Climate and Weather

Objective

In this lesson, you will

Introduction

- Weather is the condition of the atmosphere over a _____ area and _____ _____.
- Climate is the _____ of weather over a _____ period of _____.

Space and Weather

Incoming _____ from the _____ is the single largest _____ determining climate patterns.

→ Earth is roughly the shape of a sphere and rotates on an _____. The Earth's axis is _____ about _____°.

→ Seasons _____ as the Earth travels around the Sun. Due to the _____, the Northern and Southern hemispheres experience seasons at ◯ different ◯ similar times. The seasons are _____ north and south of the equator. If it is winter in the north, it is _____ in the south. Similarly, _____ in the north means autumn in the south.

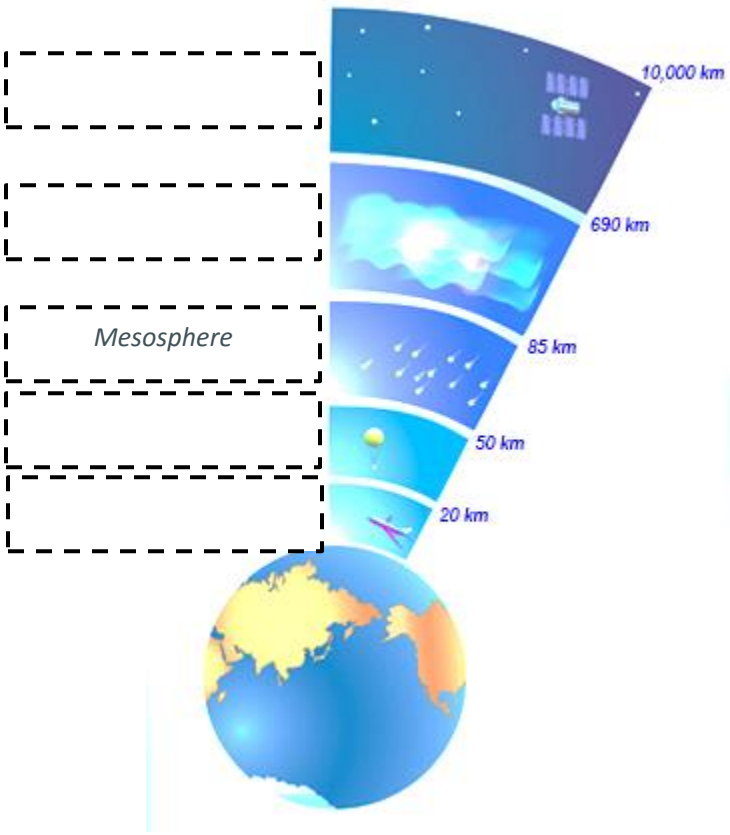
❖ The Sun's rays radiate directly on the _____ during the spring and autumn _____ (first days of spring and autumn). These days, which fall on or around March 21 and September 23, are also when day and night are about the _____ _____ at ____ places on the Earth.

❖ The days that mark the beginning of summer and winter are the _____. On these days, usually on or around June 21 and December 21, the _____ shines directly over the _____ of Capricorn (23.5°S) or the Tropic of Cancer (23.5°N). The solstices are the _____ and _____ days of the year depending on which hemisphere you are in.

- The _____ experience seasons quite differently than the rest of the planet. During half of the year, one pole receives _____ _____, while the other pole receives almost _____. From March 21 through September 22, the daylight is continuous at the _____ Pole; the same occurs at the _____ Pole from September 23 through March 20. These seasons are sometimes referred to as _____ climate differences.

Earth's Atmosphere

The _____ is made of _____ that surround the Earth. Most of the atmosphere is composed of _____ (78%) or _____ (21%), plus various other gasses. This mixture is commonly called _____.



- **Troposphere:** Most activity considered "_____" on Earth occurs in this layer.
- **Stratosphere:** This is the layer where _____ is found. Ozone is a reactive form of oxygen that is a major air _____ in the troposphere but a _____ component of the stratosphere. The stratosphere is also where scientists keep _____ _____ hovering for forecasting purposes.
- **Thermosphere:** This layer slowly trails off into space.
- **Exosphere:** The layer of space above Earth.

