Weather Dynamics

Weather Dynamics:

_____

_____

The main components of Earth that affects weather are:

1) _____

*2)*_____

*3)*_____

What's the difference between weather and climate ?

Weather -

_____

_____

_____.

ex. weeks weather in St. John's ion January could be mild, rainy, with a temperature of 2 C

Climate -

_____

_____

_____

ex. The climate in st. Johns in January is cold , snowy, windy, with an average day tempertaure of -5 C

Why does weather change?

- _____

-_____

-much solar radiation is reflected back into space

-the percentage reflected back is called albedo

-_____

Global Geography:

Longitude -
_____
_____.

Latitude –
_____.

Areas of the Earth.

Tropical Region (Tropics) - *region located between the*
_____.

Polar Regions - *Region north of the Arctic Circle*
_____.

Mid-latitude Regions - *Regions between*_____.

Special Lines of Latitude

Northern Hemisphere:

_____***North latitude***
it is the most northerly latitude reached by sun's vertical rays . it is reached on the first day of summer in the northern hemisphere, ***approx. June 21st***

_____ ***North latitude***
most northern latitude reached by the suns rays on the first day of winter in the Northern hemisphere ***approx. December 21st***

Southern Hemisphere

_____***South latitude***
most southerly latitude reached by the sun's vertical rays. It is reached on the firs day of summer in the southern ***hemisphere approx. December 21st***

_____***South latitude***
most southerly latitude reached by the sun's rays on the first day of winter in the southern hemisphere, ***approx. June 21st***

Earth's energy Balance

- _____
- -some of the energy is used to grow plants

-

- the energy balance keeps earth's temperature at about 15 C

Energy transfer

- -occurs in _____.
- -they are all involved in earth's weather.

-These include:

-
-
-
-

How does heat energy get moved around to these different areas of the earth?

1._____ is the transfer of energy by waves travelling at 300 000 000 m/s.

- Radiation _____ a medium. This means it can travel through empty space.
- _____ is one form of radiation that reaches us from the sun via empty space.
- Visible light is only one part of the _____.

What are some other kinds of light waves? **Fig 4 pg 506**

2. _____is the transfer of energy through the collision of particles in a solid.

- A pan on a stove element heats up by _____.
- Some materials are better _____ of heat than others.
- _____s are generally better conductors than materials like rock, sand, wood.

3. _____.is the transfer of energy _____ by movement of particles in

a _____ (water or atmosphere).
can be gas or liquid

4. _____is the transfer of energy _____ by movement of particles

in _____(water or atmosphere).

Lesson 2 : Solar Radiation

Reflection and Absorption of energy

Solar Energy...

_____ is the Earth's main source of electromagnetic radiation. Not all of the _____ reaching the Earth's atmosphere actually reaches the land and water.

What happens to the radiant energy from the sun that reaches the Earth?

- _____is reflected by clouds and never reaches the Earth surface
- _____is reflected off the earth's surface back into space
- the land and oceans absorb _____of the suns energy
- the clouds absorb_____of this energy

The_____ (percentage of light reflected) of a material will determine how much radiation is reflected.

Clean snow has a _____ albedo whereas black soil has a _____ albedo.

Any material that absorbs energy and becomes warmer is called _____. The oceans are _____ whereas soil and rock are _____.

Heat Capacity:

- The _____ of a substance will indicate whether a substance is agood heat sink or not.

- Heat capacity is a measure of how much heat it takes to raise the _____ of an object by _____ degree, .

- The heat capacity of water is _____.

- It takes 4.18 J to raise ____g of water by___1C

What makes a good heat sink?

- -heat up _____ and cool of_____

- high heat capacity : _____

- -releases _____ heat as it _____ than a substance with a low heat capacity

Why are oceans good heat sinks?

- has high heat capacity because it can hold a lot more heat

- _____

- -solar energy causes particles to move and set up _____ currents

  transferring the energy _____

What makes a poor heat sink?

- tends to _____ and _____ off _____

- has a low heat capacity:_____

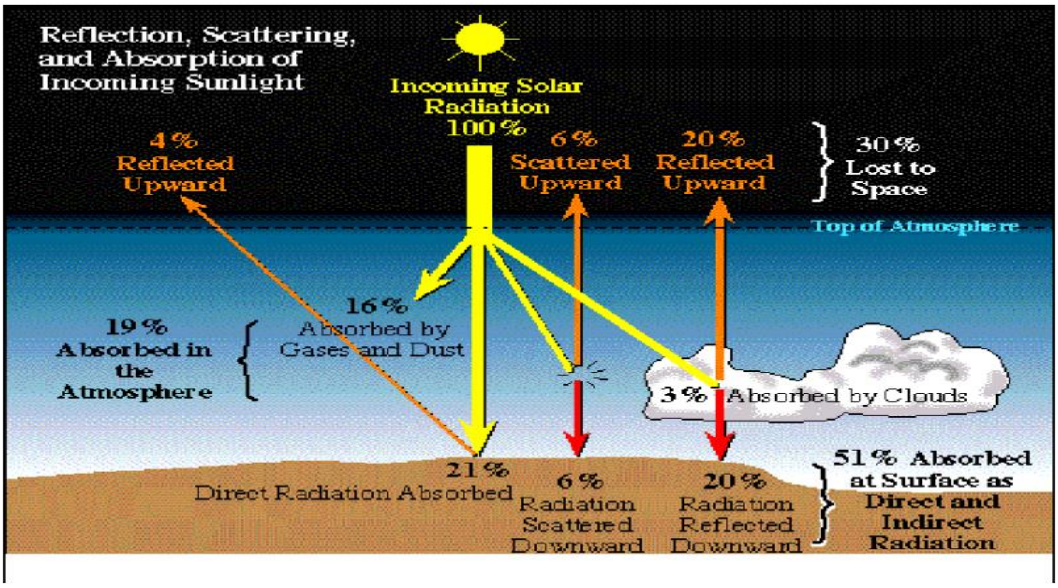
Why is soil a poor heat sink?

