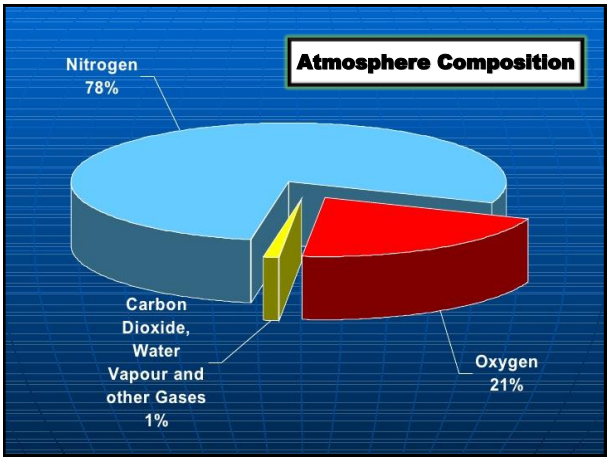
Atmosphere

Chapter 11

Atmospheric Basics:

- The atmosphere is the blanket of gases surrounding Earth that contains about 78% nitrogen, 21% oxygen, and 1% other gases such as argon, carbon dioxide, and water vapor



Variable Gasses

- Water vapor in the Earth's atmosphere can vary greatly.
- Percentages of water vapor in the atmosphere can vary between 0 – 4% depending on location and season.

Variable Gasses

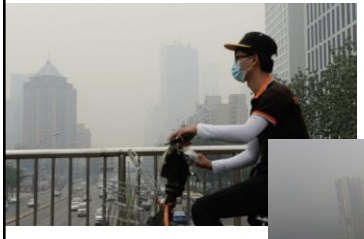
- Carbon dioxide (CO_2) levels are currently at around 0.04%.
- During the past 150 years, CO_2 concentrations have increased by about .01 percent, leading to a drastic change in global temperature.

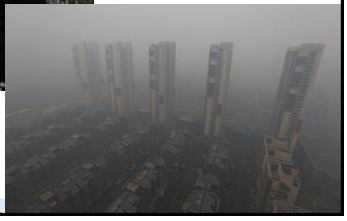
Carbon Dioxide

- The recent increase in atmospheric CO2 can be contributed to the burning of fossil fuels, such as oil, coal, and natural gas.
- Burning fossil fuel can produce other gasses, such as sulfur dioxide and nitrous oxides.

Shenyang, China:

Smog reaches 50 times the safety limit in late October, 2017





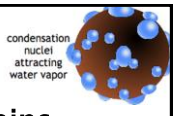
Variable Gasses

- Ozone (O_3) makes up only 0.0012% of the Earth's atmosphere, but without it, most life could not exist.
- Ozone shields us from harmful radiation by absorbing UV light from the sun.

Ozone

- Earth's ozone layer has been deteriorating over several decades, due to the presence of chlorofluorocarbons (CFCs) that react with ozone and break it down.

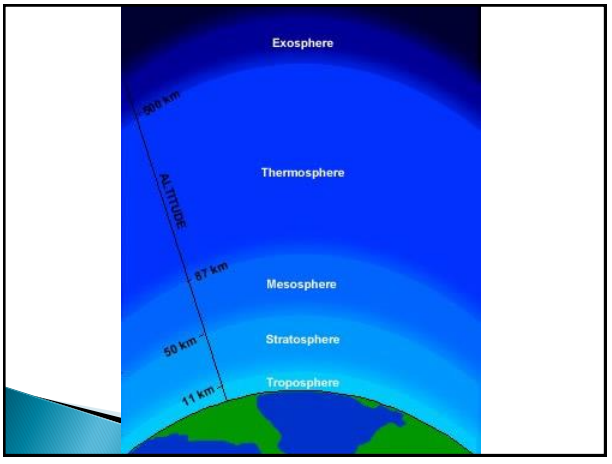

Atmospheric Particles



- Earth's Atmosphere contains variable amounts of solids in the form of dust, salt, ice, and microorganisms such as fungi and bacteria.
- They provide a surface for water vapor to condense onto to create clouds and rain.

Atmospheric Layers:

- The atmosphere is classified into five different layers.
- These layers are the troposphere, stratosphere, mesosphere, thermosphere, and exosphere.
- Each layer differs in composition and temperature profile.

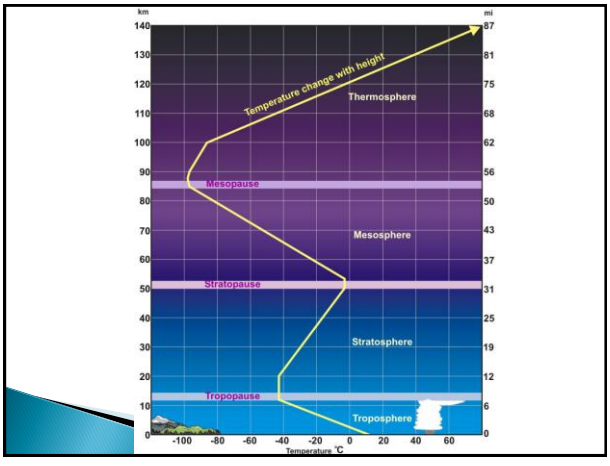


Atmospheric Layers:

- The troposphere is the layer closest to Earth's surface.
- Extends from 9-16 km above Earth's Surface
- It contains most of the mass of the atmosphere.

Atmospheric Layers:

- Weather occurs in the troposphere.
- Temperature decreases with altitude through the tropopsphere.
- The altitude at which the temperature stops decreasing is called the tropopause.

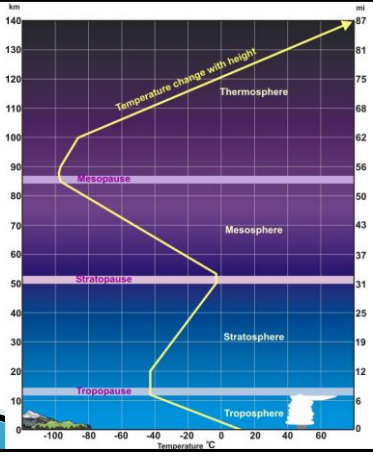


Atmospheric Layers:

- Above the troposphere is the stratosphere.
- The stratosphere contains the ozone layer.
- Temperature increases with altitude through the stratosphere starting at the ozone layer.

Atmospheric Layers:

- The heating in this layer is caused by ozone molecules (O_3) absorbing ultraviolet radiation from the Sun (UV).
- At the Stratopause, air temperature stops increasing with altitude. (99.9% of the mass of earths atmosphere is located below the stratopause)

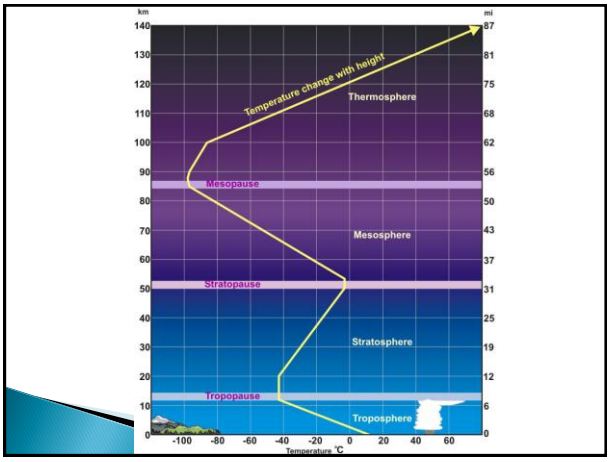


Mesosphere

- Above the stratopause is the mesosphere.
- 50–100km above Earth's Surface
- Air temperature decreases with altitude.

Mesosphere

- Little solar radiation is absorbed in this layer.
- The top layer of the mesosphere where temperatures stop decreasing with altitude is called the mesopause.

