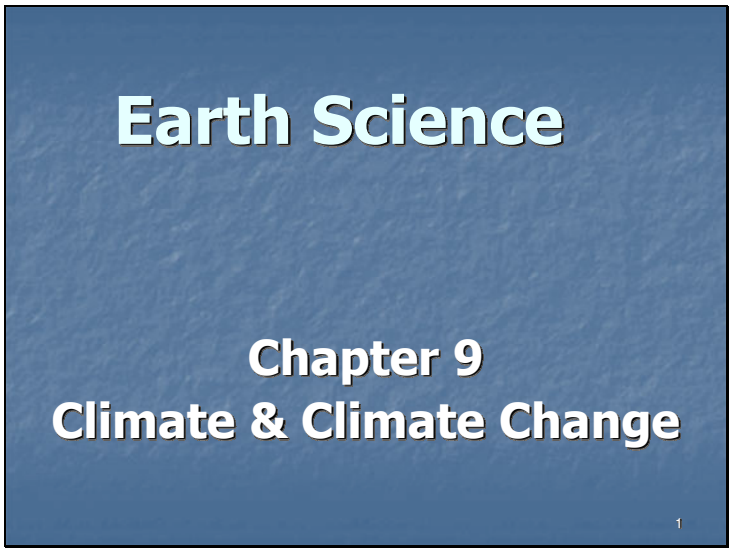
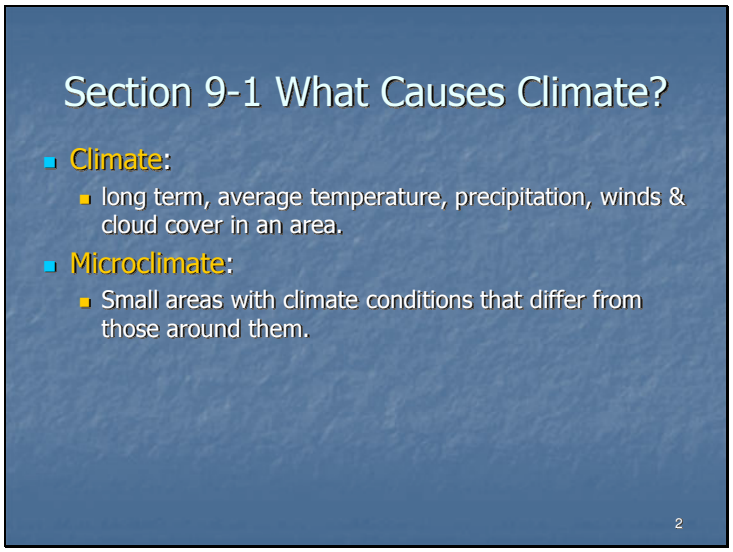
Slide 1



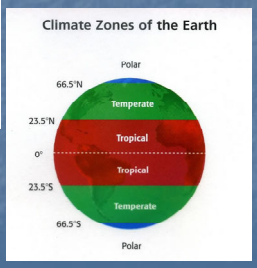
Slide 2


Section 9-1 What Causes Climate?
Climate:
long term, average temperature, precipitation, winds & cloud cover in an area.
Microclimate:
Small areas with climate conditions that differ from those around them.
2

Slide 3

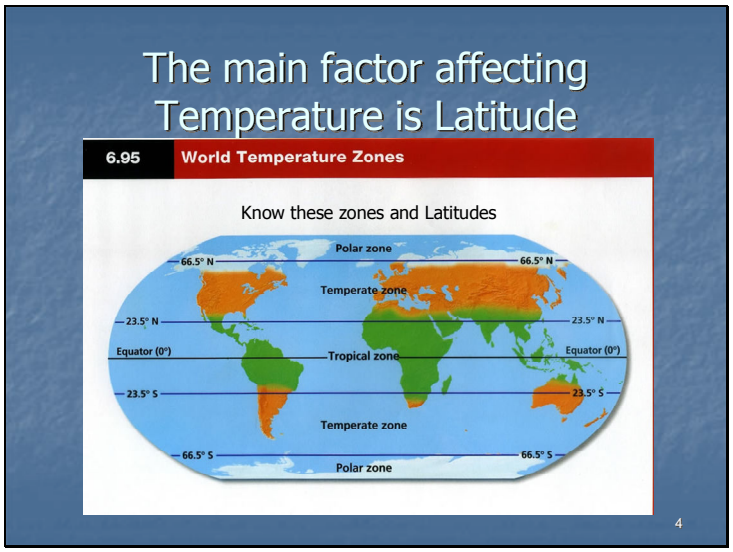
Main factors that affect climate Temperature and Precipitation:

- Factors affecting Temperature:
  - Latitude
  - Altitude
  - Distance from large bodies of water
  - Ocean currents