- _____ heat capacity
- _____ particles do not set up convection currents
- conduction occurs very _____ so there is no deep energy transfer

How does this affect our weather?

- solar energy that is reflected does not raise temperatures
- -heat sinks can increase temps

examples??
OCEANS!
Spring/summer...
Fall/winter...



Lesson 3: The Atmosphere

Student Notes

The _____ is the layer of air and moisture that surrounds the Earth.

The common atmospheric gases are _____(21%), _____ (78%), _____, and _____.
The _____of the atmosphere varies with height above sea level(_____ at sea level).

_____ *is the height(m or km) above sea level*.
The atmosphere is _____ above the equator than it is above the poles.

Warmer air takes up more space because warmer air _____.

Consists of 5 layers based on altitude and temperature

Layers of the Atmosphere

1. Troposphere

- -the layer _____ to the Earth's surface
- _____ (above the equator) and _____at the poles
- the atmosphere is _____ at the equator than at the poles due to the _____ temperatures which causes the air to _____ and to the spinning of the earth on its axis
- most of our_____ occurs in this layer.
- -contains most of the_____
- -the upper part of this layer is _____ than the lower part
- _____ Gradient - The change in temperature over a distance. The troposphere has a temperature gradient of -60 C per 1000 m (vertical distance)
- -ranges from ____ C at the surface to ____C at the top

2. Tropopause

- _____ boundary over the troposphere

- -here temperature _____increases rather than decreases due to the amount of_____, which absorbs more UV radiation

3. Stratosphere

- -a _____ layer located between _____km and ____ km above the Earth's surface.

- _____ steady winds and _____ weather changes

- the _____ moves through this layer temperature increases to apprx. 10 C

- This layer contains_____ **concentrations of ozone**. Ozone protects the Earth from harmful doses of ultraviolet given off by the sun. The ozone also causes the stratosphere to be warmer.

4. Mesosphere

- the middle layer extends from _____ km to____ km.

- temperature _____ as you move up through thislayer

- -This layer has _____concentrations of gases and_____ temperatures (-75°C).

5. Thermosphere

- -extends from _____ km to _____ km.

- _____ from the sun are absorbed here so temperature goes up average temperature is 30 C

- also called the **ionosphere** because the _____ from the sun causes molecules to become ionized

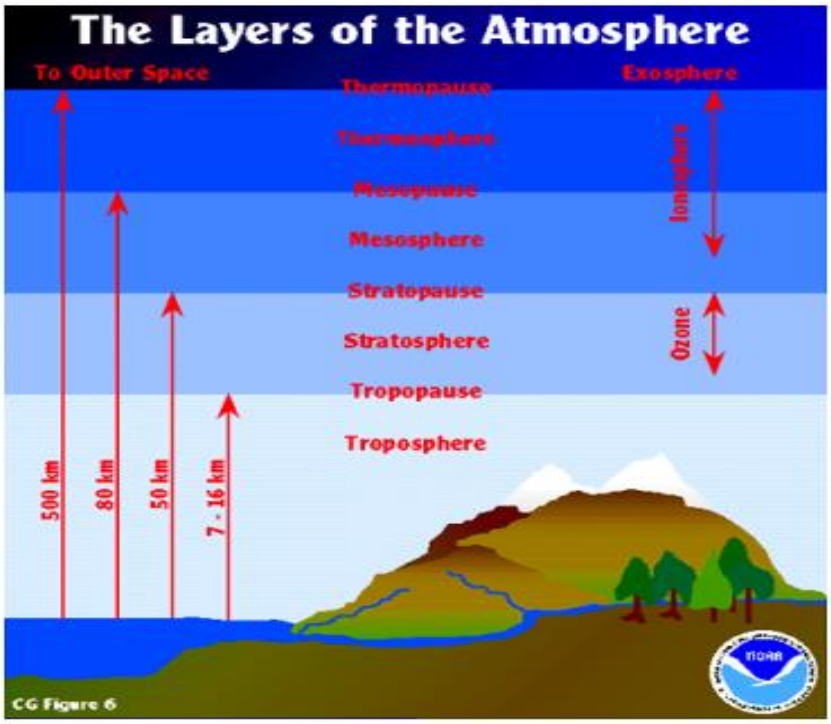
- -the sun's radiation cause the particles in this layer to become _____charged to produce the northern and southern lights.(Aurora Borealis)

6. Exosphere

- _____ km & up

- The_____ outer part of our atmosphere. There are very few particles(mainly hydrogen) in this layer.