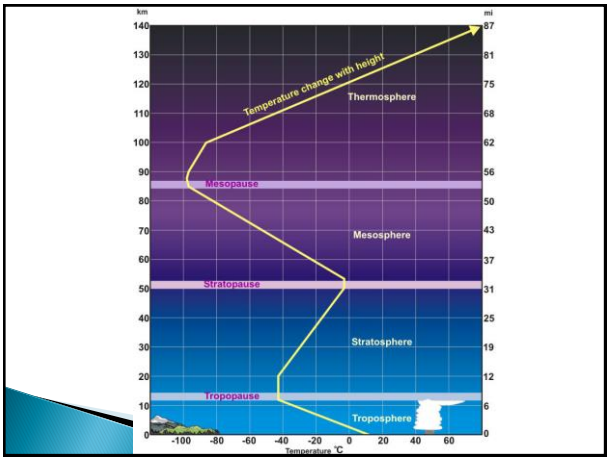


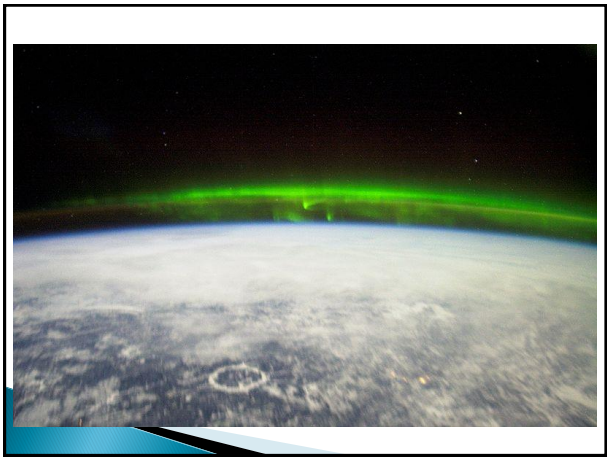
Thermosphere

- The thermosphere is located above the mesopause.
- Around 100km to 500km above Earth's surface
- Extremely low density of air.

Thermosphere

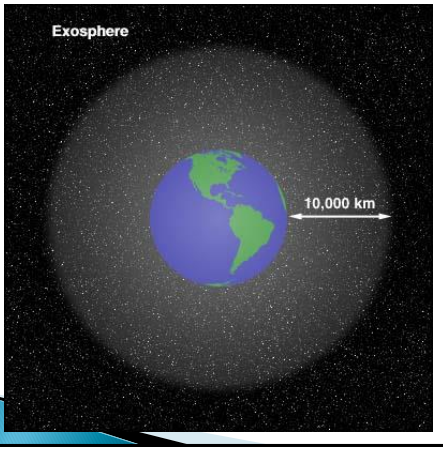
- 0_2 atoms absorb solar radiation.
- Temp. increases with altitude up to 1000°C! (1832°F)
- The Ionosphere, made of electrically charged particles, is part of the thermosphere.





Exosphere

- The exosphere is the outermost layer of Earth's atmosphere.
- Extends from 500 – 10,000 km above Earth's surface
- Transitional region between Earth's atmosphere and outer space.

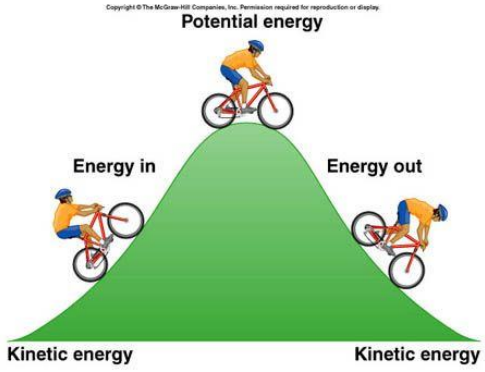


Consider the Following:

- Touch the metal chair leg and the wooden table leg. What do you notice? Which feels colder?
- Is the chair leg at a different temperature?
- Why does the metal chair leg feels colder to the touch than the wooden table leg.
- In regards to heat transfer, what happens when you touch something that feels "cold."

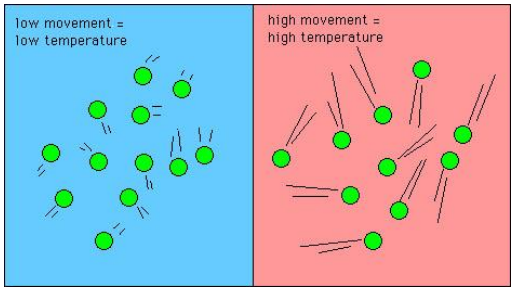
Energy Transfer in the Atmosphere

- All materials (solid, liquid, gas, plasma) are made of particles such as atoms and molecules.
- These particles are always moving, even if the object is not moving.
- The energy of motion is called Kinetic Energy.



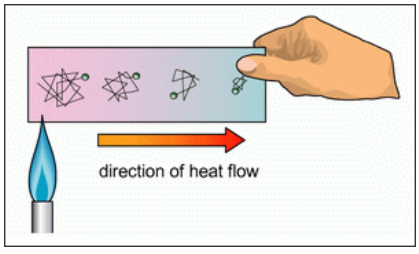
Energy Transfer in the Atmosphere

- The total energy of the motion of particles in an object is called Thermal Energy.



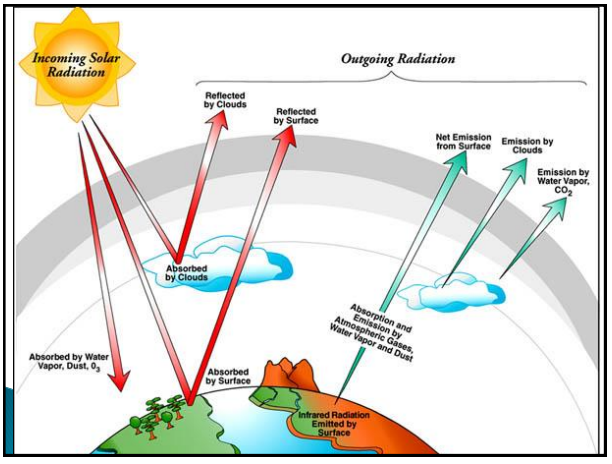
Energy Transfer in the Atmosphere

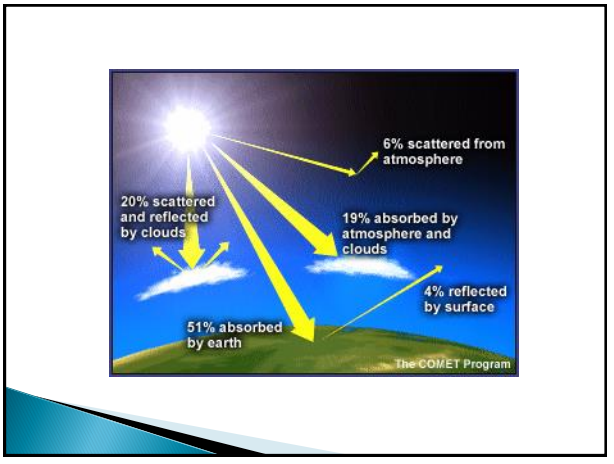
- Heat is the transfer of thermal energy from a region of higher temperature to a region of lower temperature.
- Heat flows from one place to another in one of three ways: Conduction, Convection, and Radiation.



Energy Transfer in the Atmosphere

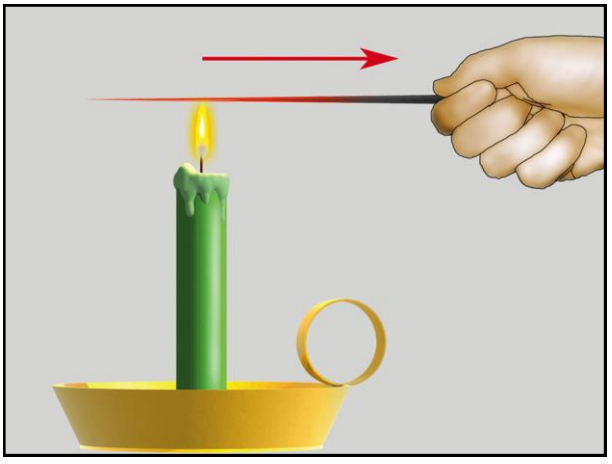
- Radiation is the transfer of thermal energy by electromagnetic waves (light).
- Heat lamps emit visible light and infrared waves that travel from a lamp and are absorbed by food.





