
Living organisms
Contamination of the Hydrosphere

Nitrogen: used in agriculture carried into water systems

excess nitrogen:
  China: 200 lbs per acre

Eutrophication: enrichment of water by nutrients, bacteria increase, oxygen depletion

http://www.oswego.edu/wscp/SNOW.htm
Death in the Gulf of Mexico (Fig. 37.12)

Hypoxia: lack of $O_2$
Aquatic life suffocates
2002: 8,500 square miles

Other effects of nitrogen?
When mixed with water vapor, nitrogen leads to acid rain
(kills plants, acidifies freshwater, damages structures)