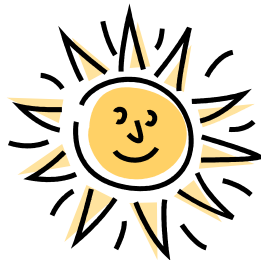


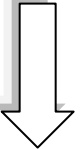

# Weather

## Unit Study Guide



## Earth's atmospheric layers

Earth's atmosphere is the layer of gases that surrounds the planet and makes conditions on Earth suitable for living things.

Atmospheric Layers	Earth's atmosphere is divided into several different atmospheric layers extending from Earth's surface outward	the <u>troposphere</u> , where all weather occurs the <u>stratosphere</u> , where the ozone layer is contained the <u>mesosphere</u> the <u>thermosphere</u> the <u>exosphere</u>	Earth's Surface  Space
Atmospheric Gases	Nitrogen and Oxygen	the two most common gases; found throughout all the layers	
	Ozone	a form of oxygen found in the stratosphere	
	Water vapor and Carbon dioxide	important gases for weather conditions; found in the troposphere	
	Trace gases, argon	play an insignificant role	
Atmospheric Temperatures	Differences in temperature separate the layers	<p>As altitude increases, temperature decreases in the <u>troposphere</u></p> <p>The <u>stratosphere</u> is cold except in its upper region where ozone is located</p> <p>The <u>mesosphere</u> is the coldest layer</p> <p>Even though the air is thin in the <u>thermosphere</u>, it is very hot</p> <p>The cold regions of outer space extend from the <u>exosphere</u></p>	
Atmospheric Pressure	The air pressure, the force exerted by the gases pushing on an object, is greatest near the surface of Earth, in the <u>troposphere</u> .	Air pressure decreases through the layers farther out from the surface as Earth's pull of gravity decreases.	Troposphere pressure decreases 

**Interactions between air masses, fronts, and pressure systems result in various weather conditions.**

**Air masses:** huge bodies of air that form over water or land in tropical or polar regions.

Temperature and humidity conditions within the air masses as they form are important to the resulting weather conditions when air masses move.

**Fronts:** form at the boundaries between the air masses when the air masses move and collide with each other. Depending upon the air masses involved, a warm front, cold front can develop.

- When a warm air mass collides and rides over a cold air mass, the resulting warm front may produce long periods of precipitation and warmer temperatures.
- When a cold air mass collides and slides under a warm air mass, the resulting cold front may produce thunderstorms and sometimes tornadoes and cooler temperatures.

### **High/Low Pressure Systems**

Warm air rising or cold air sinking combined with the spinning of Earth causes the air to spin forming high and low pressure regions.

- High pressure systems usually signal more fair weather with winds circulating around the system in a clockwise direction.
- Low pressure systems with counterclockwise circulating winds often result in rainy and/or stormy weather conditions.

**Storms:** Severe weather conditions, occur when pressure differences cause rapid air movement

- Thunderstorm: thunder, lightning, heavy rains and strong winds; usually form along a cold front but can form within an air mass.
- Tornado: rapidly whirling, funnel-shaped cloud that extends down from a storm cloud; the very low pressure and strong winds can cause great damage; are likely to form within the frontal regions where strong thunderstorms are also present.
- Hurricane is a low pressure tropical storm that forms over warm ocean water; winds form a spinning circular pattern around the center, or eye, of the storm; the lower the air pressure at the center, the faster the winds blow toward the center of the storm.

**Predict weather conditions and patterns based on weather data collected from direct observations and measurements, weather maps, satellites, and radar.**

Weather conditions and patterns can be predicted based on weather data collected from various sources.

**Weather maps:** predict weather patterns by indicating high or low pressure systems, movement of air masses and fronts, or temperature ranges

**Satellites images:** used for seeing cloud patterns and movements.

For example, hurricane clouds and movement can be observed using satellite images.

### **Uneven Heating of Earth's surface**

**Solar energy** The driving energy source for heating of Earth and circulation in Earth's atmosphere comes from the Sun

**Albedo Effect** Some of the Sun's energy coming through Earth's atmosphere is reflected or absorbed by gases and/or clouds in the atmosphere.

**Specific Heat** The land heats up and releases its heat fairly quickly, but water needs to absorb a lot of solar energy to warm up. This property of water allows it to warm more slowly but also to release the heat energy more slowly. It is the water on Earth that helps to regulate the temperature range of Earth's atmosphere.

### **Convection currents affect weather patterns and climate.**

Because warm air near Earth's surface rises and then cools as it goes up, a convection current is set up in the atmosphere.

Convection happens on a global scale in the atmosphere and causes global winds. These winds then move weather systems and surface ocean currents in particular directions.

On a smaller scale, convection currents near bodies of water can cause local winds known as land and sea breezes.

The surface currents of Earth's oceans that circulate warm and cold ocean waters in convection patterns also influence the weather and climates of the landmasses nearby.

Because of the unequal heating of Earth, climate zones (tropical, temperate, and polar) occur.

Since temperature is a major factor in climate zones, climate is related to:

- the convection regions at various latitudes,
- temperature differences between the equator and the poles, and also
- warm and cold surface ocean currents.

**Explain the influence of global winds and the jet stream on weather and climatic conditions.**

Global winds are found in each convection region.

Because convection cells are in place in the atmosphere and Earth is spinning on its axis, these global winds appear to curve. This is known as the Coriolis effect.

Tropical weather systems, for example hurricanes, are moved in the prevailing direction of the trade winds. If they enter the westerly wind belt, they are often turned, and move in the direction of that prevailing system.

The polar winds blow northeast to west in the polar region moving cold polar air in that climate zone from the poles toward the west.