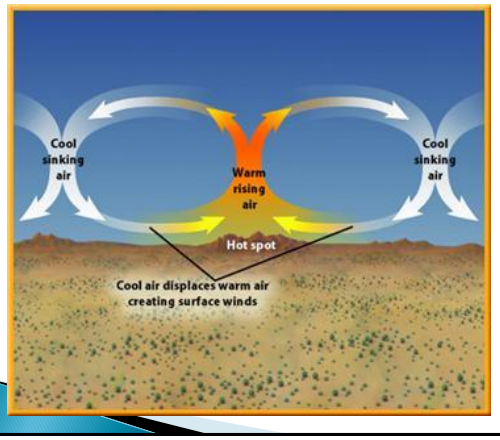
Energy Transfer in the Atmosphere

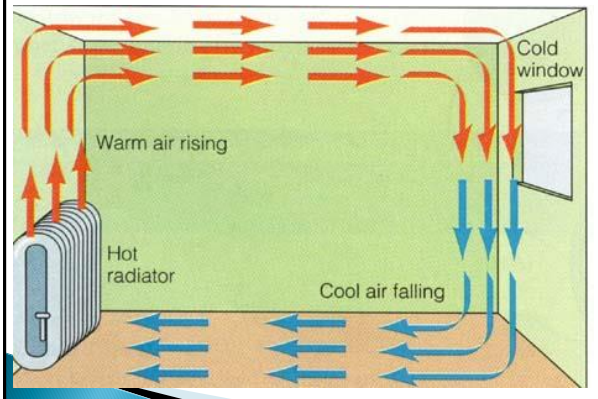
- Another process of energy transfer can occur when two objects come in contact with one another.
- Conduction is the transfer of thermal energy between two objects in contact.

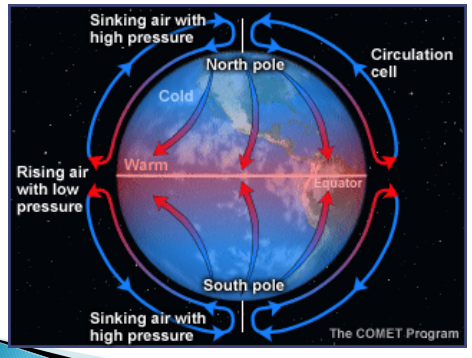


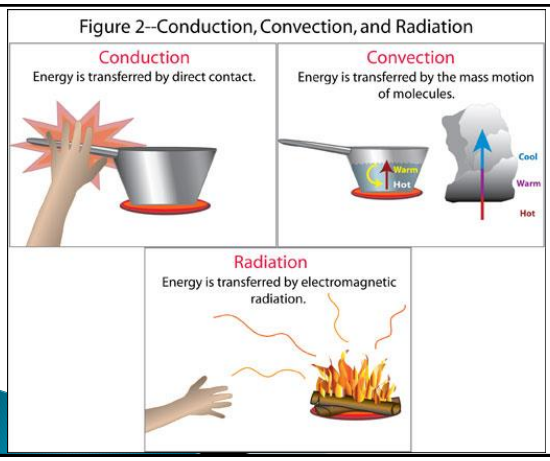
Energy Transfer in the Atmosphere

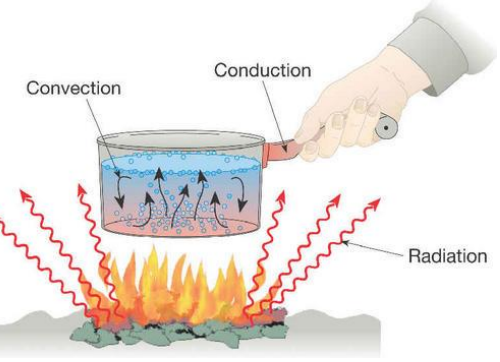
- **Convection** is the transfer of thermal energy by the movement of heated material from one place to another.
- Convection occurs mainly in liquids and gasses.









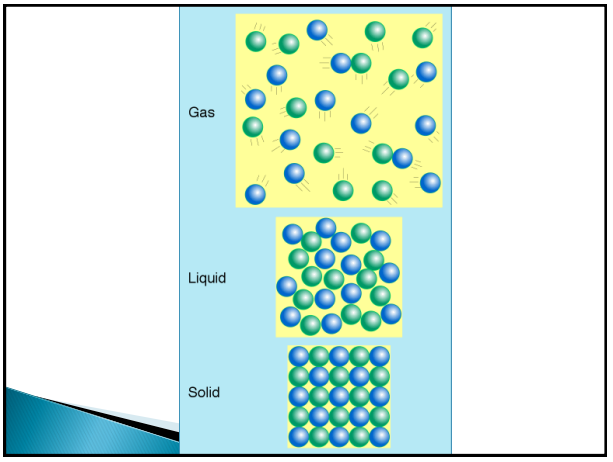


Temperature

When you turn on the burner beneath a pot of water, thermal energy is transferred to the water and the temperature increases.

Temperature

Temperature is a measure of the average kinetic energy (the energy of motion) of the particles in a material.



Measuring Temperature

- Temperature is usually measured using one of two common temperature scales.
- What are they?

Measuring Temperature

- Farenheit (°F), used mainly in the United States.
- The other is Celcius scale (°C).

Measuring Temperature

- What is the freezing point of water?
- 32°F, or 0°C
- What is the boiling point of water?
- 212°F, or 100°C

Measuring Temperature

- The Kelvin scale (K) is the SI scale used to measure temperature in science.
- Freezing point of water is 273 K
- Boiling point = 373 K

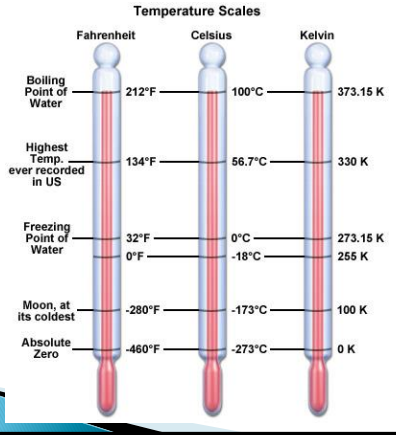
Measuring Temperature

- Absolute zero is the lowest temperature that is theoretically possible.
- No kinetic energy in the atoms of a substance.

Absolute zero = 0K

Measuring Temperature

- The closest we have come to absolute zero is 0.0001K for helium gas.



Do Now:

- Name the layers of the atmosphere
- Include specific details about each layer.

Properties of the Atmosphere

Section 11.2

Properties of the Atmosphere: 11.2

Vocab:

- **Temperature Inversion**
- **Humidity**
- **Saturation**
- **Relative Humidity**
- **Dew Point**
- **Latent Heat.**

Air Pressure

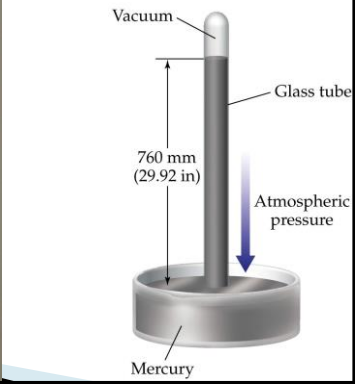
- What is air pressure?
- Answer: Air pressure is the pressure exerted on a surface by the weight of the atmosphere above the surface

Air Pressure

- **Air pressure is the pressure exerted on a surface by the weight of the atmosphere above the surface**

Air Pressure

- What device measures air pressure?
- Answer: A Barometer



Air Pressure

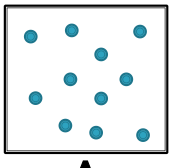
- What are the units that air pressure often measured in?
- Millibars (mb)
- Inches of Mercury (“)

Air Pressure

- **As you go higher in the atmosphere, air pressure decreases as the mass of the air above you decreases.**

Density of Air

- **Which box is more dense?**



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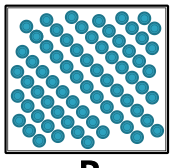


B

Density of Air

- **The density of a material is the mass of material in a unit volume, such as $1 m^3$**
- **Density is calculated by dividing the mass of an object by its volume.**

$$Density = \frac{mass}{volume}$$

Units for density = kg/m^3

Humidity

- **Humidity** is the amount of water vapor in the atmosphere.
- **Relative Humidity** is the amount of water vapor in a volume of air relative to the amount of water vapor needed for that volume of air to reach saturation.

Saturation & Dew Point

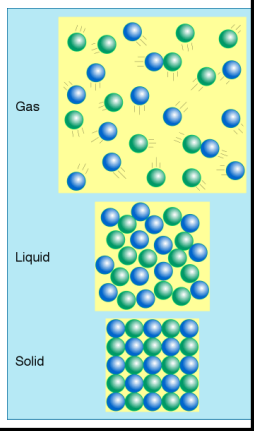
- The **dew point** is the temperature to which air must be cooled at constant pressure to reach saturation.
- **Saturation** occurs when the amount of water vapor in a volume of air has reached the maximum amount.

Do-Now

1. Why was there no change in temperature (or very little change) between the ice, and the ice and water mixture once you applied heat?

Do-Now

2. Which particles in the figure have the highest amount of kinetic energy?



Properties of the Atmosphere: 11.2

Vocab:

- Temperature Inversion
- Humidity
- Saturation
- Relative Humidity
- Dew Point
- Latent Heat.

