

Grade 3 Science

Unit 4: Weather and Climate

14 lessons and a unit quiz. Use this pack with the **Weather and Climate Student Reader** (print it, or download it once from the course) to teach the whole unit without the internet.

What is in this pack

- A lesson plan for each chapter: the Big Question, words to know, which pages to read, questions to talk over and the activity pages.
- The unit quiz, ready to print.
- Answers for the teacher at the back: every discussion question and the quiz key.

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Lesson schedule

Two or three lessons a week, about 30 minutes each. Tick each one off as you go.

	Lesson	Reader pages	Activity pages
☐	Lesson 1: The Atmosphere and Air Pressure	PDF pages 7-10	AP 1.1
☐	Lesson 2: Water in the Atmosphere	PDF pages 11-14	AP 2.1
☐	Lesson 3: Investigating Air Pressure and Precipitation	—	AP 3.1
☐	Lesson 4: Investigating Wind	—	AP 4.1
☐	Lesson 5: Wind	PDF pages 15-18	AP 5.1
☐	Lesson 6: Working with Wind Data	—	AP 6.1, AP 6.2
☐	Lesson 7: Using Weather Data to Predict Weather	PDF pages 19-24	AP 7.1, AP 7.2
☐	Lesson 8: Patterns of Weather: Seasons and Climate	PDF pages 25-30	AP 8.1, AP 8.1
☐	Lesson 9: Working with Weather Data	—	AP 9.1, AP 9.2, AP 9.3, AP 9.4, AP 9.5, AP 9.6
☐	Lesson 10: Working with Climate Data	—	AP 10.1, AP 10.2, AP 10.3, AP 10.4, AP 10.5, AP 10.6, AP 10.7, AP 10.8, AP 10.9, AP 10.10, AP 10.11, AP 10.12, AP 10.13, AP 10.14
☐	Lesson 11: Extreme Weather	PDF pages 31-36	AP 11.1
☐	Lesson 12: Engineering for Extreme Weather	PDF pages 37-42	AP 12.1
☐	Lesson 13: Evaluating Extreme Weather Solutions	—	AP 13.1
☐	Lesson 14: Weather-Related Technology	PDF pages 43-48	—
☐	Unit review and assessment	—	AP UR.1, AP UR.2, AP UR.3
☐	Words quiz	—	—

Page numbers are the PDF page numbers of the Student Reader file, so they match what your PDF reader shows.

Lesson 1: The Atmosphere and Air Pressure

THE BIG QUESTION

What is the atmosphere, and what is weather?

Words to know

- **atmosphere** — the layer of air that surrounds Earth
- **weather** — what the air outside is like at any given time and place
- **climate** — the weather patterns in a place over a long period of time

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 24–29: the steps, materials and timing for this lesson.

Read

Read Student Reader, Chapter 1: “The Atmosphere and Air Pressure”: PDF pages 7–10. Look at the pictures and maps together.

Talk it over

1. What do you think will happen when I turn this container of water upside down?
2. What is the weather like right now?
3. How quickly can weather change?
4. What are some examples of different kinds of weather that occur in the atmosphere?
5. What types of matter does the atmosphere contain?
6. What is the force that pulls all matter toward the center of Earth?
7. How do we know if something is hot or cool?
8. What tool is used to measure temperature?
9. What do the books represent in this model?
10. What does the clay represent?
11. How did the pressure change the closer to the surface you placed the clay?
12. What was the weather yesterday?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What is the atmosphere, and what is weather?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 1.1: Patterns in the Atmosphere — Teacher Guide PDF page 112

Lesson 2: Water in the Atmosphere

THE BIG QUESTION

How does water move into and out of air?

Words to know

- **precipitation** — water that falls from the sky in the form of rain, snow, sleet, or hail
 - **water vapor** — the gas form of water
 - **evaporate** — to change from liquid to gas
 - **humidity** — a measure of the amount of water vapor in the air
 - **condense** — to change from gas to liquid
 - **condensation** — the process of changing from gas to liquid
 - **evaporation** — the process of changing from liquid to gas
- Student Reader page numbers are not included for these terms. These are common vocabulary terms related to the topic that are often used within the Student Reader. Vocabulary words are not included for these terms.
- **vapor** — gas

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 30–35: the steps, materials and timing for this lesson.