Climate and Vegetation

World Climate Zones

A quick glance at a map showing world _____ zones reveals that, in general, they are similar along _____ _____. With some exceptions at extreme _____, nearly all locations near the _____ experience tropical weather. Warmer and tropical climates prevail north and south of the equator, to ____° north and ____° south. These latitudes are slightly north and south of the _____ of Cancer and Capricorn, respectively. Outside of these latitudes, climates vary more until the _____ and _____ Circles. Inside these areas _____ arctic climates are the norm.

	Climate	Weather Features
Tropical	*Tropical Humid*	
	Tropical Wet and Dry	*Dry winters and wet summers but high temperatures year-round.*
Dry		*Dry and warm climates with very little rainfall, usually not more than 10 inches annually.*
	Semiarid or Steppe	*Little rainfall, though a bit more than desert--usually 10-20 inches a year.*
Middle Latitudes	*Mediterranean*	*Mild, rainy winters and warm summers with moderate temperatures all year.*
	Humid Subtropical	*Hot, humid summers and mild, humid winters. Rain comes year round and coastal areas are vulnerable to hurricanes and typhoons.*
	Marine West Coast	*Similar to Mediterranean with mild summers and rainy winters, though tends to be much cooler overall due to influence of ocean currents and winds.*
	Humid Continental	*Four distinct seasons, with the winters being cold, though rarely below freezing, and warm, humid summers. Rainfall varies but reaches at least 20 inches and no more than 50 inches.*
High Latitudes		*Extremely cold winters and short, relatively milder summers. Low precipitation, not usually exceeding 15 inches in warmer months. Temperatures often below freezing.*
		Cold all year with harsh winters and short, chilly summers. Precipitation does not exceed 15 inches annually.
	Ice Cap	
Highland	*Highland*	*Climate is determined by elevation more than latitude. The higher an area is, the cooler its temperatures will be.*

World Vegetation Zones

Different areas specialize in different crops due to their climates.

	Climate	Vegetation Features
Tropical	Tropical Humid	
	Tropical Wet and Dry	*tropical grasslands with savanna*
Dry	Arid	*desert, with sparse drought-resistant plants*
	Semiarid or Steppe	*steppe landscapes with short grasslands and few trees*
Middle Latitudes	Mediterranean	*Mediterranean forests, scrub woodland, and grasslands*
	Humid Subtropical	*mixed forests with both broad-leafed and needled trees*
	Marine West Coast	
	Humid Continental	
High Latitudes	Subarctic	*boreal forests/taiga (coniferous forests, sometimes sparse)*
	Tundra	*arctic tundra with mosses, shrubs, and few trees*
	Ice Cap	

Highland	Highland	

Weather Factors

Other factors besides latitude and altitude contribute to _____ patterns. These include _____, ocean _____, and most recently, global _____.

- Wind is the force of horizontal air that moves _____ and _____ across Earth in high or low pressure _____. Prevailing winds are those that tend to be _____ at a given _____.
- When _____ masses coming from different directions and temperatures meet, they form a _____.
- Air _____, the force exerted by the atmosphere, shares a close relationship with air _____. High pressure fronts are associated with ◯ warmer ◯ colder weather, and low pressure fronts bring ◯ warmer ◯ colder temperatures.

Water absorbs heat much more _____ than land. There are several reasons for this. In general, water _____ sunlight more slowly than land. When light strikes _____, it does not travel farther than the surface before being reflected. When sunlight hits the _____, it must be _____ throughout the _____ of the water; the light is diffused through the water. This is why more _____ _____ are found in the world's oceans than on its land masses. The warmer temperatures of water help to _____ nearby lands from large temperature _____. It also helps to keep these _____ masses at a fairly moderate temperature year round. This explains why it is much warmer in _____ San Francisco than it is in the _____ located Kansas City, Missouri, although they reside at similar _____.

