

Copy of Notes

Page 1-2 Atmosphere notes. See Chapter 2 section 1 in textbook to read the material that goes along with the notes.

page 3-4 Air masses and fronts. See Chapter 3 Section 2 to read the material covered in these notes

page 5-6 Condensation, clouds, water cycle. See Chapter 3 section 1 to read the material covered in these notes.

page 7 Climate notes (not in science textbook)

page 8-9 Severe Weather notes. Refer to Chapter 3, Section 3

page 10-11 Atmosphere Heating. Refer to Chapter 2 Section 2

page 12-14 pollution notes. Refer to Chapter 2 Section 4.

page 15-18 Winds. Refer to chapter 2 Section 3.

* There are also many quizlets on canvas Students can use to study.

Earth's Atmosphere

Name

Key

Prefixes and Suffixes:

1. -sphere = ball
2. Tropo- turning or change
3. Strato- layer
4. Meso- middle
5. Thermo- heat

List 4 facts about each of the layers:

Troposphere (lowest)

1. densest layer
2. all life lives here
3. weather occurs here
4. all pollution happens here

Stratosphere

1. gas don't mix -- stay in layers
2. ozone layer protects from sun
3. very thin air

• very little moisture
airplanes/jetstream

Mesosphere

1. middle layer
2. coldest layer
3. meteor showers
4. colder as you go up

Thermosphere

1. very high temperature
2. ionosphere
3. auroras
4. radio waves are bounced back

How will you remember the order from the layer closest to Earth to the layer farthest from Earth? (ex. The Monkey Sang Today)

Th-

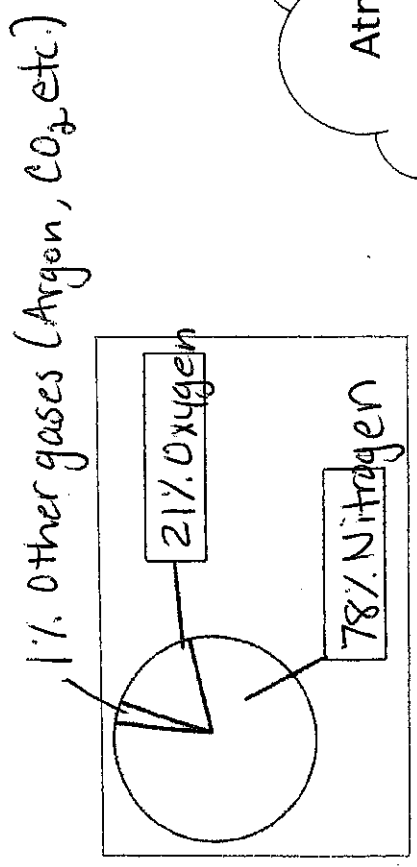
M-

S-

T-

What is an atmosphere?
The mixture of gases surrounding the Earth.

What is our atmosphere made of?



What is Air Pressure?

The amount of force caused by air molecules pushing on a surface.

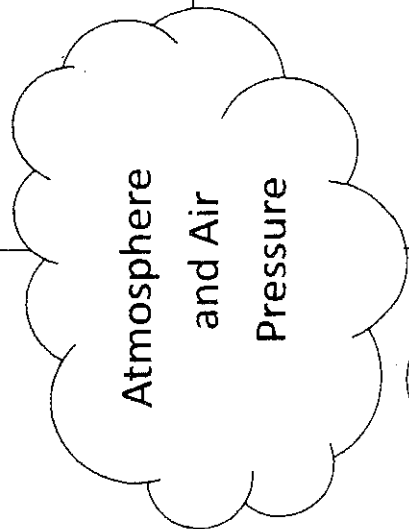
What is Atmospheric Pressure?

The amount of force caused by our atmosphere pressing on us.

Key

How is Nitrogen introduced to our atmosphere?
Lightning.

How is oxygen introduced to our atmosphere?
Plants.

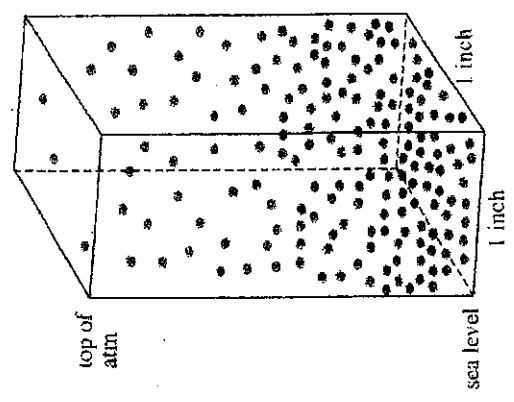


Where is Atmospheric Pressure the greatest on Earth's surface?

sea level

Why?

More gases pressing.



Where is Atmospheric Pressure the least on Earth's surface?

At the top of Mountains.

Why?

Less gases pressing.

Air Masses

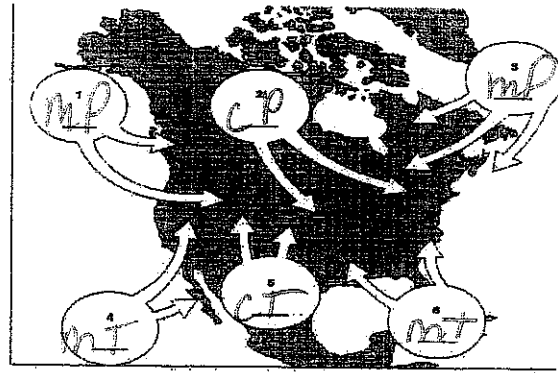
An air mass is a large body of air where moisture and temperature content are constant throughout.

Maritime (m) - air is wet and forms over H₂O

Continental (c) - air is dry and forms over land

Polar (P) - air is cold and forms @ poles

Tropical (C) - air is warm and forms @ equator



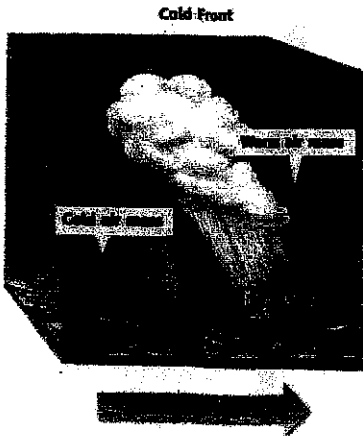
Cold Air Masses - Most of the cold winter weather in the United States is influenced by three air masses formed over the polar region. These are abbreviated as cP and cT.

