

**The
Weather
Book
Study Guide**



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Section Questions

Introduction, pages 4 - 5

Vocabulary Words:

atmosphere climate blizzard

1. Locate the vocabulary words in the glossary. Write the definition for each.
2. Name three ways weather can affect our daily lives.
3. Paul says, "All things were created by God, things in heaven and on earth, visible and invisible" (Colossians 1:16). Would you consider wind to be invisible? Tell why.
4. Even though wind cannot be seen, it can be felt. How is God's love like the wind?
5. The earth has not always had spring, summer, fall, and winter (seasons). When did they first come about?
6. As a result of Adam and Eve's sin against God, the weather was affected. What do you think the weather would have been like if man had never sinned?

God Created, pages 6 - 7

Vocabulary Words:

ultraviolet light carbon dioxide ice age tide
nitrogen latitudes ozone
oxygen pollution water vapor

1. Locate the vocabulary words in the glossary. Write the definition for each.
2. What effect does the moon have on the earth?
3. What would happen to the earth if the moon was farther than 240,000 miles away?
4. Why do the sun and moon look the same size in the sky even though they're not?

5. The earth spins on its axis once every day. Why is that just perfect for our weather on earth?
6. Why is the tilt of the earth important to our weather?
7. What percentage of gasses is our atmosphere made of?
8. Why is it important to wear sun block if out in the sun for extended periods of time?
9. How many meteors hit the earth's atmosphere each day?
10. What happens to most of the meteors?

What Causes Weather, pages 8 - 9

Vocabulary Words:

Coriolis force precipitation axis
equator

1. Locate the vocabulary words in the glossary. Write the definition for each.
2. Name the seven main components of weather.
3. What are the five main forms of precipitation?
4. What happens to sunlight that makes it to the ground?
5. What is infrared radiation?
6. How does infrared radiation affect the temperatures in the summer and in the winter?
7. As the air is forced upwards in the Coriolis force, what is formed?

World Climate Zones, pages 10 - 11

Vocabulary Words:

ice cap arid tropical humid
subarctic tundra

1. Locate the vocabulary words in the glossary. Write a definition for each.
2. The weather may change from day to day, or season to season, but climate is the average weather condition for a particular place at a particular time. Look at the world climate map on page 11. Locate where you live. By using the key at the bottom of the map, classify your climate. Describe it briefly using five words.
3. Are there any tropical rain forests found in the high or mid latitudes? Why?
4. At what degree latitude are most of the earth's deserts found?
5. How does distance from the ocean cause the weather to be affected?
6. How do mountains affect the climate?

Weather Facts, pages 12 - 13

Vocabulary Words:

monsoon typhoon

1. What caused the highest recorded surface wind?
2. Why does the air above snow stay so cold?
3. Which two states tied for the largest amount of rainfall in one hour?
4. Where is the lowest air pressure found on earth?
5. Why is the Antarctic ice sheet called a polar desert?
6. Write a poem about your favorite weather fact. Remember, poems don't have to rhyme but they should express a strong feeling or emotion.

How to Read a Weather Map, pages 14 - 15

Vocabulary Words:

cold front dew point meteorologist
warm front

1. Locate the vocabulary words in the glossary. Write the definition of each word.
2. What are the two types of weather observations?
3. How often are the measurements taken for each observation?
4. What role do computers play in predicting weather?
5. Even with a computer, why is it sometimes difficult for a meteorologist to predict the weather?
6. Suppose you are planning an outdoor activity for the next day such as hiking or camping. When you watch the weather report, do you hope to see an approaching high or low pressure area? Explain your choice.
7. Look at the graphic symbols on page 14 that are used by weather forecasters. Design some new ones that could be used for the following weather conditions: sunshine, partly cloudy, rain, and thunderstorm.

Jet Stream, pages 16 - 17

1. What is the jet stream?
2. What causes the jet stream?
3. What is the average speed of the jet stream during the summer and winter months?
4. What effect does the jet stream have on the weather?
5. Which direction do storms generally move?
6. Does the wind speed stay the same in the jet stream? Explain your answer.

7. Why are jet stream charts important to weather persons?
8. How fast would a balloon circle the world if placed in the jet stream?

El Niño, pages 18 - 19

Vocabulary words:

El Niño plankton

1. Locate the vocabulary words in the glossary and write the definition for each.
2. Name at least three unpleasant effects of El Niño on the lives of the people of Peru and Ecuador.
3. What are some of the things scientists are trying to find out about El Niño?
4. Why is the warm weather condition of El Niño not good for the fishermen?

Water in the Atmosphere, pages 20 - 21

Vocabulary Words:

condensation evaporation

1. Locate the vocabulary words in the glossary. Write the definition for each.
2. Half of our water comes from plants, wet ground, rivers, and lakes. Where does the other half come from?
3. When ocean water evaporates into the air as water vapor, what replaces it?
4. Why can we say that the water cycle is like a circle that has no beginning and no end?
5. Where the water table is deep in the ground, the land is dry. Look at the map on page 11. Where are some of the places that is true?