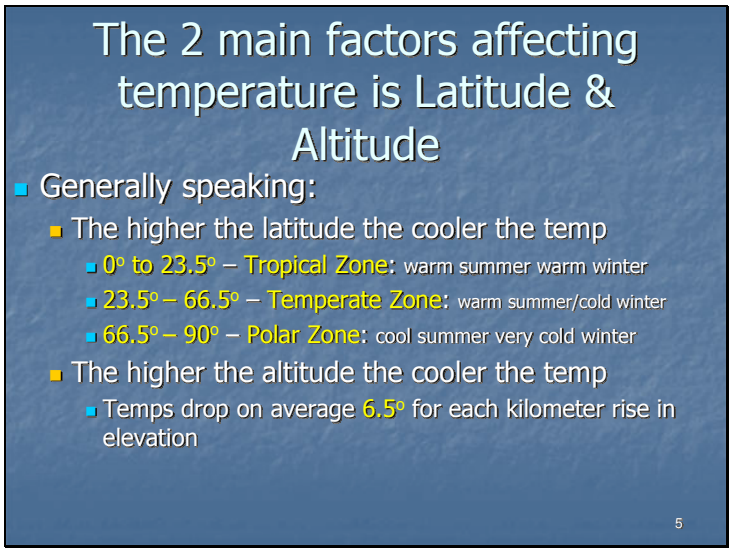


3

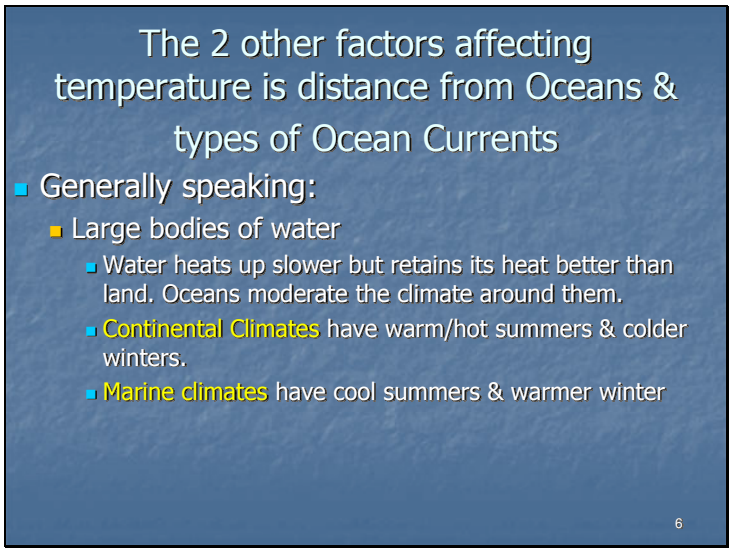
Slide 4


The main factor affecting Temperature is Latitude
6.95
World Temperature Zones
Know these zones and Latitudes
Polar zone
66.5° N
66.5° N
Temperate zone
23.5° N
23.5° N
Equator (0°)
Tropical zone
Equator (0°)
23.5° S
23.5° S
Temperate zone
66.5° S
66.5° S
Polar zone
4

Slide 5

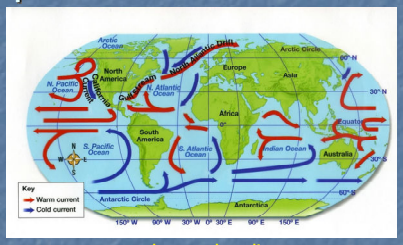

The 2 main factors affecting temperature is Latitude & Altitude
Generally speaking:
The higher the latitude the cooler the temp
0° to 23.5° – Tropical Zone: warm summer warm winter
23.5° – 66.5° – Temperate Zone: warm summer/cold winter
66.5° – 90° – Polar Zone: cool summer very cold winter
The higher the altitude the cooler the temp
Temps drop on average 6.5° for each kilometer rise in elevation
5

Slide 6


The 2 other factors affecting temperature is distance from Oceans & types of Ocean Currents
Generally speaking:
Large bodies of water
Water heats up slower but retains its heat better than land. Oceans moderate the climate around them.
Continental Climates have warm/hot summers & colder winters.
Marine climates have cool summers & warmer winter
6

Slide 7

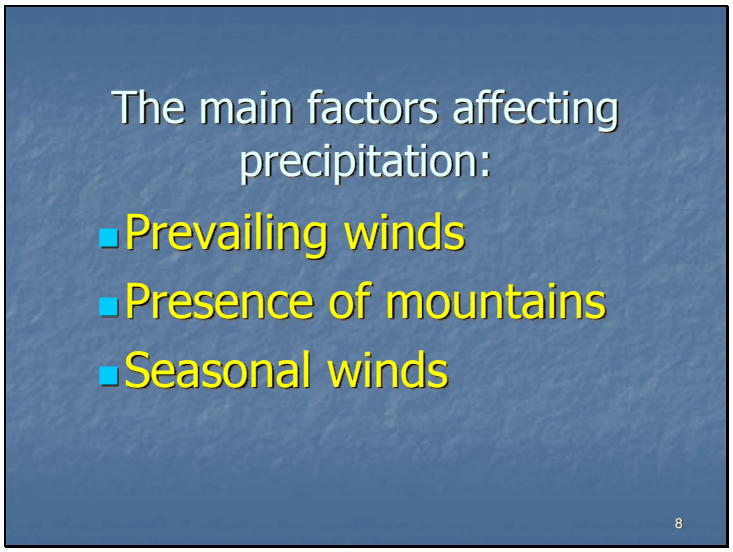
The other factor affecting temperature is Ocean Currents



- Ocean currents moderate the climate
  - Warm water currents make the climate warmer in winter & summer
  - Cold water currents make the climate cooler than the climate found at the same latitudes inland.