Warm Air Masses - Three warm air masses influence the weather in the United States. These are formed over the tropics. These are abbreviated as mP and mT.

Fronts

A front is an area in which two opposing of air masses meet.

Cold Front



Cold (dense) air moves up warm (less dense) air.

The warm air is pushed up quickly.

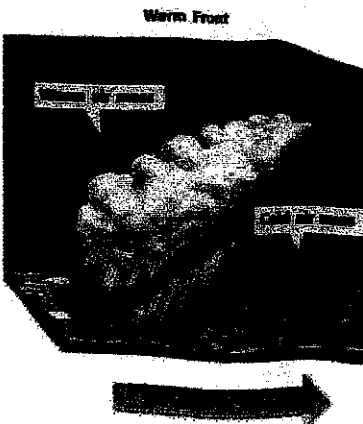
Cumulonimbus clouds form ahead of the front.

Precipitation occurs if there is enough moisture in the air (short and intense).

Strong winds occur, moving from cold to warm.

Can produce severe weather like thunderstorms

Warm Front



Warm (less dense) air pushes cold (dense) air.

The warm air slowly rides over the cold air.

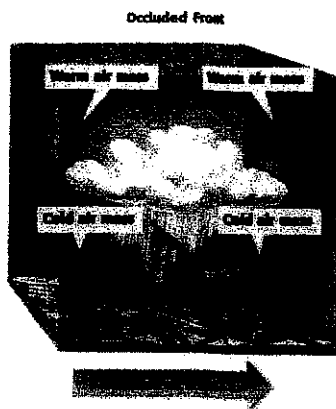
Cirrus + nimbostratus clouds form ahead of the front.

Precipitation occurs if there is enough moisture in the air (moderate rain over time).

Slow winds occur, moving from cold to warm.

Can produce flooding due to long rains.

Occluded Front



Cold (dense) overtakes warm (less dense) air, catching up with another cold air mass.

The warm air is pushed up quickly above the cold.
Cumulonimbus + nimbostratus clouds form ahead of the front.

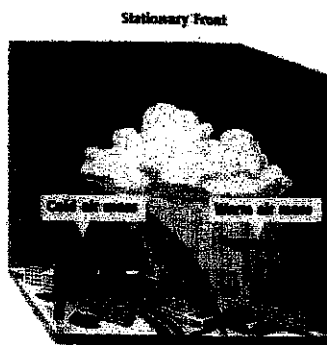
Precipitation occurs if there is enough moisture in the air.

Winds occur, then cold air.

Rarely occur in the Southeast.

Can produce large amounts of rain + snow

Stationary Front



Warm (less dense) air meets cold (dense) air. Both air masses are equal in strength, pushing against each other, no movement

The warm air slowly rises over the cold air.
nimbostratus clouds can form at the front.

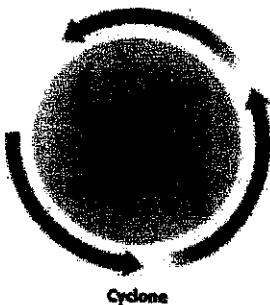
Precipitation occurs if there is enough moisture (moderate rain over many days).

mild winds occur, moving from cold to warm.

Can produce large amounts of rain or snow

Air Pressure and Air Masses

Cyclone



An area of low pressure compared to surrounding areas.

Air moves toward the center and rises.

Rising air causes low pressure + clouds

Coriolis Effect spins the air counter-clockwise.

Cyclones are associated with cloudy, wet weather.
warm

Anticyclone



An area of high pressure compared to surrounding areas.

Air moves away from the center and falls.

Falling air causes clear skies – NO clouds.

Coriolis Effect spins the air clockwise.

Cyclones are associated with good weather.
cool

Name _____

Dew Point

Key

Notes from p. 79 in your book.

1. **Condensation** is the process by which a gas ~~liquid~~, such as water vapor, becomes a liquid.
2. Before condensation can occur, the air must be Saturated, which means the air must have a relative humidity of 100 %.
3. Condensation happens when saturated air cools.
4. Air can become **saturated** when water Vapor is added to the air through evaporation.
5. Air can also become saturated when it cools to its dew point.
6. The **Dew Point** is the temperature at which a gas condenses into a liquid.
7. Before water vapor can condense, though, it must have a surface to condense on.

Dew Point Lab (class activity)

I. Purpose: I will discover the dew point temperature of this classroom and make dew form on the side of a container.

II. Hypothesis: I predict that I will make dew if I can drop the temperature of this classroom down to _____ C (which will be the dew point temperature).

III. Data:

Room Temp. C	Add warm water in aluminum can until it is 1/2 full, then record the temperature. C	In a separate plastic cup, add enough ice cubes to fill the cup, then add cold water until it is full. Stir and wait for instructions. • You will be slowly adding ice water from the cup to the can, stirring, and taking temperature until you see condensation form on the side of the can.	Record the temperature of ice water in the can when you see dew droplets on the side of the can. You have found the dew point temperature of our classroom. C
		XXXXXXXXXXXXXXXXXXXXX	

IV. Analysis:

1. What is the liquid (dew) on the outside of the container?

2. What process made the liquid droplets (dew) form?

Clouds

A cloud is a collection of small water droplets or ice crystals suspended in the air.

They form when the air is cooled and condensation occurs.

Clouds are classified by their altitude and shape.

3 Forms of Clouds

- **Cumulus Clouds** are puffy white clouds that tend to have flat bottoms. They form when warm air _____. They indicate fair/neutral weather.
- **Stratus Clouds** are clouds that form in sheets. They form a blanket that covers the sky and blocks the sunlight when a large body of air rises.
- **Cirrus Clouds** are wispy fluffy white clouds found at high altitudes. They form from _____. They indicate a _____ in weather is about to occur.