Read

Read Student Reader, Chapter 2: “Water in the Atmosphere”: PDF pages 11–14. Look at the pictures and maps together.

Talk it over

1. Which types of weather need water to happen?
2. Where does the water that makes these types of weather come from?
3. Have you ever forgotten to water a plant at your house? What happened?
4. Explain that most plants get water by absorbing it out of the soil with their roots. How does water get in the soil?
5. What happens to water that does not soak down into the soil?
6. What makes the types of precipitation that fall so different?
7. How can the amount of precipitation that falls to the ground be measured?
8. What is the water that is on the outside of the pot?
9. What is the water that is dripping off the pot?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How does water move into and out of air?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 2.1: How Water Moves — Teacher Guide PDF page 113

Lesson 3: Investigating Air Pressure and Precipitation

THE BIG QUESTION

How does temperature affect air pressure and precipitation?

Words to know

- **weather** — what the air outside is like at any given time and place
 - **climate** — the weather patterns in a place over a long period of time
 - **condensation** — the process of changing from gas to liquid
 - **evaporation** — the process of changing from liquid to gas
- Student Reader page numbers are next to the vocabulary terms related to the Big Question that are often used within the Student Reader. Vocabulary words are not.

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 36–39: the steps, materials and timing for this lesson.

Talk it over

1. What happened inside the beaker to cause the candle to go out?
2. What happened to the temperature inside the beaker?
3. What else do you know that forms by condensation?
4. What happens to the water after the condensation becomes too heavy to remain in the atmosphere?
5. How does temperature affect precipitation?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How does temperature affect air pressure and precipitation?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 3.1: Elements of Weather Observations — Teacher Guide PDF page 114

Lesson 4: Investigating Wind

THE BIG QUESTION

How can I observe and describe moving air?

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 41–45: the steps, materials and timing for this lesson.

Talk it over

1. What caused the pinwheel to turn?
2. Why did the air rise?
3. Can you see wind?
4. What evidence can help you know that wind is there?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How can I observe and describe moving air?

Activity pages

- Activity Page 4.1: Measuring Wind — Teacher Guide PDF pages 115–116

Lesson 5: Wind

THE BIG QUESTION

What is wind?

Words to know

- **weather** — what the air outside is like at any given time and place
- **wind** — the movement of air
- **wind speed** — a measure of how fast wind blows
- **wind direction** — the direction from which air moves when wind blows
- **climate** — the weather patterns in a place over a long period of time

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 46–50: the steps, materials and timing for this lesson.

Read

Read Student Reader, Chapter 3: “Wind”: PDF pages 15–18. Look at the pictures and maps together.

Talk it over

1. What does wind look like?
2. Is it windy outside today? How can you tell?
3. Can you smell wind?
4. What causes the wind to make sounds?
5. How does wind cause changes?
6. How can wind be measured?
7. What tools can be used to measure wind?
8. Why are prevailing winds easy to predict?
9. What are some places where a warm air mass such as this may form?
10. Why did you need to feel the air quickly?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What is wind?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 5.1: Air Masses and Wind — Teacher Guide PDF page 117

Lesson 6: Working with Wind Data

THE BIG QUESTION

How can I use data to discover wind patterns?

Words to know

- **pattern** — a repeating sample of data, events, or observable characteristics

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 51–54: the steps, materials and timing for this lesson.

Talk it over

1. What causes wind?
2. What is the difference between wind speed and wind direction?
3. Do you think that higher wind speed is associated with a certain type of weather?
4. Why do you think it is important to find patterns in the data?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How can I use data to discover wind patterns?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 6.1: Looking for Patterns in Wind Data — Teacher Guide PDF page 118
- Activity Page 6.2: Comparing Wind Speed — Teacher Guide PDF page 119

Lesson 7: Using Weather Data to Predict Weather

THE BIG QUESTION

What do meteorologists do?

Words to know

- **prediction** — a declaration of an expected outcome

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 57–62: the steps, materials and timing for this lesson.

Read

Read Student Reader, Chapter 4: “Using Weather Data to Predict Weather”: PDF pages 19–24. Look at the pictures and maps together.