7

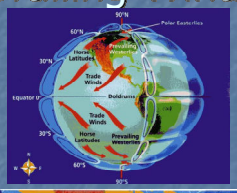
Slide 8

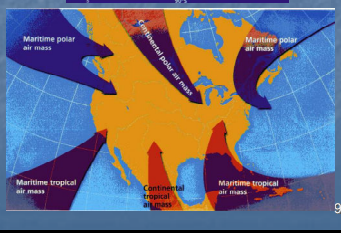

The main factors affecting precipitation:
Prevailing winds
Presence of mountains
Seasonal winds
8

Slide 9

The main factors affecting precipitation: Prevailing Winds

- Prevailing winds move huge air masses from place to place.
- There can be both warm and cold air masses
- There can be high and low humidity air masses



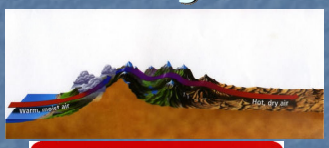


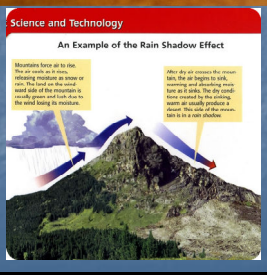
9

Slide 10

The main factors affecting precipitation: Mt. Ranges

- Mt. ranges in the path of moving air masses force the air up and over the mountains.
- As the air is forced up and over, it cools and holds less water vapor.
- Windward side of the mt receives lots of rain/snow
- Leeward side is dry w/ little or no rain.



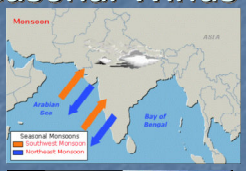


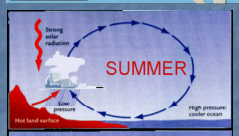
10

Slide 11

The main factors affecting precipitation: Seasonal Winds

- Sea and Land breezes over a large region that change direction w/ the seasons are called Monsoons
- Regions receive tremendous amounts of rain in the summer
- Regions receive very little rain in winter.
- Monsoons in Thailand, India, Pakistan, Indonesia
- Southern Calif. receives its Santa Ana Winds blowing warm dry winds in the fall & early winter



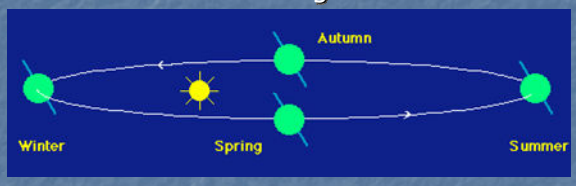


11

Slide 12

The 4 seasons are caused by the tilt of the Earth and its path around the sun.