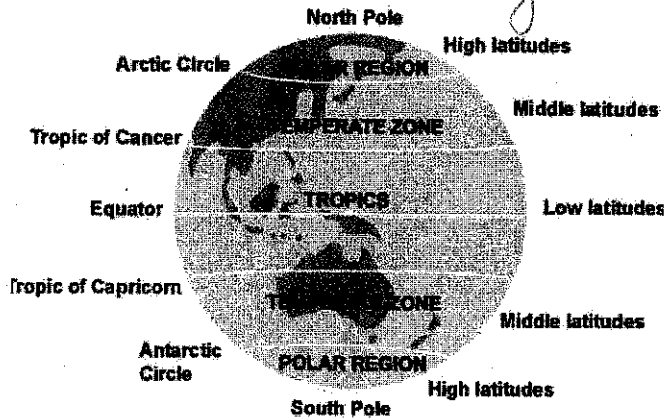
Cloud Altitude**Prefixes:**

1. Cirro - high (ex. Cirrostratus)
2. Alto - middle (ex. Altostratus)
3. Strato - low (ex. Stratocumulus)

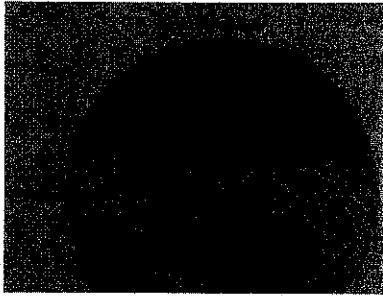
Rain Capacity

Nimbus - dark rain clouds (ex. Nimbostratus or cumulonimbus)

* Also study the stages of the water cycle and study the water cycle diagram in book.

Name Key Pd _____ Date _____1. What is Climate? The Average weather condition over a long time

2. Which Climate Zone is Ours in NC?

Temperate3. As you go up in latitude, what happens to the temperature? Increases
and moisture? Decreases**Stopping to Think 1 (Energy and the Sun)**Imagine holding a tennis ball in front of a heat lamp for 5 minutes. What do you predict will happen to the temperature along the "equator" of the ball compared to the top and bottom? It will be hotter**Stopping to Think 2 (The Role of Oceans)**

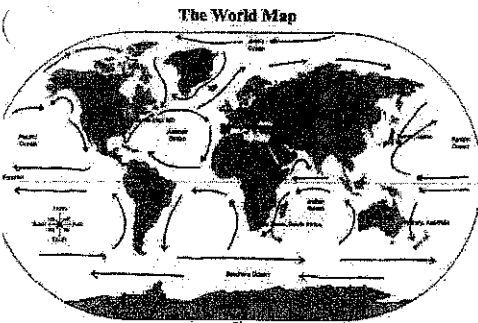
a. Which coast of the US is warmed by warm ocean currents?

East Coast

b. Which coast of the US is cooled by cool ocean currents?

West Coastc. Do you predict that the climate of southeastern states along the ocean (such as Georgia and North Carolina) would be warmer or cooler without ocean currents? Cooler

Explain

Our east coast gets warmed by a gulf stream current. Without it, we would be colder.**Stopping to Think 3 (Factors Affecting Local Climates)**What 3 factors affect local climates? 1. Mountains (landforms)2. Bodies of H₂O 3. AltitudeWhich of those 3 affect YOUR local climate? H₂O bodies + mountains

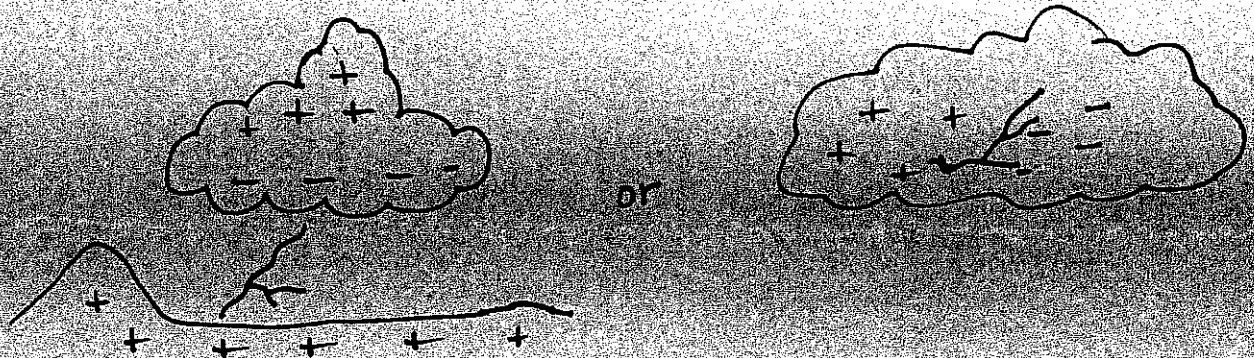
Severe Storms

Thunderstorms

- Brief, heavy storms
- Rain, winds, lightning and thunder
- Cold front
- Cumulonimbus cloud
- Unstable atmosphere

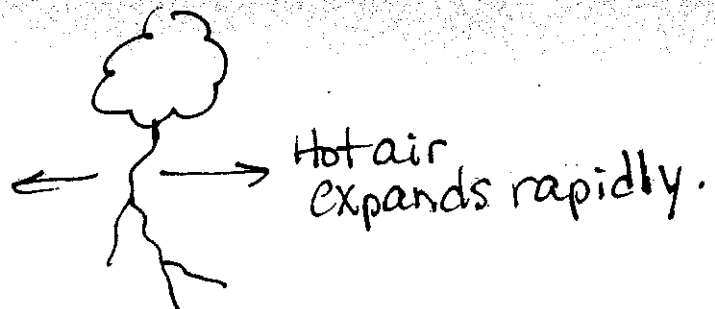
Lightning

- Electric discharge between a (+) and a (-) area.
- Between clouds
- Between clouds and Earth
- Within same cloud
- 10 million bolts per day worldwide
- Kills more people in US than tornadoes or hurricanes.
- Heats the air to 37,000 C (hotter than the sun)



Thunder

- When lightning strikes it causes the air to expand ~~and collapse~~ creating sound.

