All About Weather

Science Journal

Name _____

All About Weather Unit

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Lesson/Day	Lesson Title
1	Weather! Weather! Weather!
2	How Does Water Freeze?
3	Evaporation: How Does Water Turn Into a Gas?
4	All About Air: Why Does Hot Air Rise and Cool Air Sink?
5	All About Clouds
6	Celsius and Fahrenheit: A Look at Temperature
7	Stormy Weather
8	Lightening Strikes: All About Thunderstorms
9	The Arch After the Storm: All About Rainbows
10	The Howling Wind
11	All About the Four Seasons
12	What is Climate?

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Vocabulary

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Below Freezing	Any temperature that is **below 0° C / 32° F**.
Blizzard	A storm that is **snowy and windy**.
Breeze	**Lightly** blowing wind.
Celsius	**Measurement of temperature**. Freezing = 0° Boiling = 100°
Cold Spell	A **period of cold weather**.
Degrees	How temperature is **measured**.
Drizzle	**Light** rain.
Drought	A period with **no rainfall**.
Fahrenheit	**Measurement of temperature**. Freezing = 32° Boiling = 212°
Flood	An **overflowing amount** of rain.
Flurries	**Very light** snowfall.
Fog	A **thick cloud of vapor** that reduces visibility.
Forecast	The **weather that is expected** for the future.
Frost	**Ice crystals** that form on a frozen surface.
Hail	**Small ice pieces** that usually fall during a storm.
Heatwave	A **period with extremely hot** weather.
Humid	**Water vapor** in the air.
Hurricane	A **tropical storm** with rain and very high winds.
Icy	Covered with or consisting of **ice**.

Lightning	An **electric current** / **flash** that occurs between a cloud and the ground.
Meteorologist	A person who **studies weather** / weather patterns.
Meteorology	The **study of weather** / weather patterns.
Overcast	A cloudy sky with **no visible sunlight**.
Precipitation	**Rain or snow** that falls form the sky.
Rain	**Water** that falls from the sky.
Raindrop	A **single drop** of rain.
Rainbow	An **arch of colors that form in the sky** following a rainstorm.
Season	One of the **four divisions of the year** marked by a change in weather and daylight hours.
Shower	A **light and fast fall** of rain, snow, hail, or sleet.
Sleet	A form of precipitation consisting of **ice, mixed with rain and snow**.
Smog	**Fog or haze combined with smoke** and pollutants in the atmosphere.
Snow	**Frozen water vapor** that falls from the sky and lands as **white flakes**.
Temperature	The **degree of heat** present.
Thermometer	An **instrument for measuring the temperature**.
Thunder	**Loud noise** caused by **lightning**.
Tornado	**Vortex** of violently rotating wind.
Ultraviolet Rays	The **rays from the Sun** that can **cause damage**.
Wind	**Blowing air**.

What is Weather?

- Weather is the **state of the atmosphere** at a **specific time and location**.
- Weather includes: **rain, snow, sunshine, clouds, wind, sleet, etc**.
- Weather occurs in the **troposphere**—the lowest layer of Earth's atmosphere.
- Weather is **influenced by many factors**.
- Differences in **air pressure**, **moisture**, and **temperature between two locations** are the major reasons why weather occurs.
- Weather plays a big role in our daily lives.

Image by GDJ on Openclipart

Think About It!

What is your favorite type of weather and why?

How Does Weather Change?

- Weather varies from location to location. It can be snowy and -20° in Juneau, Alaska but sunny and 95° in San Juan, Puerto Rico.

- The factors that influence weather include:

  - **Temperature**
  - **Air pressure**
  - **Wind**
  - **Moisture in the air (humidity)**
  - **Elevation**
  - **Latitude → distance a place is, north or south, from the Equator**
  - **Ocean currents**
  - **Distance from the sea**
  - **Wind**

- Latitude is the **distance a place is, north or south, from the Equator**.

- The **Equator** is an **imaginary line drawn around the Earth equally distant from both poles**, dividing the Earth into **northern and southern hemispheres** and constituting the parallel of **latitude 0°**.

- Places **closer to the Equator** will experience **warmer climate and longer days** than places further away.

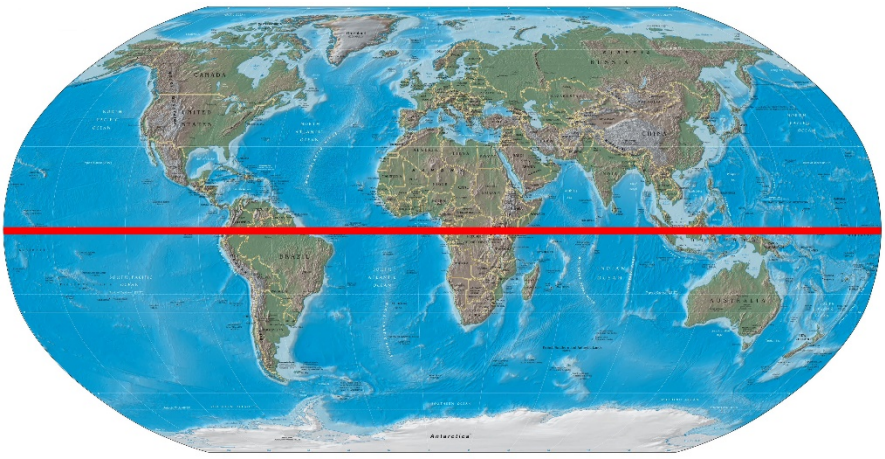
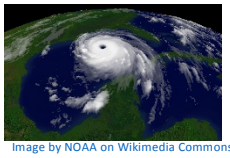
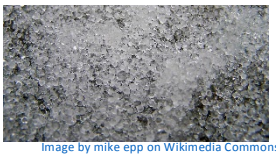


Image by Cburnett on Wikimedia Commons

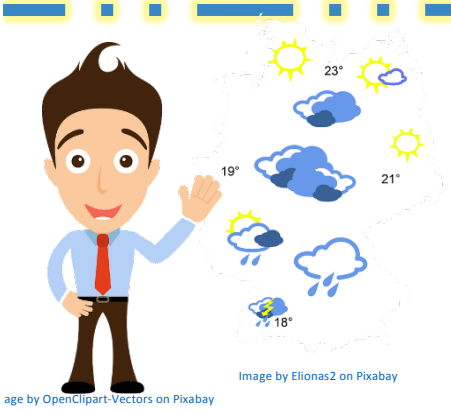
Types of Weather

Weather Type	Description	Picture
Clouds	a **visible mass of condensed water vapor floating in the atmosphere**, typically high above the ground.	 Image by WolfBlur on Pixabay
Dust Storm	a **strong, turbulent wind that carries clouds of fine dust, soil, and sand** over a large area.	 Image by NOAA George E. Marsh on Wikimedia Commons
Fog	a **thick cloud of tiny water droplets suspended in the atmosphere** at or near the Earth's surface that **obscures or restricts visibility**.	 Image by Beyond My Ken on Wikimedia Commons
Freezing Rain	**rain that freezes when it lands on an object**, such as trees, grass, power lines, buildings, etc.	 Image by Laslovarga on Wikimedia Commons
Hail	**pellets of frozen rain** that fall in showers from **cumulonimbus clouds**.	 Image by rohrspatz on Pixabay
Hurricane	a **storm with a violent wind**, in particular a tropical cyclone in the Caribbean.	 Image by NOAA on Wikimedia Commons
Lightning	**discharge of electricity** that occurs in the atmosphere.	 Image by oompa123 on Wikimedia Commons

Weather Type	Description	Picture
Rain	**moisture condensed from the atmosphere that falls visibly** in separate drops.	 Image by akshay_r13 on Pixabay
Sleet	a form of **precipitation** consisting of **ice pellets**, often **mixed with rain or snow**.	 Image by mike epp on Wikimedia Commons
Snow	**atmospheric water vapor frozen into ice crystals and falling in light white flakes** or lying on the ground as a white layer.	 Image by Ralph Hockens on Wikimedia Commons
Sunshine	**direct sunlight unbroken by cloud**, especially over a comparatively large area.	 Image by ForestWander on Wikimedia Commons
Thunderstorm	a **storm with thunder and lightning** and typically also **heavy rain or hail**.	 Image by skeeze on Pixabay
Tornado	a **mobile, destructive vortex of violently rotating winds** having the appearance of a **funnel-shaped cloud** and advancing beneath a large storm system.	 Image by Justin Hobson on Wikimedia Commons
Wind	the perceptible natural **movement of the air**, especially in the form of a current of air blowing from a particular direction.	 Image by JuliaSchSch on Pixabay

Meteorology

- Meteorology is the **study of the Earth's atmosphere**.
- A person who **studies meteorology** is called a **meteorologist**.
- A meteorologist studies the Earth's atmosphere and carefully watches the weather. A meteorologist has the **ability to predict the weather forecast—an estimate of future events**.
- There are **many factors** that go into predicting the weather, which is **why forecasts aren't 100% accurate**.
- Meteorologists **use many different tools to measure and predict the weather**. *We will learn about these tools on the next page!*



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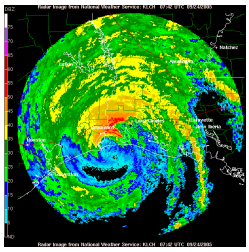
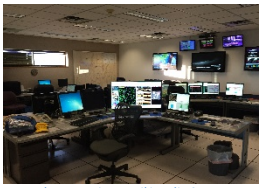
Think About It!

Do you think being a meteorologist is a hard job? Why or why not?
Would you like to be a meteorologist? Why or why not?

How Do We Measure and Predict the Weather?

Tool	Description	Picture
Doppler Radar	determines the **rate of precipitation as well as wind speed and direction**. The Doppler Radar helps the meteorologist **determine if a storm warning needs to be issued**.	 Image by NOAA on Wikimedia Commons
Satellite	used to **view cloud formations over a specific area**.	 Image by NOAA on Wikimedia Commons
Rain Gauge	used to **measure** the **amount of rainfall**.	 Image by Bidgee on Wikimedia Commons
Anemometer	used to **measure** the **speed of wind**.	 Image by Alex Borland on Public Domain Pictures
Barometer	used to **measure** the **air pressure** to see if it is rising or falling.	 Image by Agnellous on Wikimedia Commons
Thermometer	used to **measure** the **temperature outside**.	 Image by Cruccone on Wikimedia Commons
Computer Model	Different models can view many different areas to allow meteorologists to see **how the weather is changing**.	 Image by Famartin on Wikimedia Commons

The Three Forms of Water

- Water is **colorless**, **odorless**, and **tasteless** substance.
- Water exists in three states:
  - **Solid**
  - **Liquid**
  - **Gas**

Water as a Solid	Water as a Liquid	Water as a Gas
Ice *Ice is formed at 0°C and 32° F*	**Wet and Fluid**	**Vapor or Steam** *Steam is formed at 100° C / 212° F*

Identify the Three Forms of Water!

Write solid, liquid, or gas on the line under each picture.