6. Run-off carries chemicals from the soil to the ocean. If polluted chemicals are harmful to the plankton, how could the rest of the ocean suffer because of it?

Clouds, pages 22 - 25

Vocabulary words:

cirrus clouds convection clouds cumulus clouds
fog relative humidity stratus clouds

1. Use the glossary to locate the vocabulary words. Write the definition for each.
2. How do clouds form?
3. Which holds more water, warm air or cool air?
4. What does fog, mountain clouds, convection clouds, and frontal clouds all have in common?
5. What are the three basic cloud types?
6. When do you usually find cumulus clouds?
7. Which of the three basic clouds contain ice crystals?
8. Which cloud is found at low altitudes?
9. Clouds are classified according to their _____ in the sky.
10. Which two clouds especially contain rain?

Warm Fronts and Cold Fronts, pages 26 - 29

1. What happens during a warm front?
2. Where are most clouds and precipitation formed in the atmosphere?
3. What force pulls water droplets to the ground?
4. How can you tell if a warm front is approaching?

5. What weather conditions are occurring close to a warm front?
6. Which direction do cold fronts usually come from?
7. Which is denser, cold or warm air?
8. During the summer, what weather conditions can be expected with the approach of a cold front?
9. In what ways are a cold front and a warm front similar?

Fog, pages 30 - 31

1. Name the four different kinds of fog.
2. The air can no longer hold more water when it reaches the point of _____.
3. When could fog prove to be hazardous to people?
4. What is the difference between fog and clouds?
5. Which two fogs occur over water?
6. Which types of fogs occur over land?

Thunderstorms, pages 32 - 35

Vocabulary Words:

electricity thunderstorms

1. Use the glossary to write the definition for each vocabulary word.
2. Where do most of the world's thunderstorms occur?
3. Which kind of cloud do thunderstorms develop from?
4. Why is there a better chance of seeing a thunderstorm in the afternoon than in the morning or late night?
5. What is especially needed to cause a cumulus cloud to change into a huge towering cumulus?

6. Why does a cumulus cloud stop growing when it hits the stratosphere?

7. In what ways are thunderstorms a blessing from God?

8. How can thunderstorms remind us that God has promised to never flood the earth again?

Lightning, pages 36 - 37

Vocabulary words:

electrons static electricity

1. Use the glossary to write the definition of the above vocabulary words.

2. How is lightning like static electricity?

3. How is thunder created?

4. What does lightning sound like when it is near?

5. How fast does thunder travel?

6. Which is faster, thunder or lightning? Why?

7. Are electrons negative or positive?

8. Is the ground positive or negatively charged?

9. What are some problems with the scientist's theory that lightning is formed when electricity builds up in the cloud as a result of ice particles collecting?

10. A large amount of energy is released with each lightning bolt. If scientists could somehow harness this energy, in what ways could it be used to help mankind?

Dangerous Thunderstorms, page 38 - 39

Vocabulary words:

flash flood updraft down draft

1. Locate the vocabulary words in the glossary. Write the definition for each.
2. What percentage of thunderstorms each year in the United States are dangerous thunderstorms?
3. How has God provided for our safety in dangerous weather?
4. What two conditions are needed to cause a thunderstorm to develop? What is needed for a severe thunderstorm?
5. What two geographical features contribute to severe thunderstorms in the United States?
6. Which regions of the United States receive the most severe thunderstorms?
7. Look at the map of the United States on page 38. Florida has the most storms per year. Why is this true?
8. Which three states have mostly under 10 thunderstorms each year?
9. There are three reasons that flash floods occur. Name them.
10. Nearly half of the people that die in flash floods do so in their cars. In your opinion, could some of these have been prevented?

Hail and Wind Damage, pages 40 - 41

Vocabulary Word:
hailstones

1. Which kind of cloud is associated with hail?
2. What process is happening to the water drop as it travels to the top of the cloud?
3. What factors determine how fast the hail hits the earth?
4. If you pick up a hailstone that has fallen and it consists of

a large amount of cloudy ice, what does that tell you about how that hailstone was formed?

5. All hailstones are smooth and round. Is this statement true or false? Explain your answer.

6. What are some of the damages caused by hailstorms?

7. Invent three safety tips that could be used for hailstorms.

8. What are some damaging results of a wind storm?

Tornadoes, pages 42 - 47

Vocabulary words:

Doppler radar supercell tornado

1. Locate the vocabulary words in the glossary. Write the definition for each.

2. What is the difference between tornadoes and hurricanes?

3. What is the difference in how a tornado is formed as opposed to a thunderstorm?

4. Who are storm chasers?

5. A tornado forms in a special spot under a thunderstorm. Where is that spot?

6. Describe the most dangerous tornadoes. Tell what they look like, how fast they move, and how far they can go.

7. Why are tornadoes unpredictable?

8. What does a tornado watch mean?

9. What does a tornado warning mean?

10. A tornado is made of wind and water vapor. These two elements are invisible, yet we can see a tornado in the sky usually. Why?

