Name: _____ Study Guide

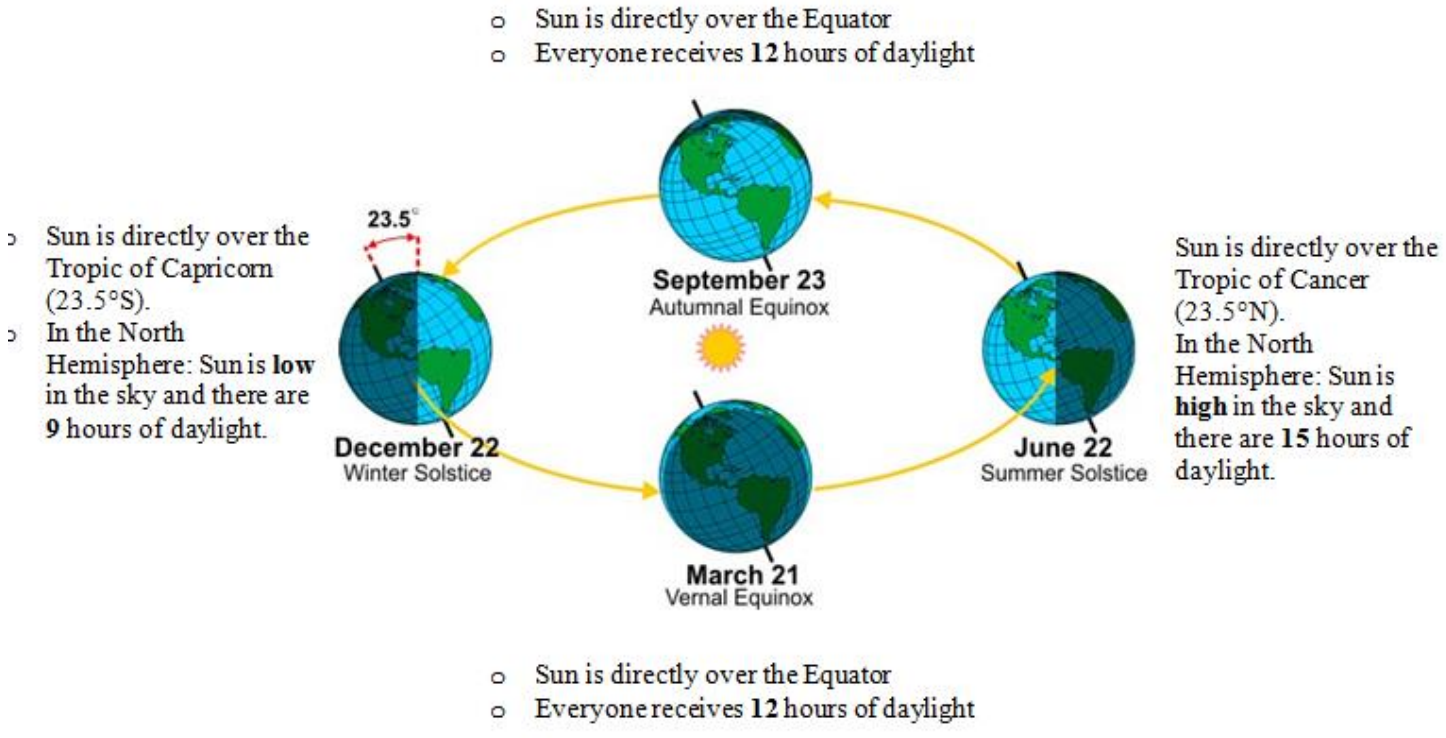
Topic 2: Seasons and Climate

Why do we have seasons?

- The seasons are NOT caused by being closer to or farther away from the sun!
  - **We are closer to the sun during winter**
  - **We are farthest from the sun during summer**

*****The seasons are caused by Earth's tilt and Earth's revolution around the sun.*****

- The **tilt** of earth affects the angle at which the sun's rays hit earth.
  - When rays strike at high angles they are more intense, concentrated, and heat the surface of the Earth more.
  - When rays strike at low angles, they are less intense, less concentrated, and do not heat the surface of the Earth as much.