Image by raphaelb on Openclipart

Liquid

Image by OpenClipart-Vectors on Pixabay

Gas

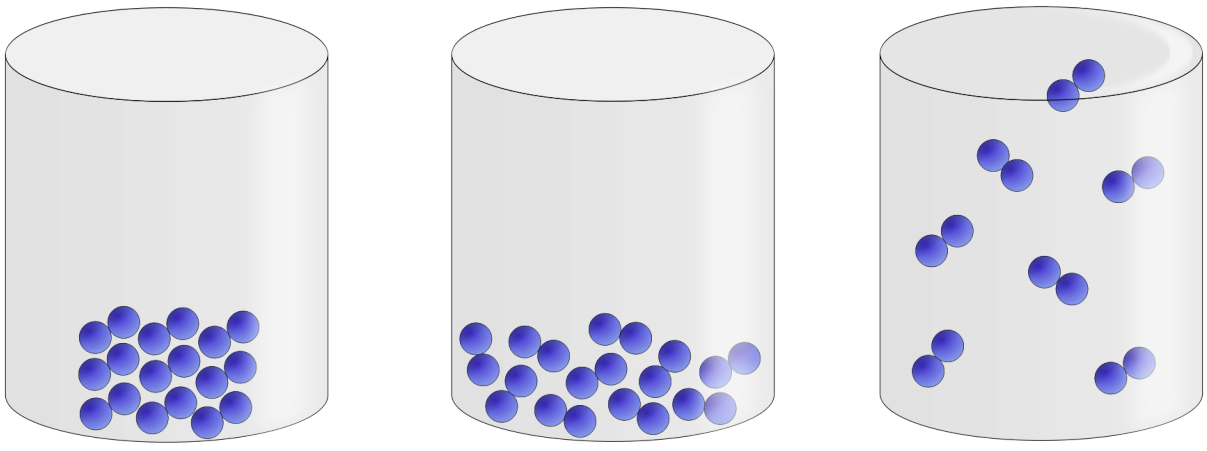
Image by lekamie on Openclipart

Solid

Water Molecules

- A molecule is a **group of atoms that are bonded together**.
- A molecule represents the **smallest fundamental unit of a chemical compound**.
- Water molecules **look different** for **each of the three forms of water**.

Solid	Liquid	Gas
Molecules **do not assume the shape of the container**. The molecules are **fixed into one position** and **do not move freely**. There is also **not a lot of space** between the molecules.	Molecules **assume the shape of the container**. The molecules **move freely**, but there is **not a lot of space** between them.	Molecules **assume the shape of the container**. The molecules **move freely** and there is **a lot of space** between them.



Solid Liquid Gas

Image by Yelod on Wikimedia Commons

How Does Water Freeze?

- Freezing is the **process of liquid water turning into a solid**.
- When something freezes, it means that **heat has been lost**.
- Water freezes at **0°C / 32°F**
- As the temperature drops, the **water molecules begin to slow down / lose energy**.
- Once the molecules slow down, it is **easier for them to attach to each other**. When molecules are **attached**, they **share electrons**.
- As the **molecules attach to each other and lock together**, they begin to **form a hexagon-shaped pattern**.
- Once the molecules are attached and locked together, and the pattern is formed, it is **hard to move them**.
- Solid water, or **ice**, takes up about **9% more room than its liquid form**.
- Solid water takes up more room because the **molecules are not freely bouncing around**.

Think about your classmates. If you all stood up and huddled together, you wouldn't take up as much room as if you stood up with your arms extended touching each other's shoulders.

- **Oceans do not freeze as quickly** as freshwater because they **contain salt**. The salt molecules **protect the water molecules by creating little "fences" around them**.
- If the **temperature drops below -2° C / 28.5° F**, the ocean will freeze.
- When a solid **melts**, it means that it is **turning back into a liquid**.
- Melting means that the **temperature has increased**.
- Once the molecules have enough heat, their **energy will return and they will break free**.
- Once the **molecules break free**, they will **begin to bounce freely**.

Image by Juliancolton on Wikimedia Commons

Image by peltierclem on Pixabay

Image by refotech on Pixabay

Ice: Environmental Effects

- Rain that **falls and freezes on contact** is called **freezing rain**.
- **Sleet** is a **combination** of **ice**, **rain**, and **snow**.
- Ice can make **walking and driving** **very dangerous**.
- When **roads become icy**, the **chances** of getting into a **car accident or falling increase**.
- When trees / tree limbs become heavy with ice, they can **break**.
- When power lines become heavy with ice, they can **fall or break, causing power outages**.
- When the roads are icy, it is best to stay indoors to avoid injuries.
- Special salt is usually thrown onto the roads to melt the ice and to **prevent more ice from freezing onto the road**.

Image by Thomas Brueckner on Flickr

The Water Cycle

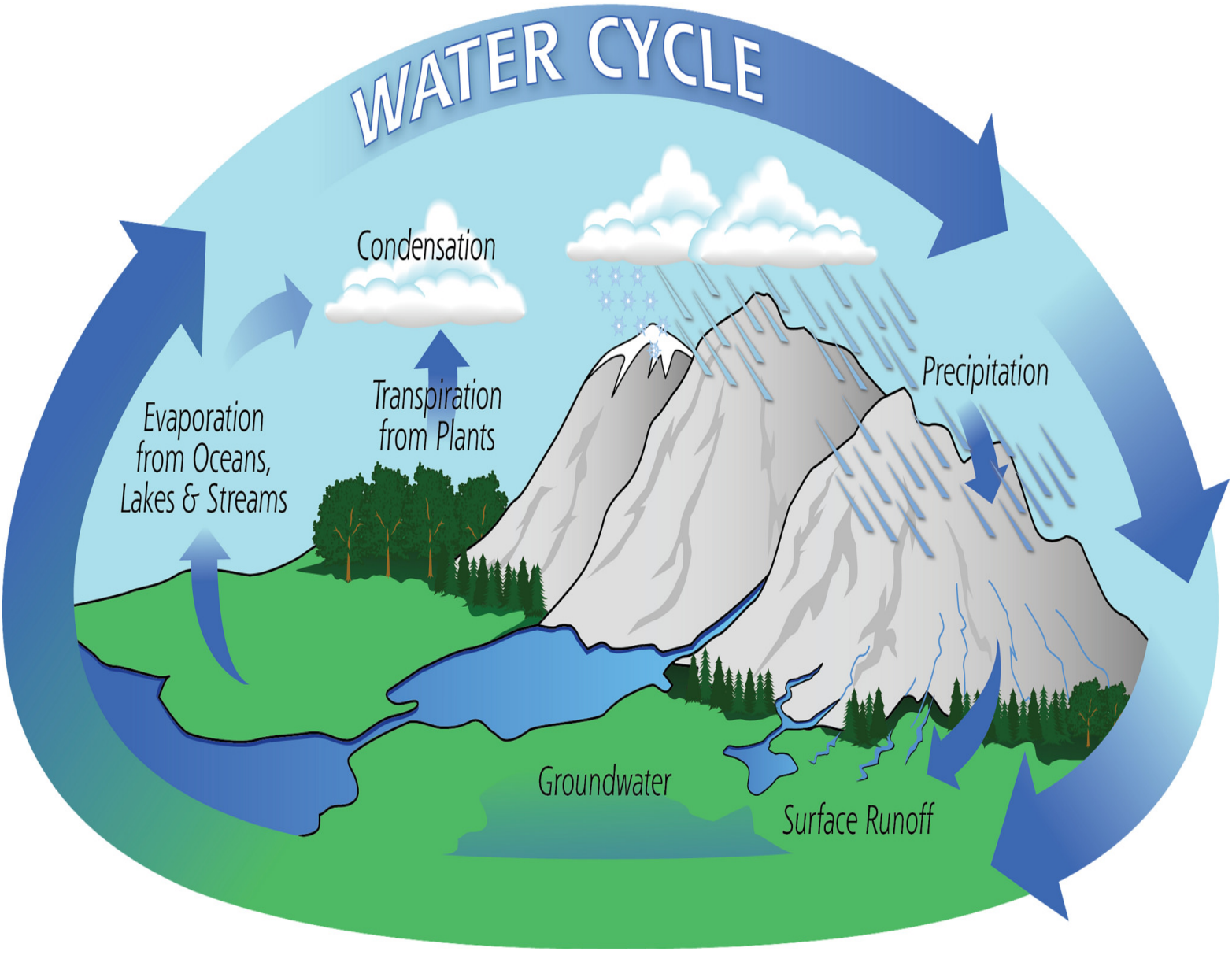


Image by NASA on Flickr

Evaporation and Condensation

- Evaporation is the process in which a **liquid turns into a vapor**.
- Water molecules **leave the surface of the Earth** and **enter the atmosphere**.
- Evaporation occurs when even the **slightest drop of water leaves a pond, puddle, ocean, lake, or stream**.
- When the molecule **evaporates**, it takes **some heat / energy from the object is left**. The heat is known as **latent heat**.

Think about sweating. On a hot day, your body begins to sweat. You can feel the sweat on your body. When you cool down, the sweat begins to disappear / dry.

- Evaporative cooling is the process of **cooling down an object through evaporation**.
- The speed of evaporation is affected by these factors:
  - **Temperature**
  - **Amount of water vapor in the air**
  - **Wind speed**
- Evaporation occurs at any temperature, but occurs **quicker in warmer temperatures**. The **molecules move faster when warmer and evaporation is quicker**.
- Water vapor that is in the air is known as **humidity**.

- The **opposite of evaporation** is **condensation**.
- Condensation is the process in which a **vapor turns back into a liquid**.
- Condensation occurs when the **atmosphere is saturated** (full of water).
- In order for the water to condense, there **must be a surface—such as grass, a window, or a water bottle**.

Think about a water bottle. Suppose you take a water bottle out of the refrigerator. You drink a little bit of the water, but do not finish all of the water. If you leave the bottle out of the refrigerator for a while, you will notice tiny water droplets on the outside of the bottle. This is condensation.

- Dew point is the **atmospheric temperature** (varying according to pressure and humidity) below which **water droplets begin to condense and dew can form**.

Image by Tristan Schmurr on Flickr

Image by Acdx on Wkimedia Commons

Rain, Dew, and Fog: What is the Difference?

Rain	**Moisture condensed from the atmosphere** that falls visibly in **separate drops**.	 Image by Giuliamar on Pixabay
Dew	Tiny drops of water that **form on cool surfaces at night**, when atmospheric vapor condenses.	 Image by Valentin Riess on Pexels
Fog	a thick cloud of **tiny water droplets suspended in the atmosphere at or near the Earth's surface** that obscures or restricts visibility.	 Image by David Boozer on Pexels

What is Air?

- Air is another word for **atmosphere**.
- Air is **colorless** and **odorless**.
- Air is made up of **nitrogen**, **oxygen**, **argon**, **carbon dioxide**, and a **small percentage of water vapor**.
- Air is **required** for human, animal, and plant **survival**.
- **Polluted air** is the result of **gases**, such as ozone and carbon monoxide, **ash**, and **smoke**.

