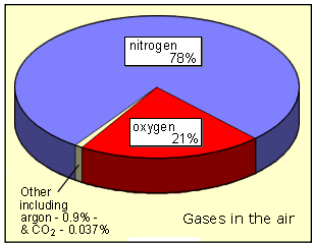
Atmosphere: Meteorology

Characteristics of Atmosphere



Study of atmosphere is called _____.

_____ – general condition of atmosphere at a particular time & place

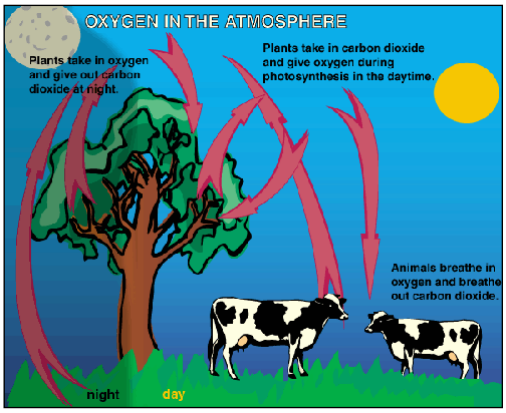
_____ – general weather conditions over many years

Our atmosphere is a mixture of chemical elements and compounds. The most abundant element is _____ and the most abundant compounds are _____ and _____.

O_3 (_____) is another important substance in our atmosphere. It is important in the upper atmosphere to protect us from _____, which cause _____ and can lead to _____.

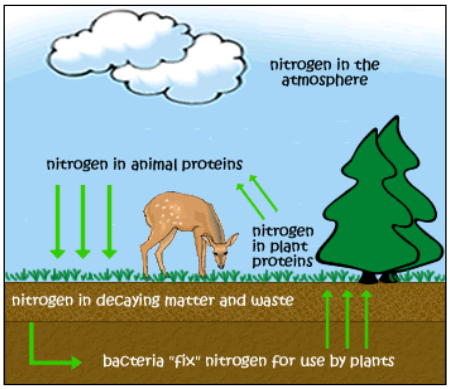
Oxygen in the Atmosphere:

Maintained by _____ that _____ the atmosphere.



Nitrogen in the Atmosphere:

Nitrogen moves from _____ to _____ to _____ and then back again to the _____.



Atmospheric Pressure:

Ratio of _____ to the area of the surface on which it presses.

- At higher altitudes, _____ air therefore _____ weight which means _____ pressure
- At lower altitudes, _____ air therefore _____ weight which means _____ pressure

For example:

_____ – instrument used to measure atmospheric pressure

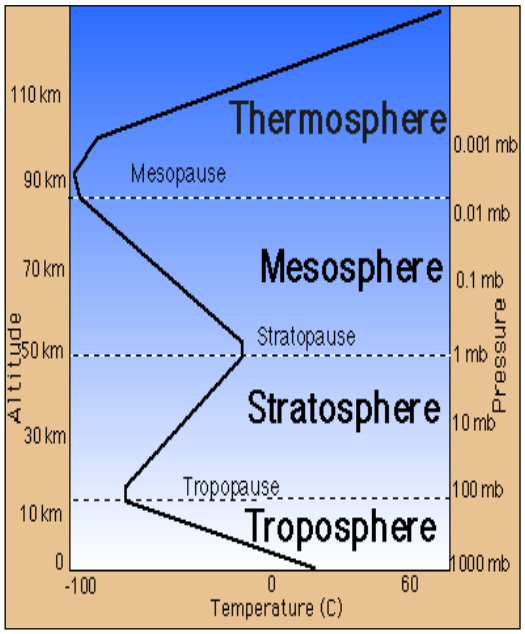
Two Types: 1. _____ Barometer – uses liquid mercury

(Std. Pressure = 760 mm Hg = 1 atm)

2. _____ Barometer – "without liquid", no Hg used – it's a sealed container without air

LAYERS OF ATMOSPHERE

No distinct changes in pressure BUT do see changes in _____ with increasing _____.