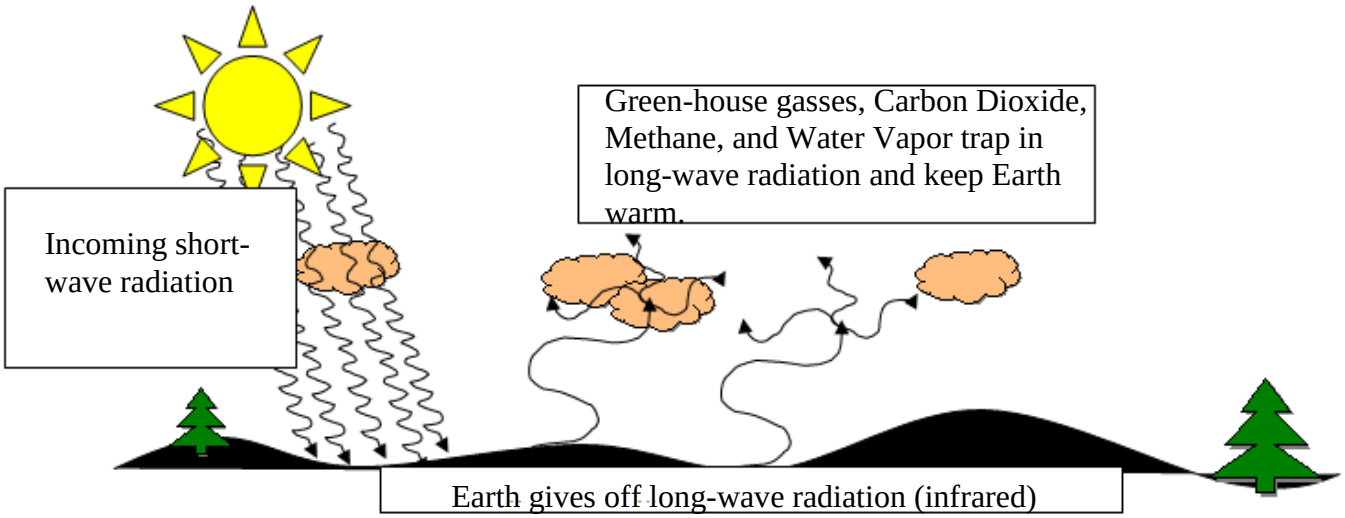


Times of Maximum and Minimum temperature

- During the year: have the lag of seasons
  - Maximum temperature is always after maximum insolation. (for us it is July and August)
  - Minimum temperature is always after minimum insolation. (for us it is January and February)

Insolation

Insolation: means sunshine (**IN**coming **SOLA**r radia**TION**)



- Insolation from the sun can be **reflected, refracted, scattered, or absorbed**, by the atmosphere.
- Insolation at Earth's Surface
  - The darker and rougher, the more insolation is **absorbed.**
  - **Angle of Insolation**: how high the sun is above the horizon (how high the sun is in the sky)
    1. **The Angle of Insolation is always greatest at local noon.**
    2. The Angle of Insolation is always greatest on **June 21st** in NYS in any given year.
    3. The **greater** the angle of insolation, the **more** insolation **absorbed** by the ground and the hotter it is!

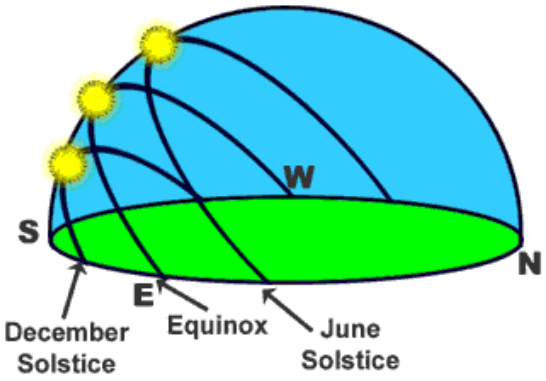
Specific Heat

- Not all substances heat up or cool down at the same rate.
- The heat needed to raise temperature of 1 gram of a substance by 1°C is called its specific heat. (see Ref Tables, page 1)
- What does it mean to say that something such as water has a **high specific heat**?

Means it heats up slow (takes lots of heat to make it warm,) and cools down SLOW (has to give lots of heat to make it cool)

What affects the angle of insolation?

- **Latitude**
  - Since the earth's axis is tilted 23.5° as it revolves around the sun, different latitudes have the sun directly overhead at local noon throughout the year.
    - On **June 21st (first day of summer)** the sun is highest in the northern hemisphere and lowest in the southern hemisphere.
    - On **December 21st (first day of winter)** the sun is lowest in the northern hemisphere and highest in the southern hemisphere.



