# **Atmosphere and Weather Discussion Guide (for use during or after reading)**

1. What is the atmosphere? Describe its role on Earth. (What Is the Atmosphere?, p. 4-7)
   1. The atmosphere is the layer of air that protects and surrounds Earth. It is 78% nitrogen, 21% oxygen, and 1% argon, carbon dioxide, and trace other gasses. The atmosphere allows plants and animals to breathe, and its pressure allows for water to be in a liquid state. In addition, it absorbs the sun’s harmful radiation while trapping the right amount of heat to keep Earth warm, but not too hot.
2. Explain how weather and climate are different from one another. (The Weather, p. 10-13)
   1. Weather and climate are related but are two different concepts. Weather is the state of the atmosphere at a particular place and time. Climate, on the other hand, is the average weather of a place or region over a period of time.
3. How do radiation, conduction, and convection work to affect the air temperature, and therefore the weather? (Air Temperature, p. 14-17)
   1. Air temperature plays a role in changing the weather. Radiation from the sun warms the air on Earth and becomes trapped by gasses in the atmosphere. This greenhouse effect keeps our Earth warm. The sun’s radiation changes in strength depending on whether it’s day or night, the season, and altitude.
   2. Conduction happens when molecules bump into one another, causing heat energy to be transmitted through a substance. In the air, molecules are farther apart than in solids or liquids. This causes conduction in the air to happen more slowly. During the day, the sun heats the ground through radiation and the ground in turn heats the air above it via conduction. At night, the air cools the ground through conduction.
   3. Convection is the movement of molecules through a substance. Convection happens more easily in the air because molecules move around more freely there than in solids or liquids. Convection works by transferring heat from hot areas to the air. As air warms, it becomes lighter and rises.
4. What role does gravity play in creating air pressure? How does air pressure affect the weather? (Air Pressure, p. 18-21)
   1. Gravity plays a large role in creating air pressure. Gravity pulls things, including air, toward the ground. This creates air pressure, the weight of air pressing down on the ground. Air pressure changes depending on your elevation as well as the air temperature. Because cold air is more dense than warm air, it exerts high air pressure. Areas with high air pressure tend to have clear skies, whereas areas with low pressure can expect clouds and storms.

1. What is humidity? Describe what happens to the weather as humidity changes. (Humidity, p. 22-23)
   1. Humidity is a measure of the amount of water vapor in the air. If the relative humidity measures 100 percent, the air is fully saturated and water droplets begin to condense. When this happens on the ground, it creates fog. When this happens in the air, it creates clouds. Humidity also accounts for the creation of dew in the mornings or frost when temperatures fall below freezing.
2. How do clouds form? What role do they play in the water cycle? (Clouds, p. 24-25)
   1. Clouds form when water vapor that rises into the sky by convection cools down to become saturated before clinging to particles in the air. Clouds play an integral role in the water cycle. Once clouds are fully saturated, they release their water back to Earth in the form of rain or snow. Here it travels through rivers, streams, lakes, and more before draining to the ocean to evaporate and turn into a cloud once more.
3. What are prevailing winds? Why do they occur? (Prevailing Winds, p. 28-29)
   1. Prevailing winds are giant belts of wind that continuously circle Earth due to the patterns of warm air with low pressure around the equator and cool air with high pressure at the poles. The cold, high-pressure air from the poles moves towards the equator, pushing the warm air up so it can flow back to the poles. This creates a continuous cycle of wind over the entire planet.
4. Compare warm and cold fronts, including how they form and how they affect the weather. (Fronts, p. 32-33)
   1. A front occurs where air masses meet. A warm front occurs when an advancing warm air mass meets a retreating cold air mass and the warm air rises. A cold front occurs when an advancing cold air mass meets a retreating warm air mass. The denser cold air pushes the warm air up. Both cold and warm fronts cause the temperature to drop, humidity to rise, and often clouds and rain.
5. Choose one extreme weather event and describe it. Why did this type of extreme weather interest you? (Extreme Weather, p. 34-35)
   1. Students’ responses will vary. They may highlight any of the following:
   2. Thunderstorms are powerful storms that produce thunder, lightning, and often powerful winds.
   3. Blizzards are intense snowstorms with high winds and freezing temperatures.
   4. Hurricanes are powerful storms with violent winds that can reach up to 200 miles per hour. They form over warm, tropical ocean water.
   5. Tornadoes are rapidly spinning columns of air that have touched the ground. Tornadoes are extremely violent storms.
6. Why is it important for people to look after the atmosphere? How can people help take care of it? (Looking After the Atmosphere, p. 36-37)
   1. It is important for people to look after and protect the atmosphere because it plays such a vital role in our lives and survival. Air pollution, burning coal, contributing to global warming, clearing forests, and more all have negative effects on our atmosphere. We must work to protect the ozone layer as it is our number one defense against the sun’s powerful rays.
   2. One way people can protect the atmosphere is by passing laws and other regulations that reduce harms to the ozone layer. In addition, we can use fewer fossil fuels and plant more trees and plants to absorb CO2 and help clean the air!