Chapter 8: Weather Patterns

Word Work

weather, wind , air pressure, weather map, humidity, precipitation, clouds, cirrus, stratus, cumulus, cumulonimbus, barometer anemometer, rain gauge, wind speed, wind direction, temperate, thermometer, Celsius, Fahrenheit, freezing point, climate, elevation, latitude, climate zones, polar, tropical, environments, desert, grassland, tundra, wetland, rainforest

Lesson 1: How Does Air Move?

1. Layers of Air
2. Air is made of gases, 8/10 of air is nitrogen, 2/10 of air is oxygen.
3. The rest of the air is carbon dioxide, water, and other gases.
4. The atmosphere of Earth has five layers and the temperature changes as you go up through the layers.
5. As you go higher, the altitude increases and the air pressure gets lower.
6. Altitude is how high you are in the atmosphere and air pressure is the amount of air.
7. The higher you are in the atmosphere, the lower the air pressure is because the gas particles in the air are farther apart and the less air there is above you.
8. Convection Currents
9. Sunlight warms up land quickly, but it takes longer to warm up water so at night, land cools off faster than water.
10. This is why the air above land and the air above water are different temperatures.
11. Convection currentsform when there are different air temperatures.
12. A convection current happens when gases or liquids rise and sink in a circular path.
13. Gas particles are closer together in cool air and are farther apart in warm air.
14. This makes cool air heavier than warm air so when warm and cool air are next to each other, the cool air sinks and the warm air rises.
15. This is what happens to convection currents near the ocean at night.
16. There are six very large convection currents in the air over Earth.
17. The convection currents over North America and the spinning of Earth cause wind patterns. In North America, this makes the wind blow mainly from west to east.
18. There are jet streams high above the ground, which are a very high fast wind.
19. The different temperatures between the convection currents form jet streams.
20. Jet streams can change the temperature, winds, and rain because it affects air movement.

Lesson 2: What are Air Masses?

1. Kinds of Air Masses
2. When air stays in one area for a long time, it takes on properties of that area and becomes an air mass.
3. An air mass is a large body of air with similar properties through it. The air mass keeps these properties even after it moves away from the area.
4. Weather is often caused by air masses. If it is warm and sunny, it will stay that way until a new air mass moves to the area.
5. Some types of weather only happen at the edges of air masses.
6. There are different types of air masses. Maritime polar air masses form over the oceans near the poles. These air masses are cold and moist.
7. Maritime tropical air masses form over warm oceans or rainforests. These air masses are warm and wet.
8. Continental polar air masses form over land near the poles. These air masses are cold and dry. Continental tropical air masses form over hot deserts. These air masses are warm and dry.
9. Air masses move because of winds. The winds may be close to the ground or high like the jet stream.
10. If a jet stream brings air from Canada to the United States, the weather will probably get colder.
11. When Air Masses Meet
12. A frontis a boundary between two air masses.
13. Air masses usually move from west to east over North America. Fronts have the same movement.
14. Fronts are named for the kind of air they bring to an area.
15. A cold front brings colder air.
16. A warm front brings warmer air.
17. A stationary front does not move very much. It stays in the same area for a while.
18. Fronts often have rising warm air. This makes the areas near the fronts have low air pressure.
19. Areas in the middle of the air mass have higher air pressure. The rising air at fronts causes precipitation such as rain or snow.

Lesson 3: What Causes Severe Weather?