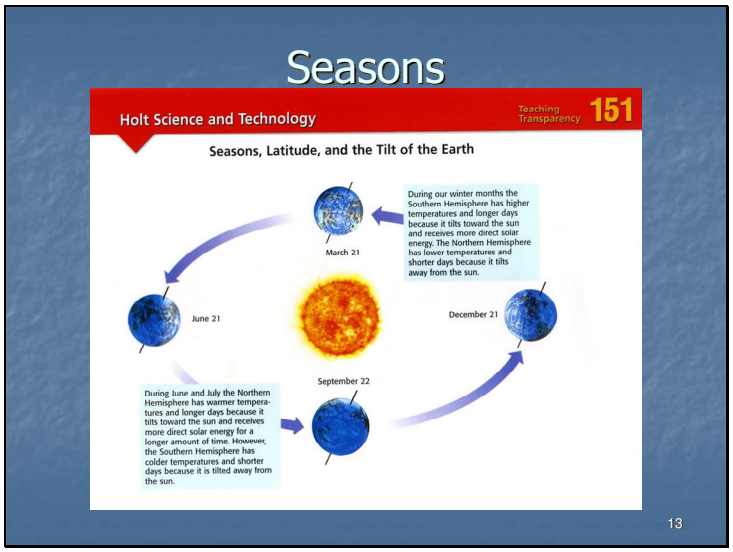
- Earth is tilted at a 23.5o angle



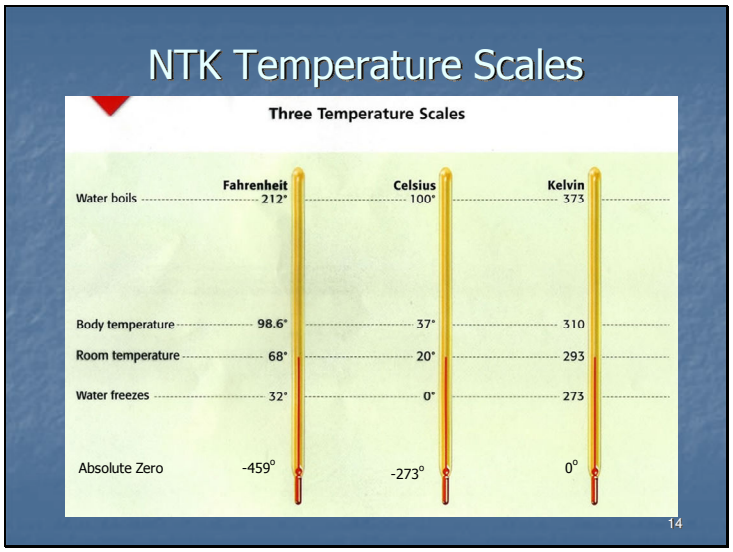
- Summer: June 21st: Summer Solstice
- Winter: Dec. 21: Winter Solstice
- Spring: March 21: Vernal Equinox
- Fall: Sept 22: Autumnal Equinox

12

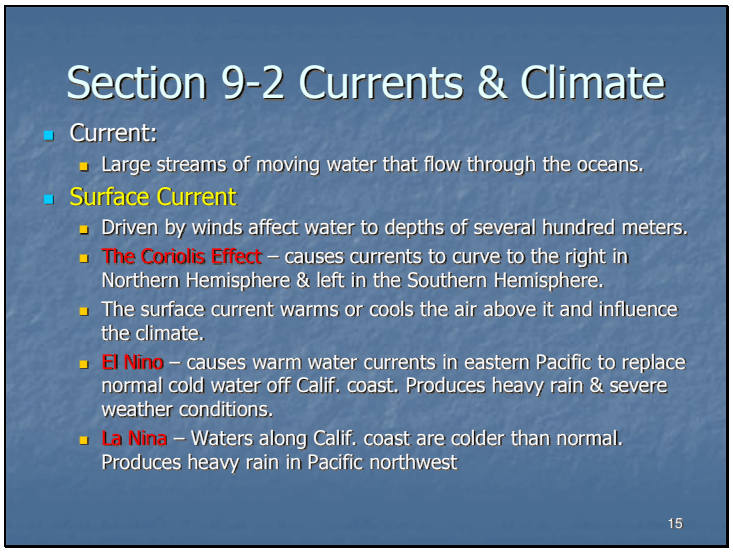
Slide 13


Seasons
Holt Science and Technology
Teaching Transparency 151
Seasons, Latitude, and the Tilt of the Earth
March 21
During our winter months the Southern Hemisphere has higher temperatures and longer days because it tilts toward the sun and receives more direct solar energy. The Northern Hemisphere has lower temperatures and shorter days because it tilts away from the sun.
June 21
December 21
September 22
During June and July the Northern Hemisphere has warmer temperatures and longer days because it tilts toward the sun and receives more direct solar energy for a longer amount of time. However, the Southern Hemisphere has colder temperatures and shorter days because it is tilted away from the sun.
13

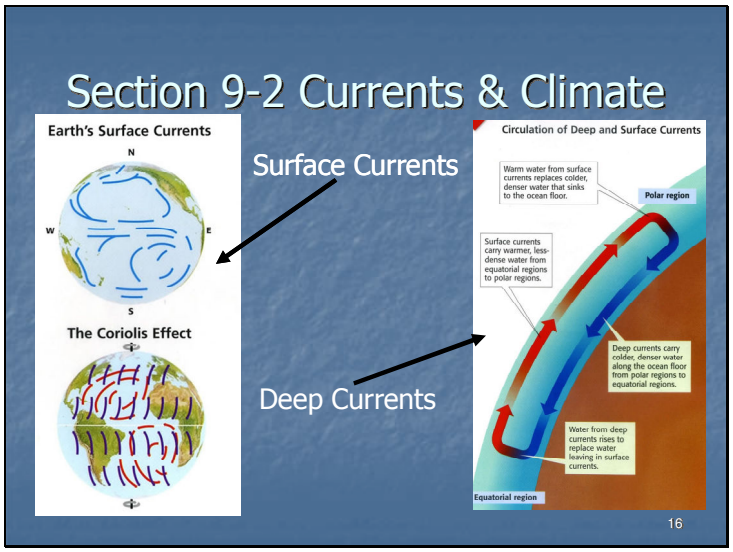
Slide 14


NTK Temperature Scales
Three Temperature Scales
Fahrenheit
Celsius
Kelvin
Water boils
212°
100°
373
Body temperature
98.6°
37°
310
Room temperature
68°
20°
293
Water freezes
32°
0°
273
Absolute Zero
-459°
-273°
0°
14