- temperature _____ and can be called outer space



What is the atmospheres role in supporting and protecting earth?

The atmosphere makes life possible because:

- _____ and _____in the atmosphere are needed to support life

- _____ is needed for green plants, ozone absorbs UV radiation which prevents the burning of plants and animals
- it plays a major role in the _____ all organism need clean water
- it regulates _____ by keeping the average temperature within a life supporting range because water vapor and gases like CO2 trap energy during the day and release it slowly during the night

- it protects the earth surface from _____, most often burn up as they enter the atmosphere

Atmospheric Pressure

_____ - the pressure the air exerts as gravity pulls it toward the Earth.

Atmospheric pressure is _____ at sea level and generally _____ with altitude

Atmospheric pressure is influenced by:

- altitude

- and rising and falling of air
  - as altitude_____ the atmosphere _____

  - _____ air has _____ pressure than falling air

Atmospheric pressure is measured in kilopascals.

The average atmospheric pressure at sea level is_____ kPa.

_____ weather system have atmospheric pressure _____ **than 101.3kpa**

_____ weather systems have atmospheric pressure _____ **than 101.3kpa**

Atmospheric pressure is measured with a Barometer.

Lesson 4: Seasons

- The Earth travels _____ the sun _____ full time per year.

- During the year, the _____change depending on the amount of_____ reaching parts of the earth.
- The seasons are caused because the Earth is _____ degrees on its axis.

- Summer happens to the hemisphere tilted _____ the Sun, and winter happens to the hemisphere tilted _____ from the Sun.
- That means that when it is summer in the _____ Hemisphere, it is winter in the _____ Hemisphere.

- The hemisphere experiencing summer, tilted towards the Sun, has _____ days and _____ nights than the hemisphere tilted away from the Sun.

Seasons and Angle of the Sun

Summer Solstice:

- On _____, the Northern Hemisphere is having its summer solstice because it is tilted _____ the Sun. This is the "_____ day" meaning most hours of daylight. The _____Hemisphere starts its summer. The sun is over The Tropic of_____
- The _____ Hemisphere is having its winter solstice, because it is tilted _____from the Sun. The Southern Hemisphere starts its_____.

Autumnal Equinox:

- On _____ (the autumnal equinox) the sun is over the equator and there are _____hours of daylight and darkness. Sun hits the earth at the _____. Northern hemisphere starts _____ and _____hemisphere starts spring.

Winter Solstice:

- On _____, The Northern Hemisphere is having its winter solistice , the _____ day of the year. The earth is tilted _____ from the sun. The sun is over the Tropic of _____. Northern hemisphere starts _____, southern hemisphere starts _____.

Vernal Equinox:

- _____, (vernal equinox) the sun is again over the _____. Northern hemisphere starts _____ and this day has _____ hours of daylight and darkness. Southern hemisphere starts its_____.

In general, summer and winter temperatures get _____ the further you travel from the equator.

At the equator, there are _____seasons because each day the Sun strikes at about the ____ angle. Every day of the year the equator receives about _____hours of sunlight.

The poles remain _____ because they are never tilted in the direct path of the sunlight.

Light must travel through so much atmosphere that much of it is scattered before reaching the Earth surface. During midwinter, when a pole is tilted away from the Sun, there is _____daylight at all at the pole. The Sun never _____. However, during the summer, a pole receives sunlight ____ the time and there is no _____!

Lesson 5: Water Cycle

The Hydrosphere

- The _____ is made up of both _____ and _____ water found on Earth.

- Approximately _____of the Earth's surface is water.

- Only _____of all water is fresh.

- Of this 2.5 % , most of the fresh water on Earth is frozen in _____ and in The_____.

The Water Cycle

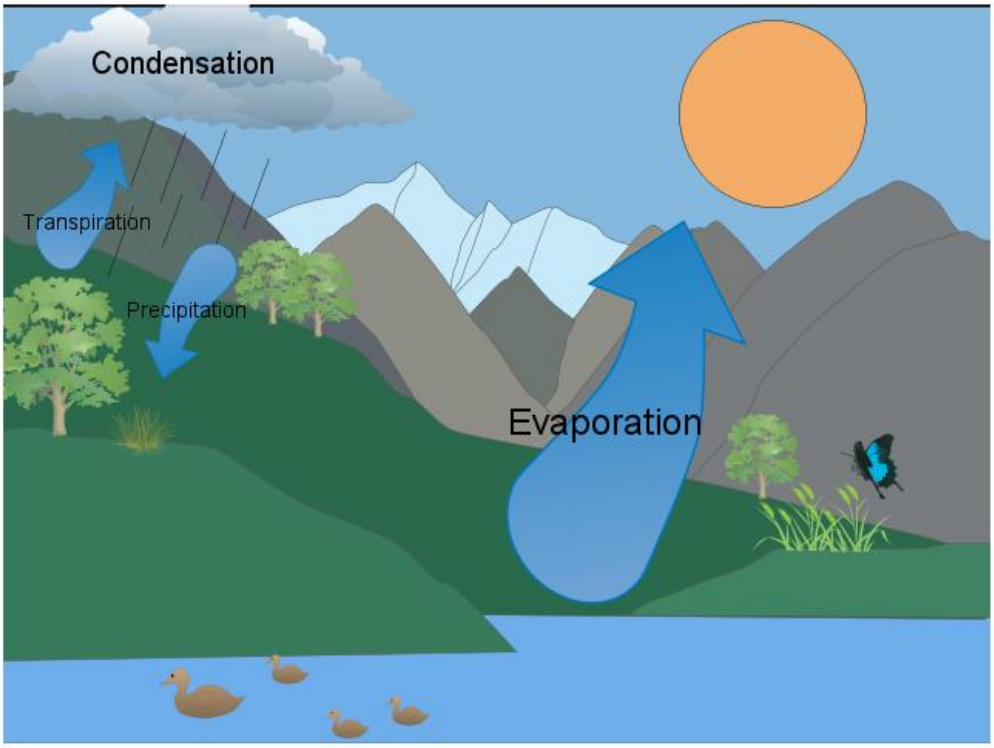
The _____ provides the energy for the water cycle.