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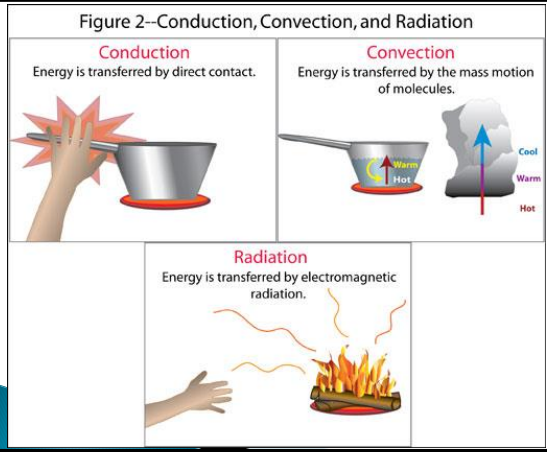

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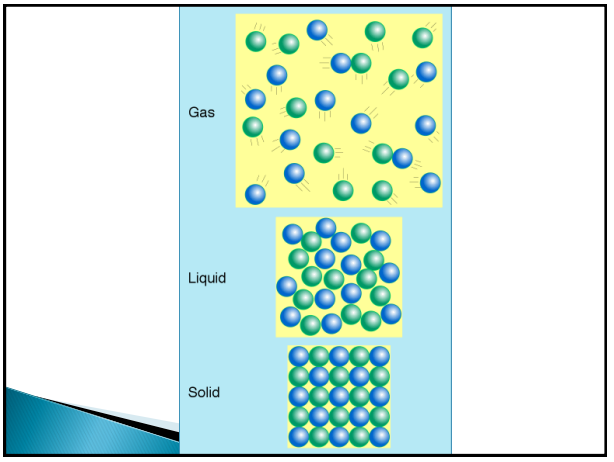

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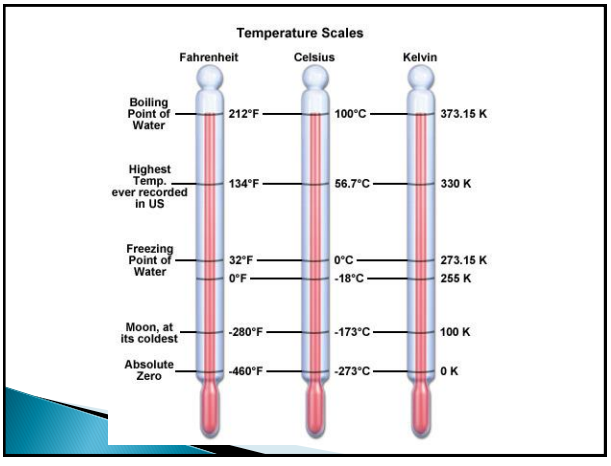

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Absolute zero = 0K

Freezing = 273K

Measuring Temperature

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Absolute zero = 0K

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Do-Now

- What is air pressure?
- What are the units that air pressure is often measured in?
- What device measures air pressure?

Do-Now

- What is air pressure?
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Do-Now

- What are the units that air pressure often measured in?
- Millibars (mb)

Do-Now

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Air Pressure

- **Air pressure is the pressure exerted on a surface by the weight of the atmosphere above the surface**

Air Pressure

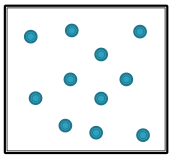
- **As you go higher in the atmosphere, air pressure decreases as the mass of the air above you decreases.**
- **Demonstration**

Density of Air

- **The density of a material is the mass of material in a unit volume, such as $1 m^3$**

Density of Air

- Which box is more dense?



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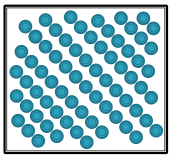

B

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Saturation & Dew Point

- The dew point is the temperature to which air must be cooled at constant pressure to reach saturation.
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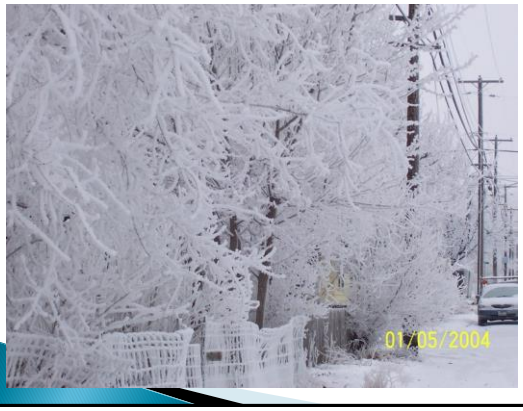
Freezing fog:

Fog which contains supercooled water which freezes upon contact with objects it encounters.

Freezing Fog Pictures



Freezing Fog Pictures

Freezing Fog Pictures

Freezing Fog Pictures

Freezing Fog Pictures

Pressure, Temperature, & Density

- Temperature, pressure, and density of air are all related to each other.

Equation of State (a.k.a. the "Ideal Gas Law")

$$p = \rho RT$$

- p: pressure ($N\ m^{-2}$)
- ρ: density ($kg\ m^{-3}$)
- R: "gas constant" ($J\ K^{-1}\ kg^{-1}$)
- T: temperature (K)

- *Direct* relationship between density and pressure
- *Inverse* relationship between density and temperature
- *Direct* relationship between temperature and pressure

Air Pressure and Temperature.

- Pressure exerted by air in a container is due to the collisions of the gas particles in the air with the sides of the container.

Air Pressure and Temperature.

- If you placed an inflated balloon in the freezer, what would happen?
- Why?

Air Pressure and Density

- At the same temperature, air with a higher density exerts more pressure than air with a lower density.

Air Pressure and Density

- Example:
- Overinflating a Basketball

Temperature and Density

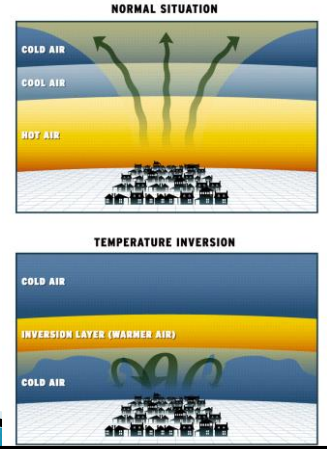
- At the same pressure, Warm air is less dense than cold air.
- Ex: Hot air rises.
- Hot air balloon.

Temperature Inversion

- A temperature inversion is an increase in temperature with height in the atmospheric layer.

Temperature Inversion

- Through the troposphere, temperature usually decreases with height.
- With a temperature inversion, this normal situation is reversed, or turned upside down.



Temperature Inversion

- Causes: Rapid cooling of land on a cold winter night, pollutants (smog).
- Effects: Hazy sky, Fog, Low level clouds.

Wind

- Air moves from areas of high pressure to areas of low pressure.
- Differences in air pressure are the result of an unequal heating of the Earth.

Wind Speed

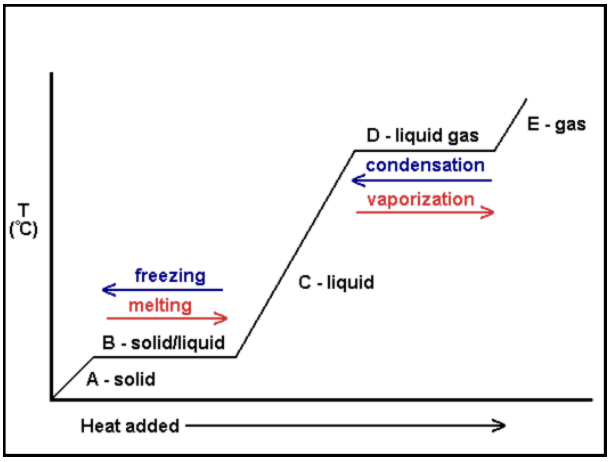
- Wind speed at the surface of the Earth is slowed by friction resulting from contact with trees, buildings, and mountains.

Wind Speed

- Wind speed in the upper atmosphere is much greater, due to less friction.

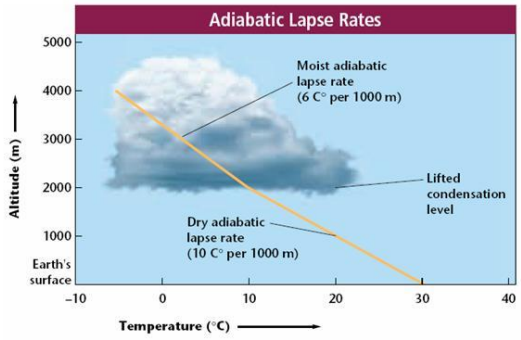
Latent Heat

- Latent heat is the heat required to change the state of matter.
- Latent heat of fusion
- Latent heat of vaporization



Condensation Level

- Water vapor in the atmosphere will condense to form clouds at a point known as the lifted condensation level (LCL).
- This is the point in the atmosphere where the air reaches saturation.