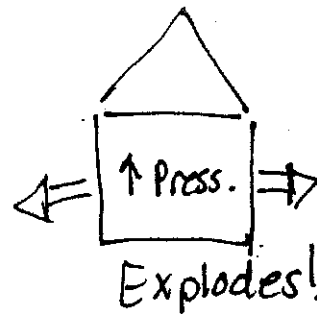
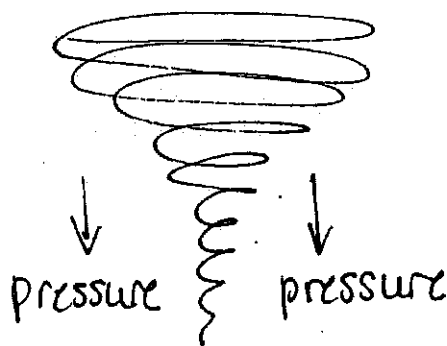


How far is the storm?

3 | Lightning → Count Seconds → Thunder

Tornadoes

- Speed
- Pressure
- Cumulonimbus clouds
- Has to touch Earth to be called a tornado
- Wind moving in 2 directions
- At edge of a cold front
- 75% of them are in US
- Mostly seen in Spring and Summer
- cP meets a mT



Hurricanes

- Over tropical oceans
- Most powerful storm
- Winds over 120 km/hr
- Called typhoons in the Pacific
- Called cyclones in the Indian
- Occur b/w 5 and 20 N and S latitude (doldrums)
- Most damage is from the storm surge
- Loose energy when they hit land.

Heat Transfer in the Atmosphere

Name Key pd _____

Energy in the Atmosphere

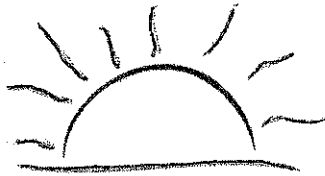


- Earth and its atmosphere are warmed by energy from the sun.
- Only two-billionths of the sun's energy reaches the Earth.

Three Ways of Heating

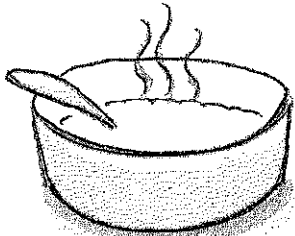
1. Conduction 2. Convection 3. radiation

Radiation



- The transfer of energy as electromagnetic waves.
- The small fraction of the Sun's radiation that we receive here on Earth is enough to drive the water cycle, wind, currents, etc. and make Earth habitable.

Thermal Conduction



- The transfer of thermal (heat) energy through a material.
- Always transferred from hot to cold.
- Conduction occurs when two things touch.

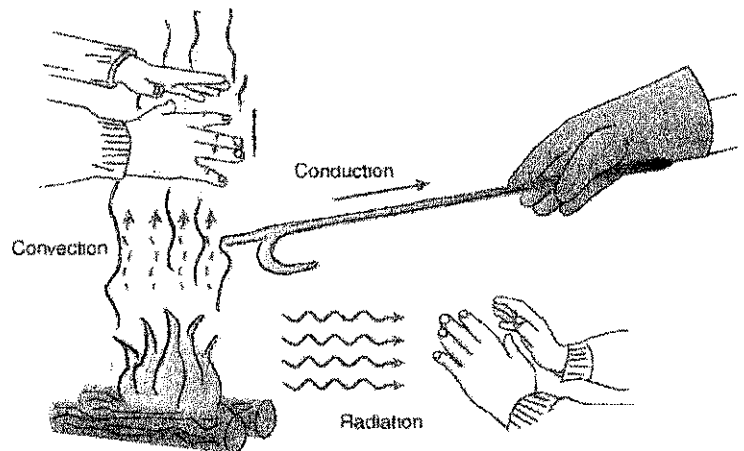
Convection

- The transfer of heat energy by the circulation of a gas or a liquid.
- Air or water is heated, becomes less dense, and rises.
- Air or water is cooled, becomes more dense, and sinks.



Convection Current

- The circulation of warm air or water rising, and cool air or water sinking causing a circular motion.



Greenhouse Gases, Greenhouse Effect, and Global Warming

Name _____ pd _____

What are greenhouse gases?

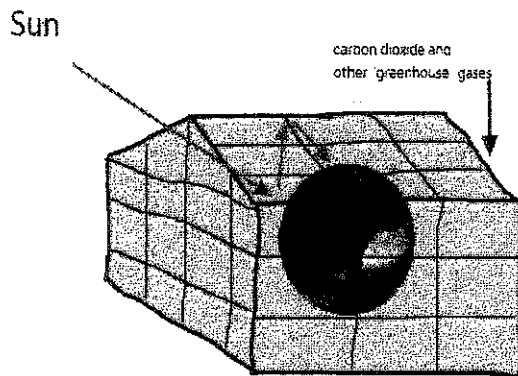
Gases that contribute to the greenhouse effect by absorbing and trapping heat from solar radiation.

List 4 greenhouse gases.

1. CO₂
2. H₂O vapor
3. methane
4. ground level ozone

What is the Greenhouse Effect?

The Earth's natural heating process, in which gases in the atmosphere trap thermal (heat) energy.



What is a radiation balance?

The balance between incoming and outgoing energy.



What is happening to the amount of carbon dioxide (CO₂) in the atmosphere?

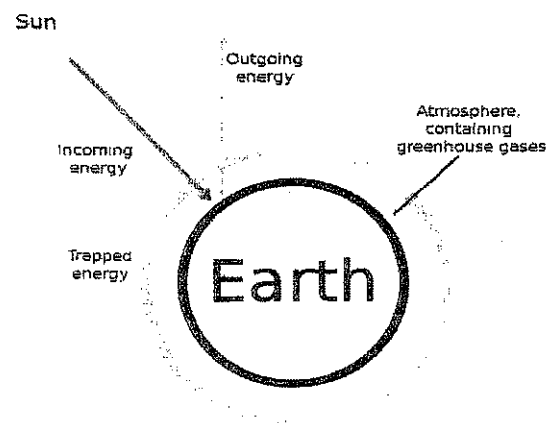
increasing

Why is this a problem?

traps heat increasing average global temp.

What is global warming?

