

Weather Study Guide

Weather and Climate:

How are weather and climate different? **Weather** is the daily condition of the atmosphere (the blanket of gases that surrounds the Earth). **Climate** is the average weather in one place over a long period of time.

Weather Reporting:

Meteorologists are people who study the weather. They gather weather data by using different instruments, or tools. Weather instruments include an anemometer, barometer, rain gauge, and thermometer (pictured below with the type of weather data they measure).



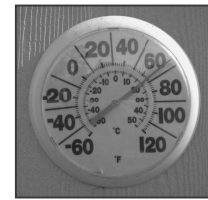
anemometer
wind speed



barometer
air pressure



rain gauge
amount of precipitation



thermometer
air temperature

Meteorologists use computers to analyze weather data and create **forecasts**, or predictions, of weather patterns. For example, a meteorologist might use a barometer to analyze the changes in air pressure over time. This will help him/her to predict how the weather patterns will change.

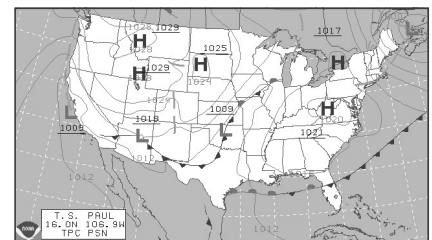
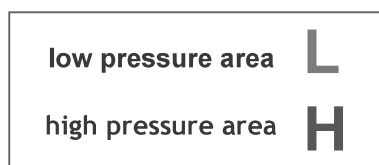
Air Pressure:

Air pressure is the weight of the air pressing against a surface. The amount of air pressure in one place is determined by several factors, including the temperature of the air. Air pressure is usually categorized as “high” or “low” pressure.

An **air mass** is a large area of air with nearly the same temperature and moisture throughout. It can be as large as several states!

- **Low pressure areas** are created when the air heats up, expands, and rises. Low pressure systems are light air masses associated with rainy, stormy weather.
- **High pressure areas** are created when the air cools, becomes denser, and sinks. High pressure systems are heavy air masses associated with clear, dry, and fair weather.

Air pressure is shown on a weather map with different symbols.

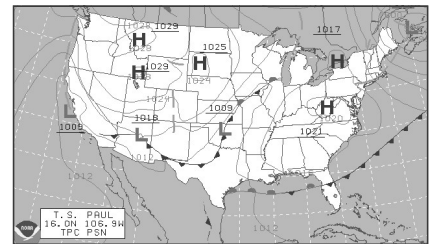
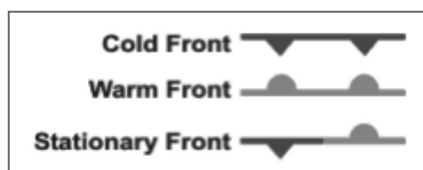


Fronts:

A **front** is the boundary where two air masses meet; it usually brings weather changes.

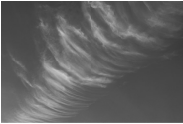



- **Warm fronts** are created when a warm air mass moves in to replace a retreating cold air mass. Warm fronts move slowly and bring clouds, light rain, drizzle, or snow, and warmer temperatures.
- **Cold fronts** are created when a cold air mass replaces a warm air mass. Cold fronts move quickly and bring heavy rain, thunderstorms, or hail, and cooler temperatures.
- A **stationary front** is the boundary that forms when warm and cold air meet but move very little.

Fronts are shown on a weather map with different symbols.



Cloud Types:

During the water cycle, many different types of clouds are formed. Each cloud type is associated with certain weather conditions.

Cloud Name	Description	Associated Weather
Cirrus 	thin, feathery clouds known as “mare’s tails”	fair weather, though they often indicate that rain or snow will fall within several hours
Stratus 	gray, flat clouds that look like a blanket covering the sky, letting little sunlight pass through	light rain or drizzle
Cumulus 	white, rounded, puffy clouds	fair weather
Cumulonimbus 	tall, dark storm clouds	thunderstorms and sometimes tornadoes

Precipitation:

Different conditions in the atmosphere create different types of precipitation.


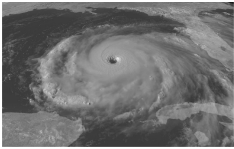

Precipitation is water that falls to the ground as rain, snow, sleet, or hail.



- **Rain** is formed when liquid water droplets in the clouds become heavy and fall to the earth. Very small rain droplets are called drizzle.
- **Snow** is formed in clouds where the temperature is below freezing. The water droplets in the cloud freeze and turn into ice crystals. They group together and when they become too heavy, they fall to the ground as snowflakes.
- **Sleet** is formed when snowflakes fall first through a layer of warm air, and begin to melt, and then fall through a layer of cold air, and re-freeze into ice pellets, or sleet.
- **Hail** is formed during a thunderstorm, when water droplets are lifted upward into freezing temperatures. The water droplet freezes and becomes a hailstone, which can grow as more water freezes onto it. When it becomes too heavy, it falls to the ground.

Stormy Weather:

Extreme conditions in the atmosphere create various kinds of storms including thunderstorms, hurricanes, and tornadoes. Tornadoes are the most violent of all storms.

Storm Name	When It Occurs	Associated Weather
thunderstorm 	A warm, moist air mass near the ground is covered by a cold air mass, which causes an uplift of warm air.	<ul style="list-style-type: none">• frequent thunder and lightning• heavy rain• strong winds• sometimes, hail and/or a tornado
hurricane 	A hurricane forms over warm ocean water near the equator. As warm, humid air rises and forms clouds, cooler air rushes in to replace it.	<ul style="list-style-type: none">• strong winds that can reach nearly 200 miles per hour• strong rain• can cause high tides/huge waves if it moves ashore
tornado 	A tornado usually forms from a thunderstorm. If two air masses of different temperatures and humidity meet, and certain changes in wind direction and speed occur, a tornado may form. A tornado is a violently rotating column of air extending from the base of the thunderstorm to the ground.	<ul style="list-style-type: none">• very strong winds in a funnel-shaped cloud (the most extreme tornadoes can reach speeds of more than 300 miles per hour)