Humidity

- Humidity is the amount of water vapor in the atmosphere.
- Relative Humidity is the amount of water vapor in a volume of air relative to the amount of water vapor needed for that volume of air to reach saturation.

Dew Point

- The dew point is the temperature to which air must be cooled at constant pressure to reach saturation.

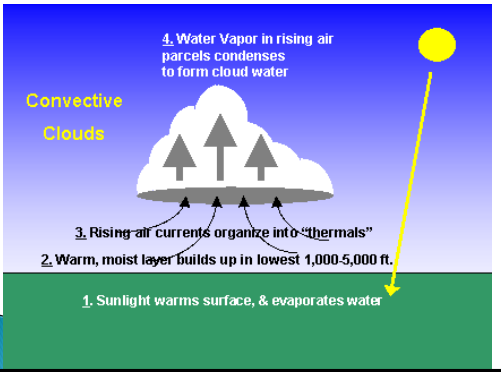
Cloud Formation

- Clouds are made from droplets of water and ice
- Also needed for cloud formation is dust for the water to condense on.

Cloud Formation

- As hot air rises, it cools down to its dew point.
- The rising hot air causes a drop in air pressure and water condenses into tiny droplets.

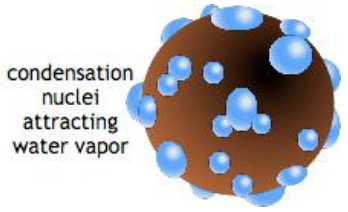
Cloud Formation



Cloud Formation

- Water vapor condenses around condensation nuclei.
- A condensation nucleus is a small particle in the atmosphere around which water droplets can form.

Condensation Nucleus



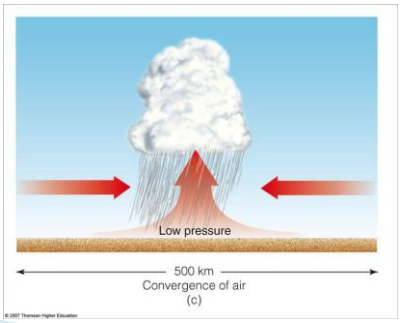
Atmospheric Lifting

- Air rises when it is heated and becomes warmer than the surrounding air.
- Convective Lifting

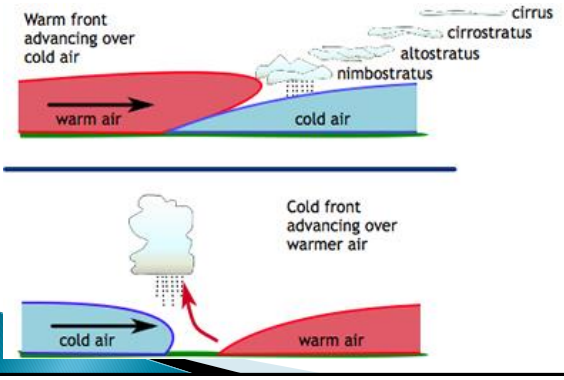
Atmospheric Lifting

- Clouds can also form when air is forced upward or lifted by mechanical processes. EX:
- Orographic lifting
- Convergence

Convergence



Convergence



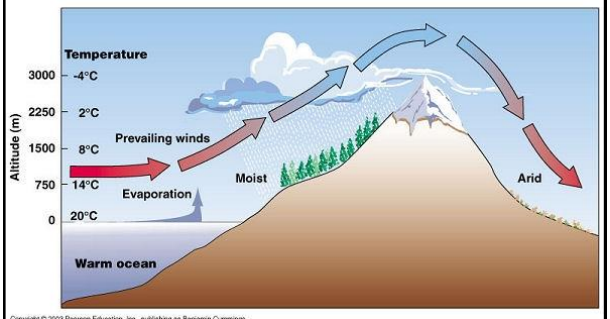
Convergence

- Air is lifted by convergence when air flows into the same area from different directions.

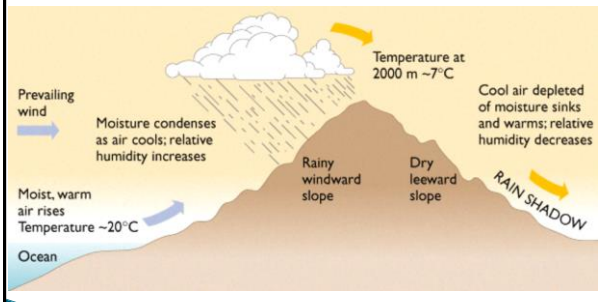
Orographic Lifting

- Orographic lifting occurs when an air mass is forced to rise over a topographic barrier. (mountain)

Orographic lifting



Orographic lifting



Cloud Terminology

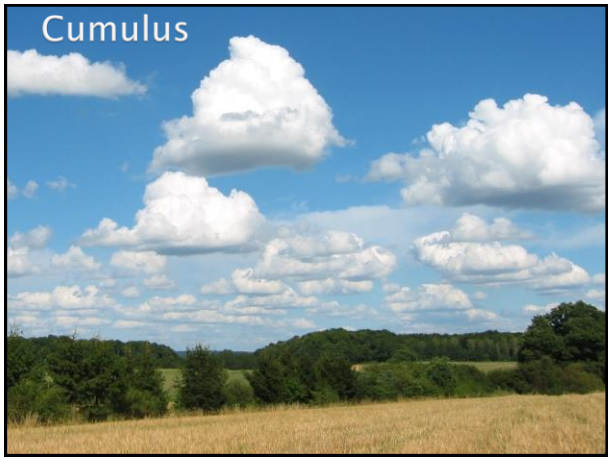
- **Cumulus** – Latin for 'heap', to describe a puffy cloud
- **Cirrus** – Latin for 'curl of hair', to describe a wispy cloud
- **Stratus** – Latin for 'layer', to describe a sheet-like cloud
- **Nimbus** – Latin for 'violent rain', to describe a rain cloud.

Low Clouds:

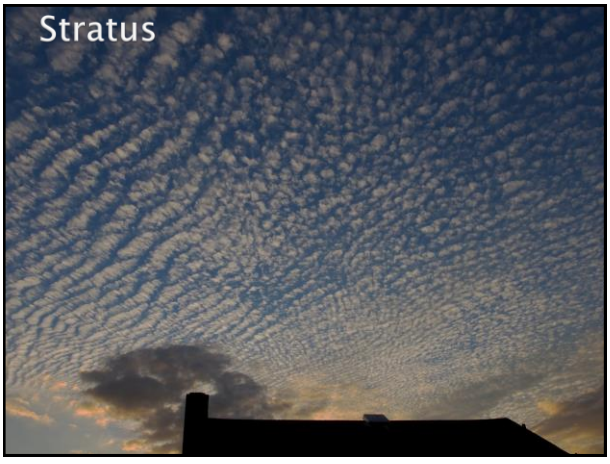
- **Cumulus**: puffy and lumpy looking (heap or pile)
- **Stratus**: Layered, sheet-like cloud.
- Form when fog lifts away from Earth's surface
- Both found under 2000m

Low Clouds

Cumulus



Stratus



Middle Clouds:

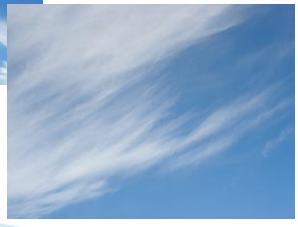
- Altocumulus and Altostratus
- Found between 2000 and 6000 meters.
- Made up of ice crystals and water droplets because of this altitude
- Produce mild precipitation

Middle Clouds

High Clouds

- High Clouds are made up of ice crystals and form at heights of 6000 m where temperatures are below freezing.
- Cirrus clouds have a wispy, indistinct appearance.
- Cirrostratus can form a continuous layer.