_____ - layer closest to earth

- Temp. decreases as you go higher
- Layer where weather occurs

_____ - contains almost all atmospheric ozone
- temperature increases as you go higher

_____ - temperature decreases as you go Higher
- coldest layer of atmosphere

_____ - temperature increases as you go Higher

- difficult to measure temp. here because air is so thin

- contains 2 regions:

- _____ – transmits radio waves

-_____ – last part of our atmosphere, borders with space

AIR POLLUTION

Any substance in the atmosphere that is harmful

(examples: _____)

_____ – gases from burning fossil fuels combine with water in atmosphere and form acids which fall as rain or snow

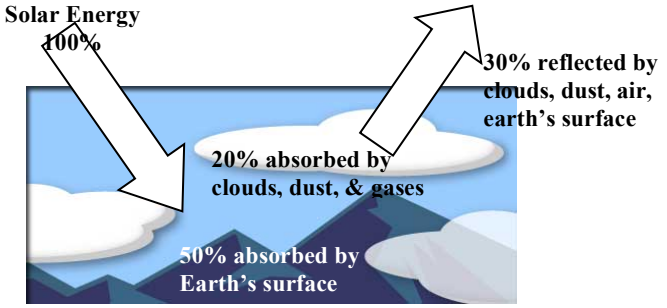
_____ – general term for air pollution, combined term for smoke and fog

Solar Energy & Atmosphere

_____ – all forms of energy that travel through space as waves

- _____ is the form that we see, but most is _____ to human eyes.
- All of these make up the _____ and are referred to as _____.

_____, _____, and _____ affect the path of radiation from the sun and cause them to _____.



_____ percent absorbed by Earth

_____ percent absorbed by clouds

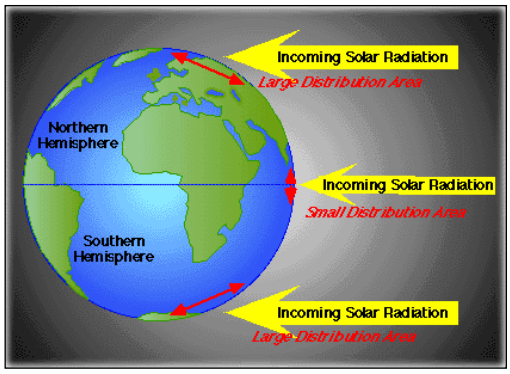
_____ percent reflected by clouds

_____ – part of solar radiation reflected by a surface

_____ – process in which atmosphere traps infrared rays over earth's surface

- _____ for life on earth as we know it

Radiation strikes more _____ at the _____ and is more _____ at the poles.



Same amount of _____ spread out over a larger area, therefore the _____ are lower.

_____ – energy transfer by direct contact

_____ – energy transfer due to unequal heating

Winds

_____ in the atmosphere at the _____ and at the _____ created a general movement of air worldwide.

Global Winds

Spinning/rotation of earth causes winds to move _____ in the N. hemisphere and _____ in the S. hemisphere. This is known as the _____.

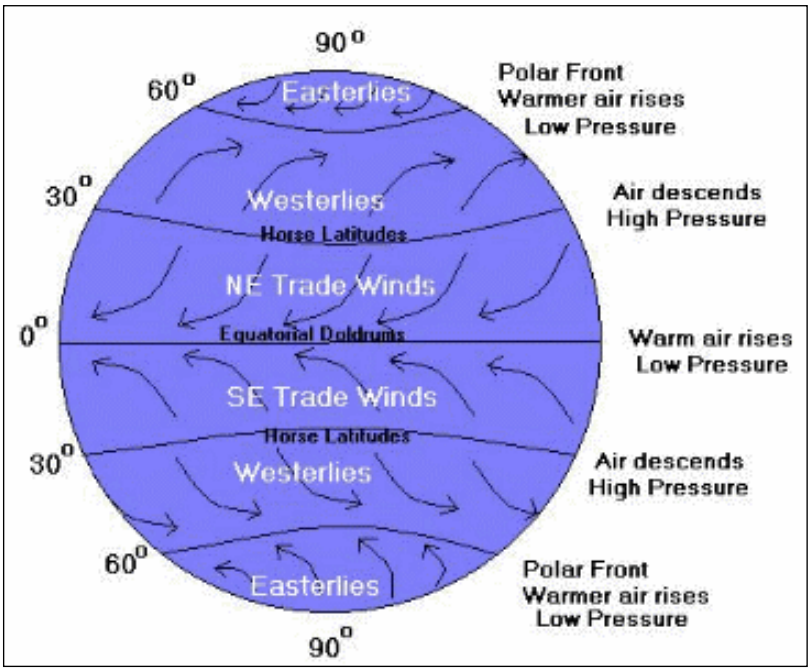
_____ – flow toward equator between 30° and 0° latitude

- Meet at the equator in a "no wind" zone called the _____.
- At other edge of the Trade Winds is another low/no wind belt known as the _____.