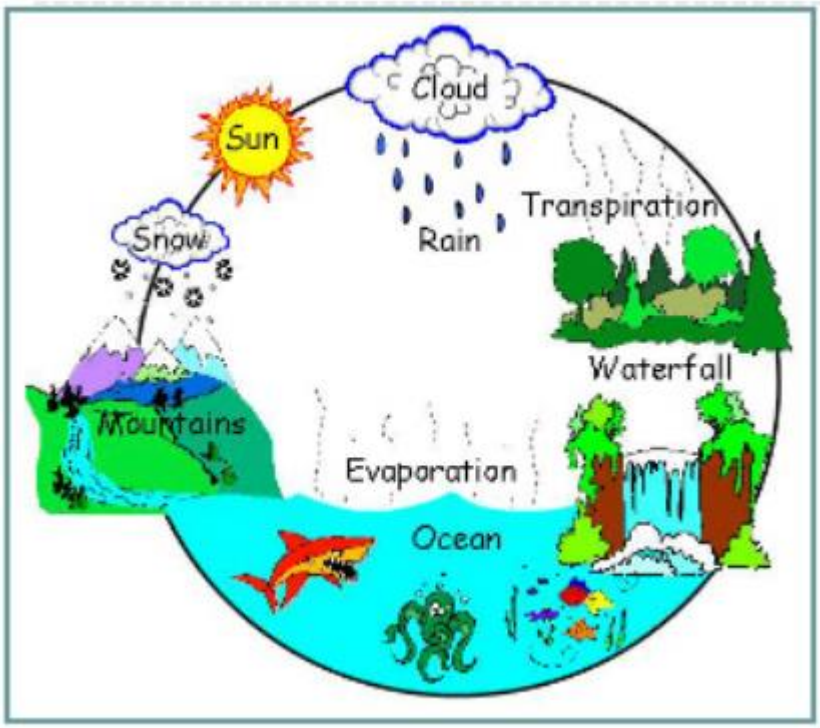
The water cycle causes _____ to circulate which creates much of weather.
Evaporation - _____
.
Sublimation -
_____

Condensation - _____.

Transpiration - _____

Do plants sweat?
Well, sort of.... people perspire (sweat) and plants transpire. Transpiration is the process by which plants _____ out of their leaves. Transpiration gives _____a bit of a hand in getting the water vapor back up into the air.