High Clouds

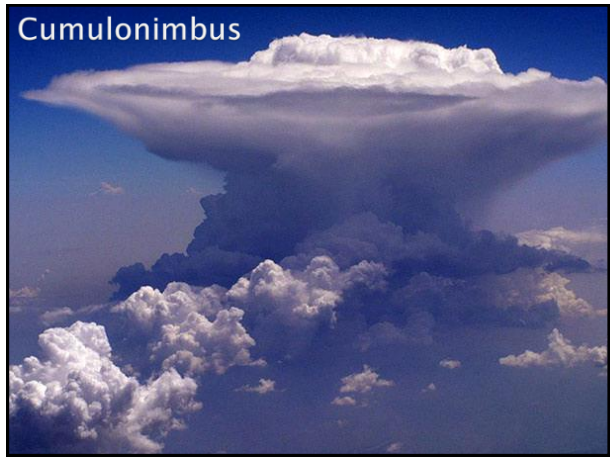


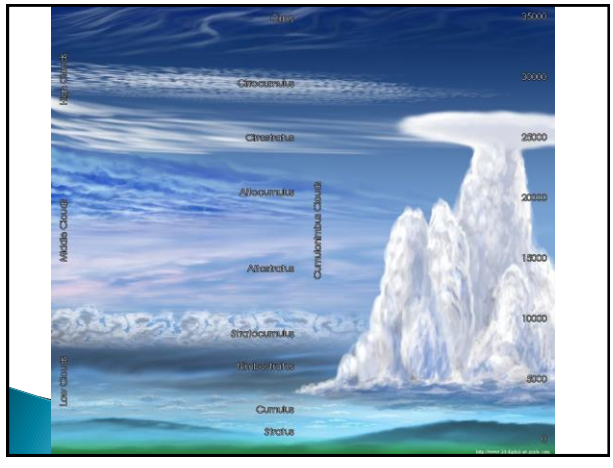
Cloud Types

- Low: Stratus and Cumulus
- Medium: Altocumulus and altostratus
- High: Cirrus and Cirrostratus.

Vertical Development Clouds

- If the air in a cumulus cloud is unstable, the cloud will be warmer than the surrounding air.
- Warm air in the cloud will continue to rise, reaching the top of the tropopause.
- These towering cloud types are called **cumulonimbus** clouds.
- Produces strong rains, winds, and hail.





Cloud Formation

Roll Clouds

Roll Clouds

Roll Clouds

Mammatus Clouds

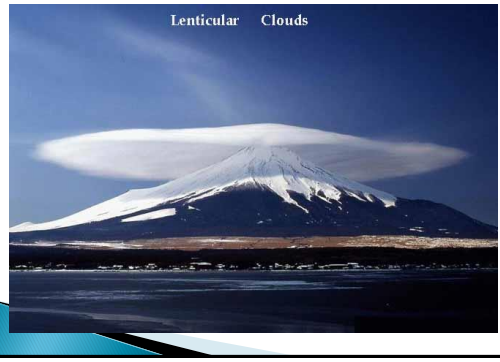
Mammatus Clouds

Mammatus Clouds

Mammatus Clouds

Lenticular Clouds

Lenticular Clouds



Lenticular Clouds

Kelvin-Helmholz Waves

Kelvin-Helmholz Waves

Kelvin-Helmholz Waves

Kelvin-Helmholz Waves

Undulatus Asperatus Cloud

11-3: Clouds and Precipitation

- Clouds vary in shape, size, height of formation, and type of precipitation.

Cloud Formation

- Clouds are made from droplets of water and ice
- Also needed for cloud formation is dust for the water to condense on.

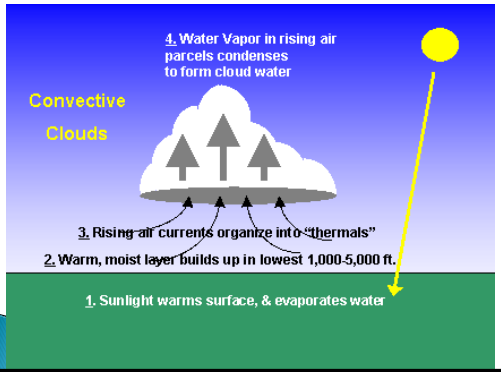
Cloud Formation

- A cloud forms when a rising air mass cools.
- As an air mass is heated, it becomes less dense than the cooler air around it.

Cloud Formation

- As hot air rises, it cools down to its dew point.
- The rising hot air causes a drop in air pressure and water condenses into tiny droplets.

Cloud Formation



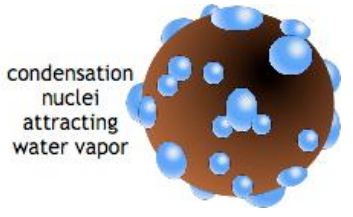
Cloud Formation

- Water vapor condenses around condensation nuclei.
- A condensation nucleus is a small solid particle in the atmosphere around which water can condense.

Condensation Nuclei

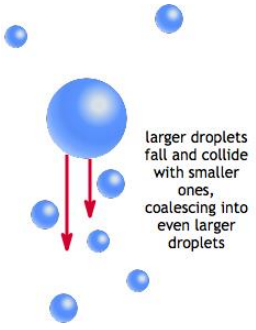
- These particles are usually less than about 0.001 mm in diameter and can be made of ice, salt, dust, and other materials.

Condensation Nucleus



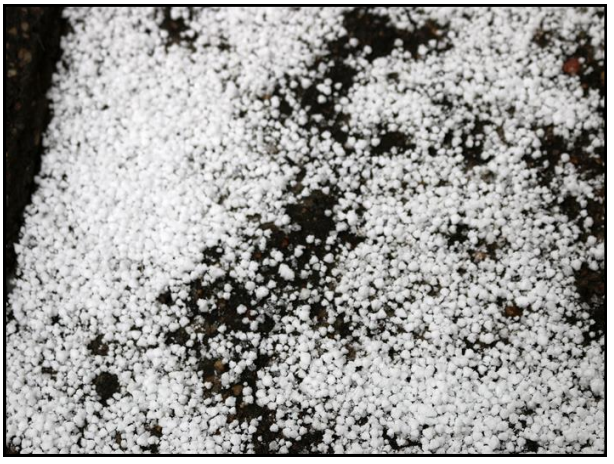
Precipitation

- Coalescence occurs when cloud droplets collide and join together to form a larger droplet.
- Once the drops get too heavy, they fall to Earth as precipitation



Precipitation Types

Type	Surface Temperatures	Cloud Temperatures	Other Factors
Snow	Generally mid 30s or colder if the atmosphere aloft is cold	Colder than 15 degrees	If any layer of the atmosphere below the cloud warms to more than 38 degrees or so, precipitation will usually not be snow
Sleet	Generally mid 30s or colder	Usually colder than 15 degrees	A warm layer of more than 38 degrees must melt all snow, then a deep cold layer below freezing below it must be present to totally refreeze the drops
Freezing Rain	32 degrees or colder	Could be just about anything	Warm air aloft ensures all precipitation is liquid, then a thin cold layer below freezing near the surface "supercools" the drops so the freeze when they contact a cold surface
Hail	Vary widely	Partially below freezing, partially above freezing	Precipiation is cycled through a cloud's updraft with layers of ice growing concentrically from the center. Usually associated with a strong thunderstorm updraft
Graupel	Generally 45 degrees or colder	Mostly below freezing, with some portion colder than 15 degrees	Precipitation forms as snow, then is rimed in layers by supercooled liquid from updrafts into showers. Usually occurs when the lower atmosphere is very unstable. Also called snow pellets.



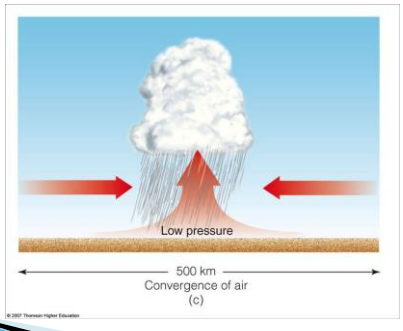
Atmospheric Lifting

- Air rises when it is heated and becomes warmer than the surrounding air.
- Convective Lifting

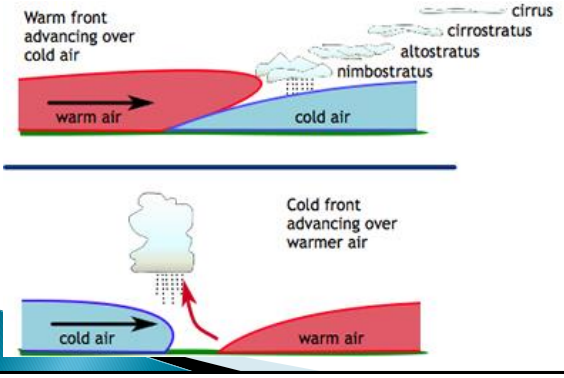
Atmospheric Lifting

- Clouds can also form when air is forced upward or lifted by mechanical processes. EX:
- Orographic lifting
- Convergence

Convergence



Convergence



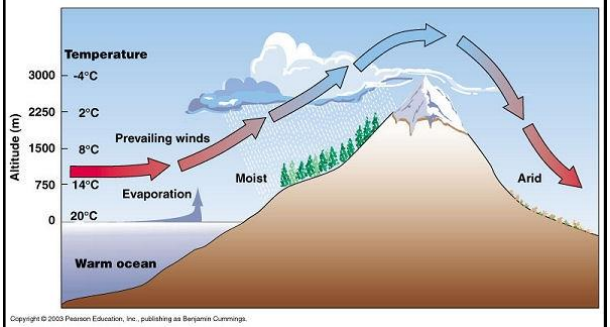
Convergence

- Air is lifted by convergence when air flows into the same area from different directions.