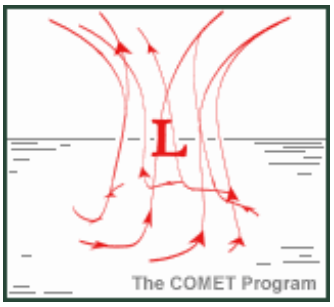
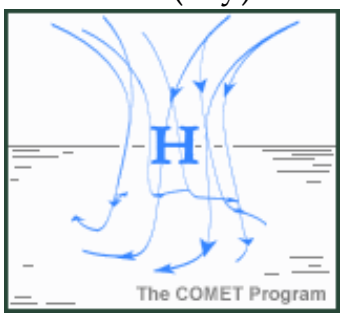
- **Time of Day**
  - The angle of insolation increases from dawn until local noon, then decreases from local noon to sunset.
  - Greatest at local noon, but never directly overhead in NYS. Sun is always to the south at local noon in NYS.
    - Why? NYS is too far north.

Climate

- **Climate:** the weather conditions in an area over a long period of time

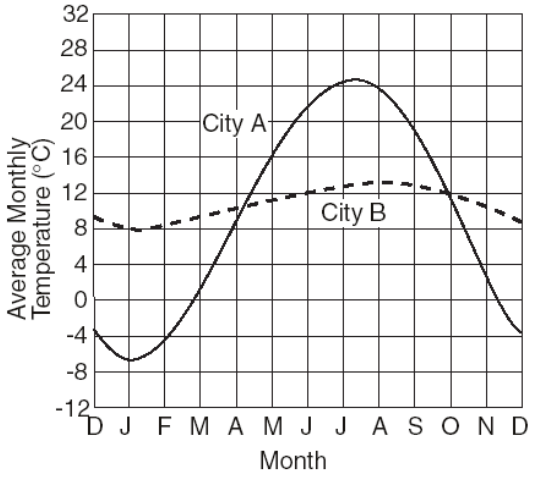
Factors Affecting Climate

- **Latitude**
  - As latitude increases, average temperature decreases.
  - Pressure Zones are affected by a location's latitude.

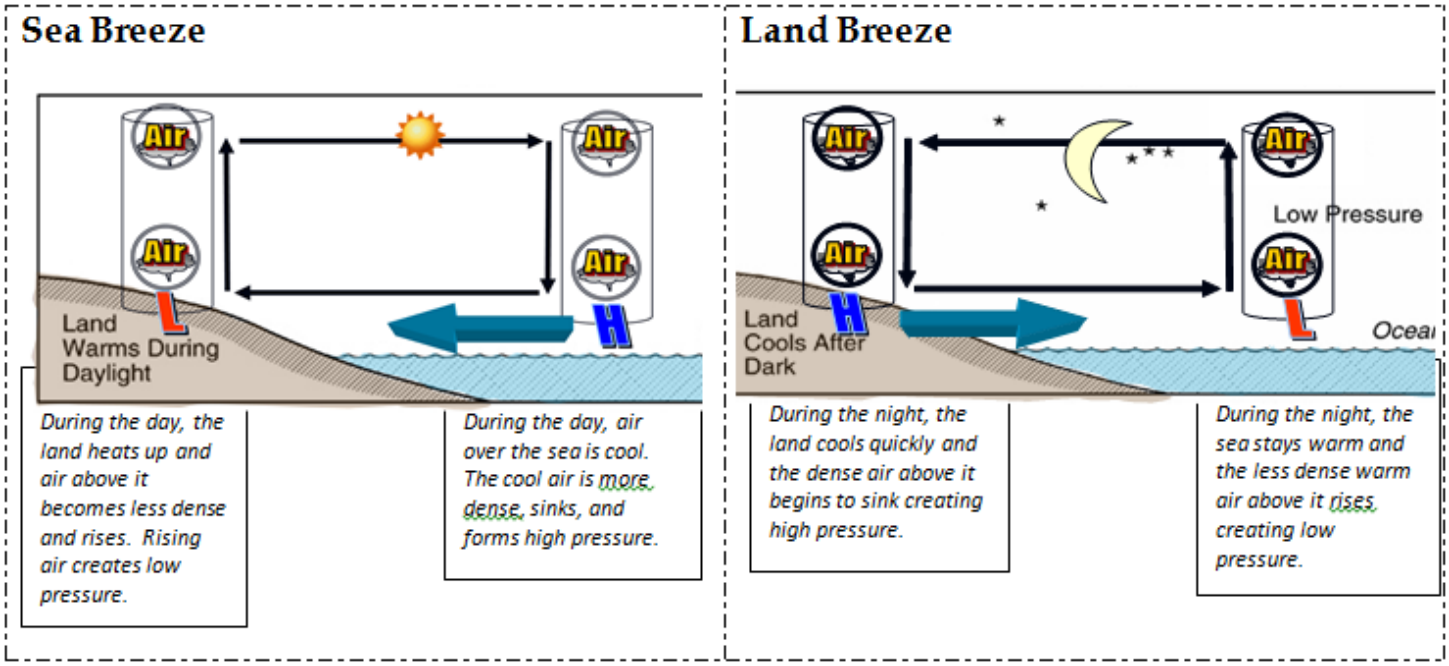
Rising Air	Sinking Air
▪ Found at 0° and 60° ▪ Precipitation is plentiful 	▪ Found at 30° and 90° ▪ Causes arid (dry) conditions 