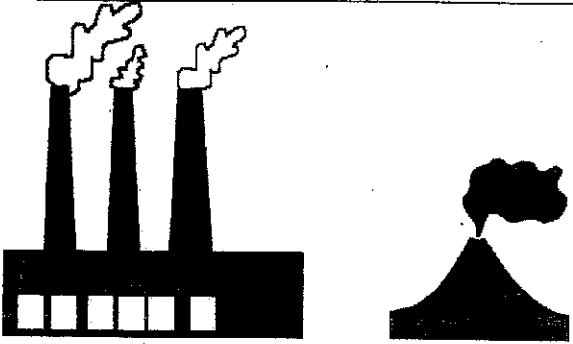
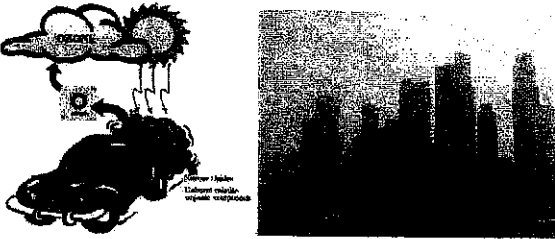
The gradual increase in the average global temperature that is due to high concentration of greenhouse gases in our atmosphere.



Air Pollution

Key

The contamination of the atmosphere by pollutants from human and natural sources.

Primary Pollutants	Secondary Pollutants
Are put directly into the air by <u>Human</u> or natural activity.	These form when primary pollutants react with something else to create a new pollutant.
Examples: 1. <u>Volcanic gas</u> 2. <u>Paint fumes</u> 3. <u>Methane from pig farm</u>	Example: <u>Car exhaust</u> + <u>Sun</u> = Ground Level Ozone Or Ozone + <u>car exhaust</u> = Smog Or Electrical Plant Exhaust + <u>H₂O</u> = Haze
	
Point Source Pollutants	Non-Point Source Pollutants
Released from <u>a single</u> source (you can point to it).	Come from many <u>different</u> sources and are hard to identify.

Primary/Point	Secondary/Non-Point
Exhaust Chemicals	Ozone
Pollen Methane	Smog
Volcanic Gas	Haze
Dust	
Sea Salt	

Big Idea: Burning fossil fuels = carbon dioxide, Ozone, Smog, and Haze.

Industrial Pollution – When industrial plants burn fossil fuels or produce gases that can pollute the air.

Indoor pollution– Polluted air inside a building. The best way to clean the air inside is ventilate.

Particulate matter– Little bits of dander, dust, hair, fiber, etc. that float in the air.

Health Effects

Short Term	Long Term
coughing headaches irritation to eyes runny nose sneezing	lung cancer heart disease

1. Scrubber - A device used to clean up the pollutants before they are released.

2. Catalytic Converter - Remove pollutants from car exhaust.

3. To reduce pollution, I can....

drive more efficient cars
drive less (carpool, bus, bike, walk)
conserve electricity

4. When did the government pass the Clean Air Act? 1970 Why?
to regulate the amount of pollutants that can
be released from one source

5. The EPA sets Air Quality Standards for each state.

6. List 2 pollutants the EPA must regulate. ozone and
smog

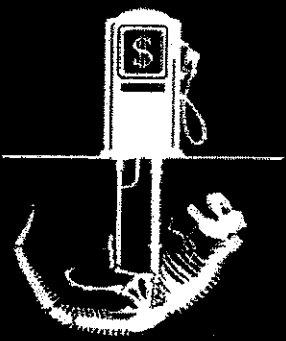
7. Primary Standards protect humans.

8. Secondary Standards protect animals and plants
and buildings.

Acid Precipitation

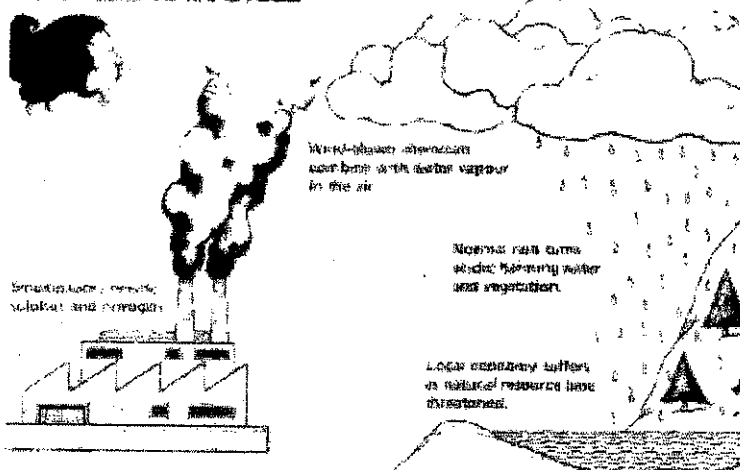
Name Key pd _____

- A fossil fuel is a nonrenewable energy source formed from the remains of organisms that lived long ago. Examples include oil, coal, and natural gas.
- Much of the energy we use comes from the burning of fossil fuels, such as coal and oil.
- We use fossil fuels to generate heat, light, and to produce electricity.



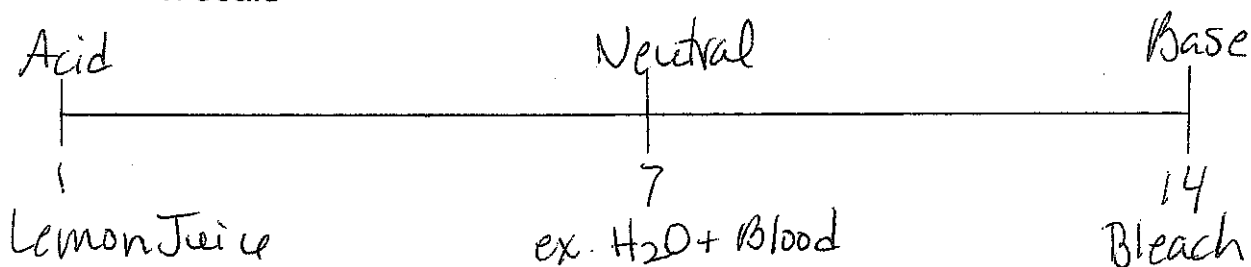
1. When fossil fuels burn, they release CO_2 and other gases. When these mix with H_2O vapor, they create acid precipitation.