11. Where do the largest number of waterspouts occur?

Hurricanes, pages 48 - 53

Vocabulary words:

Intertropical Convergence Zone	tropical depression
tropical storm	hurricane

1. Locate the above vocabulary words in the glossary. Write the definition for each.
2. What is a monsoon?
3. What are the three types of storms that happen in the tropics?
4. What is the name of the strongest storm?
5. How are hurricane hunters similar to tornado chasers?
6. Why are scientists able to predict the months that hurricanes will occur north of the equator?
7. Where is the eyewall located in a hurricane?
8. What causes the wind to increase inside a hurricane?
9. What are the different names given to a hurricane by the Japanese and Australians?
10. If you were to make up a name for a hurricane, what would you call it?
11. What causes nine out of ten deaths in a hurricane?
12. What is the factor inside a hurricane that can cause the sea level to rise?
13. What are the geographical and economic factors in Bangladesh that caused so many deaths during the hurricane of 1970?
14. What killed most of the people who died after Hurricane Andrew?
15. What is the National Weather Service's National Hurricane Center?
16. How has this agency been able to save lives?
17. How is Doppler radar useful in tracking hurricanes?

Winter Storms, pages 54 - 59

Vocabulary words:

ice storms Northeaster sleet wind chill factor

1. Locate the vocabulary words in the glossary. Write the definition for each.
2. What causes the earth to have seasons?
3. What causes cooler temperatures in the winter?
4. What causes warmer temperatures in the summer?
5. What are the seasons in the tropics like?
6. Why do the west coasts of the United States, Canada, and Europe very seldom have snow?
7. What would happen to the earth if all snow melted as soon as it hit the ground?
8. Name some of the reasons it is good that we have winter rainstorms in the southern United States.
9. What kinds of problems are caused in California by heavy rain storms?
10. What weather conditions are present during a blizzard?
11. What is a Northeaster?
12. What causes ice storms?
13. What are some problems that result from ice storms and winter storms?

Wild Weather, pages 60 - 63

Vocabulary words:

chinook winds Santa Ana winds St. Elmo's Fire
ball lightning

1. Locate the vocabulary words in the glossary and write the definition for each.

2. When, during a thunderstorm, is St. Elmo's Fire known to have been seen?
3. Why does Mt. Waialeale have so much rain?
4. Which state has a rain forest and an area that is nearly a desert?
5. What is a foehn wind?
6. What kinds of clouds are the foehn wall made of?
7. What is another name for foehn winds?
8. How can chinook winds become dangerous to nature and man?
9. What happens to the Great Lakes area after an Arctic cold front passes?
10. What is one of the reasons that Buffalo, New York, has so much snow?
11. Why do you think some people might think ball lightning could be a UFO?

Climate in the Past; Noah's Flood — Key to the Past, pages 64 - 67

1. What are some of the evidences scientists have found that shows climates were much different in the past?
2. Why is it impossible to be scientific about the study of the past?
3. Why is it important to have a model while studying the past?
4. What does the creation-Genesis flood model state?
5. Why do you think the word "Genesis" was included in this model?
6. What is the problem with the evolution-uniformitarian model and the flood of Noah's time?

7. What is an explanation for the past climate according to some creationists?

The Ice Age, pages 68 - 69

Vocabulary words:

permafrost bogs

1. Locate the vocabulary words in the glossary. Write the definition for each.
2. What would the climate have been like after the world-wide flood of Noah?
3. Why would the oceans have been warmer?
4. What caused the giant ice sheets to develop?
5. How long did the Ice Age last?
6. What might have caused the Sahara to turn into a mild, wet climate?
7. How could the mammoth have lived in Siberia?

Future Climate, pages 70 - 73

Vocabulary words:

greenhouse warming environment fossil fuels
ozone

1. Locate the above words in the glossary and write the definition for each.
2. Why do creationists believe there will not be another ice age?
3. What part does the gas carbon dioxide play in our atmosphere?
4. What factors have caused carbon dioxide levels to be raised?

5. Why should we be cautious about theories of the greenhouse warming?
6. What is the purpose of the ozone layer?
7. What are some of the factors that scientists believe is causing the ozone layer to decrease?
8. Some evolutionists believe that life evolved from the sea. What is the scientific problem with this theory?

Observing the Weather, pages 74 - 77

Vocabulary words:

weather vane thermometers barometer
weather balloons rain gauge

1. How often are measurements taken by meteorologists?
2. The condensation experiment shows how water vapor is formed. What process does this simulate in nature?
3. When the barometer measures low, what does this mean?
4. Weather balloons are sent up twice a day all over the world. Why do you think they send them up at the same time each day?
5. How is snow measured?

God, Creation, and You, pages 78 - 79

1. God made us responsible for the earth. What obligations as Christians do we have to our environment?
2. What is the problem with the “back to nature” ways of living?
3. Who are pantheists and what do they believe?
4. What is the most serious pollution problem of all according to Christians?

Unit Quizzes

Unit One Quiz, pages 4 - 20

1. When did the first seasons as we know them come about?
2. What effect does the moon have on the earth?
3. Why is the tilt of the earth important to the weather?
4. Name the seven components of weather.
5. What are the five forms of precipitation?
6. How does the distance from the ocean cause the weather to be affected?
7. Why is the Antarctic ice sheet called a polar desert?
8. Which is associated with good weather, high or low areas of pressure?
9. What is the jet stream?
10. What is one of the major problems that an El Niño brings to the people of Peru and Ecuador?