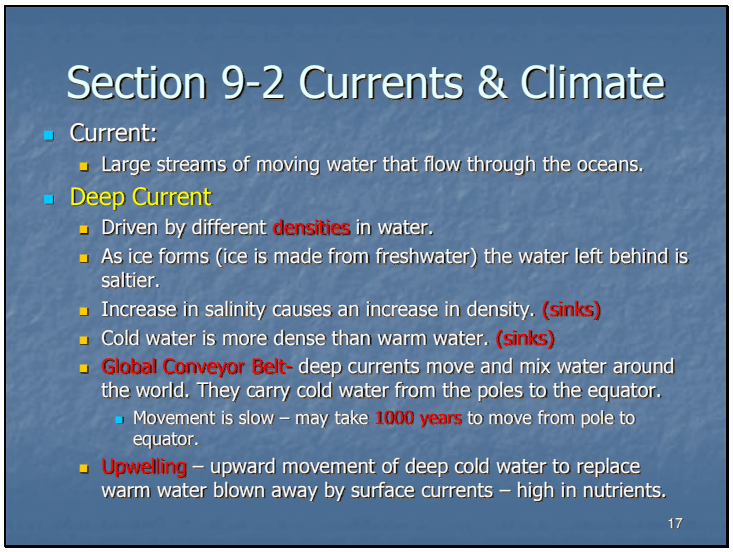
Slide 15


Section 9-2 Currents & Climate
Current:
Large streams of moving water that flow through the oceans.
Surface Current
Driven by winds affect water to depths of several hundred meters.
The Coriolis Effect – causes currents to curve to the right in Northern Hemisphere & left in the Southern Hemisphere.
The surface current warms or cools the air above it and influence the climate.
El Nino – causes warm water currents in eastern Pacific to replace normal cold water off Calif. coast. Produces heavy rain & severe weather conditions.
La Nina – Waters along Calif. coast are colder than normal. Produces heavy rain in Pacific northwest
15

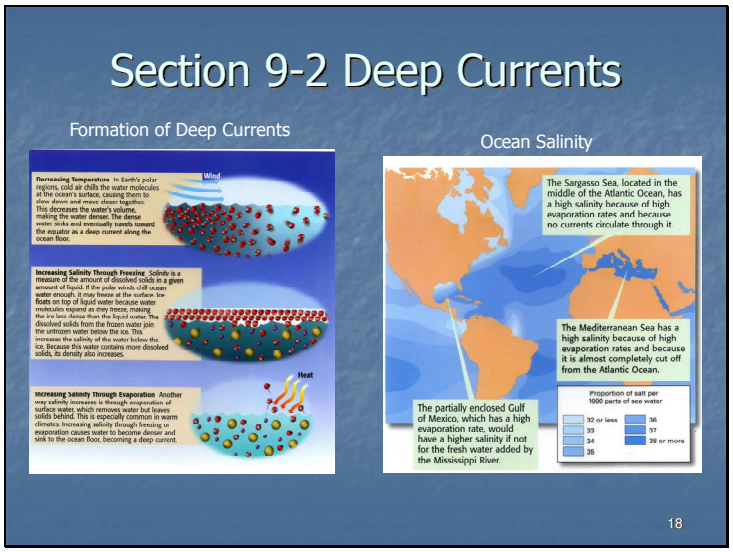
Slide 16


Section 9-2 Currents & Climate
Earth's Surface Currents
N
W
E
S
The Coriolis Effect
Surface Currents
Deep Currents
Circulation of Deep and Surface Currents
Warm water from surface currents replaces colder, denser water that sinks to the ocean floor.
Polar region
Surface currents carry warmer, less-dense water from equatorial regions to polar regions.
Deep currents carry colder, denser water along the ocean floor from polar regions to equatorial regions.
Water from deep currents rises to replace water leaving in surface currents.
Equatorial region
16

Slide 17


Section 9-2 Currents & Climate
Current:
Large streams of moving water that flow through the oceans.
Deep Current
Driven by different densities in water.
As ice forms (ice is made from freshwater) the water left behind is saltier.
Increase in salinity causes an increase in density. (sinks)
Cold water is more dense than warm water. (sinks)
Global Conveyor Belt- deep currents move and mix water around the world. They carry cold water from the poles to the equator.
Movement is slow – may take 1000 years to move from pole to equator.
Upwelling – upward movement of deep cold water to replace warm water blown away by surface currents – high in nutrients.
17

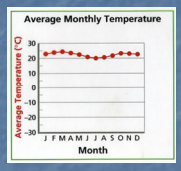
Slide 18

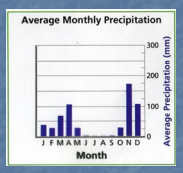

Section 9-2 Deep Currents
Formation of Deep Currents
Wind
Heat
Ocean Salinity
The Sargasso Sea, located in the middle of the Atlantic Ocean, has a high salinity because of high evaporation rates and because no currents circulate through it.
The Mediterranean Sea has a high salinity because of high evaporation rates and because it is almost completely cut off from the Atlantic Ocean.
The partially enclosed Gulf of Mexico, which has a high evaporation rate, would have a higher salinity if not for the fresh water added by the Mississippi River.
Proportion of salt per 1000 parts of sea water
32 or less
33
34
35
36
37
38 or more
18

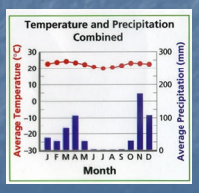
Slide 19

Section 9-3 Climate Regions

- Climates classified by:
  - Temperature
  - Precipitation
- 6 main regions:
  - Tropical Rainy
  - Dry
  - Temperate Marine
  - Temperate Continental
  - Polar
  - Highlands