  WHY? _____ were thrown overboard to save water when ships weren't moving

_____ – located between 40° – 60° latitude

_____ – from about 60° latitude to the poles



_____ – bands of high speed winds that exist in upper troposphere (can affect air travel)

LOCAL WINDS: often referred to as breezes, Named for where the winds come _____

_____ Breeze – dry cool breeze FROM land to sea

_____ Breeze – dry cool breeze FROM sea to land

_____ Breeze – during the day, warm air FROM the valley moves up the slope

_____ Breeze – during the night, cool air FROM the mountain moves down into the valley

Water in the Atmosphere

Atmospheric Moisture

Water in the atmosphere exists in two forms other than water vapor. It can be _____ or _____.

_____ – phase change from liquid to gas

_____ – solid directly to gas (ex. dry ice at Halloween

_____ – vapor directly to a solid (ex. frost)

_____ – measure of amount of water vapor in the atmosphere

- _____ – air holds all the water vapor it possibly can

_____ – ratio used to express amount of water vapor in the atmosphere

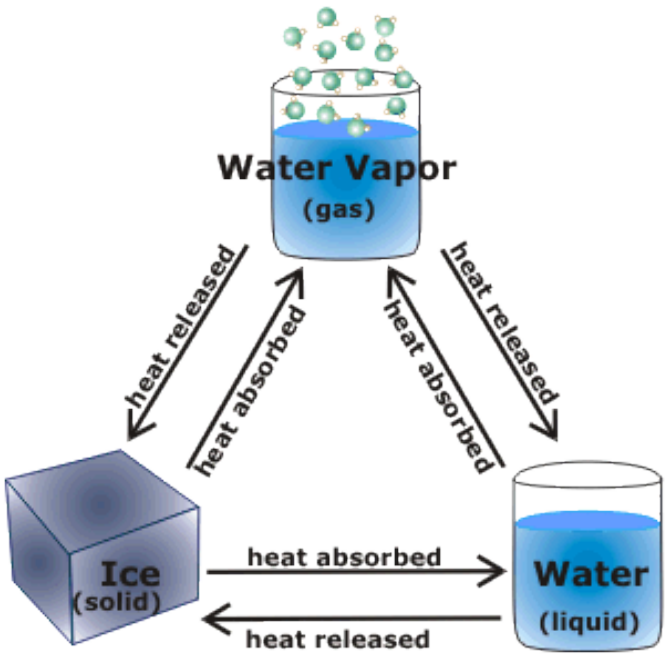
- Amount of _____water in the atmosphere with the amount of water that _____ be in the atmosphere.

_____ – instrument used to measure relative humidity

_____ – actual amount of moisture in the air

_____ – temperature to which air must be cooled to reach saturation.

- If the dew point is below freezing, then _____ occurs and _____ forms. (direct from _____ to _____)



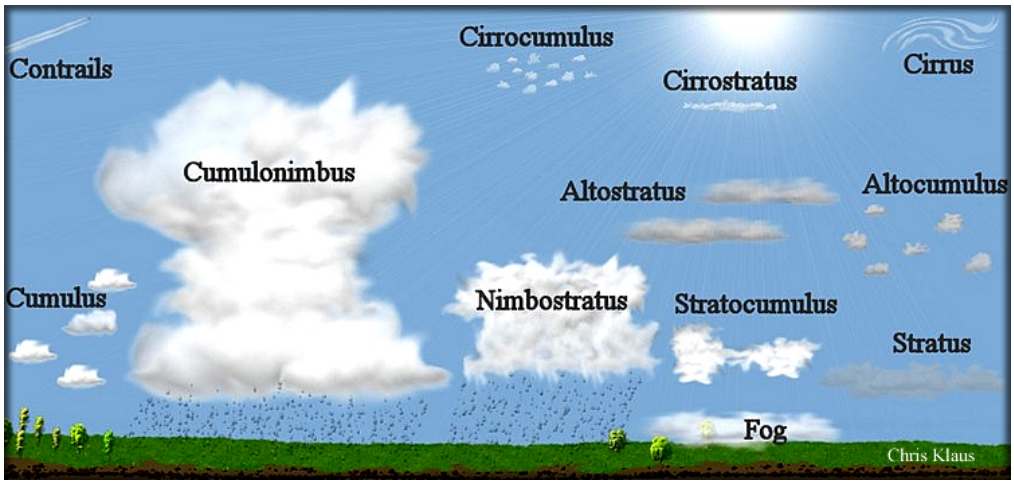
Clouds & Fog

Result from condensation of _____ throughout the large volume of _____.