THE ACID RAIN CYCLE



2. Smoke + H_2O Vapor = Acid in the air.

3. Ph scale



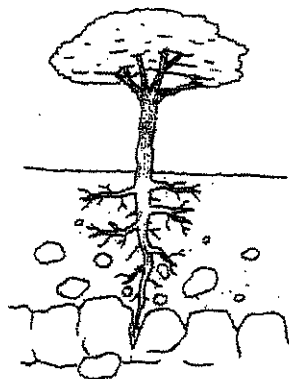
4. Which winds carry pollution from the US into Eastern Canada?

Westerlies

5. How does acid precipitation affect forests? Kills plants

6. What is it called when soil's acidity changes?

Acidification



7. Which two metals are unlocked from the ground due to acid precipitation? Mercury and Aluminum

8. What does mercury do to ~~big~~ living things? Kills them Brain Damage



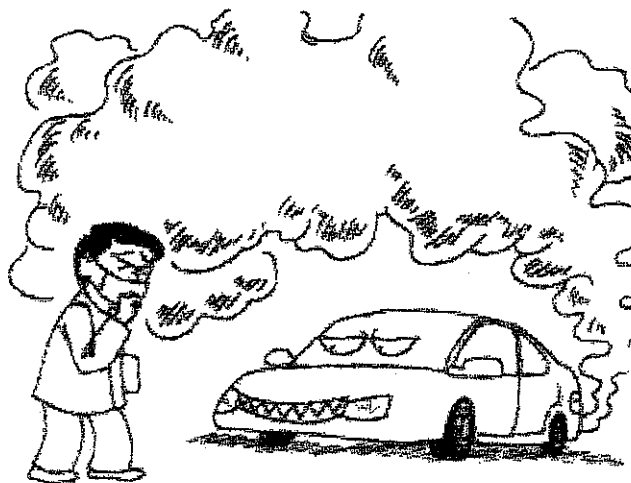
9. When the ice and snow melt in the spring, what occurs in the lakes and rivers?



Acid Shock

10. What is the very worst thing humans do that harms the atmosphere?

transportation (Burning fossil fuels)

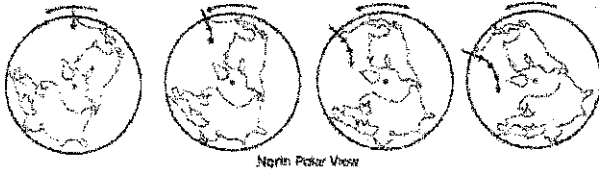


Global Winds

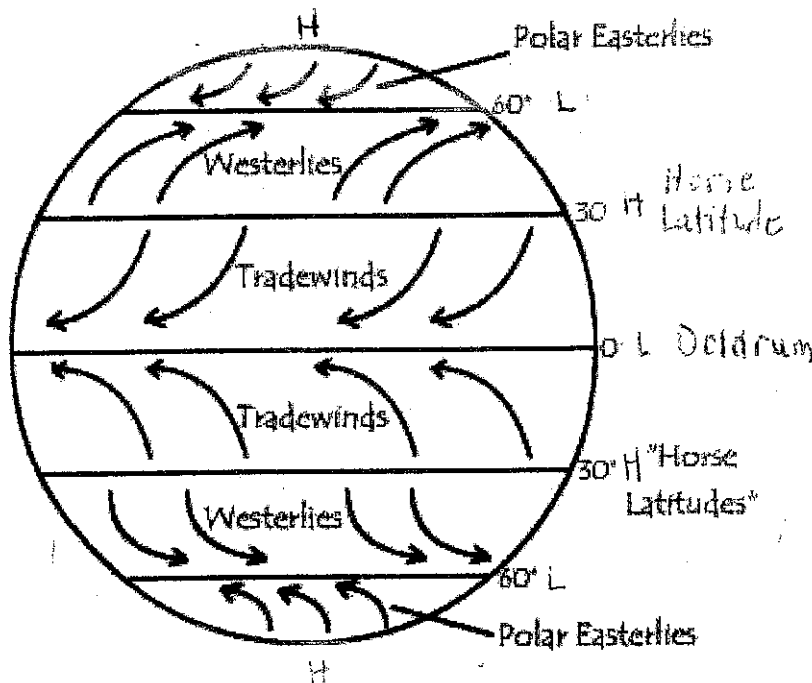
1. Wind is the movement of air caused by changes in air pressure and uneven heating of the Earth.
2. Why does air rise at the equator? hot air rises creating low pressure.
3. Why does air sink at the poles? cold air sinks creating high pressure.
4. So, temperature changes cause air pressure to go up and down. Hot air = low pressure and cold air = high pressure.

The Coriolis Effect

5. What is the Coriolis Effect? The apparent curved of the path of winds and ocean currents due to Earth's rotation.



6. Where is air pressure the least around our planet? equator
7. Where is air pressure the greatest around our planet? poles