1. Thunderstorms
2. Thunderstorms, hurricane, tornados, and blizzards are all examples of severe weather.
3. Severe weather can be dangerous. It is important to get ready for severe weather if you know it is coming.
4. The first stage of a thunderstorm has strong, quickly rising currents of moist air. This air forms big clouds. The clouds have both water droplets and ice crystals.
5. During stage two of a thunderstorm rain falls. Some air is pulled down with the rain. This causes the storm to have currents moving up and down.
6. During the third and final stage of a thunderstorm, all the currents move down. The clouds get smaller as the rain falls
7. Tornadoes
8. The weather has to happen in a certain way for a tornado to form. First, layers of wind blow at different speeds in different directions.
9. Between these layers, a column of air starts to spin on its side. One end of this column is lifted by upward winds. The other end is pushed down by downward winds. T
10. The spinning column of air is a funnel cloud. When it reaches the ground, it is called a tornado.
11. Tornados often last only a few minutes. However, their path can be very long and wide.
12. Winds in a tornado move so fast they can even throw a car around!
13. Tornados are very dangerous. If you know a tornado is coming, take shelter. A basement is the best place to go. A closet or a windowless room is good places too.
14. Hurricanes
15. Warm ocean water has a lot of energy in it. When water vapor from the warm oceans condenses, energy is released. Sometimes this energy grows and powers the winds of a hurricane.
16. A hurricane’s winds are slower than a tornado’s winds, but a hurricane usually does more damage. This is because hurricanes last for days. They are also much wider than tornados and can hit several countries. Hurricanes also cause huge waves. The ocean can rise and flood the shores. Heavy rains can also cause floods inland.
17. If you know a hurricane is coming, here are some ways to get ready. Put boards over your windows. Test your flashlights and battery-powered radios. Store valuable things in plastic containers high off the ground. When the hurricane gets close, it is important to stay inside or leave immediately if the authorities ask people to evacuate.

Lesson 4: How are Weather Forecasts Made?

1. Collecting Data
2. A weather system has many parts. A weather system has temperature, moisture, clouds, precipitation, wind speed, and wind direction. In a weather system, these parts may work with each other and often change. We use tools to learn about these parts.
3. A barometer shows air pressure. An anemometer measures wind speed. A hygrometer measures the moisture in the air. A rain gauge measures how much rain has fallen. People use radar to measure the winds and rain inside a storm. People use the data from all these tools to describe a weather system
4. Weather Forecasts
5. Weather forecasters look at how the temperature changes with the seasons. They look at patterns of snowfall and rainfall. Forecasters study weather patterns to learn more about how land, air, and the water cycle affect the weather.
6. Weather forecasters look at many patterns of weather change. There are patterns in the seasons of the year. There are even patterns during each day.
7. Weather forecasters expect the current weather to act the same way that weather has acted in the past. The more information forecasters have, the more accurate the forecast will be.
8. Forecasters show current weather and predictions on weather maps. Their maps show which way a front is moving. In the United States, fronts move from west to east. Fronts are always in areas of low pressure. Areas around fronts are often cloudy. Areas of high pressure that are away from fronts often have clear skies.

Lesson 5: What is Climate?

1. Weather and Climate
2. Do you know the difference between weather and climate? Weather is all  
   the conditions in one place at one time. Weather can change from day to day. **Climate** is the average of weather conditions over a long time. Climate includes the average amount of rain, the average temperature, and how much temperature changes in a year.
3. Landforms Effect Climate
4. Mountains may have different climates than the low areas near them. Higher  
   land is cooler than the lower land around mountains. The opposite sides of a mountain can also have different climates. In the United States, the west side of the Cascade Mountains is wet. But the east side of the mountains has a dry climate. This is because the air does not have as much moisture in it when it reaches the east side.
5. Oceans Affect Climate
6. Ocean currents can also make a climate warmer or cooler. Big currents carry warm water north. Some of the warm water evaporates and makes the wind above it warmer. Those winds blow over land, making its climate warmer. Big ocean currents also carry cold water south. The cold water cools the winds. These winds make the climate cooler.
7. Past Climates
8. Climates are the average weather conditions over a long time. But climates do change. In the 1600s the climate of North America and Europe were much colder and wetter than they are now. This time is called the Little Ice Age.
9. Climates have changed many times. Sometimes they change quickly and sometimes they change slowly. Scientists study fossils to learn about climates from long ago. If a plant fossil looks like a modern plant, scientists guess the two plants need the same climate. If the modern plant needs water and the plant fossil was found in a desert, scientists guess the climate might have changed.
10. How Climates Change
11. Many things can cause a climate to change. The Little Ice Age may have been caused by the Sun making less energy. An erupting volcano or an asteroid hitting the Earth can cause a sudden climate change. This is because the volcano and the asteroid release materials into the atmosphere that block or reflect sunlight. The climate becomes cooler.
12. Warmer climates may be caused by carbon dioxide, methane, and water vapor in the atmosphere. Burning coal and using gasoline releases these things into the air.
13. Scientists talk about the changes in climates. They do not always agree on why a climate changed. Scientists work very hard to understand why a climate changed.