- **Planetary Wind Belts** (see Ref. Tables, pg. 14)
  - Are caused by pressure differences in the atmosphere and curve due to the Coriolis Effect.

- **Large Bodies of Water have a moderating effect on climate**
  - **Marine climate** (ex: city B) - cooler summers and warmer winters
  - **Continental climate** (ex: city A) - hotter summers and colder winters.



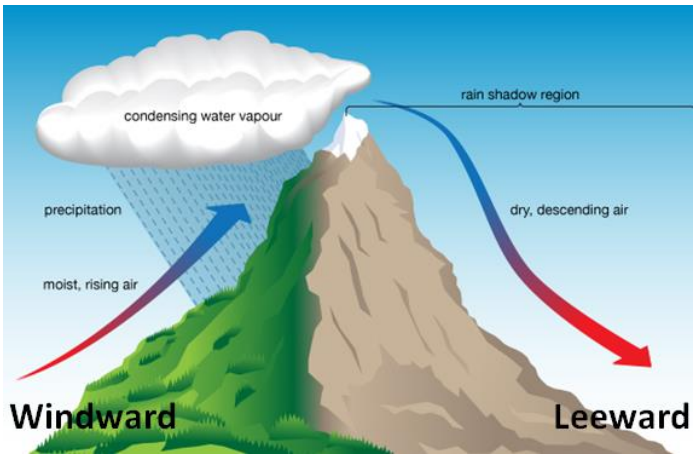
- **Land and Sea Breezes**
  - **Sea Breezes**: occurs during the day, when low pressure is over land and high pressure is over the sea. **Wind blows in towards the land from the sea.**
  - **Land Breeze**: occurs during the night, when low pressure is over the sea and high pressure is over the land. **Wind blows out to sea from land.**



- **Ocean Currents**
  - "Pushed" by the global winds and affected by the Coriolis Effect.
  - **Cold ocean currents** (from the poles) bring cold, dry climates.
  - **Warm ocean currents** (from the equator) bring warm, moist climates.

- **Mountains**

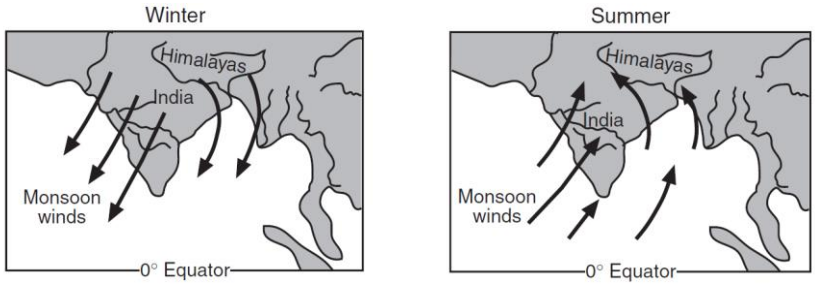
Windward: the side of the mountain that is exposed to wind, experiences heavy precipitation and has lots of vegetation