Unit Two Quiz, pages 20 - 42

1. Describe the path that a drop of water takes as it cycles through the atmosphere.
2. What are the three basic cloud types?
3. Under what conditions are most clouds and precipitation formed?
4. What is the difference between fog and clouds?
5. Which kind of cloud does a thunderstorm develop from?
6. How is thunder created?
7. What three conditions are needed to cause a thunderstorm to develop?

8. During the formation of hail inside a cloud, what processes are happening to the water drop as it travels to the top of the cloud?
9. How is lightning similar to static electricity?
10. Name one reason that a flash flood occurs.

Unit Three Quiz, pages 42 - 59

1. What is the difference between tornadoes and hurricanes?
2. What does a tornado watch mean?
3. What does a tornado warning mean?
4. What causes the earth to have seasons?
5. What causes cooler temperatures in the winter?
6. What causes warmer temperatures in the summer?
7. What weather conditions are present during a blizzard?
8. What is a monsoon?
9. Why are scientists able to predict the months that hurricanes will occur north of the equator?
10. How is Doppler radar useful in tracking hurricanes?

Unit Four Quiz, pages 60 - 78

1. What is a foehn wind?
2. What does the creation-Genesis flood model state?
3. What is the problem with the evolution-uniformitarian model and the flood of Noah's time?
4. What might the climate have been like after the world-wide flood of Noah's time?
5. What caused the giant ice sheets to form?

6. Why do creationists believe there will not be another ice age?
7. What is the purpose of the ozone layer?
8. What is the problem with the theory that life evolved from the sea?
9. What does a low barometer reading mean?
10. What obligations do Christians have for our earth and environment?

Glossary

arid — a dry climate lacking moisture.

atmosphere — the body of gasses surrounding Earth.

axis — an imaginary straight line through the center of the earth on which it rotates.

ball lightning — a glowing ball of red, orange, or yellow light found during a thunderstorm.

barometer — a weather instrument used to measure the pressure of the atmosphere.

blizzard — a very heavy snowstorm with violent winds.

bogs — soft, waterlogged ground such as a marsh.

carbon dioxide — a colorless, odorless gas formed during respiration, combustion, and organic decomposition.

chinook winds — foehn winds that are mild, gusty, west winds found along the east slopes of the Rocky Mountains.

cirrus clouds — a high altitude cloud made of ice crystals that appear thin, white, and feathery.

climate — the weather conditions that are particular to a certain area, such as wind, precipitation, and temperature.

- cold front** — a boundary of cold air, usually moving from the north or west, which is displacing the warm air.
- condensation** — the act of water vapor changing from a gas to a liquid.
- convection clouds** — clouds that occur in a rising updraft, usually when the sun's radiation warms the earth. This causes the water vapor to condense.
- Coriolis force** — the movement of atmospheric air caused by the rotating earth.
- cumulus clouds** — low clouds that are thick, white, and puffy with flat bottoms and rounded tops.
- dew point** — the temperature at which air becomes saturated and dew forms.
- Doppler radar** — a special type of radar used to track severe weather by detecting wind speed and direction.
- downdraft** — a downward current of air.
- electricity** — a moving electric charge, such as in a thunderstorm.
- electrons** — a subatomic particle with a negative electrical charge.
- El Niño** — a warm current from the west that replaces the cool ocean current along Peru and Ecuador.
- environment** — the surrounding circumstances or conditions around us.
- equator** — an imaginary line dividing the northern and southern hemispheres of the earth.
- evaporation** — to change into a vapor such as the evaporation of water by the warming of the sun.
- flash flood** — a flood caused by a thunderstorm that deposits an unusual amount of rain on a particular area.
- fog** — clouds that form on the surface of the ground.
- fossil fuels** — coal and oil derived from the remains of plant and animal organisms.

greenhouse warming — the phenomena of a steady, gradual rise of temperatures due to the increase of carbon dioxide in the atmosphere. This could result in natural catastrophes such as droughts, flooding, and a meltdown of the ice sheets.

hailstones — precipitation in the form of ice and hard snow pellets.

humid — a weather condition containing a large amount of moisture or water vapor.

hurricane — the strongest storm found in the tropics, with heavy rain and winds of 75 mph or greater.

Ice Age — a period of time marked by extensive glaciers on the face of the earth.

ice cap — an extensive covering of ice and snow.

ice storm — a storm caused by rain falling into a lower atmosphere that is below freezing.

Intertropical Convergence Zone — area near the equator where winds from different directions merge or mix.

latitudes — the distance north or south of the equator measured with imaginary lines on a map or globe.

meteorologist — a person that interprets scientific data and forecasts the weather for a specific area.

monsoon — a wind system that causes periods of wet and dry weather in India and southern Asia.

nitrogen — a naturally occurring element that is responsible for around four-fifths of the earth's atmosphere.