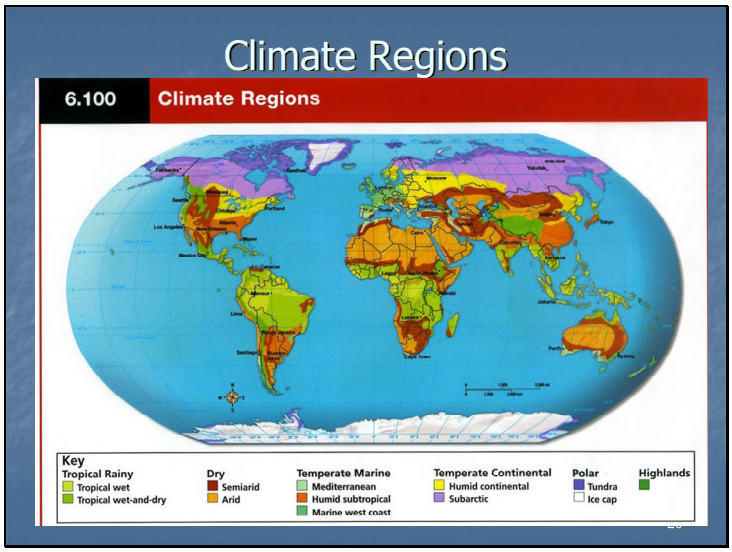




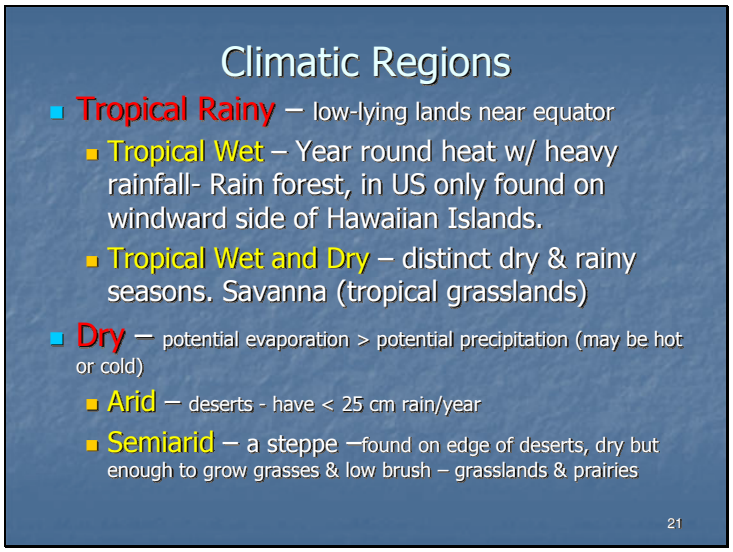


19

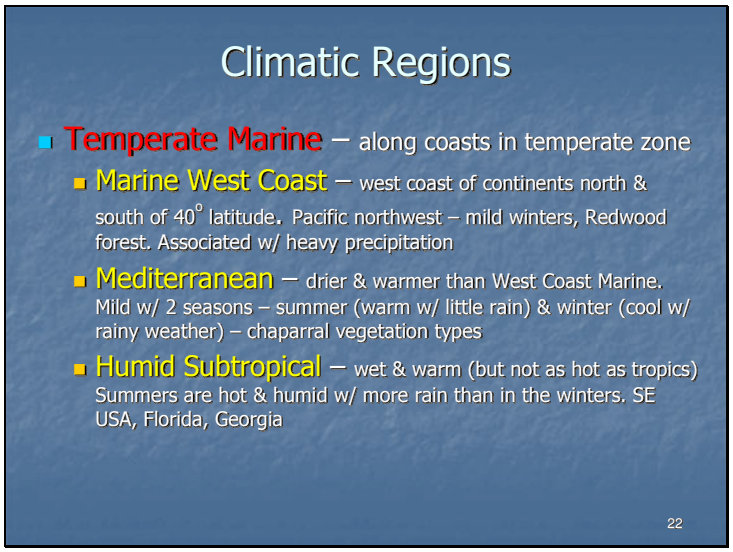
Slide 20


Climate Regions
6.100
Climate Regions
Key
Tropical Rainy
Tropical wet
Tropical wet-and-dry
Dry
Semiarid
Arid
Temperate Marine
Mediterranean
Humid subtropical
Marine west coast
Temperate Continental
Humid continental
Subarctic
Polar
Tundra
Ice cap
Highlands