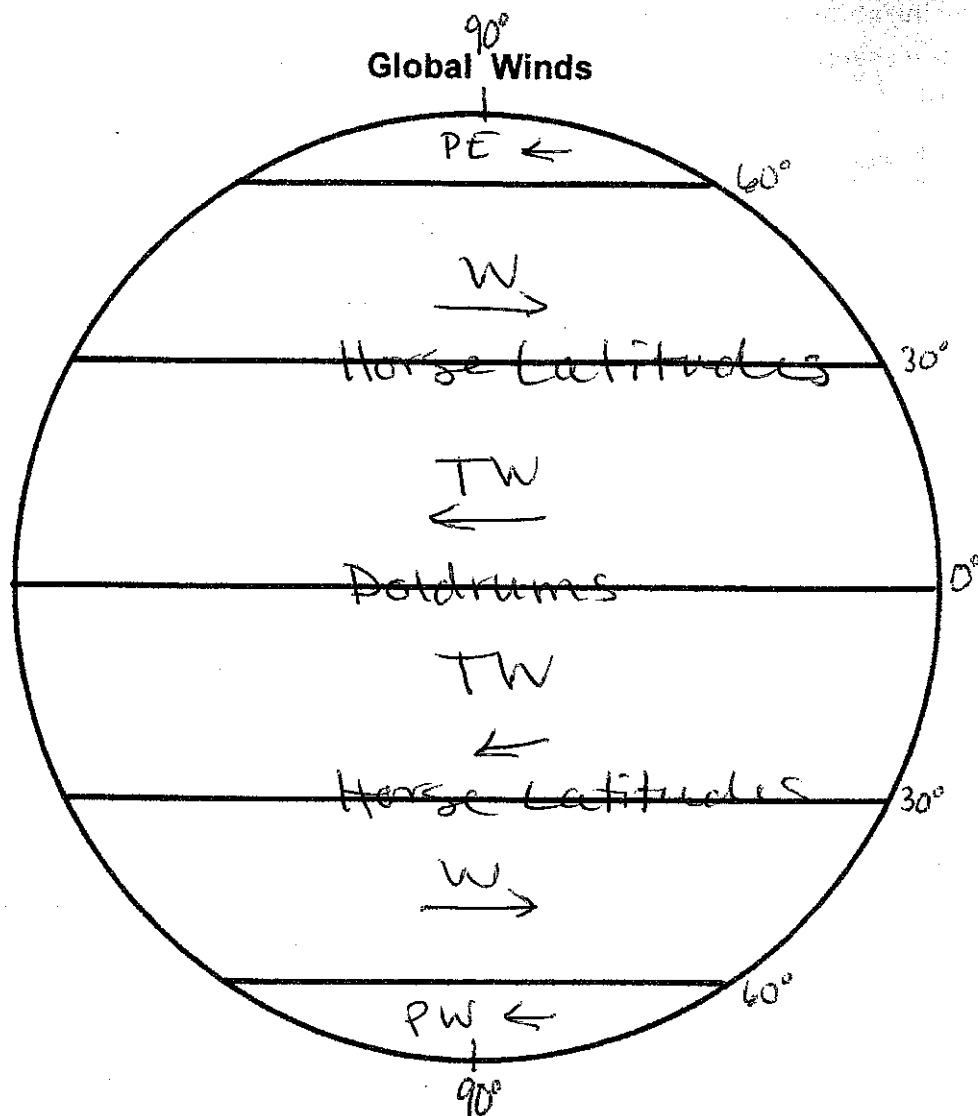


8. What do you call the bands of high and low pressure that occur at every 30 degrees north and south of the equator? pressure belts

9. Doldrums are an area of little wind around the equator.

10. Horse Latitudes are areas of little wind at the 30N and 30S pressure belts above and below the equator.

11. What are the Polar Easterlies? Winds that blow between 60°-90° degrees. They are cold and come from the east.
12. What are the Westerlies- Winds that blow between 60-30 degrees from the west.
13. What are Trade Winds? Winds that blow from 0°-30° degrees above and below the equator. They brought sailors to the New world.



1. Their name is based on the direction from which they come.
2. They are caused by differences in air pressure
3. Pressure belts are found at every 30 degrees latitude.
4. These winds appear to curve because of the coriolis effect

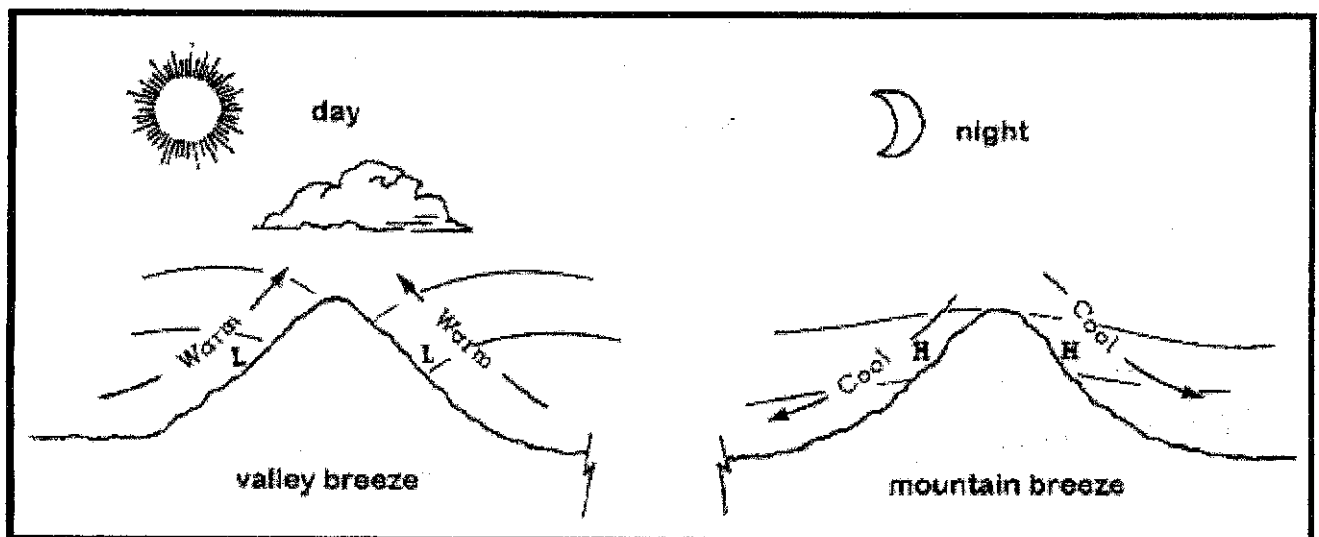
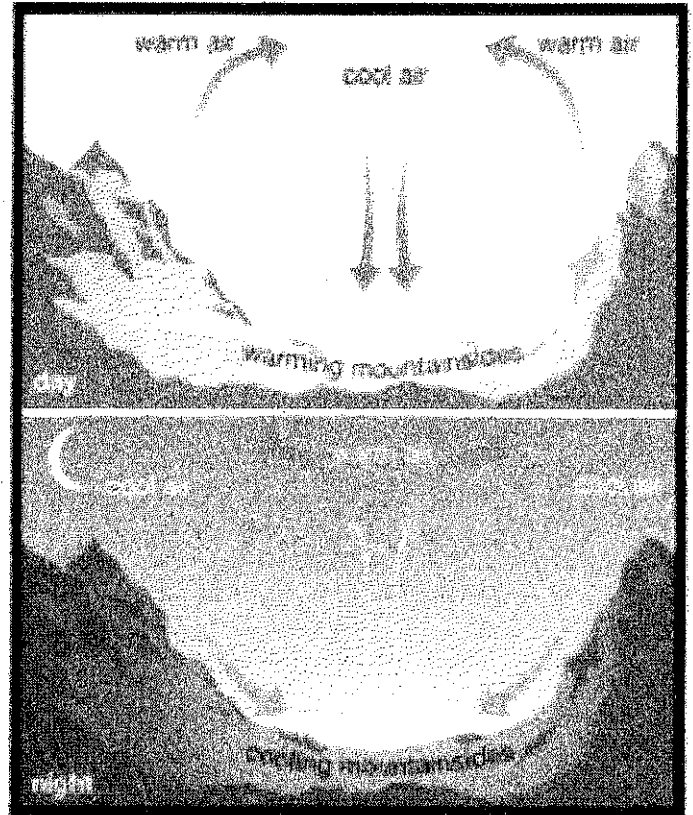
Local Winds