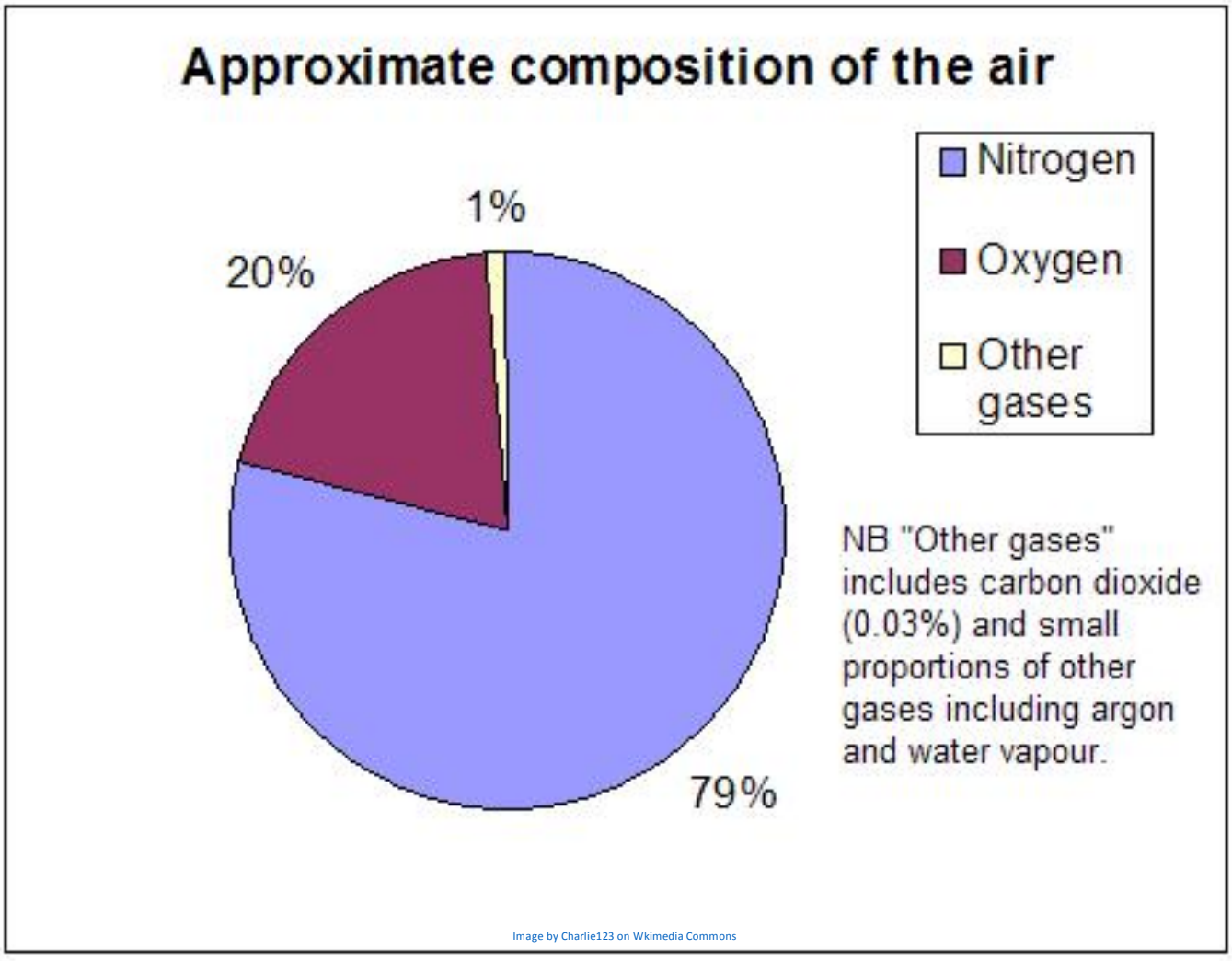


Image by Charlie123 on Wkimedia Commons

Words About Air

Term	Definition
Humidity	a quantity representing the **amount of water vapor in the atmosphere**
Air Pressure	**force exerted onto a surface** by the **weight of the air**
Air Quality	the degree to which the **ambient air is pollution-free**, assessed by measuring a number of indicators of pollution.
Warm Front	the **boundary of an advancing mass of warm air**, in particular the leading edge of the **warm sector of a low-pressure system**.
Cold Front	the **boundary of an advancing mass of cold air**, in particular the trailing edge of the **warm sector of a low-pressure system**.

Warm Air vs. Cool Air

- When air is **hot**, the **molecules are farther apart**.
- **Hot air is less dense** and **lighter** than cold / cool air.
- **Closer to the Earth's surface**, the **air is warmer**. The Sun's heat warms the air, so it rises.
- As the **air rises**, it **cools down**. When **air is cool**, the **molecules are closer together**.
- **Cool hair is not as dense or light as hot air**. Since the cooler air is "heavier", it **sinks**.

Think about the temperature in the morning compared to the temperature in the afternoon. In the morning, especially in the Summer, it is cooler than the afternoon. This is because the thermals or heat pockets, cannot rise very high. The air during the night is cooler because the Sun is not out. Once the Sun comes out, the thermals can rise higher and create warmer temperature.

- Tornados, thunderstorms, hurricanes, and even breezes are the result of the **cycle of rising warm air and the sinking cool air**.

Life Cycle of a Cloud

- A cloud is a **collection of water droplets or ice pellets that forms in the sky**.
- The **water droplets / ice pellets** are **very light** that they can **float in the air**.
- Since clouds are made up of many droplets / ice pellets, they can each **scatter the seven color wavelengths**. When **all the colors** (red, orange, yellow, green, blue, indigo, violet) **come together**, **white is produced**. Therefore, clouds are white.

How a Cloud Forms

Warm air rises, expands and cools.

Image by Clker-Free-Vector-Images on Pixabay

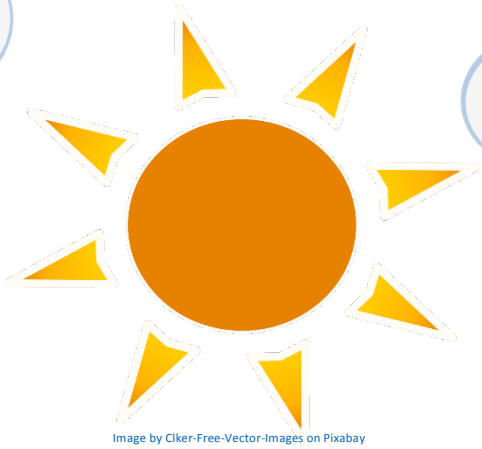


Image by Clker-Free-Vector-Images on Pixabay

When billions of droplets come together, a cloud is formed.

Droplets attach to dust particles in the air. The water droplets surround the dust particles. and cools.

As these new droplets form, they attach to each other.

Types of Clouds

- There are **three types** of cloud groups:
  - **Cirrus: high clouds → above 18,000 feet**
  - **Alto: middle clouds → 6,500 feet to 18,000 feet**
  - **Stratus: low clouds → up to 6,500 feet**

Cloud Name	Description	Picture
Cirrus	high cloud; made up of **ice**; **white**; indicate **pleasant weather**, but a **change of weather within 24 hours**.	 Image by Fir0002 on Wikimedia Commons
Cirrocumulus	high cloud; **small, round**, and **appear in rows**; often resemble **fish scales**; seen in the **winter** and are a **predictor of cold weather**; can also be an **indicator of a hurricane (in the tropics)**	 Image by Biswarup Ganguly on Wkimedia Commons
Cirrostratus	high cloud; **thin**, **covers the entire sky**; light from the Sun and Moon can be seen through them; **seen 12-24 hours prior to a snow or rain storm**.	 Image by Simon Eugster on Wkimedia Commons
Altostratus	mid-level cloud**; gray or blue**; made of **water vapor and ice**; **cover the entire sky**; some light can get through; **sign of continuous rain or snow**	 Image by The Great Cloudwatcher on Wkimedia Commons
Altocumulus	mid-level cloud; made up of **water droplets**; **gray**; **form in groups**; sign of a **thunderstorm** later in the day	 Image by Bidgee on Wkimedia Commons

Cloud Name	Description	Picture
Nimbostratus	**dark gray**; **wet**; associated with **precipitation- falling rain or snow**	 Image by Simon Eugster on Wkimedia Commons
Stratus	**gray clouds that cover the sky**; looks like fog that is high in the sky; can produce **light mist or drizzle**	 Image by Kevin on Coclouds
Stratocumulus	**light, gray, and puffy**; form in rows; can see parts of the sky between the clouds; **can turn into nimbostratus clouds**	 Image by Simon Eugster on Wkimedia Commons
Cumulus	**white and puffy**; indicate **fair weather**; **flat base and rounded towers**; can develop into **cumulonimbus clouds**	 Image by Alexas_Fotos on Pixabay
Cumulonimbus	**thunderstorm clouds**; **top** of the cloud **resembles an anvil**, which **indicates which way the storm is moving**; indicates **snow, rain, hail, lightning, and tornados**.	 Image by Simon Eugster on Wkimedia Commons

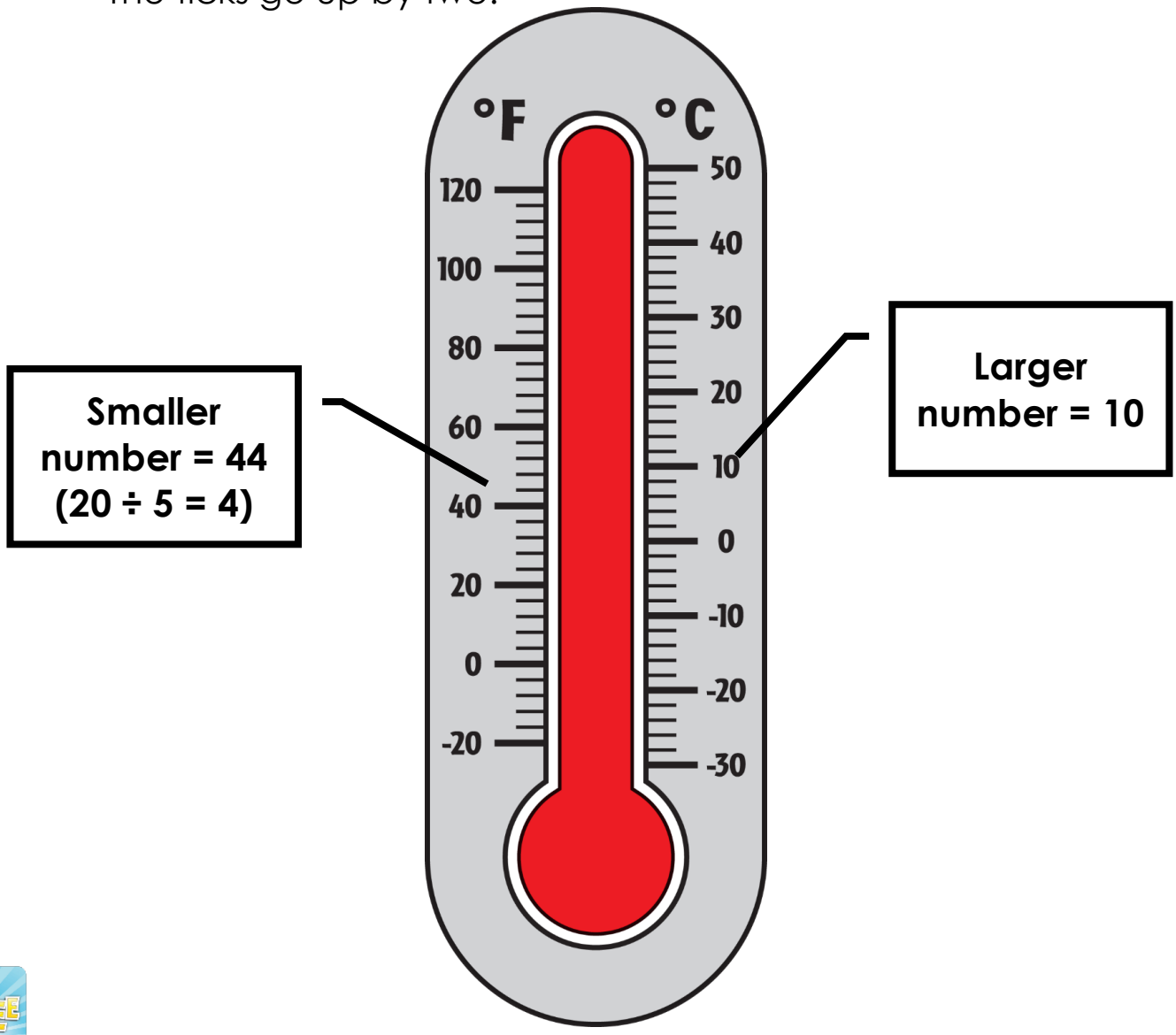
Why Does it Rain?