Condensation
Transpiration
Precipitation
Evaporation


Cloud
Sun
Snow
Rain
Transpiration
Waterfall
Mountains
Evaporation
Ocean

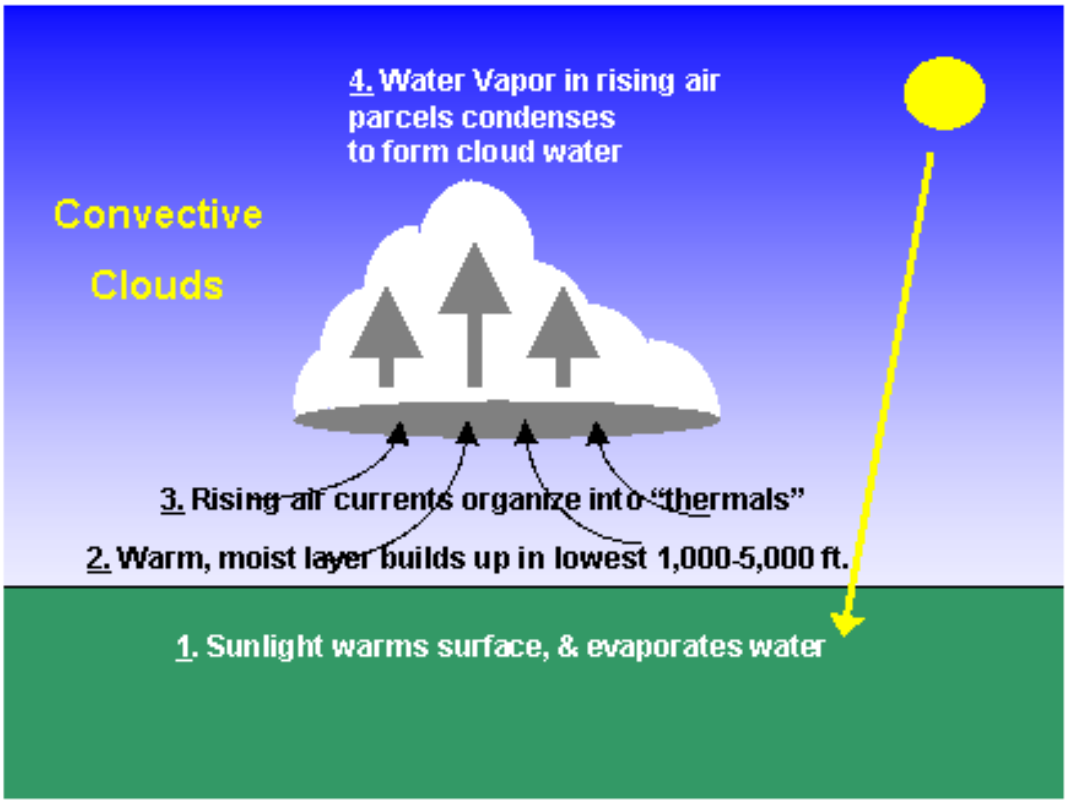
Lesson 6 :Cloud Formation

Solar energy _____ up water causing _____. This mixture of water vapor and heated air rises in the atmosphere.

As the moist air _____, air pressure and temperature_____, causing _____ to occur to form _____.

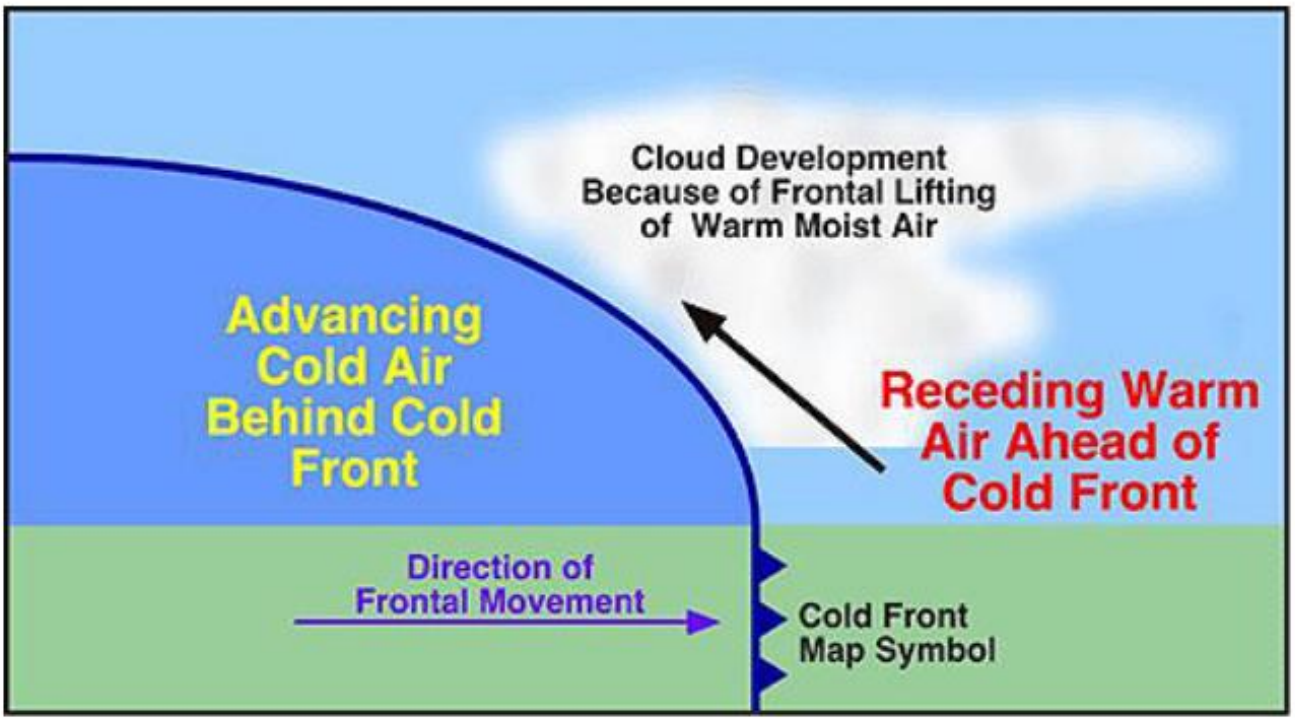
Three Categories of Clouds

1. Convective Clouds - form when air _____r the ground absorbs energy from _____ surfaces and _____ in the atmosphere. The water vapor_____ and_____, forming clouds. Most clouds are convective.



2. Frontal Clouds - form where the _____ edge, or front, of a large moving mass of air meets another mass of air at a _____ temperature.

Warm air contains _____ water vapor and _____ over the cold air mass. The _____ warm air will _____, _____ and water vapor _____ to form clouds.