Talk it over

1. Based on what you have learned so far in this unit, what kinds of data do you think meteorologists collect?
2. How does using data help meteorologists make reasonable predictions?
3. How did the temperature change from noon to 5 p.m. each day?
4. What does a meteorologist explain with a map?
5. What might a meteorologist say about the weather on either side of the blue-colored cold front?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What do meteorologists do?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 7.1: Finding Temperature Change Patterns — Teacher Guide PDF pages 120–121
- Activity Page 7.2: Meteorologist Job Description — Teacher Guide PDF page 122

Lesson 8: Patterns of Weather: Seasons and Climate

THE BIG QUESTION

What is the difference between weather and climate?

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 63–70: the steps, materials and timing for this lesson.

Read

Read Student Reader, Chapter 5: “Patterns of Weather: Seasons and Climate”: PDF pages 25–30. Look at the pictures and maps together.

Talk it over

1. Which season is best to visit Alaska for most visitors?
2. Which months are the warmest in Alaska?
3. Which part of the year has the most hours of daylight?
4. In which months can you see bears fishing for salmon in the Alaska rivers?
5. Which three months have the lowest low temperatures?
6. What season of the year is that?
7. Which three months have the highest high temperatures?
8. Which three months have the most precipitation in Omaha?
9. Which seasons of the year are those months in?
10. Which three months have the least precipitation?
11. At which point in Earth's trip around the sun would a person living where the sticker is feel warm weather?
12. Which season do you think that is?
13. At which point in Earth's trip around the sun would a person living where the sticker is feel cold weather?
14. How do the number of hours of sunlight in a day compare by season?
15. How does the pattern of hours of sunlight relate to the pattern of high temperatures?
16. What is the weather today where we live?
17. What will the weather here be on this date next year?
18. What is the wettest season in San Jose? How do you know?
19. What is the driest season in San Jose? How do you know?
20. What is the coldest season in Fairbanks? How do you know?
21. What is the warmest season in Fairbanks? How do you know?

22. What is the best time of year to visit San Jose if you like warm, dry weather? How do you know?
23. How does the temperature change each season where we live?
24. How does the amount of precipitation change each season where we live?
25. How does our climate compare to that of San Jose, Costa Rica?
26. How does our climate compare to that of Fairbanks, Alaska?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What is the difference between weather and climate?

Activity pages

- Activity Page 8.1: Using Temperature Patterns to Describe Climate — Teacher Guide PDF page 123
- Activity Page 8.1: Using Temperature Patterns to Describe Climate — Teacher Guide PDF page 126

Lesson 9: Working with Weather Data

THE BIG QUESTION

How can I use weather data to reveal patterns?

Words to know

- **weather** — what the air outside is like at any given time and place
- **precipitation** — water that falls from the sky in the form of rain, snow, sleet, or hail
- **temperature** — the measure of thermal energy in a quantity of matter

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 71–76: the steps, materials and timing for this lesson.

Check for understanding

- Answer the Big Question in a sentence or two: How can I use weather data to reveal patterns?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 9.1: Deciding When to Hold a Carnival — Teacher Guide PDF pages 127–128
- Activity Page 9.2: Draw a Graph to Show Your Reasoning — Teacher Guide PDF page 129
- Activity Page 9.3: Write a Letter to Your Principal — Teacher Guide PDF page 130
- Activity Page 9.4: Help Another School Choose When to Hold a Carnival — Teacher Guide PDF page 131
- Activity Page 9.5: Write a Letter to Your Pen Pal — Teacher Guide PDF page 132
- Activity Page 9.6: Self-Evaluation Checklist — Teacher Guide PDF page 133

Lesson 10: Working with Climate Data

THE BIG QUESTION

How can I use climate data to reveal patterns?

Words to know

- **precipitation** — water that falls from the sky in the form of rain, snow, sleet, or hail
- **pattern** — a repeating sample of data, events, or observable characteristics
- **temperature** — the measure of thermal energy in a quantity of matter

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 77–83: the steps, materials and timing for this lesson.