- Rain is **water that falls from the sky**.
- Rain is considered precipitation. **Precipitation is any water that falls from the Earth**—snow, hail, ice, sleet, or drizzle.
- Through the **process of evaporation**, water from lakes, oceans, puddles, and other bodies of **water turns into water vapor in the atmosphere**.
- The water vapor uses the **Sun's energy to form tiny droplets**. This **process is called condensation**.
- These **tiny water droplets come together** and **create a cloud**.
- When the **droplets come together**, the **cloud becomes heavy**. When the **cloud becomes too heavy**, the **water droplets fall as precipitation**.

Reading a Thermometer

- A thermometer is a **tool used to measure what the temperature is**.

- When reading a thermometer, we **count by 10's**. **Each tick/ line between represents numbers between each larger number**. The ticks can be calculated by dividing the number of ticks in between the two numbers by the difference of the two numbers. For example, there are 5 ticks between 20 and 30 (diff. of 10) so 10 divided by 5 = 2. The ticks go up by two.



Celsius vs. Fahrenheit

- Celsius and Fahrenheit are **the two units for measuring temperature**.
- The **main difference between Celsius and Fahrenheit** is the **temperature at which they begin measuring**.

Let's begin with Celsius!

- **Celsius** was invented by **Swedish astronomer**, **Anders Celsius in 1742**.
- Celsius is used in **mostly every country except for the United States**.
- **Originally**, Celsius was known as **Centigrade** because it is **divided into 100 degrees**.
- In Celsius, **water freezes at 0° and boils at 100°**.

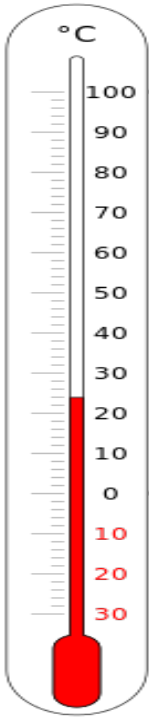
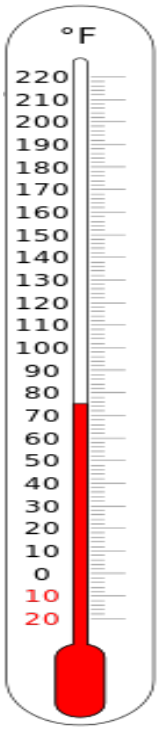


Image by Gringer on Wikimedia Commons

Image by Olof Arenius on Wikimedia Commons

Now let's learn about Fahrenheit!

- **Fahrenheit** was invented by **German physicist**, **Daniel Gabriel Fahrenheit in 1724**.
- In the **Western world**, **since the 1960s**, Fahrenheit has been used for **climatic, industrial, and medical purposes**.
- Due to the simplicity of the Celsius scale, **Fahrenheit is rarely used in countries, except for the United States**.
- Some people view Fahrenheit as the **"old-fashioned"** way of measuring temperature.
- In Fahrenheit, **water freezes at 32° and boils at 212°**.



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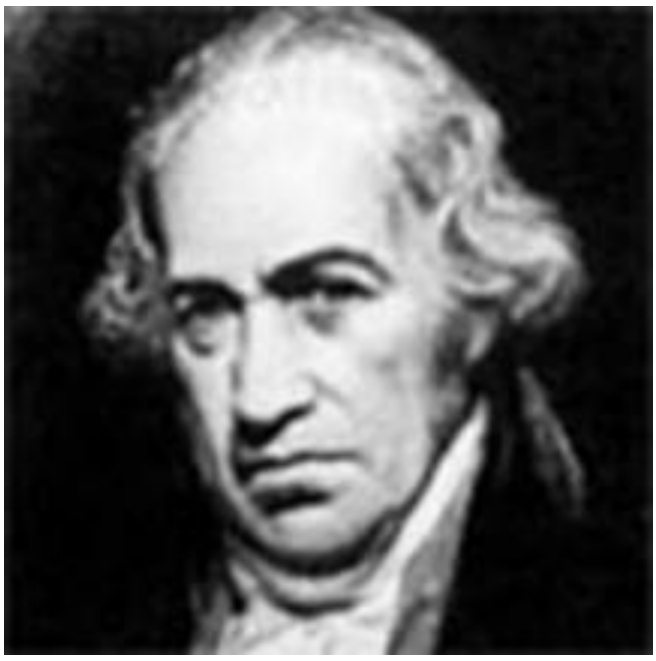

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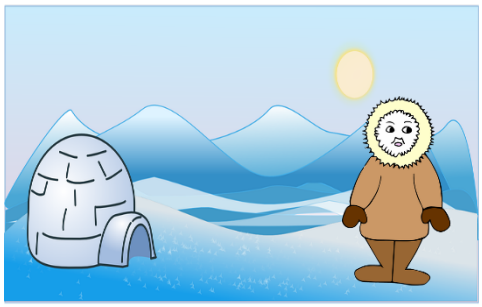
What is the Wind Chill?

- The wind chill is the **temperature you feel when the wind speed and the air temperature combine**.
- When the **wind speed is higher**, the **areas of your body that are exposed**—such as your face or hands—will **lose heat faster**.
- When the **wind chill is between -10° and -24°**, a **wind chill advisory is issued**.
- When the wind chill is **-25° or lower**, a **wind chill warning is issued**. It is at these temperatures where it is **possible to get frostbite** if you are out and not properly dressed.



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Think About It!

What are some ways you can protect yourself when it is bitter cold outside?

What is the Heat Index?

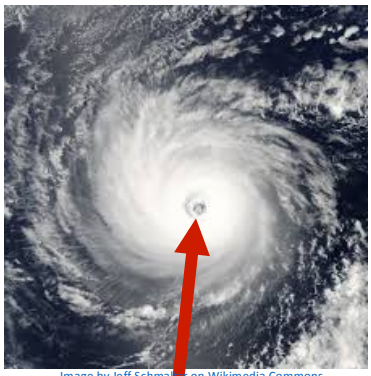
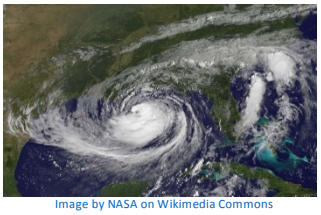
- The heat index is a **combination of air temperature and humidity**.
- The heat index describes the **temperature we feel**, but is **not the actual temperature**.
- When the **heat index is too high**, you can risk **getting heat stroke**.
- **Heat stroke is a type of heat injury**, in which the **person becomes too hot and the body cannot sweat to cool the body temperature**. Heat stroke occurs if the person spends **too much time in extremely hot temperatures**.

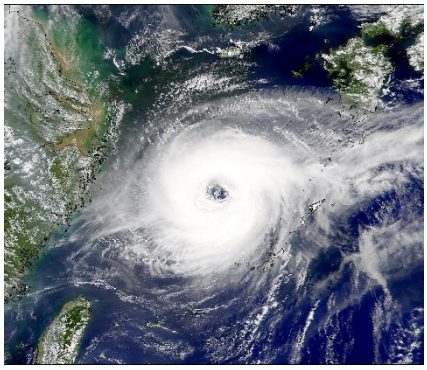
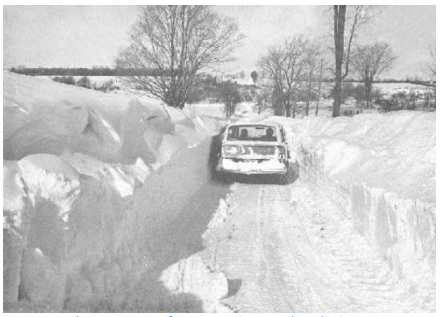
Heat Index	How It Affects the Body
130° and higher	Strong probability of heat stroke.
105° to 130°	Moderate probability of heat stroke
90° to 105°	Slight probability of heat stroke

- If the heat index is **predicted to be above 115° F within the next few days**, an **excessive heat watch** is issued.
- When the heat index is **115°F or higher for 3 or more hours a day** and will continue for **2 consecutive days**, an **excessive heat warning is issued**.
- When the heat index is **105°F or lower for 3 or fewer hours during the day** and **80°F during the night** for **2 consecutive days**, a **heat advisory is issued**.

Severe Weather

- Severe or extreme weather is weather that **doesn't occur often**. Severe weather is often **detrimental**—**causing harm or destruction**—and can result in the **loss of infrastructures (buildings, roads) and even people's lives**.

Severe Weather	Description	Picture
Hurricane	a **big storm that forms over the ocean, 5 to 15 degrees latitude north or south of the Equator**; also known as a **tropical cyclone**; temperature must be **80° F or warmer** in order for a hurricane to form; **winds** from a hurricane **range from 75 mph to 200 mph**; **last for more than a week**; move **10-20 mph**; hurricanes are named by the **World Meteorological Organization**; if a hurricane does significant damage/ is historical, its name is retired.	 Image by Jeff Schmaltz on Wikimedia Commons Eye of the Storm
Tornado	a **mobile, destructive vortex of violently rotating winds having the appearance of a funnel-shaped cloud**; form from **thunderstorms** when the **warm, moist air from the Gulf of Mexico combines with the cool, dry air from Canada**; wind speeds can reach **300mph**; area of rotation is between **2 and 6 miles wide**; common in the Great Plains (USA); "funnel;" is the air **spiraling away from the thunderstorm**, when it **reaches the ground, it is called a tornado**	 Image by Daphne Zaras on Wikimedia Commons
Tropical Storm	a localized, **very intense low-pressure wind system**, forming over **tropical oceans** and with between **39 mph and 73 mph**; step down from a hurricane.	 Image by NASA on Wikimedia Commons

Severe Weather	Description	Picture
Typhoon	a tropical storm in the **region of the Indian or western Pacific oceans** (near Hawaii and Asia/Southeast Asia); form during **the late summer**; wind speeds can be anywhere between **74 mph and 110 mph**	 Image by NASA on Wikimedia Commons
Tsunami	a **long high sea wave caused by an earthquake, submarine (underwater) landslide, or other disturbance, such as a volcanic eruption**; very common in the **Pacific Ocean** because of the active submarine earthquake zones; two tsunamis occur per year; **in 15,000 feet of water, a tsunami travels at a speed of 475 mph**; **in 100 feet of water, the speed drops to 40 mph**; out at sea, tsunamis rarely go above 3 feet, as they **approach shore**, the **height increases and they can be over 10 feet**; when a tsunami hits land, it looks like a giant wave; tsunamis **last anywhere between 5 and 60 minutes**	 Image by rolandmey on Pixabay
Blizzard	a **severe snowstorm with high winds and low visibility**; in order for a blizzard to form, there needs to be: **moisture, cool air at the surface, and a lift—where warm air rises above the cold**; a **Nor'easter** is similar to a blizzard, but **occurs in the eastern part of the United States**; named for the type of wind that occurs during this storm; the **storm travels up the Gulf Stream—warm waters off the Atlantic Coast**.	 Image by Department of Transportation on Wikimedia Commons

Categorizing Hurricanes:
The Saffir-Simpson Hurricane Wind Scale

- The Saffir-Simpson Hurricane Wind Scale is a scale **used to measure the categories of a hurricane based on wind speed**.