Frontal clouds give rise to warm and cold fronts.

Cold front:

- as _____ air collides with_____ air it forces its way_____ the warm air forming a steep front where they meet

- the warm air _____ high into the atmosphere and _____ to form, clouds (_____)

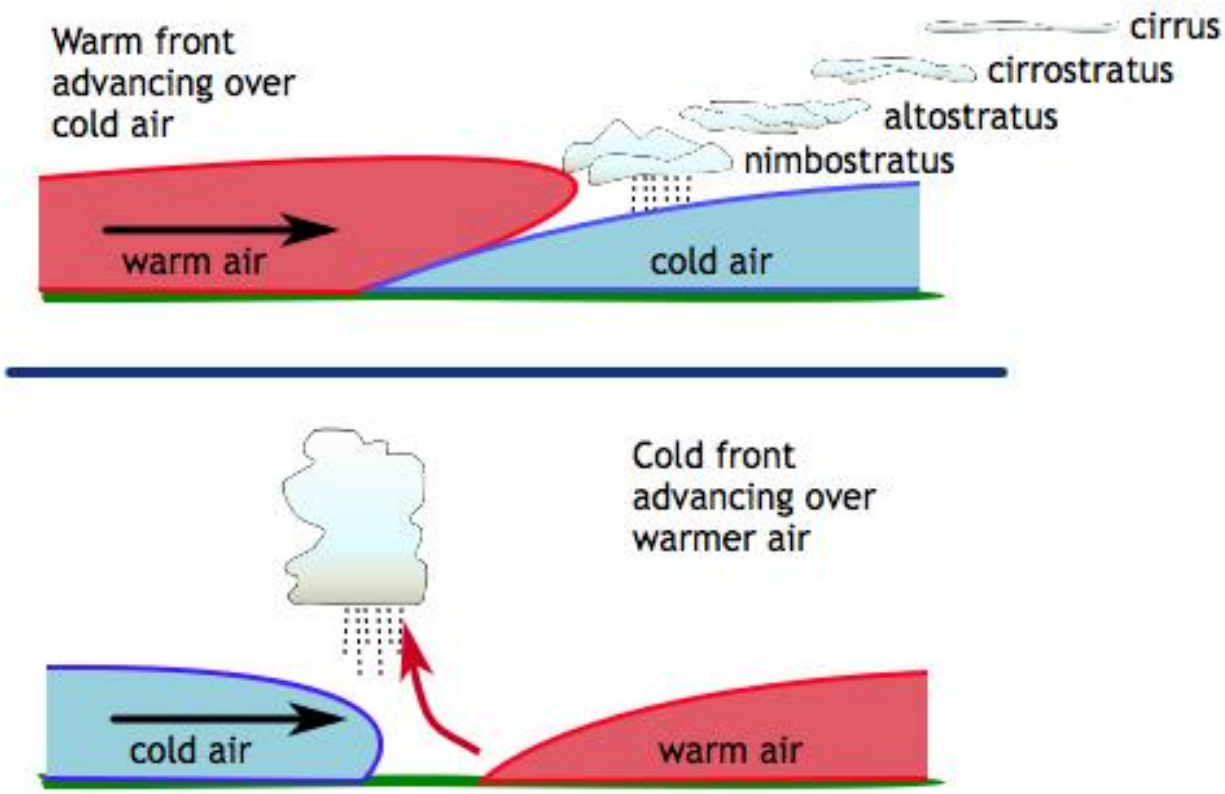
- _____ precipitation falls but only lasts for a _____.
- weather _____ as the cold front passes

Warm front:

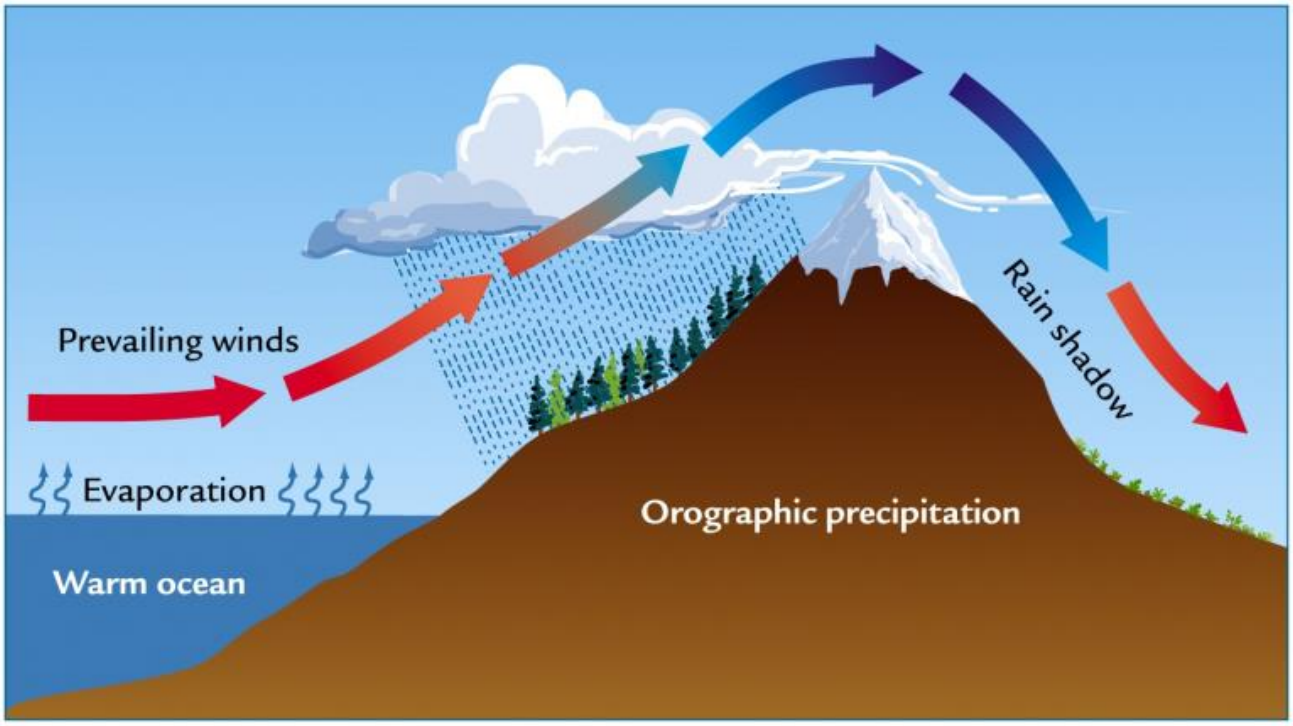
- warmer air is _____ dense and contains _____ water vapor than cool air does,