Winds and Breezes

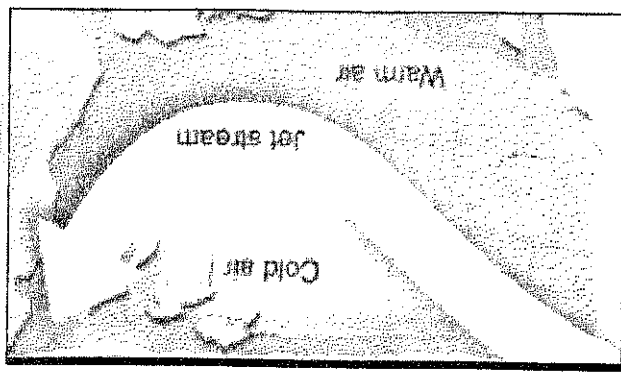
Mountains and large bodies of water cause temperature differences, which in turn, cause local winds.

Mountain and Valley Breezes

The Sun warms the air above the valley during the day. The warm air rises and flows up the mountain, causing a valley breeze. At night, the mountains cool down faster than the valleys because of their elevation. The cool air sinks and flows down the mountain causing a mountain breeze.

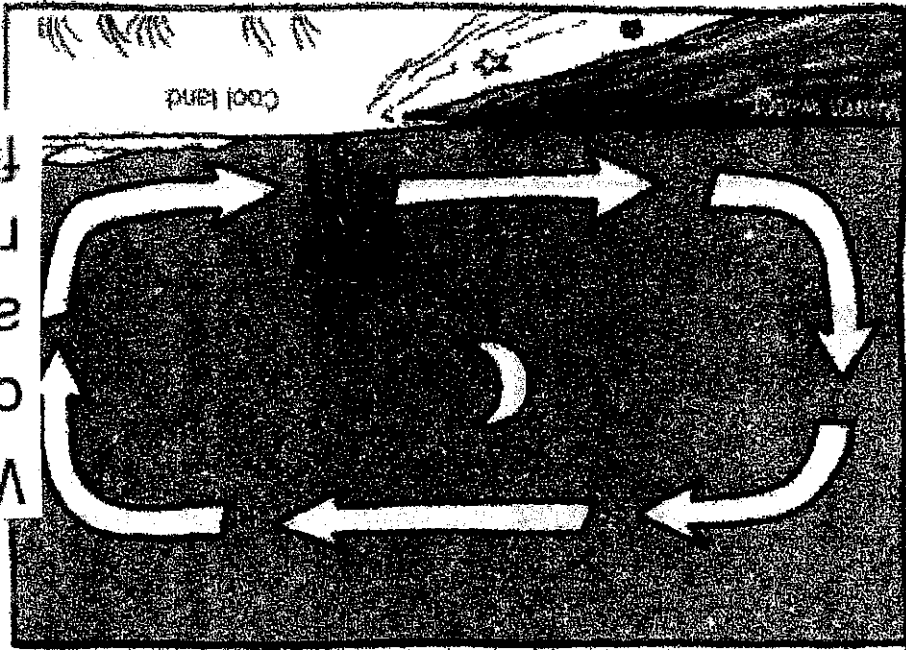


High speed winds coming from the west in the upper troposphere and lower stratosphere



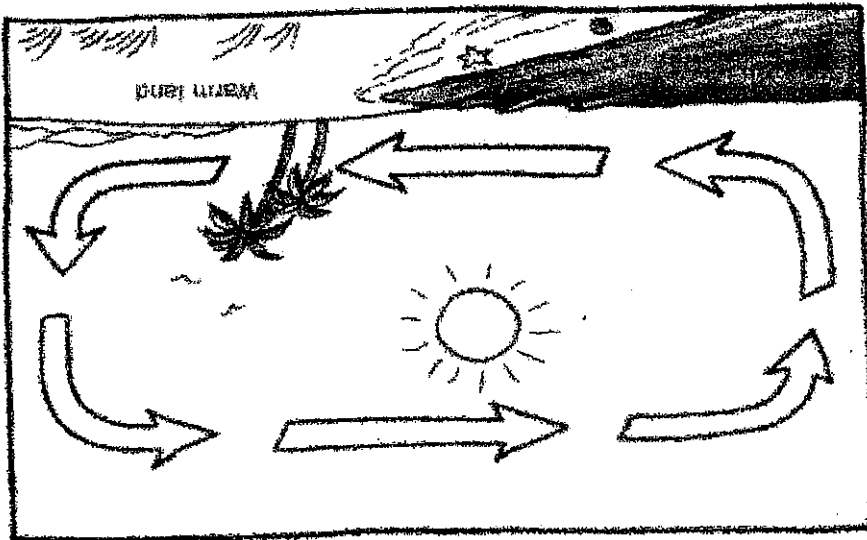
Jet Stream

Warm air rises off the water and cool air replaces it from land.



LAND BREEZE

Warm air rises off the land and cool air replaces it from the sea.



SEA BREEZE