Requires the presence of solid particles, called _____.

Air temperature changes as the air expands and is compressed. These changes are known as _____.

3 Main Cloud Types



_____ – sheetlike clouds

- Low base (almost at the surface)
- Warm air lies above cool air
- Variations = _____, which are dark clouds that do produce heavy rain

_____ – puffy vertical clouds

- Forms as warm moist air rises and cools
- _____ = variation of high, dark storm clouds

_____ – highest clouds

- Wispy and feathery
- Halo can be seen around the sun or moon, if viewed thru a cirrostratus cloud (light rays bend as they hit ice crystals)

_____ – a cloud that formed at the surface

Precipitation

_____ – any moisture that falls from the air to earth's surface

FORMS:

LIQUID		Liquid precipitation
LIQUID		Raindrops smaller than 0.5mm
SOLID		Most common solid, freezing up high and all the way to the ground
SOLID		Rain falls thru freezing layer at the ground
SOLID		Rain falls and only freezes upon contact with a solid surface (glaze ice)
SOLID		Lumps of ice form as winds blow frozen substance back up into clouds repeatedly

Causes of Precipitation:

A cloud produces _____ when its droplets or ice crystals become _____ to fall as _____ or _____.

_____ – combination of different size water droplets to form large droplets that fall as raindrops

_____ – process where water droplets remain liquid at temperatures below zero degrees Celsius

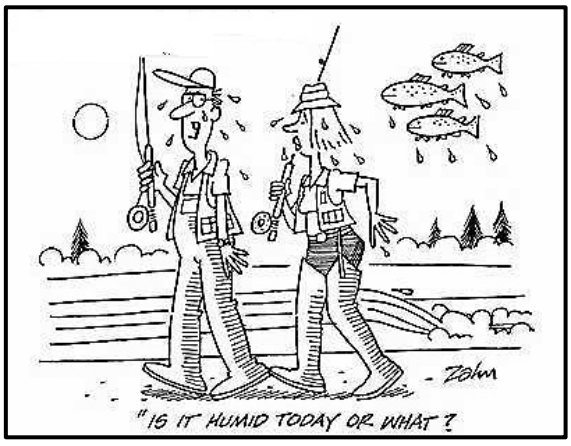
_____ – special condensation nuclei that have crystalline structure similar to ice (required for precipitation to fall)

_____ – process when freezing nuclei are artificially added to clouds to force precipitation to occur

WHY WOULD THIS BE USEFUL???

-
-

_____ – instrument used to measure amount of rainfall



Weather

Air Masses

Differences in air pressure worldwide create _____. Air moves from areas of _____ to areas of _____.

_____ – large body of air with uniform/same moisture and temperature

Four Main Types of Air Masses:

NAME	ABBREV.	DESCRIPTION

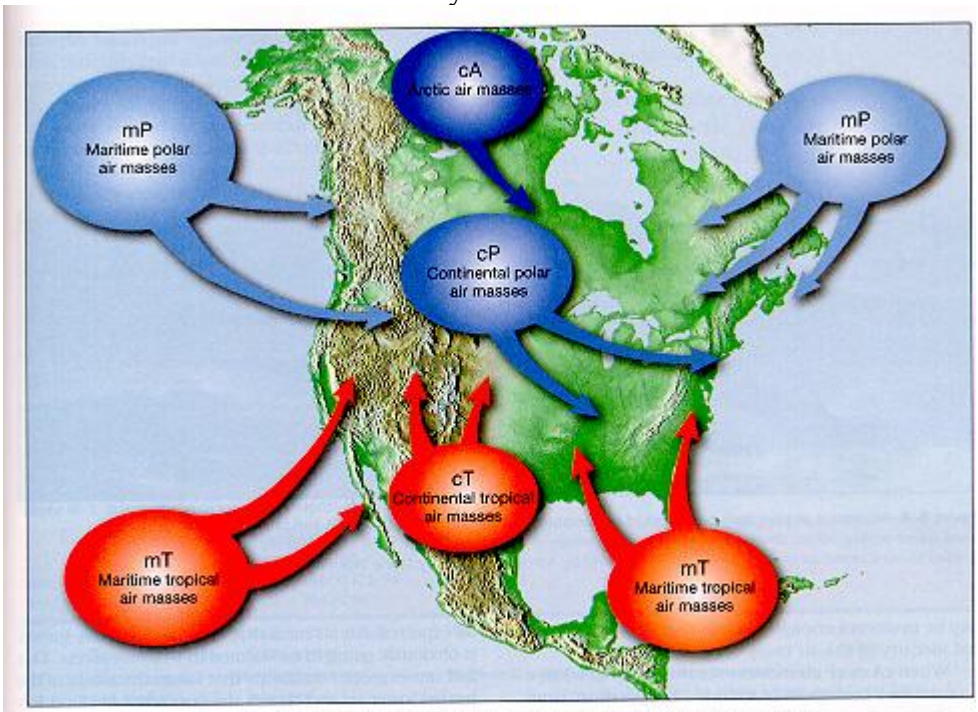
North American Air Masses:

3 Polar Air Masses:

- cP Canadian – from Canada into the US
- mP Pacific – from the Pacific near Alaska into the northwestern US
- mP Atlantic – from the N. Atlantic into the New England states

4 Tropical Air Masses:

- cT – only in summer, from southwest US to the northeast US
- mT Gulf – froms in the Gulf of Mexico and moves to the eastern US
- mT Atlantic – forms in the tropical N. Atlantic and travels to the eastern US
- mT Pacific – forms in the N. Pacific and rarely reach land



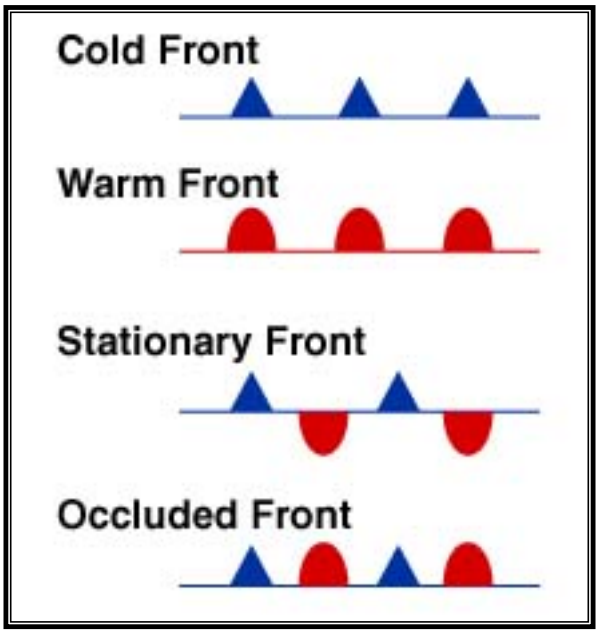
Air-mass source regions for North America. (Courtesy of Ward's Natural Science Establishment, Inc., Rochester, N.Y.)

Fronts

When two unlike air masses meet, _____ differences keep them _____.

The boundary that is formed between the air masses is called a _____.

Four Main Types of Fronts:



_____ Front:

- Cold air mass overtakes a warm air mass & lifts it in the air
- Produces storms
  - Squall line – long line of heavy thunderstorms

_____ Front: warm air mass overtakes a cold air mass & rises over it

_____ Front: 2 air masses meet, but neither is displaced

_____ Front: fast moving cold front lifts a warm front completely off the ground

_____ refers to the region where the cold air at the _____ meets the warm air of the _____.

These areas help create the beginnings of the low pressure storms known as _____.

_____ – large storms that start typically along cold or stationary fronts

- big influence of middle latitude weather in the US

_____ – large stormsthat center on areas of high pressure

_____:

- Severe tropical storm where winds exceed _____ km/hr
- Develop over warm tropical oceans
- Most destructive storms
- Called _____ in the Pacific

_____ – storm accompanied by thunder, lightning and strong winds

- _____ – loud noise produced by the rapid expansion and collapse of air (caused by electricity rapidly heating the air with lightning)

_____

- whirling, funnel-shaped cyclone
- smallest, most violent, and shortest-lived severe storm
- forms when thunderstorm meets high altitude horizontal winds which causes air to rotate

_____ – tornadoes over the ocean (or a very large body of water)

Weather Instruments

_____ – measures temperature

_____ – measures wind speed

_____ – determines the direction of the wind

_____ – used to determine upper-atmospheric conditions

Forecasting the Weather

_____ – (scientists that study the weather)

They prepare weather maps that plot all the weather data gathered from many different sources.

_____ – lines drawn to connect points of equal atmospheric pressure

- closely spaced = _____ wind speeds
- far apart = low change and _____ winds
- circles = high (H) or low (L) pressure areas