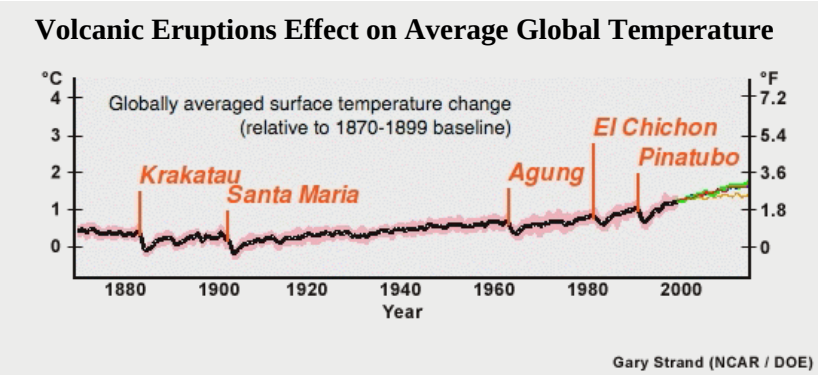
Leeward: the side of the mountain that is shelter by the wind and is usually dry with very little vegetation

Natural events that affect climate

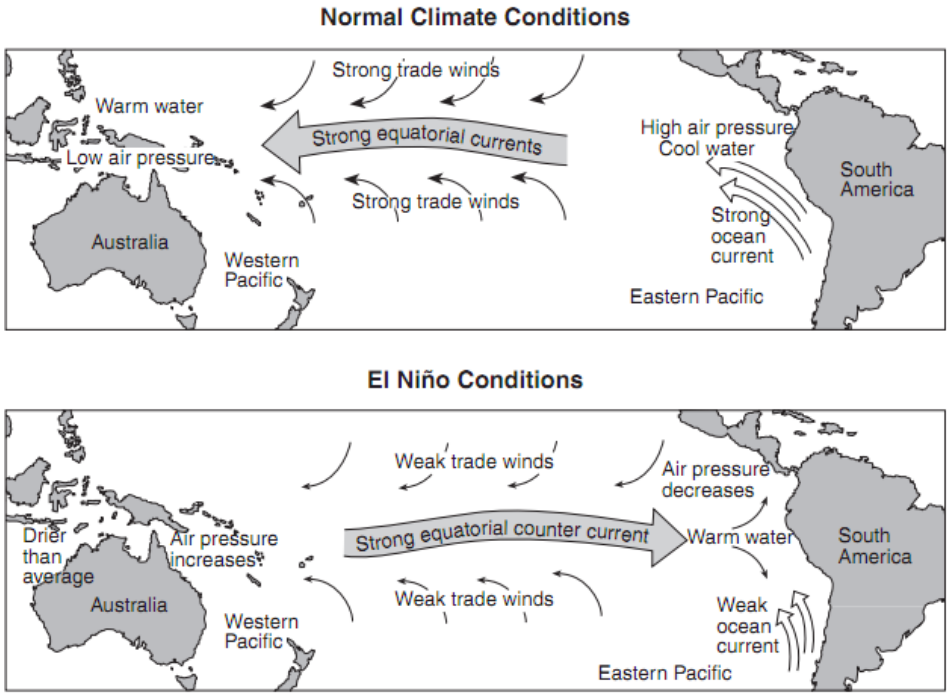
- **Monsoons**: Caused by a seasonal shift in the wind direction, which produces excessive rainfall in many parts of the world, most notably India. In the summer, unequal heating of the land versus the water causes winds to move from the ocean to land bringing much precipitation.



- **Volcanic Eruptions**: Add dust to the atmosphere which blocks sunlight and causes less insolation to reach the ground causing cooler temperatures.



- **El Nino:** A series of weather changes on Earth caused by a change from cold surface ocean water to warm surface ocean water in the eastern Pacific Ocean off western South America.



Climate Change

- **Climate Change:** refers to general **changes** in **climate** patterns, including temperature, precipitation, winds, and other factors.
- **Greenhouse Effect:** a natural warming of Earth's surface and atmosphere. It is caused by gases in the air that trap energy from the sun.
    - **Greenhouse gases:** gases that trap heat (infrared radiation): *water vapor*, *carbon dioxide*, *methane*.
- **Global Warming:** an unnatural warming of the Earth's atmosphere due to an increase of greenhouse gases caused by human activity.
    - **Effects:** glaciers melting, ocean levels are rising, intensified weather events