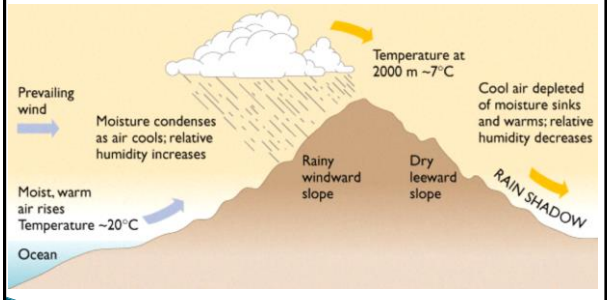
Orographic Lifting

- Orographic lifting occurs when an air mass is forced to rise over a topographic barrier. (mountain)

Orographic lifting

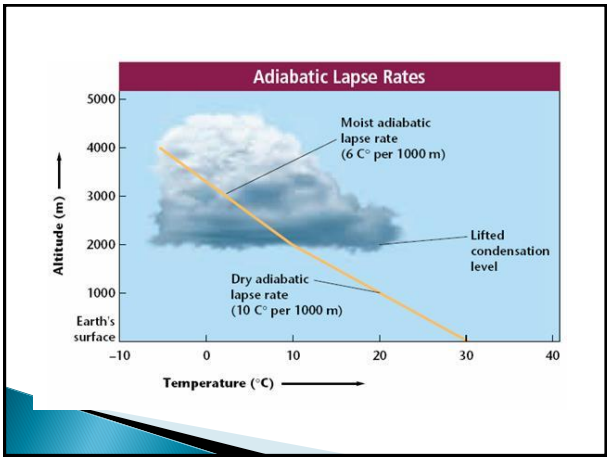


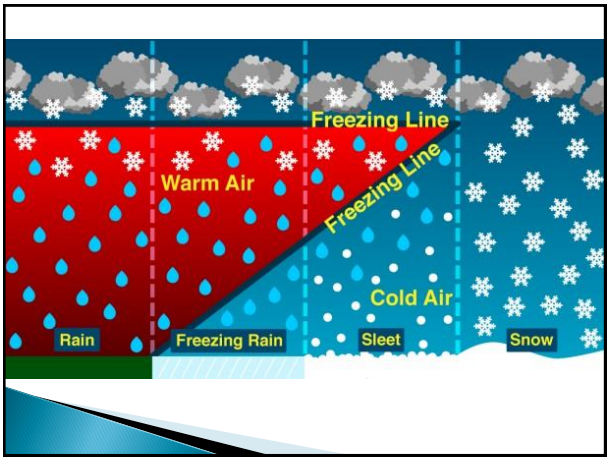
Orographic lifting

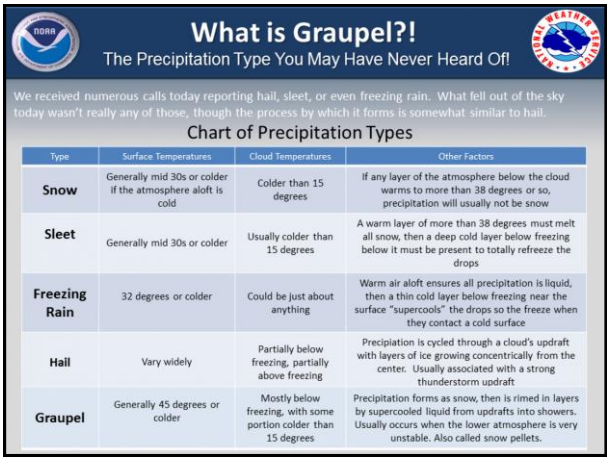


Condensation Level

- Water vapor in the atmosphere will condense to form clouds at a point known as the lifted condensation level (LCL).
- This is the point in the atmosphere where the air reaches saturation.







What is Graupel?!

The Precipitation Type You May Have Never Heard Of!

We received numerous calls today reporting hail, sleet, or even freezing rain. What fell out of the sky today wasn't really any of those, though the process by which it forms is somewhat similar to hail.

Chart of Precipitation Types

Type	Surface Temperatures	Cloud Temperatures	Other Factors
Snow	Generally mid 30s or colder if the atmosphere aloft is cold	Colder than 15 degrees	If any layer of the atmosphere below the cloud warms to more than 38 degrees or so, precipitation will usually not be snow
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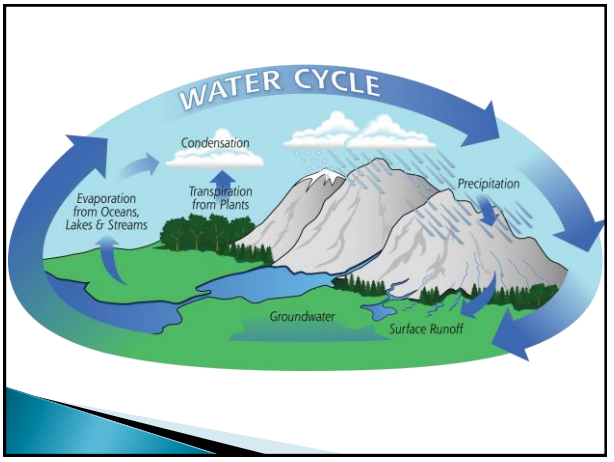


Atmospheric Lifting

- Air rises when it is heated and becomes warmer than the surrounding air.
- Convective Lifting

Atmospheric Lifting

- Clouds can also form when air is forced upward or lifted by mechanical processes. EX:
- Convergence
- Orographic lifting

Temperature Conversion

$$°F = (1.8 * °C) + 32$$

$$°C = \frac{°F - 32}{1.8}$$

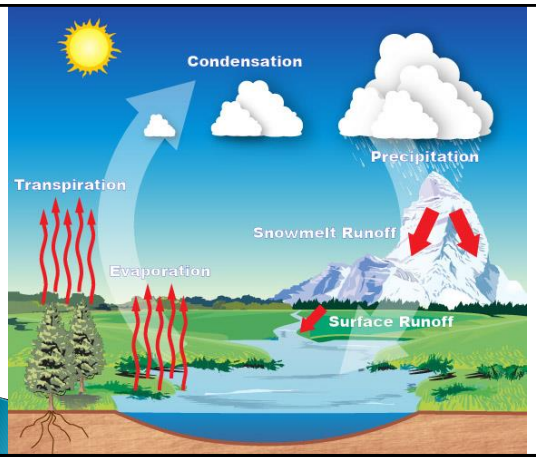
$$K = °C + 273$$

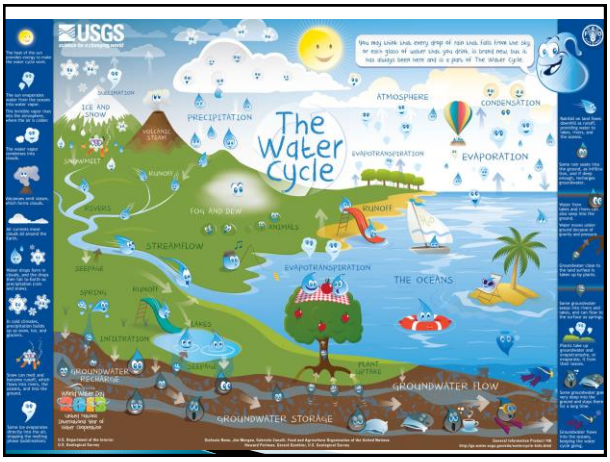
Precipitation

- Coalescence occurs when cloud droplets collide and join together to form a larger droplet.
- Once the drops get too heavy, they fall to Earth.