Talk it over

1. Where can you find the climate data for each park?
2. How can you use it to predict which month is best for visiting each park?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How can I use climate data to reveal patterns?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 10.1: Join the Famous Ten World Parks Club! — Teacher Guide PDF page 134
- Activity Page 10.2: Find the Climate of a Park — Teacher Guide PDF page 135
- Activity Page 10.3: Ten World Parks Club Passport Stamp Sheet — Teacher Guide PDF page 136
- Activity Page 10.4: Self-Evaluation Checklist — Teacher Guide PDF page 137
- Activity Page 10.5 — Teacher Guide PDF page 138
- Activity Page 10.6 — Teacher Guide PDF page 139
- Activity Page 10.7 — Teacher Guide PDF page 140
- Activity Page 10.8 — Teacher Guide PDF page 141
- Activity Page 10.9 — Teacher Guide PDF page 142
- Activity Page 10.10 — Teacher Guide PDF page 143
- Activity Page 10.11 — Teacher Guide PDF page 144
- Activity Page 10.12 — Teacher Guide PDF page 145
- Activity Page 10.13 — Teacher Guide PDF page 146

- Activity Page 10.14 — Teacher Guide PDF page 147

Lesson 11: Extreme Weather

THE BIG QUESTION

What are extreme weather hazards?

Words to know

- **weather** — what the air outside is like at any given time and place
- **climate** — the weather patterns in a place over a long period of time
- **hazard** — a dangerous condition that can cause damage

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 86–91: the steps, materials and timing for this lesson.

Read

Read Student Reader, Chapter 6: “Extreme Weather”: PDF pages 31–36. Look at the pictures and maps together.

Talk it over

1. What is weather?
2. What kinds of things does weather include?
3. Does weather always stay the same, or does it change from one day to the next?
4. Can you study weather data to look for patterns in weather over time?
5. What are some hazards caused by tornadoes?
6. Why can hail be dangerous?
7. Where do hurricanes form?
8. What parts of land do hurricanes threaten the most?
9. What kinds of destructive things did you see in the video that were caused by the hurricane?
10. What did you notice about the tornado?
11. Is lightning dangerous?
12. Why is lightning dangerous?
13. What should you do if there is lightning?
14. How are thunderstorms, tornadoes, and hurricanes similar?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: What are extreme weather hazards?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 11.1: Extreme Weather: Cause and Effect — Teacher Guide PDF page 148

Lesson 12: Engineering for Extreme Weather

THE BIG QUESTION

How do engineers design solutions for extreme weather hazards?

Words to know

- **weather** — what the air outside is like at any given time and place
- **climate** — the weather patterns in a place over a long period of time
- **engineering design process** — the steps that engineers take to solve a problem
- **evaluate** — to examine the details of something and determine the value or effectiveness of it
- **problem** — a condition that falls short of satisfying a want or a need
- **solution** — a process, action, or device that solves or remedies a problem

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 92–97: the steps, materials and timing for this lesson.

Read

Read Student Reader, Chapter 7: “Engineering for Extreme Weather”: PDF pages 37–42. Look at the pictures and maps together.

Talk it over

1. What are some types of extreme weather that involve a lot of rain?
2. What are some types of extreme weather that involve a lot of wind?
3. What are some types of extreme weather that involve periods of dryness?
4. What are some types of extreme weather that involve snow?
5. What is the problem caused by hurricanes?
6. What are engineers trying to solve?
7. What are some solutions that engineers can try?
8. What problem is solved by lightning rods?
9. How does a lightning rod work?
10. How does a lightning rod keep people safe?
11. What problem does a sandbag solve?
12. What is a seawall?
13. What does a levee prevent?
14. How can a snow fence help during strong snowstorms?
15. What are the criteria and constraints of using sandbags?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How do engineers design solutions for extreme weather hazards?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 12.1: Check — Teacher Guide PDF page 149

Lesson 13: Evaluating Extreme Weather Solutions

THE BIG QUESTION

How can we evaluate design solutions to weather hazard problems?

Words to know

- **claim** — an assertion (or v. to assert)
- **evaluation** — the process of evaluating or the outcome of the process
- **evidence** — a detail that provides a supporting clue or furnishes proof of a claim

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 98–103: the steps, materials and timing for this lesson.