Northeaster — a storm that moves northeast along the east coast.

oxygen — a colorless, odorless gas that is 21 percent of our atmosphere. It is essential for plant and animal respiration.

ozone — a gas in the earth's upper atmosphere that is responsible for screening most of the sun's harmful ultraviolet radiation.

permafrost — permanently frozen subsoil found around polar regions.

plankton — tiny plant and animal organisms found in the oceans.

pollution —harmful or unsafe waste products.

precipitation — falling moisture in the form of rain, sleet, snow, hail, or drizzle.

rain gauge — a weather instrument used to measure the amount of rainfall over a particular period of time.

relative humidity — the amount of water vapor in the air compared to the amount of water vapor the air can contain at the point of saturation.

Santa Ana winds — a foehn wind that blows westward from the mountains of southern California to the coast when a high pressure area settles over Nevada, Utah, and Idaho.

sleet — precipitation that consists of frozen raindrops.

static electricity — a build-up of electrical charge on an insulated body.

St. Elmo's fire — a condition caused by a high charge of electricity in the air that causes pointed objects to glow slightly.

stratus clouds — low altitude gray clouds with a flat base.

subarctic — a region just south of the Arctic Circle.

supercell — a severe, well-organized thunderstorm with warm moist air spiraling upwards.

thermometer — an instrument used to indicate the temperature.

thunderstorm — a condition of weather that produces thunder, lightning, and rain.

tide — a raising and lowering of the water in the oceans and seas caused by the gravitational pull of the moon. The sun causes some, but to a lesser degree.

tornado — a funnel-shaped column of air rotating up to 300 mph, touching the ground.

tropical — a warm climate located near the equator, usually having lots of precipitation.

tropical depression — rainstorms with winds of 38 mph or less.

tropical storm — a storm of heavy rain and winds between 39 and 74 mph.

tundra — a region usually located at high altitude. The ground is permanently frozen.

typhoon — another name for a hurricane.

ultraviolet light — the range of wavelengths just beyond violet in the visible spectrum. Invisible to humans, yet capable of causing skin cancer.

updraft — an upward current of air.

warm front — a boundary of warm air which is pushing out cold air in the atmosphere.

water vapor — invisible water distributed throughout the atmosphere.

weather balloons — balloons used to carry weather instruments into the atmosphere to gather data.

weather vane — an instrument used to indicate wind direction.

wind chill factor — the temperature of windless air that would have the same cooling effect on exposed skin as a combination of wind speed and air temperature.

Section Answer Keys

Introduction, pages 4 - 5

1. See glossary.
2. Accept reasonable answers. Examples: daily activities, how we dress, our moods, work to be done, travel, play.
3. Wind is invisible because we cannot see it. We can feel it and see the effects of it around us.
4. Accept reasonable answers. Examples: We cannot see the love of God yet it is all around us. We can feel it in our hearts.
5. Seasons have come and gone since at least the time of Noah and the great flood.
6. Accept reasonable answers. Examples: Perhaps beautiful with year-round growing seasons.

God Created, pages 6 - 7

1. See glossary.
2. The moon causes tides in the ocean.
3. The oceans would become very polluted.
4. The sun is 400 times the size of the moon and its distance is 400 times the distance of the moon from the earth.
5. If the earth were to spin slower, the light side of the earth would be too hot and the dark side would be too cold. If it were to spin faster there would be fierce winds on the face of the earth.
6. A smaller tilt would result in the higher latitudes being too cold which would bring about an ice age. A greater tilt would result in unstable climates.
7. Oxygen 21% Nitrogen 78%
Argon 0.9% Water vapor and carbon dioxide 0.15%

8. The sun emits dangerous ultraviolet rays that can cause skin cancer.
9. 20 million
10. Most burn up before they hit the ground.

What Causes Weather, pages 8 - 9

1. See glossary
2. Wind direction, wind speed, visibility, water vapor, air pressure, cloud condition, air quality.
3. Rain, freezing rain, snow, hail, drizzle.
4. It is absorbed and reflected.
5. Invisible rays that cool the land at night.
6. If days are long and nights short during summer, more heat is gained by sunshine than lost by infrared radiation. It works the opposite in the winter.
7. Clouds and precipitation.

World Climate Zones pages 10 - 11

1. See glossary.
2. Answers will vary. Accept reasonable replies.
3. Tropical rain forests are found near the equator where it is both very warm and wet.
4. Thirty.
5. The closer to the ocean, the wetter the climate.
6. Mountains are cooler and wetter.

Weather Facts, pages 12 - 13

1. Tornado.
2. Snow reflects 90 percent of light energy back into the atmosphere.

3. Missouri and Hawaii.
4. The center of a tornado.
5. The Antarctic ice sheet normally only receives an inch of precipitation per year.
6. Accept reasonable answers.

How to Read a Weather Map, pages 14 - 15

1. See glossary.
2. The two types of weather observations are surface observations and upper air observations.
3. The measurements are taken hourly for the surface and twice a day for the upper.
4. Computers draw weather maps and solve equations that tell estimated position of the jet stream, the fronts, and pressure centers in the future.
5. Meteorologists do not know enough about the atmosphere nor do they have enough observations. They need bigger and faster computers.
6. High pressure areas are generally areas of good weather.
7. Accept reasonable answers.