- warm air mass_____ and move _____ cold air, it _____ and _____ so that its water vapor condenses to form clouds

- eventually release precipitation that can last for _____ or until front passes.



3. Orographic Clouds - form when _____,_____t air moves up a mountain, _____ at the _____ pressure, and _____. Clouds are formed when water vapor in this air cools and condenses.



Fog

- Fog is actually a _____at _____ level. Air _____ the ground cools (especially on clear nights) and water vapor _____ into fog.

- There are a number of different types of fog.

- These include:
  - energy near the surface radiates _____, but is not reflected back to earth by clouds. The air near the ground _____ allowing the water vapor to condense into fog.

- When warm air passes over _____. A sharp _____ in the temperature of the warm air causes the moisture to condense and form fog.
- When warm air meets either _____ ocean current of colder air at the shoreline. This is type of fog found in _____

Cloud Classification - Two General Shapes

1. Cumulus clouds

- -These clouds have a_____ billowing shape.
- -derived from the word _____
- -They tend to grow _____, usually indicating _____ weather.

2. Stratus clouds

- These clouds have a _____shape.
- -derived from the word meaning _____ created from a warm air front over rides a colder air mass
- -They tend to grow _____ and usually indicate _____ conditions.

Rules for naming clouds

Clouds are also given names according to their _____.

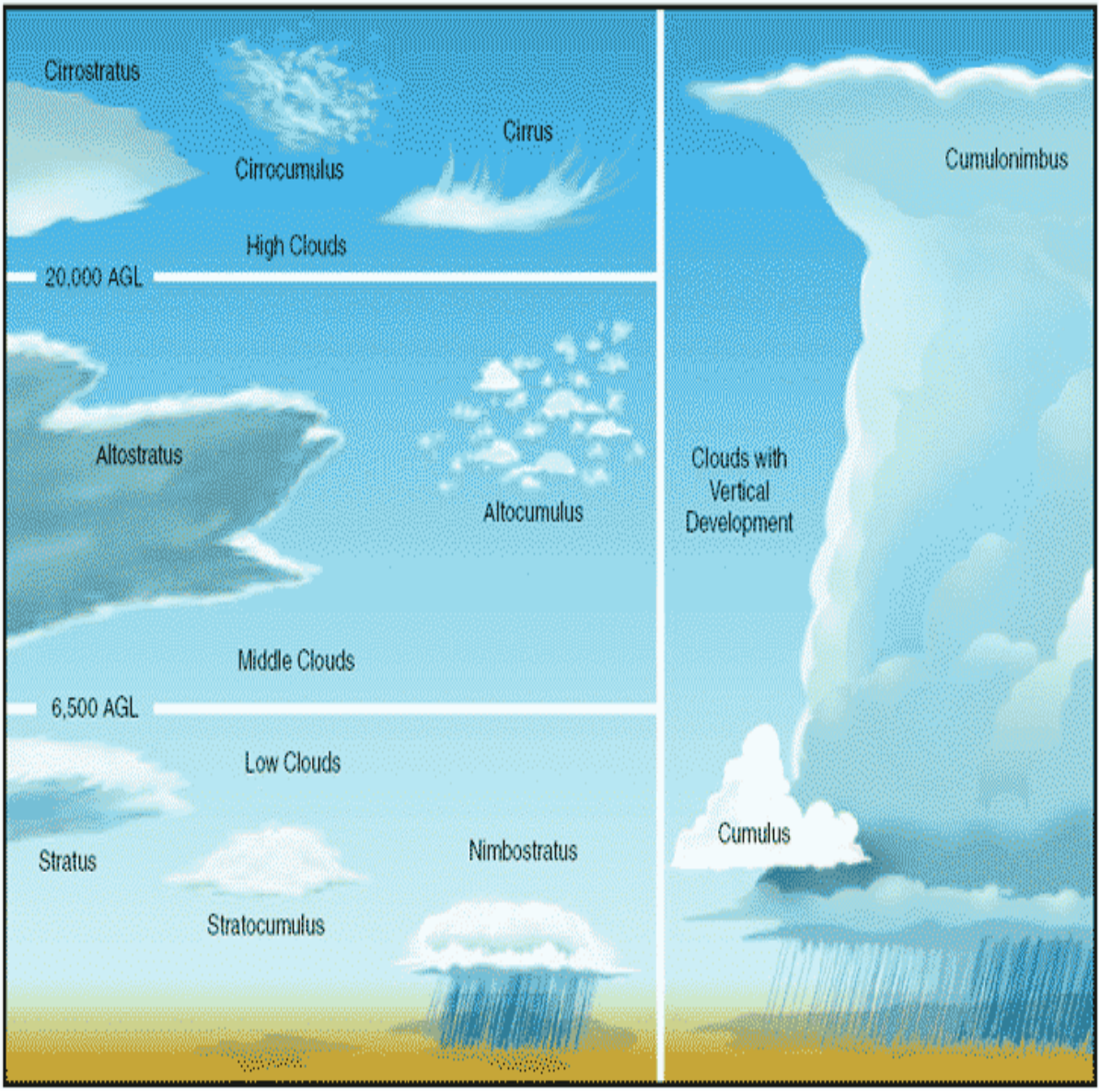
cirro - _____ clouds (means curly lock of hair)