- ❖ Ocean currents are driven by _____ _____. They are responsible for transferring heat between the polar regions and the tropics.

Weather Watchers

National Weather Service: This federal agency is responsible for everything from _____ hurricanes to issuing tornado and tsunami _____.

- The scientific study of weather and the atmosphere is _____. One specific branch of meteorology is weather _____. Weather forecasters _____ and _____ _____ to make educated predictions about future atmospheric conditions.

Temperature: measured with a/an ◯ anemometer ◯ barometer ◯ thermometer

Air Pressure: measured with a/an ◯ anemometer ◯ barometer ◯ thermometer

Wind Speed: measured with a/an ◯ anemometer ◯ barometer ◯ thermometer

- Public _____ is a primary purpose of the federal _____ that keep an eye on weather.

Common Types of Storms

- Tornadoes or "_____" are narrow _____-moving, twisting spirals of air that cause tremendous damage where they do pass through. Tornadoes are a particular type of _____. The _____ has more incidences of tornadoes than anywhere else in the world.
- Hurricanes are also cyclones. Since they are so _____, they are considered the most dangerous of this storm system class. Hurricanes, also called _____, are fed by warm tropical waters where they originate. These storms often travel thousands of miles and over many political _____. Hurricanes are fed by _____ air and _____, which are common in tropical waters in the summer.

Weather and Culture

Climate gives clues about human _____ with Earth. For instance, tropical climates are more hospitable to some _____ than colder climate zones.

Global Warming

In the last century, Earth's temperature has _____ by about half of a degree Fahrenheit. The vast _____ of the _____ community believes that burning fossil fuels and other human activities that introduce _____ gasses to the atmosphere are responsible for this temperature rise, known as global warming.

Ten Indicators of a Warming World

Air Temperature Near Surface:	◯ increasing	◯ decreasing
Humidity:	◯ increasing	◯ decreasing
Temperature Over Ocean:	◯ increasing	◯ decreasing
Sea Surface Temperature:	◯ increasing	◯ decreasing
Sea Level:	◯ increasing	◯ decreasing
Glaciers:	◯ increasing	◯ decreasing
Snow Cover:	◯ increasing	◯ decreasing
Temperature Over Land:	◯ increasing	◯ decreasing
Sea Ice:	◯ increasing	◯ decreasing
Ocean Heat Content:	◯ increasing	◯ decreasing

Fossil fuels are _____ energy sources obtained from the remains of ancient _____ and _____. Burning them impacts the way the greenhouse effect _____ the _____. The _____ _____ is part of how the Earth's temperature is maintained. Greenhouse gasses in the Earth's atmosphere _____ energy and heat from the _____, just as the surface of the Earth does. The gasses radiate some of this heat _____ to the surface, helping maintain the temperature that humans and other life forms _____ to survive. The rest of the heat is radiated back out to _____. According to many scientists, global warming is occurring because there are greater amounts of CO_2 (_____ _____), _____, and other greenhouse gasses released into the atmosphere than before. This causes _____ energy to radiate out into space, so more heat is radiated back to Earth.

- Scientists can study past CO_2 and temperature levels through analysis of old _____ _____ and _____ _____. Many scientists believe that the rate of warming will _____ in the future. However, if human activities are _____ _____ the trend could slow.
- Scientists think that even _____ shifts in the planet's average _____ can result in significant and potentially catastrophic _____ to the world's climate.
- The science _____ that global warming is developing. Scientists have demonstrated that the number of _____ storms has increased over the last part of the 20th century. This is one reason why global warming has largely become headline news: because so many people are observing severe weather patterns _____ _____.

Global Response to Climate Change

In December 1997, the Kyoto Protocol was adopted in Kyoto, Japan. Critics doubt the treaty will succeed in reducing climate change when some of the world's largest polluters refuse to adopt the convention.

Summary

How does the Sun impact climate on Earth, and how do humans impact climate on Earth?