Jet Stream, pages 16 - 17

1. The jet stream is a ribbon of high speed wind in the upper atmosphere.
2. A jet stream is caused by the differences in temperature between the tropical and polar latitudes.
3. The speed of the jet stream is 90 mph during winter and 35 mph during the summer.
4. The jet stream can cause storms (low pressure areas) and cold and warm fronts and steers storms.
5. Storms move generally from west to east.
6. The wind speed varies with areas.

7. Stormy weather can usually be found associated with certain portions of the maximum wind.
8. Fourteen days.

El Niño, pages 18 - 19

1. See glossary.
2. Poor fishing, heavy rains, flooding, thunderstorms, and mud slides.
3. Research scientists are trying to find out what causes an El Niño, how far the influences may extend, and what effect the two El Niños have on global weather.
4. The warm water is poor in nutrients so there are few plankton and therefore few fish.

Water in the Atmosphere, pages 20 - 21

1. See glossary.
2. It evaporates from the ocean.
3. Rainwater.
4. The water cycles from the ocean to the land to the ocean again.
5. See semi-arid and arid climates.
6. Plankton is the bottom of the ocean food chain. Sea life depends on it for survival.

Clouds, pages 22 - 25

1. See glossary.
2. Clouds form when the atmosphere can no longer hold all of the invisible water vapor.
3. Warm air.
4. They are all formed by moist air cooling enough to form clouds.

5. Cumulus, cirrus, and stratus.
6. Usually on a bright, sunny day.
7. Cirrus.
8. Stratus.
9. Height.
10. Cumulonimbus and nimbostratus.

Warm Fronts and Cold Fronts, pages 26 - 29

1. Warm air pushes the cold air back and warmer air rises above it.
2. Most clouds and precipitation are formed in areas of rising air in the atmosphere.
3. Gravity.
4. We can tell when a warm front is approaching by the type of clouds observed.
5. The clouds are low and precipitation falls.
6. North or west.
7. Cold.
8. Thunderstorms.
9. Accept reasonable answers.

Fog, pages 30 - 31

1. Evaporation, advection, radiation, upslope.
2. Point of saturation.
3. Accept reasonable answers.
4. Fog is a cloud that forms on the ground.
5. Evaporation and advection.
6. Radiation, upslope, and advection.

Thunderstorms, pages 32 - 35

1. See glossary.
2. Tropics.
3. Cumulus.
4. Because updrafts that cause thunderstorms occur more often when the ground is warm than cool.
5. Three conditions: (1) A large difference in temperature between the ground and upper troposphere, (2) plenty of moisture in the lower atmosphere, and (3) a trigger — a process to start the thunderstorm.
6. Because the stratosphere is warmer than the air immediately below it.
7. Thunderstorms provide summer water, cool the earth, and clean the air. They also balance the earth's electricity and provide fertilizer.
8. Rainbows are sometimes seen with thunderstorms.

Lightning, pages 36 - 37

1. See glossary.
2. Both lightning and static electricity involve electrons that travel from a negative to a positive area creating energy.
3. Thunder is created when a lightning bolt splits the air. The temperature causes the air to expand. This expansion causes sound that we hear.
4. A sharp crack.
5. The speed of sound, 750 mph.
6. Lightning travels at the speed of light which is a million times faster.
7. Negative.
8. Positive.
9. Small clouds can generate electricity. Electricity can form

without ice crystals. There are cases of positive charges, and scientists can't explain it.

10. Accept reasonable answers, such as fuel for consumption, heating, or an alternative to fossil fuel.

Dangerous Thunderstorms, pages 38 - 39

1. See glossary.
2. Ten percent.
3. He has given us the knowledge and ability to predict dangerous weather patterns so we can protect ourselves.
4. The combination of warm earth and moist air creates thunderstorms. Severe thunderstorms require this condition along with a strong updraft and a strong downdraft.
5. The two features are (1) moist air from the Gulf of Mexico and (2) the warm earth of the plains.
6. These regions are the southern and central midwest.
7. This is true because the Gulf of Mexico's moisture moves east and the extra-moist air blows across Florida, and Florida stays warm most of the year.
8. California, Oregon, and Washington.
9. (1) Slow moving thunderstorms drop an unusual amount of rain on a small area that cannot be absorbed by the ground. (2) Two or more gully-washing thunderstorms hit the same spot, one after another. (3) It can also happen when it rains heavily on rapidly melting snow.
10. Accept reasonable answers. Possibly by paying more attention to weather forecasts or by not taking chances unnecessarily while driving in flash flood conditions, such as not driving across a road when water is flowing over it.

Hail and Wind Damage, pages 40 - 41

1. Cumulonimbus.

2. The drop is collecting other supercooled drops, all the while growing bigger.
3. The speed of the downdraft and the size of the hail determines the speed of the hail.
4. The cloudy ice is caused mainly by rapid freezing, trapping many air bubbles.
5. False. It comes in strange shapes, sometimes with ragged edges.
6. Answers should include crop losses, property damage, injury, and possible death.
7. Accept reasonable answers.
8. Losses include damage to mobile homes, roofs, and airplane crashes.