Category	Winds (MPH)	Pressure (Inches)	Storm Surge (Feet)	Damage
1	74-95	<28.94	4'-5'	Minimal
2	96-110	28.91-28.50	6'-8'	Moderate
3	111-130	28.47-27.91	9'-12'	Extensive
4	131-155	27.88-27.17	13'-18'	Extreme
5	>155	<27.17	>18'	Catastrophic

Damage	Examples
Minimal	**slight damage** to roof tiles, shingles, gutters, power lines; loss of tree branches power outages for a **few to several days**.
Moderate	**severe damage** to homes; power outages that could last **several days to weeks**
Extensive	**severe damage** to homes; trees uprooted that could block roads; loss of power for **several weeks**
Extreme	homes mostly **destroyed**; trees uprooted; roads blocked from trees; loss of power for **several weeks to months**; area **uninhabitable**
Catastrophic	Homes **completely destroyed**; trees uprooted; loss of power for months; area is uninhabitable and will stay like that for several months.

Categorizing Tornados:

The Fujita Tornado Intensity Scale

- The Fujita Tornado Intensity Scale is used to **rate a tornado intensity based on its damage to infrastructure and vegetation**.

Scale	Wind Speed (MPH)	Damage	Enhanced Operational Fujita Scale
F0	40-72	light damage to trees, homes, roofs	EFO 65-85 mph
F1	73-112	broken tree branches, mobile homes pushed, roofs damaged	EF1 86-110 mph
F2	113-157	trees uprooted; mobile homes completely damaged; structured homes slightly damaged	EF2 111-135 mph
F3	158-206	severe damage to cars and trains; homes somewhat destroyed	EF3 136-165 mph
F4	207-260	Homes completely destroyed; area looks like a giant pile of debris; cars thrown 300 yards or more	EF4 166-200 mph
F5	261-318	catastrophic damage; trees, homes, an other infrastructures destroyed	EF5 Over 200 mph

Historical Storms

Storm Name/ Type	Year & Location (s)	Description	Picture
Hurricane Katrina [Hurricane]	August 2005 Louisiana & Mississippi (USA)	**Category 3 cyclone**; winds of over 125mph; death toll of 1,200; thousands of people lost their homes; 80% of New Orleans was under water; $108 billion in damages.	 Image by Paul Morse on Wikimedia Commons
Hurricane Andrew [Hurricane]	August 1992 Bahamas, South Florida, and Louisiana	**Category 5 hurricane**; highest wind speed recorded was 175 mph; death toll of 65; $26.5 billion in damages.	 Image by National Hurricane Center on Wikimedia Commons
Daulatpur-Saturia, Bangladesh Tornado [Tornado]	April 1989 Daulatpur, Saturia, Bangladesh	**F1-F4 tornado**, making it the deadliest tornado in history; death toll of 1,300, 12,000 causalities; completely destroyed homes and trees; cost $1.5 million in damages.	 Image by Kmusser on Wikimedia Commons
Iran Blizzard [Blizzard]	February 1972 Northwestern, Central, and Southern Iran	lasted 6 days; estimated 10 feet of snow fell; death toll of 4,000, with more buried under the snow; two villages saw no survivors	 Image by Uwe Dedering on Wikimedia Commons

Storm Name/ Type	Year & Location (s)	Description	Picture
Haiti Earthquake of 2010 [Earthquake]	January 2010 Haiti	**7 M. earthquake**; three million people affected; death toll recorded was between 100,000 and 160,000; 250,000 homes and 30,00 commercial buildings were destroyed; $14 billion in damages.	 Image by Marco Dormino on Wikimedia Commons
1980 United States Heatwave [Heatwave]	July 1980 Midwestern United States/ Southern Plains	**42-day heatwave**; cost $20 billion in damages, especially to agriculture and livestock; death toll of 10,000 people; temperatures did not drop down below 100^{O}F for days;	 Image by Pexels on Pixabay
Indian Ocean Earthquake and Tsunami [Tornado]	December 2004 Indonesia, Sri Lanka, India, Thailand, Maldives, Malaysia, Madagascar, Somalia, Kenya, Tanzania, and South Africa	**9.1-9.3 M earthquake**; tsunami waves of 50-100 feet; third largest earthquake ever recorded; death toll of 230,000-280,000 with many more people missing/ never found; $14 billion in damages	 Image by Michael L. Bak on Wikimedia Commons
1931 China Floods [Floods]	July-August 1931 China	28.5 million people affected; death toll between 145,000 and 4 million; 24 inches of rain fell within one month; many people died from starvation or water-borne diseases;	 Image by Bundesarchiv, Bild 102-12231 on Wikimedia Commons

Thunderstorm Terms

Word	Definition
Severe Thunderstorm Watch	a thunderstorm with **winds that exceed 58 mph** and **hail** that is **1 inch or more in diameter**.
Severe Thunderstorm Warning	a thunderstorm with **winds that exceed 58 mph** and **hail** that is **¾ of an inch or more in diameter** will occur in your area.
Downdraft	a **downward current or draft of cool air to the ground**, usually with precipitation; associated with a **thunderstorm or rain showers**.
Updraft	an **upward current or draft of warm air**. If the air is moist, it will form a **cumulus cloud**.

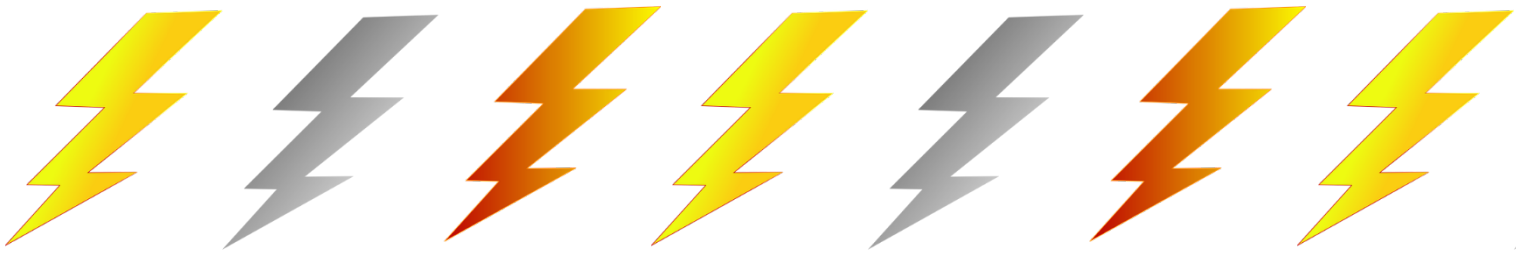


Image by Clker-Free-Vector-Images on Pixabay

What Causes a Thunderstorm?

- A thunderstorm is a storm that includes **rain**, **thunder**, **lightning**, **gusty winds**, and **sometimes hail**.
- Thunderstorms form from **cumulonimbus clouds**.
- A thunderstorm forms when there is **moisture, unstable air that is warm and rises quickly, and lift**.
- Thunderstorms can happen **anytime during the year**, but are **more common in the spring and summer**.
- Thunderstorms usually happen in the **afternoon and evening**.
- An estimated **1,800** thunderstorms occur on Earth each day.

Image by Clker-Free-Vector-Images on Pixabay

Think About It!

Do you like thunderstorms? Why or why not?

What is Lightning?

- Lightning is a **bright flash of electricity** that a thunderstorm produces.
- Lightning occurs during a thunderstorm and can be **very dangerous**. Lightning kills between 75 and 100 people a year.
- Lightning is the result of **frozen raindrops bumping into each other within a thundercloud**. The **collisions result in an electric charge**.
- Eventually, the entire thundercloud becomes **filled with electrical charges**.
- At the **top of the thundercloud**, there are **positive charges**. These attract to the **negative charges at the bottom** of the cloud.
- Since the positive and negative forces are attracting, a **buildup of positive charges occurs on the ground**.
- Mountains, people, tree—**anything on the ground**—allow the electrical charge to **concentrate around it**.
- The **charge climbs up these objects and eventually reaches the charge that is coming down from the cloud**. When the two meet, lightning occurs.

Think about electrical shocks. Have you ever touched a light switch or a metal doorknob and got a shock? This is how lightning works!

How Far Away is the Storm?

- **Thunder** is the **result of lightning**.
- The sound we hear comes from the **lightning bolt traveling from the cloud to the ground**.
- As the **lightning bolt travels**, it **creates a channel** or an **opening in the air**.
- The **air collapses and a sound wave is created** once the **lightning bolt disappears**.
- Since light travels faster than sound, we see the lightning before we hear the thunder.

Let's learn how to calculate how far away the storm is!

- The first thing to do is watch for lightning.
- Once you see the lightning, begin counting.
- Once you hear the thunder, stop counting.
- Take the number of seconds between the lightning and the thunder and divide by 5.
- The answer tells you how many miles away the storm is!

Image by OpenClipart-Vectors on Pixabay

20 seconds / 5 = 4 miles

The storm is 4 miles away!

Rainbow Terms

Term	Definition
Reflection	the **throwing back** by a body or surface of light, heat, or sound **without absorbing it**.
Refraction	a **change in the direction of light** as a result of its traveling at different speeds at different points along the wave front.
Dispersion of Light	the **separation** of white light into colors.
Moonbow / Lunar Rainbow	a phenomenon similar to a rainbow, produced by **moonlight reflecting and refracting off water droplets in the air**.
Fogbow	a phenomenon similar to a rainbow, produced by **sunlight shining on fog**.

Image by Captain76 on Wikimedia Commons

What is a Rainbow?

- A rainbow is an **arch of colors formed in the sky**.
- The colors of the rainbow, in this order, are: **red, orange, yellow, green, blue, indigo, and violet** (ROY G BIV).
- A rainbow is the result of the **refraction and dispersion of the Sun's light by rain or water droplets in the atmosphere**.
- A rainbow is an **optical illusion**/ light trick—they **do not exist**.
- To see a rainbow, we must be **standing between the Sun and the raindrops**.
- Rainbows are a **complete circle**, but because we are standing on the ground, we only see the arch.
- When the **sunlight hits a raindrop**, the raindrop acts like a prism. The **sunlight shines through the raindrop and the colors refract or bend**. The **colors then disperse** and a rainbow is seen.
- Every raindrop can create its own rainbow, but we do not see the rainbow until **millions of raindrops come together**.
- Rainbows are formed when the light is spotted on the raindrops at a **42 degree angle**.
- **Sir Isaac Newton** was the first person to explain what a rainbow is.

- **No two people will see the rainbow the same**. This is due to the light bending differently at different angles.
- Rainbows will be **higher in the sky when the Sun is lower**.
- Rainbows will be **lower in the sky when the Sun is higher**.
- A **double rainbow** is the result of the **sunlight refracting twice through the raindrop**. (***see picture on page 42***)
- Double rainbows are the **reflection of the first rainbow**.
- Double rainbows are **lighter and have the colors reversed**.
- **Alexander's Band** is the name given to the **dark portion of the sky** you observe **when looking at a double rainbow**.