alto - _____height clouds

stratus, cumulus, stratocumulus - _____clouds

nimbus - rain-holding cloud, these are _____ clouds

(Text: P.533 figure 7 shows 10 types of clou



Precipitation

_____

Types of Precipitation

_____- fine water droplets (40 micrometers to 0.5mm)

_____ - falling water droplets (0.5mm to 5 mm)

_____- raindrops that freeze instantly on contact with a cold surface

_____ - crystallized water vapour at temperatures below freezing

_____ - also called ice pellets

- form when snow partially melts as it falls but then refreezes by passing through a layer of air that is below freezing

_____ - solid form of precipitation formed in cumulonimbus clouds

_____ - water vapor condensed on cool surfaces near the ground

_____ - water vapour that sublimates on cold surfaces (below freezing)

Lesson 8 : Ocean currents

Why are oceans so important for weather and climate?

Oceans and Major Ocean Currents

The oceans have an important effect on _____.

1. The oceans occupy a _____ portion of the Earth's surface. Water's _____ heat

   capacity will affect _____ changes in a given area.

   In Newfoundland...

   In _____ in Newfoundland_____ ocean waters keep regions along the coast cooler than _____, while in _____ the warmer ocean water keeps coastal regions _____ than inland

2. Since there is a _____ amount of water at the equator, where the sun is most

   direct, ocean currents act as _____ to transport _____ energy around the world.

The major ocean currents are shown in figure 1 on page 525 of your text.

Note that
the direction of the major ocean currents are similar to the directions of the major winds.

Results of currents:

-_____ winters with ice _____ harbors for many northern countries that are

affected by the _____.

eg, Ireland, England, Norway

-_____ currents from Northern and far Southern regions are _____ as they

migrate near the equator,

Eg, _____

Causes of Ocean Currents

1. **Solar heating of the oceans near the equator sets up convection currents.**.

   This warm water _____

2. **Winds across the oceans**

   at the equator the _____, and the tendency

   of the water to be deflected by the _____ affect, the currents flow _____

   further **north and south** the **prevailing winds are _____** and

   the currents are influenced by the Corelais effect they flow _____**.**

3. **The salt content affects ocean currents.**

   As water evaporates, sea water becomes _____, setting up deep water convection currents.

4. **The Earth's rotation**

   _____ rotation of the earth causes the **west side** currents to flow_____ and

   travel at speed of_____

   while the currents on the eastern side are _____ and travel at a speed of _____

5. **Shape of the continents**

   as currents come close to the continents they are forced to flow along the_____.

As a result of the movement of ocean waters:

east coast continents have _____ocean currents flowing along the coastline

while the **west coast** has _____ ocean currents along the coastline

Effects of Ocean Currents

1. Creation of Rain Forests

Warm currents _____ the air above them. This warm air carries_____ moisture.

When this warm, moist air blows onshore, _____quantities of precipitation often result.

eg. Southeast Asia and Brazil

2. Creation of Deserts

Cold currents _____ the air above them. Cold air does not carry _____ moisture.

This cool, dry air creates _____ conditions when it blows onshore.

eg. Peru and west coast of Africa

3. **Moderation of Climate**

Coastal areas have _____ summers and _____ winters because of the high heat capacity of the ocean
.
The ocean takes a _____ time to_____l down and so it is _____ than the land in the **fall and winter.**

It also takes a_____ time to _____t up so it is colder than the land in **the spring and summer.**

3. **Warming currents keep harbors _____of ice in the winter.**

eg, Ireland, England,, Norway