Tornadoes, pages 42 - 47

1. See glossary.
2. Tornadoes are small, while hurricanes cover hundreds of miles.
3. For tornadoes, the updraft must be halted for a while, by a layer of warm air just above the ground.
4. Storm chasers are professional people who try to get as close to a tornado as possible so they can film and take pictures of it.
5. Tornadoes form under the thunderstorm where there is little rain or lightning, in the southwest part of the storm cloud.
6. The most dangerous tornadoes are thick, black clouds that are 2,000 feet across. They spin at 250 - 300 mph. They move about 50 mph across the land. They can travel for 100 miles and have a damage path of over 1 mile wide.
7. Tornadoes can change shape as they move. They can also go back up into the cloud and to the ground again.

8. A tornado watch means conditions are right for a tornado to form.
9. A tornado warning means one has been spotted or seen on Doppler radar.
10. We are able to see tornadoes because of condensed water vapor, dust, and debris.
11. The large number of waterspouts occur in the Florida Keys.

Hurricanes, pages 48 - 53

1. See glossary.
2. A monsoon is six months of rain in the tropics.
3. Tropical depression, tropical storm, hurricane.
4. Hurricane.
5. They both chase after dangerous storms, hoping to gather information.
6. They have learned that most hurricanes form after the ocean water warms up past 80 degrees Fahrenheit.
7. The eyewall directly surrounds the center, or eye, of the storm.
8. The falling barometric pressure in the middle of the mass of the hurricane causes the winds to increase.
9. Typhoons and willy-willies.
10. Accept reasonable answers.
11. The rising ocean water on land causes 90 percent of the deaths.
12. Extremely low air pressure.
13. The country is very flat, and there was no way to warn them because they are so poor. and do not have modern communication systems.
14. Most were killed by touching downed electrical wires.

15. It is a governmental agency that issues watches and warnings to the people of advancing hurricanes. They use the latest technology to do so.

16. It has been able to give 24-hour warnings of approaching storms. The people are able to leave their homes to go to safer areas until after the storm has passed.

17. When a hurricane draws near, Doppler weather radar tracks the storm's details.

Winter Storms, pages 54 - 59

1. See glossary.

2. The earth has seasons due to the tilt of the earth.

3. Less sunshine during short days and long nights cause cooler temperatures.

4. Long days give the sun more time to warm the ground and atmosphere.

5. No seasons or very small changes in the temperature.

6. Warm winds from the ocean blow onto the land keeping it too warm for snow.

7. Plants and animals would not be protected. We would have no storehouse of water in the mountains.

8. It adds to the water table and the above-ground water.

9. Flooding and mud slides.

10. Large drifts of snow, winds over 35 mph, and poor visibility.

11. A storm which moves northeast along the east coast.

12. Rain falls into a lower atmosphere that is below freezing.

13. Accept reasonable answers. Examples: auto accidents, property damage, personal injury or death due to the freezing temperatures.

Wild Weather, pages 60 - 63

1. See glossary.
2. It occurs during the last phases of a violent thunderstorm.
3. Trade winds move up the mountains on Kauai. They pick up the water vapor where it condenses above the mountains as clouds. The clouds develop into thunderstorms.
4. Washington.
5. A relatively warm and dry wind that is descending down a mountain front.
6. Cumulus.
7. Chinook.
8. They can fan grass fires out of control. They can blow vehicles off the road or damage homes.
9. Very heavy snow squalls can develop.
10. Buffalo is located on the east end of Lake Erie, a prime location for lake effect snowstorms.
12. Accept reasonable answers.

Climate in the Past; Noah's Flood — Key to the Past, pages 64 - 67

1. Warm climate fossils were found at high latitudes. Fossilized swamp cypress trees were found the Arctic Islands, etc. Old river channels have been found in the Sahara. Woolly mammals were found in Siberia.
2. It is impossible to exactly recreate the past or know about temperatures.
3. A model is a representation of what a scientist thinks happened in the past. Experiments can then be conducted and the past can be studied.
4. It states that God was the creator of everything. Everything was to reproduce after its own kind. It also explains that most of the sedimentary rocks were laid down in Noah's flood.

5. Accept reasonable answers.
6. The flood of Noah was thousands of years ago, not the millions needed by the evolutionists to explain the sedimentary rock formations.
7. There could have been a warm climate in polar regions before the flood due to a vapor canopy.

The Ice Age, pages 68 - 69

1. See glossary.
2. The ground would have been cooler and summers much colder. The oceans would have been very warm. Snow fell in the northern latitudes year-round.
3. Hot water would have been added from the fountains of the deep. Volcanoes, lava flows, and earth movements would have added more heat.
4. The falling snow in the northern latitudes built up and compacted into ice sheets.
5. About 700 years.
6. A storm track might have reached into the Sahara bringing a change in the climate.
7. A warm Arctic and north Pacific Ocean kept Siberia comfortable during the winter. There would have been no permafrost to cause massive summer bogs. More precipitation would have resulted in more vegetation to eat.