Don't forget:
ROY G BIV!

Color the Rainbow

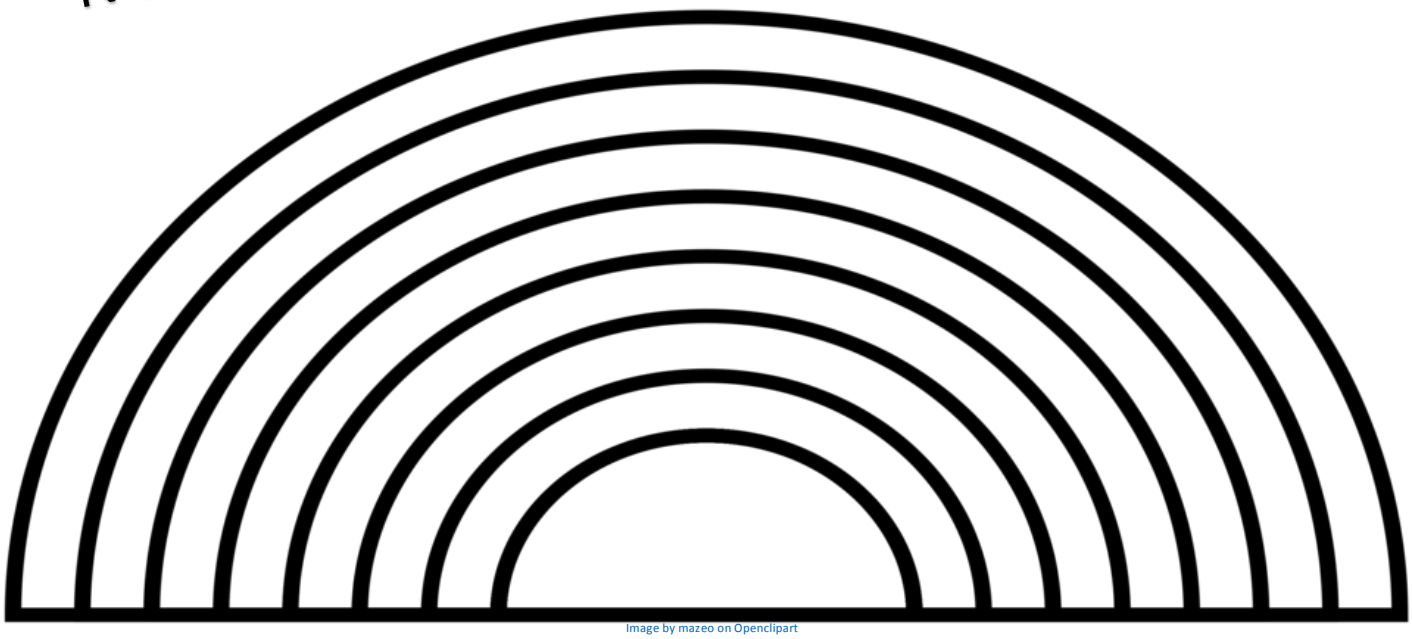


Image by mazeo on Openclipart

Refractive Dispersion of Light
Activity Sheet

Directions: On the yellow line, write "**Incoming Rays from the Sun**". On the blue line, write "**Raindrop**." Trace over the dotted lines. On the green line, write "**Outgoing Rays**."

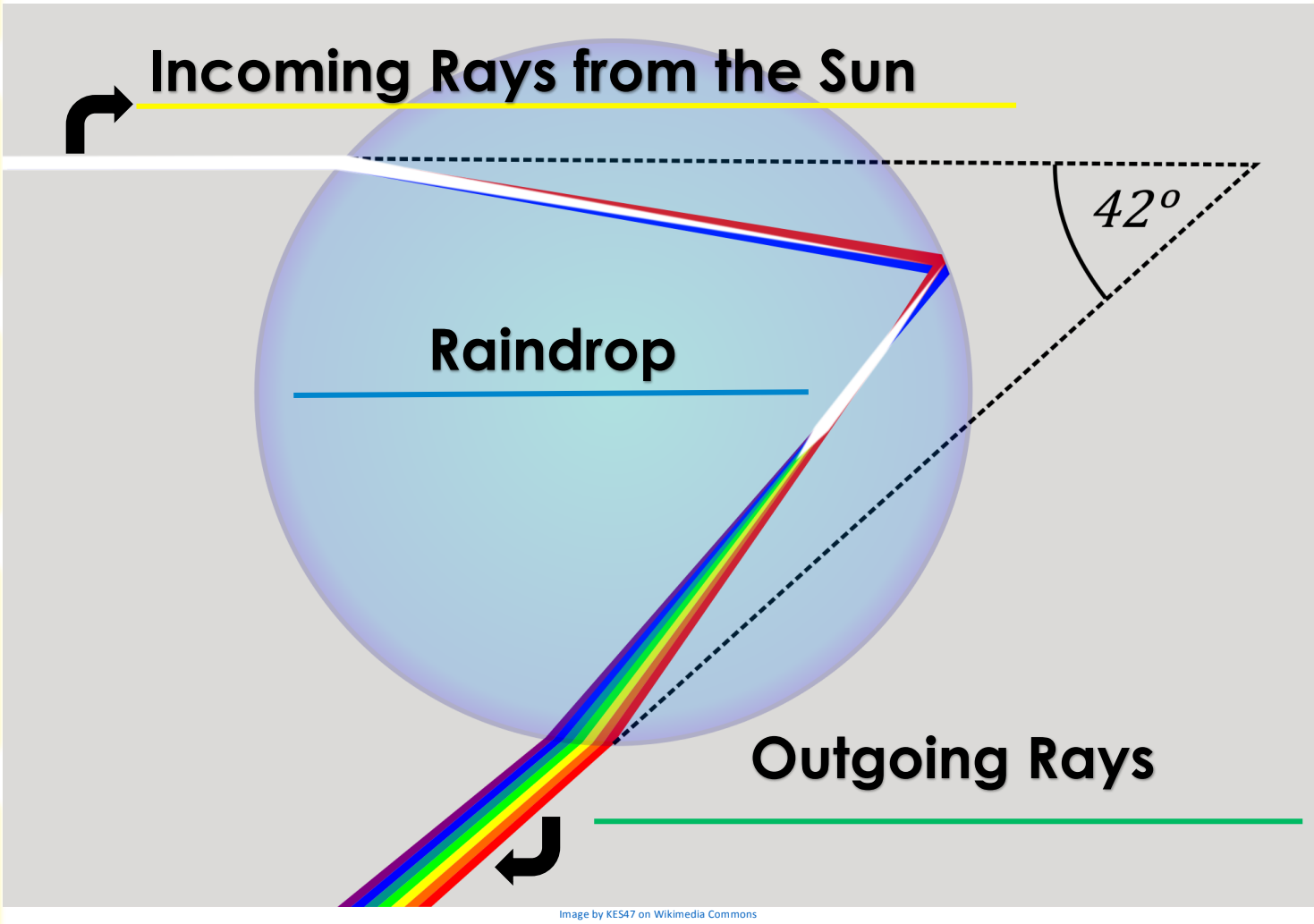


Image by KES47 on Wikimedia Commons

The sunlight must hit the raindrop at **42** degrees.

What is Wind?

- **Moving air** is called wind.
- The Sun **unevenly heats** the Earth's surface.
- The unevenness comes from **landforms and bodies of water absorbing the radiation / energy**.
- Some places on Earth are in the **Sun's direct path**—these places are **warm all year long**. Other places on Earth receive the **Sun's energy indirectly**—these places are **cooler all year long**.
- **Warm air is lighter**, so it **rises**. As it rises, it is **replaced by the cool / cold air**. This is what causes the wind to blow.
- In order to specify the wind, you need two factors: **speed and direction**.

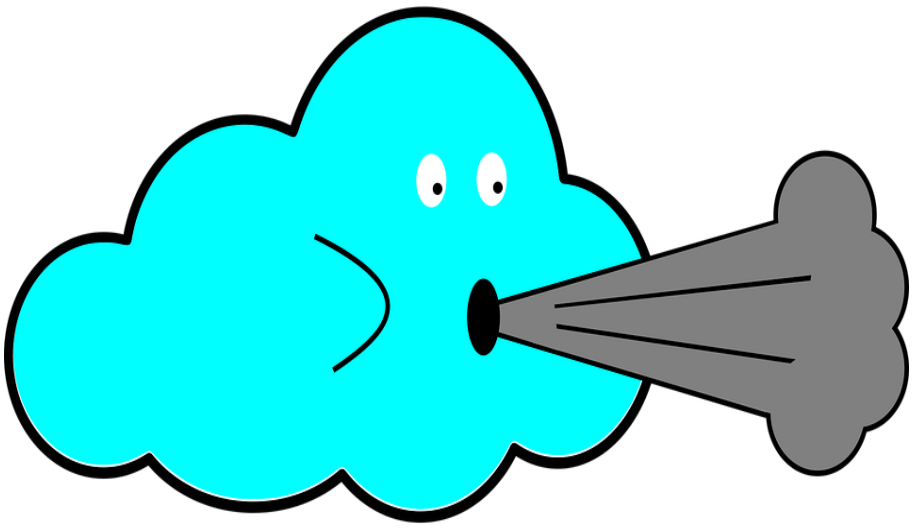


Image by monhtm on Pixabay

Wind Terms

Term	Description
Downburst	a **strong downward current of air from a cumulonimbus cloud**, usually associated with intense **rain or a thunderstorm**.
Derecho	a **line of intense, widespread, and fast-moving windstorms and sometimes thunderstorms that moves across a great distance** and is characterized by damaging winds.
Doldrums	an **equatorial region of the Atlantic Ocean** with calms (wind-free weather), sudden storms, and light unpredictable winds.
Santa Ana Winds	**strong, dry, winds that slope downward and affect Southern California and Northern Baja California**. These winds are either very cold or very hot, depending on the temperature. The winds bring **very hot and dry weather** and often cause wildfires in California.

Image by allysonmiller1969 on Pixabay

Image by OpenClipart-Vectors on Pixabay

Term	Description
Monsoons	a **seasonal prevailing wind in the region of South and Southeast Asia, blowing from the southwest between May and September and bringing rain** (the wet monsoon), or from the **northeast between October and April** (the dry monsoon).
Prevailing Westerlies	winds that occur between **30 and 60 degrees latitude and blow from the west to the east**. These winds play a big role in the weather patterns of the **United States and Canada**.
Polar Easterlies	**dry, cold, winds that occur at 60 degrees latitude (north and south)**. The winds blow from the **high pressure areas in the poles** to the **low pressure areas within the Westerlies**.
Jet Stream	a **narrow, variable band of very strong, predominantly westerly air currents encircling the globe several miles above the Earth**. There are typically **two or three** jet streams in each of the northern and southern hemispheres.

The Beaufort Scale

- Created by Sir Francis Beaufort in 1806.
- Measures the **weather's intensity based on wind power**.