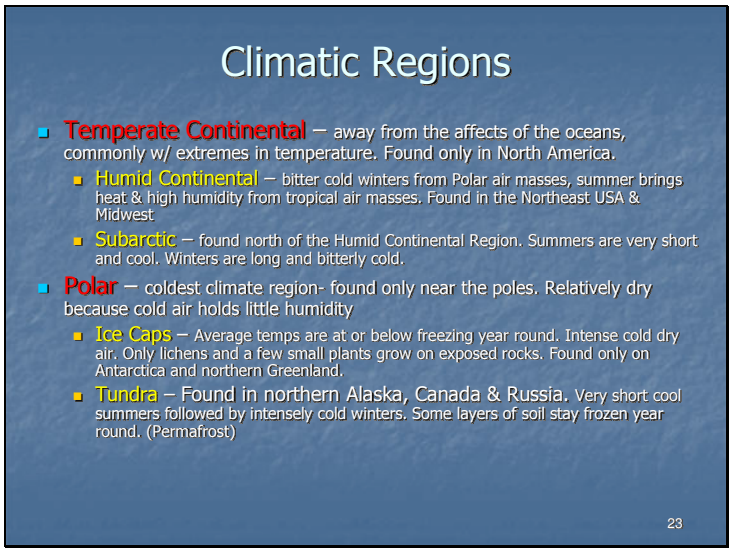
Slide 21


Climatic Regions
Tropical Rainy – low-lying lands near equator
Tropical Wet – Year round heat w/ heavy rainfall- Rain forest, in US only found on windward side of Hawaiian Islands.
Tropical Wet and Dry – distinct dry & rainy seasons. Savanna (tropical grasslands)
Dry – potential evaporation > potential precipitation (may be hot or cold)
Arid – deserts - have < 25 cm rain/year
Semiarid – a steppe –found on edge of deserts, dry but enough to grow grasses & low brush – grasslands & prairies
21

Slide 22


Climatic Regions
Temperate Marine – along coasts in temperate zone
Marine West Coast – west coast of continents north & south of 40° latitude. Pacific northwest – mild winters, Redwood forest. Associated w/ heavy precipitation
Mediterranean – drier & warmer than West Coast Marine. Mild w/ 2 seasons – summer (warm w/ little rain) & winter (cool w/ rainy weather) – chaparral vegetation types
Humid Subtropical – wet & warm (but not as hot as tropics) Summers are hot & humid w/ more rain than in the winters. SE USA, Florida, Georgia
22

Slide 23


Climatic Regions
Temperate Continental – away from the affects of the oceans, commonly w/ extremes in temperature. Found only in North America.
Humid Continental – bitter cold winters from Polar air masses, summer brings heat & high humidity from tropical air masses. Found in the Northeast USA & Midwest
Subarctic – found north of the Humid Continental Region. Summers are very short and cool. Winters are long and bitterly cold.
Polar – coldest climate region- found only near the poles. Relatively dry because cold air holds little humidity
Ice Caps – Average temps are at or below freezing year round. Intense cold dry air. Only lichens and a few small plants grow on exposed rocks. Found only on Antarctica and northern Greenland.
Tundra – Found in northern Alaska, Canada & Russia. Very short cool summers followed by intensely cold winters. Some layers of soil stay frozen year round. (Permafrost)
23

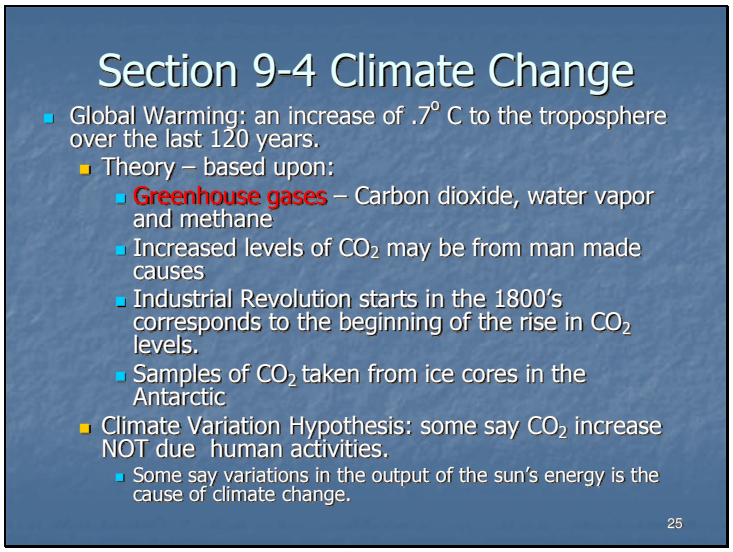
Slide 24

Climatic Regions

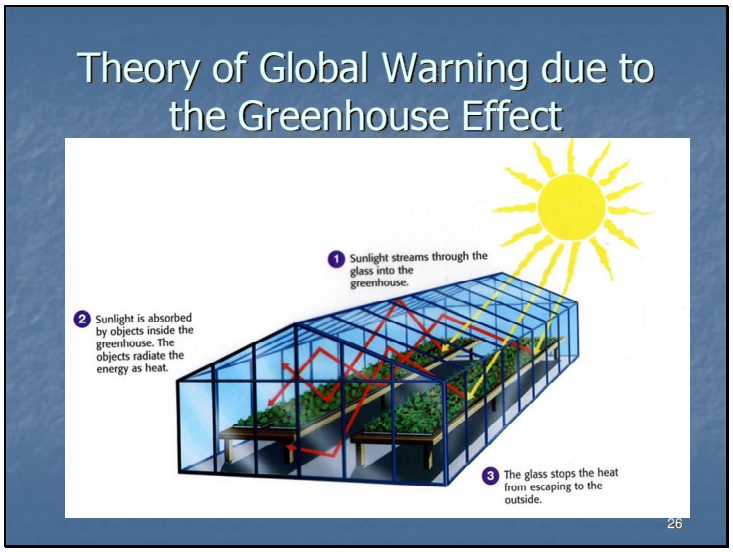
- **Highlands** – since temp drops as altitude increases, Highlands are colder than the regions that surround them.
  - Similar climate as latitudes farther North
    - Precipitation also increases as altitude increases until clouds dump remaining humidity.
  - 1000 meters in elevation is similar to going 1200 km north.