Future Climate, pages 70 - 73

1. See glossary.
2. God has promised there will never be another worldwide flood. This flood would be necessary to create another ice age.
3. Carbon dioxide helps keep the earth's atmosphere warm.
4. Burned fossil fuels and the destruction of rain forests.

5. Accept reasonable answers. Examples: Not enough information is known or studies could be inaccurate on the facts.
6. It protects the earth from harmful ultraviolet rays.
7. Chemical compounds and chemicals.
8. Their theory cannot evolve life with oxygen or without it.

Observing the Weather, pages 74 - 77

1. Once per hour, and more under bad weather conditions.
2. Cloud formation.
3. Stormy weather.
4. Accept reasonable answers. Because meteorologists need to know the state of the atmosphere at one time for the initial conditions on their computer runs.
5. Snow is measured with a yardstick.

God, Creation, and You, pages 78 - 79

1. We are to take care of the earth and be concerned about environmental issues such as pollution, ozone, etc.
2. Very poor countries that are forced to live that way due to economic factors have severe environmental problems.
3. They believe all things in nature are god.
4. Sin.

Unit Quiz Answer Key

Unit One Quiz, pages 4 - 20

1. Seasons have been here since the time of the great flood. Previous to the flood there were no seasons as we know them.

2. The pull of the moon on the oceans causes tides to form.
3. A smaller tilt on the higher latitudes would cause the climate to be too cold. This would bring about an ice age. A greater tilt would result in the climates being unstable.
4. The seven components of weather are: wind direction, wind speed, visibility, water vapor, air pressure, cloud condition, and air quality.
5. The five forms of precipitation are: rain, freezing rain, snow, hail, and drizzle.
6. The closer the distance to the ocean, the wetter the climate.
7. A large portion of the Antarctic ice sheet normally receives an inch of precipitation per year.
8. High pressure areas are generally areas of good weather.
9. The jet stream is a ribbon of high speed wind in the upper atmosphere.
10. El Niño brings poor fishing, heavy rains, flooding, thunderstorms, and mud slides.

Unit Two Quiz, pages 20 - 42

1. The water drop cycles from the ocean to the land to the ocean again.
2. The three basic cloud types are cumulus, cirrus, and stratus.
3. Most clouds and precipitation are formed in areas of rising air in the atmosphere.
4. Fog is a cloud that forms on the ground.
5. A thunderstorm develops from a cumulus cloud.
6. Thunder is created when a lightning bolt splits the air. The temperature causes the air to expand at a rapid rate causing the sound we hear.
7. The three conditions needed are warm earth, moist air, and a trigger.

8. As the drop of water travels upward, it collides with other super-cooled drops, all the while growing bigger.
9. Both lightning and static electricity involve electrons that travel from a negative to a positive area, creating energy.
10. Flash floods occur from:
 1. Slow moving thunderstorms drop an unusual amount of rain on a small area that cannot be absorbed into the ground.
 2. Two or more gully-washing thunderstorms hit the same spot, one after another.
 3. It can also happen when it rains heavily on rapidly melting snow.

Unit Three Quiz, pages 42 - 59

1. The difference between tornadoes and hurricanes is that tornadoes are small, while hurricanes cover hundreds of miles.
2. A tornado watch means conditions are right for a tornado to form.
3. A tornado warning means one has been spotted or detected from Doppler radar.
4. The earth has seasons due to the tilt of the earth.
5. Less sunshine during short days and long nights cause cooler temperatures.
6. Long days during the summer give the sun more time to warm the ground and atmosphere.
7. The weather conditions during a blizzard are large drifts of snow, winds over 35 mph, and poor visibility.
8. A monsoon is six months of rain in the tropics.
9. Scientists have learned that most hurricanes form after the ocean water warms up past 80 degrees Fahrenheit.
10. Doppler weather radar can track the details of a hurricane and thus provide warning to the population of an area threatened.

Unit Four Quiz, pages 60 - 78

1. A foehn wind is a relatively warm and dry wind that is descending a mountain front.
2. The creation-Genesis model states that God is the creator of everything. Everything was to reproduce after its own kind. It also explains that most of the sedimentary rocks were laid in the flood of Noah's time.
3. The flood of Noah was thousands of years ago, not the required millions needed for the evolutionist's model to work.
4. The ground would have been cooler and summers much colder. The oceans would have been warmer. Snow would have fallen in the northern latitudes year-round.
5. The falling snow in the northern latitudes would have built up and compacted into giant ice sheets.
6. Creationists know that God has promised to never destroy the earth again with water. This flood would be necessary to create another ice age.
7. The ozone layer protects the earth from harmful ultraviolet rays.
8. The problem with the theory that life evolved from the sea is that (according to their model) life could not form with oxygen or without it. Therefore, the sea would have been an impossible place for this to take place.
9. A low reading on the barometer means stormy weather is approaching.
10. Christians are to take care of the earth and everything on it, including the atmosphere.

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