Beaufort Number	Wind Speed (MPH)	Description	Sea Conditions	Land Conditions
0	<1	**Calm**	Flat	Calm
1	1-3	**Light Air**	Ripples (no crests)	Wind motion is visible through smoke
2	4-7	**Light Breeze**	Small wavelets	Rustling leaves
3	8-12	**Gentle Breeze**	Large wavelets	Movement of small twigs
4	13-18	**Moderate Breeze**	Small waves	Movement of small branches
5	19-24	**Fresh Breeze**	Moderate longer waves	Swaying of small trees
6	25-31	**Strong Breeze**	Large waves; foam crests	Movement of large branches
7	32-38	**Near Gale**	Sea heaps up; foam streaks	Movement of whole trees
8	39-46	**Gale**	Somewhat high waves; crests break	Broken twigs
9	47-54	**Severe Gale**	Waves are high; foam is dense	Some structure damage
10	55-63	**Storm**	Very high sea waves; sea surface is white	Uprooted trees; moderate damage
11	64-72	**Violent Storm**	Extremely high waves	Moderate structural damage
12	73-82	**Hurricane**	Sea surface is entirely white	Massive structural damage

How is Wind Measured?

- Wind has two factors: **speed and direction**.
- There are two different devices that are used to measure wind: **anemometers** and **weather vanes**.
- **Weather vanes measure wind direction**
- **Anemometers measure wind speed**.

Image by ProfDEH on Wikimedia Commons

Image by Sean Linehan on Wikimedia Commons

Weather Vane

- Typically **mounted on the top of a building**.
- Has four points: north, south, east, west
- The weather vane **always points into the wind**.
- For example, if the wind is blowing east, the weather vane will point towards the east.

Anemometer

- Has **four cups**.
- The cups **catch the wind and a pressure difference is produced within the cup**.
- The **pressure difference** and the **wind force** cause the cups to **rotate**.
- The **speed of rotation** is measured by an **electrical switch** and is **proportional to the wind speed**.

Global Winds, Local Winds, and Trade Winds

Global Winds	Local Winds	Trade Winds
Winds that are named for the **direction in which they blow**. Each hemisphere has **three wind belts**, for a total of **six belts on Earth**. The belts **move north in the summer in the Northern Hemisphere** and **south in the winter in the Southern Hemisphere**.	winds that are caused by **differences in air temperature in a local area**.	a **wind blowing steadily toward the Equator from the northeast in the northern hemisphere or the southeast in the southern hemisphere**, especially at sea.

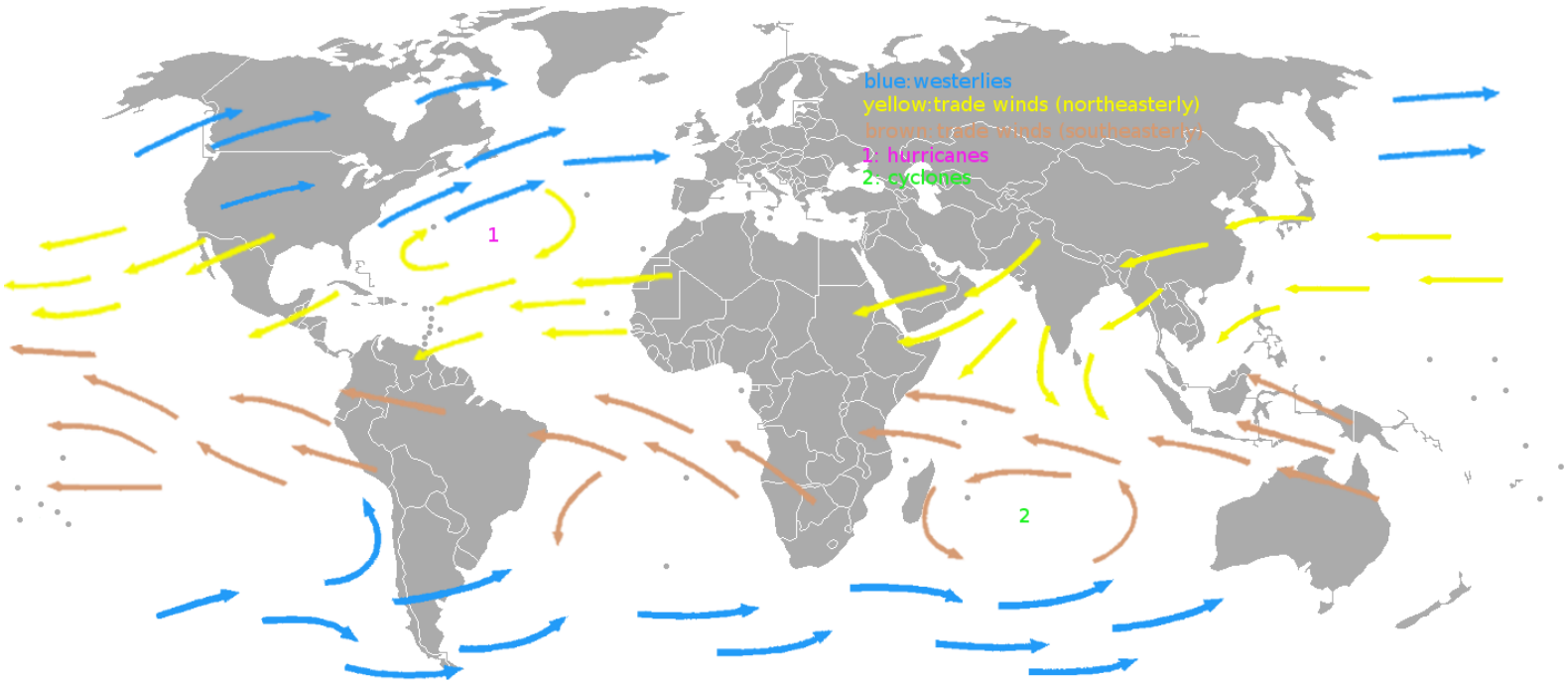
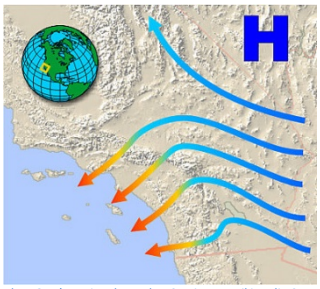
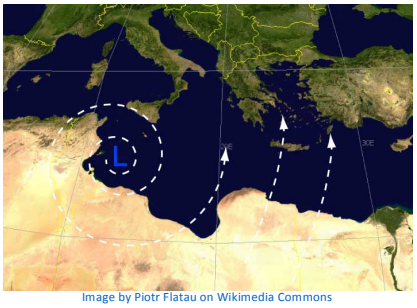
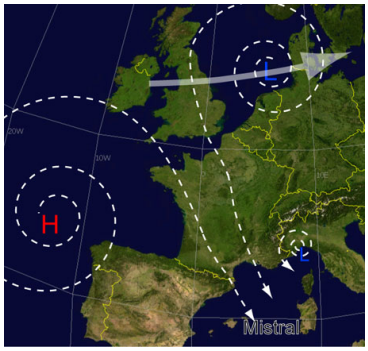
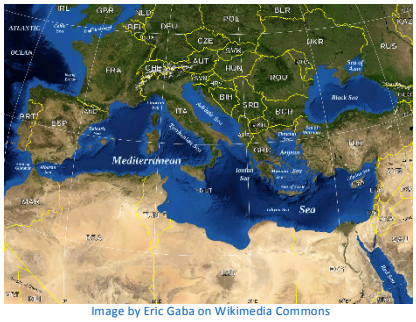


Image by KVDP on Wikimedia Commons

Wind Systems

Wind System	Location	Picture
Chinook	**Westerly wind**; eastern side of the Rocky Mountains (USA)	 Image by Kanadano on Wikimedia Commons
Santa Ana	**Easterly wind**; blow towards Southern California	 Image by NOAA's National Weather Service on Wikimedia Commons
Sirocco	**Southerly wind**; blows from North Africa to Southern Europe	 Image by Piotr Flatau on Wikimedia Commons
Mistral	**Northwesterly wind**; blows from central France to the Mediterranean	 Image by Pflatau on Wikimedia Commons

Wind System	Location	Picture
Marin	**Southeasterly wind**; blows from the Mediterranean to France	 Image by Eric Gaba on Wikimedia Commons
Bora	**Northeasterly wind**; blows from Eastern Europe to Italy	 Image by Joy on Wikimedia Commons
Gregale | Etesian	**Northeasterly wind**; blows from Greece **Northwesterly wind**; blows from Greece	 Image by Lencer on Wikimedia Commons
Libeccio	**Southwesterly wind**; blows from Italy	 Image by F l a n k e r on Wikimedia Commons

Why Do We Have Four Seasons?

- The four seasons are: **winter, spring, summer, and autumn (fall)**.

- The Earth spins on its **axis**. This spin is what **causes night and day**.

- The **Earth also orbits around the Sun**. This orbit, which takes **365 ¼** days, is what **causes the four seasons**.

The tilt of the Earth's axis is what causes the four seasons!

- The Earth's axis is tilted to **23.5 degrees**.

- **Without the tilt of Earth's axis**, **the Sun would be over the Equator and both hemispheres would experience the same weather year-round**.

- When the Earth's **axis is pointed towards the Sun, summer occurs**. During this time, **the Sun's rays are vertical**, which **produce light and heat more effectively than slanting rays**.

- When the Earth's **axis is pointed away from the Sun, winter occurs**.

- During the **winter solstice**, the **Sun is actually closer to the Earth**.

- The **seasons are opposite in the Northern and Southern Hemispheres**.

Northern Hemisphere Seasons & Dates

Seasons	Dates
Winter	December 21st – March 20th
Spring	March 20th – June 21st
Summer	June 21st – September 22nd
Autumn (Fall)	September 22nd – December 21st

Southern Hemisphere Seasons & Dates

Seasons	Dates
Winter	June 21st – September 20th
Spring	September 21st – December 20th
Summer	December 21st – March 20th
Autumn (Fall)	March 21st – June 20th

Image by Shelly on Sketchport

The Equator and Seasons

- The Equator is **an imaginary line that goes around the center of the Earth**.
- The Equator is **half way between the North and South Poles**.
- The **Sun is very high in the sky at the Equator**, which is why it is **always very hot and humid**.
- Places located at the Equator **do not experience seasons**.
- This is because the **Equator is at the center of the Earth**.
- The **center of the Earth does not tilt very much**. Since the four seasons are the result of the tilt of the Earth's axis, the Equator does not experience seasons like the rest of the world does.

Image by nadisna on Pixabay

Think About It!

Would you like to live near the Equator? Why or why not?

Seasonal Weather

Season	Weather
Winter	❄ Coldest season. ❄ Occurs when the Earth is tilted away from the Sun. ❄ Typical weather includes: **snow, ice, freezing rain, very cold temperatures, and wind**.
Spring	♦ Season after winter, ♦ Temperatures begin to warm and snow/ice begin to melt. ♦ Typical weather includes: **warmer temperatures, rain, and sunshine**.
Summer	☼ Hottest season. ☼ Occurs when the Earth is tilted towards the Sun. ☼ Marked by long days and short nights. ☼ Typical weather includes: **hot temperatures, sunshine, and thunderstorms**.
Autumn (Fall)	● Season after summer. ● Temperatures begin to cool down. ● Change in foliage—leaves begin to change colors. Harvest begins to occur. ● Typical weather includes: **cooler temperatures, and cloudy skies. Occasionally an Indian Summer—summerlike temperatures—can occur**.

Seasonal Weather

Directions: Describe the weather for each season based on your location!