24

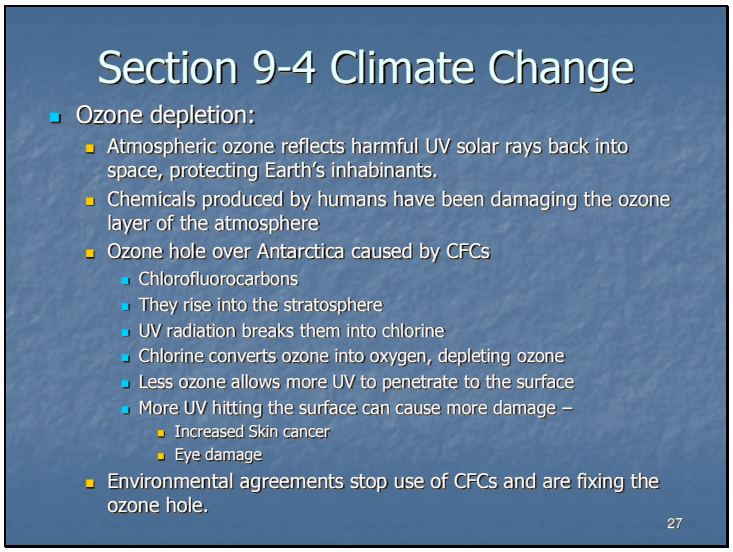
Slide 25


Section 9-4 Climate Change
Global Warming: an increase of .7° C to the troposphere over the last 120 years.
Theory – based upon:
Greenhouse gases – Carbon dioxide, water vapor and methane
Increased levels of CO_2 may be from man made causes
Industrial Revolution starts in the 1800's corresponds to the beginning of the rise in CO_2 levels.
Samples of CO_2 taken from ice cores in the Antarctic
Climate Variation Hypothesis: some say CO_2 increase NOT due human activities.
Some say variations in the output of the sun's energy is the cause of climate change.
25

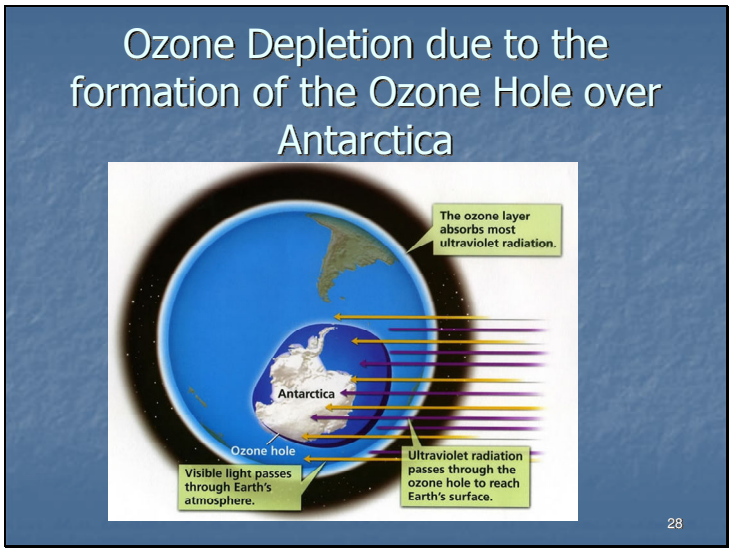
Slide 26


Theory of Global Warning due to the Greenhouse Effect
1 Sunlight streams through the glass into the greenhouse.
2 Sunlight is absorbed by objects inside the greenhouse. The objects radiate the energy as heat.
3 The glass stops the heat from escaping to the outside.
26

Slide 27


Section 9-4 Climate Change
Ozone depletion:
Atmospheric ozone reflects harmful UV solar rays back into space, protecting Earth's inhabinants.
Chemicals produced by humans have been damaging the ozone layer of the atmosphere
Ozone hole over Antarctica caused by CFCs
Chlorofluorocarbons
They rise into the stratosphere
UV radiation breaks them into chlorine
Chlorine converts ozone into oxygen, depleting ozone
Less ozone allows more UV to penetrate to the surface
More UV hitting the surface can cause more damage –
Increased Skin cancer
Eye damage
Environmental agreements stop use of CFCs and are fixing the ozone hole.
27

Slide 28


Ozone Depletion due to the formation of the Ozone Hole over Antarctica
The ozone layer absorbs most ultraviolet radiation.
Antarctica
Ozone hole
Visible light passes through Earth's atmosphere.
Ultraviolet radiation passes through the ozone hole to reach Earth's surface.
28