Do Now:

- Become a raindrop.
- Explain your journey from a cloud and back.
- Try and be as descriptive as possible.
- (The Water Cycle)





REVIEW

- 1. **Which gas is most abundant in Earth's atmosphere?**

a) Nitrogen
b) Oxygen
c) Carbon Dioxide
d) Argon

REVIEW

- 1. **Which gas is most abundant in Earth's atmosphere?**

a) Nitrogen
b) Oxygen
c) Carbon Dioxide
d) Argon

REVIEW

- 2. **The outermost layer of Earth's atmosphere**

a) Troposphere
b) Mesosphere
c) Geosphere
d) Exosphere

REVIEW

- 2. **The outermost layer of Earth's atmosphere**

a) Troposphere
b) Mesosphere
c) Geosphere
d) Exosphere

REVIEW

- 3. The temperature at which condensation of water vapor can occur.

a) Condensation point
b) Dew point
c) Coalescence
d) Convection

REVIEW

- 3. The temperature at which condensation of water vapor can occur.

a) Condensation point
b) Dew point
c) Coalescence
d) Convection

REVIEW

- 4. The amount of water vapor present in air.

a) Condensation
b) Saturation
c) Relative Humidity
d) Humidity

REVIEW

- 4. The amount of water vapor present in air.

a) Condensation
b) Saturation
c) Relative Humidity
d) Humidity

REVIEW

- 5. _____ are small particles in the atmosphere in which water droplets form

a) Condensation nuclei
b) Saturation nuclei
c) Condensation point
d) Saturation point

REVIEW

- 5. _____ are small particles in the atmosphere in which water droplets form

a) Condensation nuclei
b) Saturation nuclei
c) Condensation point
d) Saturation point

REVIEW

- 6. Which is the primary cause of wind?

a) Air saturation
b) Pressure imbalances
c) Pollution
d) Movement of water

REVIEW

- 6. Which is the primary cause of wind?

a) Air saturation
b) Pressure imbalances
c) Pollution
d) Movement of water

REVIEW

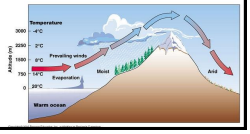
- 7. What mechanical process is causing air to rise?

a) Coalescence
b) Convection
c) Orographic lifting
d) Convergence

REVIEW

- 7. What mechanical process is causing air to rise?

a) Coalescence
b) Convection
c) Orographic lifting
d) Convergence



REVIEW

- 8. Almost all weather, clouds, and storms occur in which layer of the atmosphere?

a) Thermosphere
b) Mesosphere
c) Stratosphere
d) Troposphere

REVIEW

- 8. Almost all weather, clouds, and storms occur in which layer of the atmosphere?

a) Thermosphere
b) Mesosphere
c) Stratosphere
d) Troposphere

REVIEW

- 9. What color would be best for a home designed to absorb energy?

a) Red
b) White
c) Gray
d) Black

REVIEW

- 9. What color would be best for a home designed to absorb energy?

a) Red
b) White
c) Gray
d) Black

REVIEW

- 10. Which Temperature is the coldest?

a) 32°F
b) 10°C
c) 280 K
d) 5° C

REVIEW

- 10. Which Temperature is the coldest?

a) 32°F
b) 10°C
c) 280 K
d) 5° C

REVIEW

- 1. Which of the following is considered to be a “low cloud”?

a) Cirrus
b) Cumulonimbus
c) Altostratus
d) Stratus

REVIEW

- 1. Which of the following is considered to be a “low cloud”?

a) Cirrus
b) Cumulonimbus
c) Altostratus
d) Stratus

REVIEW

- 2. Convert 27°C into Kelvin

a) 127 K
b) 227 K
c) 300 K
d) 400 K

REVIEW

- 2. Convert 27°C into Kelvin

a) 127 K
b) 227 K
c) 300 K
d) 400 K

REVIEW

- 3. Wind speed on Earth is reduced by which?

a) Temperature
b) Friction
c) Weather
d) Convergence

REVIEW

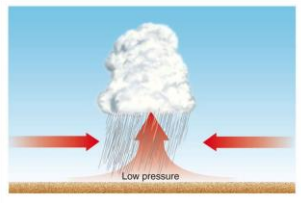
- 3. Wind speed on Earth is reduced by which?

a) Temperature
b) Friction
c) Weather
d) Convergence

REVIEW

- 4. Which of the following describes the picture below

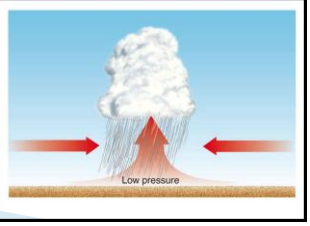
a) Orographic Lifting
b) Convergence
c) Pollution
d) Adiabatic Heating



REVIEW

- 4. Which of the following describes the picture below

a) Orographic Lifting
b) **Convergence**
c) Pollution
d) Adiabatic Heating



REVIEW

- 5. Which is a vertical development cloud?

a) Cumulonimbus
b) Cirrus
c) Stratus
d) Altocumulus

REVIEW

- 5. Which is a vertical development cloud?

a) **Cumulonimbus**
b) Cirrus
c) Stratus
d) Altocumulus

REVIEW

- 6. Occurs when the amount of water vapor in a volume of air has reached the maximum point

a) Condensation
b) Dew Point
c) Humidity
d) Saturation

REVIEW

- 6. Occurs when the amount of water vapor in a volume of air has reached the maximum point

a) Condensation
b) Dew Point
c) Humidity
d) Saturation

REVIEW

- 7. Which atmospheric gas has increased in concentration by 0.011 percent over the past 150 years.

a) oxygen
b) nitrogen
c) carbon dioxide
d) water vapor

REVIEW

- 7. Which atmospheric gas has increased in concentration by 0.011 percent over the past 150 years.

a) oxygen
b) nitrogen
c) carbon dioxide
d) water vapor

REVIEW

- 8. Which of the following is considered to be a "middle cloud"

a) stratus
b) altostratus
c) cirrostratus
d) cirrus

REVIEW

- 8. Which of the following is considered to be a "middle cloud"

a) stratus
b) **altostratus**
c) cirrostratus
d) cirrus

REVIEW

- 9. Convert 40°F to °C

a) 4.4 °C
b) 8.2 °C
c) 10 °C
d) 0 °C

REVIEW

- 9. Convert 40°F to °C

a) 4.4 °C
b) 8.2 °C
c) 10 °C
d) 0 °C

REVIEW

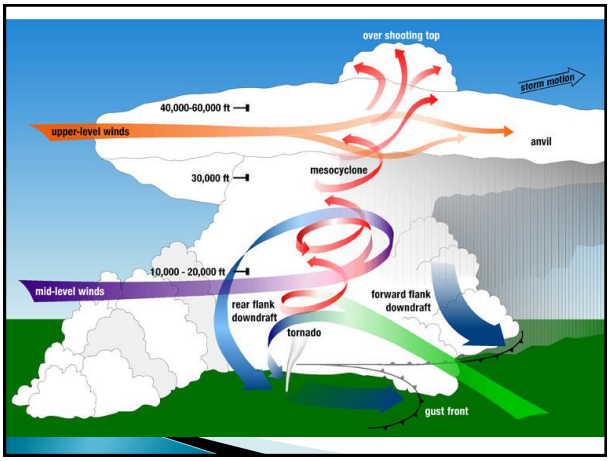
- 10. The process of water changing from a liquid to a gas.

a) Condensation
b) Precipitation
c) Coalescence
d) Evaporation

REVIEW

- 10. The process of water changing from a liquid to a gas.

a) Condensation
b) Precipitation
c) Coalescence
d) **Evaporation**



Section 11.1 Assessment

1. Nitrogen, Oxygen, Argon, Carbon Dioxide, Water Vapor.

Section 11.1 Assessment

2. Dust, Salt, Ice, and Airborne Microorganisms.

Section 11.1 Assessment

3. Each layer is marked by a cessation of temperature change called a "pause". The troposphere and mesosphere cool with increased altitude, while the stratosphere and thermosphere warm with increased altitude. Each layer is different in composition.

Section 11.1 Assessment

4. Temperature increases with height in the stratosphere because ozone molecules absorb UV radiation from the Sun.

Section 11.1 Assessment

5. Earth's surface absorbs solar radiation in the form of visible light, and emits radiation in the form of infrared waves.

Section 11.1 Assessment

6. The pot heated from above would take longer to boil because less dense warm water wouldn't sink (convection wouldn't occur)

Section 11.1 Assessment

7. A planet with no atmosphere would most likely be very cold.