Season	Weather
Winter	
Spring	
Summer	
Autumn (Fall)	

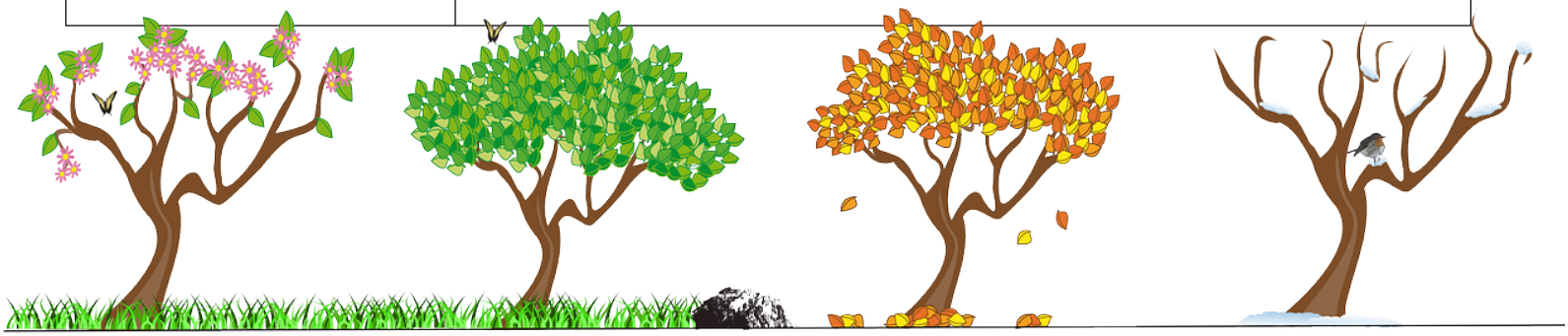


Image by OpenClipart-Vectors on Pixabay

Weather vs. Climate

Weather	Climate
▪ Describes the **state of the atmosphere at a given time**. ▪ Weather is measured over a **short period**. ▪ The weather in an area **changes all the time**.	▪ Describes the weather of a specific area **over a long period of time (30 years)**. ▪ When talking about climate, scientists look at **wind patterns, temperatures, the temperature of the surface of the ocean, and precipitation**. ▪ The climate in an area **does not change**.

- The Earth's climate system includes:
  - **Atmosphere**
  - **Oceans**
  - **Land**
  - **Ice**
  - **Biosphere**

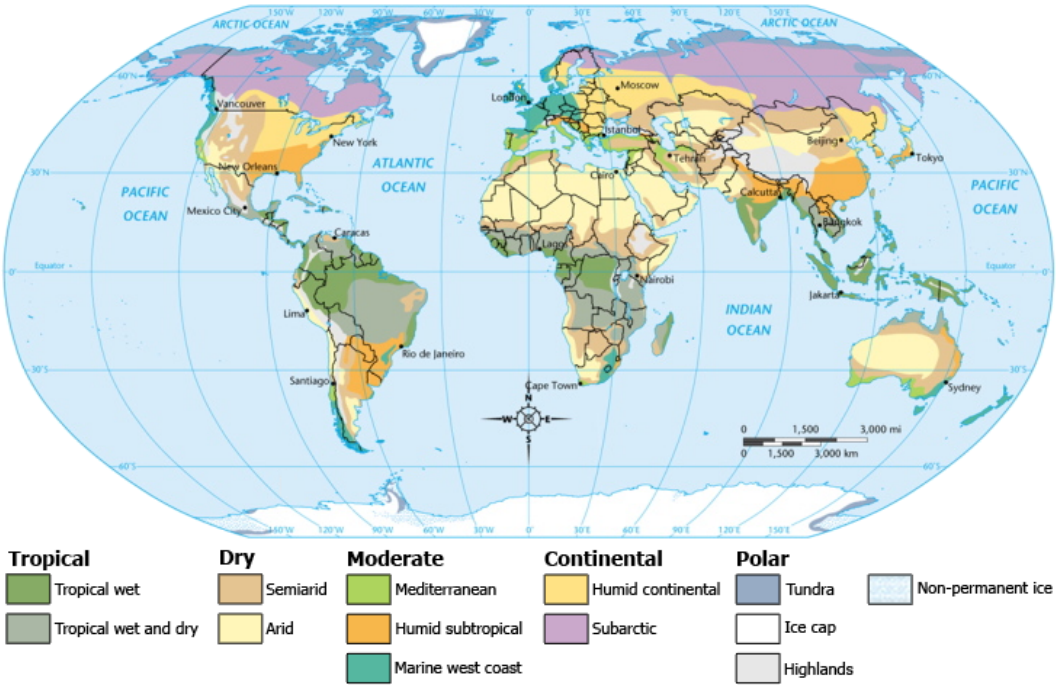


Image by Waitak on Wikimedia Commons

Causes for Climate

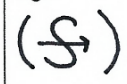
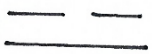
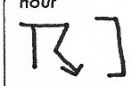
Cause	Description
Latitude	describes the **area's closeness to the Equator**. Places that are close to the Equator are **warmer**.
Elevation	describes **how high above sea level an area is**. Places that have a **higher elevation** are generally **cooler**.
Ocean/Wind Currents	describes the **rising of hot air/ water and the sinking of cool air/ water**. These create currents that move heat around the Earth.
How Close the Location is to Water	places that are **close to the water** can see an **increase in precipitation**.
Terrain	**mountains can play a role in how much rain or sun an area receives**. The **north side and south side** of a mountain usually have **different climate**.

Types of Climate

Climate	Location	Seasons	Temperatures	Precipitation
Tropical Wet	Philippines; Indonesia; Democratic Republic of the Congo; Brazil	1	Average = 80°F Daytime temperatures do not go above 93°F and nighttime temperatures do not drop below 68°F	100-300 inches per year
Tropical Wet/Dry	Africa; Brazil; India	2 Wet summer and dry winter	Wet season = 77°F Dry season = 68°F	Wet season = 25 inches Dry season = less than 4 inches
Mediterranean	Western side of the continents	2	Summer = above 50°F Winter = 30°F – 65°F	20 inches per year
Humid Subtropical	Eastern side of the continents	2	Summer = 70°F – 80°F Winter = 45°F – 50°F	48 inches per year
Marine West Coast	West coast of regions that are mid-latitude	2	Summer = ~72°F Winter = never below 30°F	Between 30 and 98 inches per year
Humid Continental	Interior parts of the continents	4	Summer = ~71°F Winter = ~25°F	Between 20 and 50 inches per year
Subarctic	Interior (non-coastal) areas of high latitude continents; only found in the Northern Hemisphere	2	Summer - ~85°F Winter = ~ - 25°F	Between 10 and 20 inches per year
Tundra	Coast of the Artic Ocean	2	Summer = 35°F – 50°F Winter = -18°F - -50°F	5-15 inches per year
Ice Cap	Only near the poles	2	Summer = ~ -16°F Winter = ~ -90°F	Less than 10 inches per year
Arid	Desert regions	2	Between -30°F and 130°F	Less than 10 inches per year
Semiarid	Outer edge of arid regions	2	Depends on region's latitude	Depends on ocean currents
Highland	High mountain areas	0	Depends on elevation	Depends on elevation

Weather Map Symbols

The numbers in each box represent the weather codes use in weather reports.

00 Cloud development during past hour 	01 Clouds dissolving during past hour 	02 Sky unchanged during past hour 	03 Clouds forming during past hour 	04 Visibility reduced by smoke 	05 Haze 	06 Dust suspended by air 	07 Dust or sand raised by wind 	08 Dust devils within the past hour 	09 Dust storm/ Sandstorm in sight 
10 Mist 	11 Patches of fog 	12 Continuous shallow fog 	13 Visible lightning, no thunder 	14 Precipitation visible, but not reaching ground 	15 Precipitation reaching the ground at a distance 	16 Precipitation reaching the ground at nearby 	17 Thunder, no precipitation 	18 Wind squall within past hour 	19 Tornado/ funnel cloud observed within past hour 
20 Recent drizzle 	21 Recent rain 	22 Freezing snow 	23 Recent rain/snow 	24 Freezing rain 	25 Rain showers 	26 Snow showers 	27 Hail or hail and rain 	28 Fog within past hour 	29 Thunderstorm within past hour 
30 Slight/moderate dust storm decreased 	31 Slight/moderate dust storm, no change 	32 Slight/moderate dust storm increased 	33 Severe dust storm decreased 	34 Severe dust storm increased 	35 Severe dust storm no change 	36 Drifting snow, slight or moderate 	37 Drifting snow, heavy 	38 Blowing snow, slight/ moderate 	39 Blowing snow, heavy 
40 Distant fog	41 Patchy fog	42 Fog, sky discemable, thinner within past hour	43 Fog, sky not discemable has become thinner within past hour	44 Fog, sky discemamble, no change within past hour	45 Fog, sky not visible, no change within past hour	46 Fog, sky visible, has become thicker	47 Fog, sky not visible, has become thicker	48 Freezing fog, sky visible	49 Freezing fog, sky not visible
50 Light intermittent drizzle	51 Light continuous drizzle	52 Moderate intermittent drizzle	53 Moderate continuous drizzle	54 Heavy intermittent drizzle	55 Heavy continuous drizzle	56 Light freezing drizzle	57 Moderate/ heavy freezing drizzle	58 Light drizzle/ rain	59 Moderate drizzle/ rain
60 Light intermittent rain	61 Light continuous rain	62 Moderate intermittent rain	63 Moderate continuous rain	64 Heavy intermittent rain	65 Heavy continuous rain	66 Light freezing rain	67 Moderate/ heavy freezing rain	68 Light rain/ snow	69 Moderate/ heavy rain/ snow
70 Light intermittent show	71 Light continuous snow	72 Moderate intermittent snow	73 Moderate continuous snow	74 Heavy intermittent snow	75 Heavy continuous snow	76 Ice needles, with/ without fog	77 Snow grains, with/ without fog	78 Snow crystals, with/ without fog	79 Ice pellets (sleet)
80 Light rain showers	81 Moderate/ heavy rain showers	82 Torrential rain showers	83 Light rain/snow showers	84 Moderate/ heavy rain/ snow showers	85 Light snow showers	86 Moderate/ heavy snow showers	87 Light ice pellet showers	88 Moderate/ heavy ice pellet showers	89 Light hail. Not associated with thunder
90 Moderate/ heavy hail. Not associated with thunder	91 Light rain, thunder within past hour	92 Moderate rain, thunder within past hour	93 Light snow, rain/snow, hail., thunder	94 Moderate snow, rain/snow, hail, thunder	95 Light thunderstorm, rain/ snow, no hail	96 Light thunderstorm, hail	97 Severe thunderstorm, rain/ snow, no hail	98 Thunderstorm with dust storm	99 Severe thunderstorm, hail

El Niño and La Niña

El Niño	La Niña
☼ Spanish for **"little boy", "Christ child."** ☼ Term originates from the **1600s**, when South American **fisherman noticed how warm the waters of the Pacific were during December**. ☼ Effects the **winter season** weather of North America. ☼ Effects include: – **Warmer than average temperatures in wester/central Canada and western/northern United States** – **Wetter than average conditions in the U.S. Gulf Coast and Florida**. – **Drier than average conditions in the Ohio Valley and Pacific Northwest**. ☼ El Niño also effects the **ocean currents**.	☼ Spanish for **"little girl"**. ☼ Produces **colder or below-average sea temperatures in the east-central Equatorial Pacific**. ☼ The effects of La Niña are the **opposite of El Niño**. ☼ During La Niña, **winter temperatures in the Southeast are warmer**, while **temperatures in the Northwest are cooler**.  Image by OpenClipart-Vectors on Pixabay

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