Talk it over

1. What makes something a hazard?
2. What are some examples of weather hazards?
3. What is the difference between criteria and constraints?
4. What is the difference between a problem and a solution?
5. How can we evaluate whether a solution works?
6. Go over the big question again: How can we evaluate design solutions to weather hazard problems? Ask: Why do you think that it is important to evaluate design solutions?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: How can we evaluate design solutions to weather hazard problems?
- Use one of today's words in a sentence of your own.

Activity pages

- Activity Page 13.1: Evaluations and Claims — Teacher Guide PDF pages 150–151

Lesson 14: Weather-Related Technology

THE BIG QUESTION

Who are some inventors of weather-related technology?

Words to know

- **atmosphere** — the layer of air that surrounds Earth
- **weather** — what the air outside is like at any given time and place
- **air pressure** — the weight of air as it presses on objects below or within it
- **precipitation** — water that falls from the sky in the form of rain, snow, sleet, or hail
- **water vapor** — the gas form of water
- **evaporate** — to change from liquid to gas
- **humidity** — a measure of the amount of water vapor in the air
- **condense** — to change from gas to liquid
- **wind** — the movement of air
- **air mass** — a large body of air in the atmosphere
- **wind speed** — a measure of how fast wind blows
- **prevailing winds** — regular patterns of winds that blow from one direction
- **wind direction** — the direction from which air moves when wind blows
- **data** — information that is observed or measured and recorded
- **meteorologist** — a scientist who studies weather conditions and patterns
- **front** — the place where two air masses meet
- **climate** — the weather patterns in a place over a long period of time
- **hazard** — a dangerous condition that can cause damage
- **drought** — a long period of weather with less precipitation than normal
- **engineering design process** — the steps that engineers take to solve a problem
- **constraint** — the limitation of a design
- **criteria** — the requirements of a design for it to be a success

Teacher's lesson plan

Follow the Teacher Guide, PDF pages 104–109: the steps, materials and timing for this lesson.

Read

Read Student Reader, Chapter 8: “Weather-Related Technology”: PDF pages 43–48. Look at the pictures and maps together.

Talk it over

1. What do you think life would be like if we did not have the technology to study weather data?
2. Is it helpful for us to have technology that lets us study the weather and collect weather data?
3. How can studying weather data keep people safe?
4. Which is the worst category of tornado?
5. What does the abbreviation SM mean on the scale?
6. Online Resources If the degree of damage for a softwood tree is 4, what will you expect to see?

Answers are at the back of this pack.

Check for understanding

- Answer the Big Question in a sentence or two: Who are some inventors of weather-related technology?
- Use one of today's words in a sentence of your own.

UNIT REVIEW

Unit review and assessment

- Unit Assessment (print for your student): Teacher Guide PDF pages 156–159
- How to mark it (for the teacher): Teacher Guide PDF pages 164–165
- Activity page answer key (for the teacher): Teacher Guide PDF pages 160–163
- Activity Page UR.1: Design a Weather-Related Technology — Teacher Guide PDF page 152
- Activity Page UR.2: Vocabulary Crossword Puzzle — Teacher Guide PDF page 153
- Activity Page UR.3: Vocabulary Review — Teacher Guide PDF page 155

WORDS QUIZ

Weather and Climate

Name: _____ Date: _____

Circle the letter of the best answer.

1. Which word means “water that falls from the sky in the form of rain, snow, sleet, or hail”?

- a) meteorologist
- b) wind speed
- c) precipitation
- d) wind

2. Which word means “the gas form of water”?

- a) drought
- b) air mass
- c) air pressure
- d) water vapor

3. Which word means “information that is observed or measured and recorded”?

- a) data
- b) prevailing winds
- c) front
- d) wind direction

4. Which word means “the steps that engineers take to solve a problem”?

- a) hazard
- b) engineering design process
- c) atmosphere
- d) wind speed

5. Which word means “the requirements of a design for it to be a success”?

- a) humidity
- b) wind speed
- c) criteria
- d) atmosphere

6. Which word means “the movement of air”?

- a) wind
- b) engineering design process
- c) weather
- d) humidity

7. Which word means “the limitation of a design”?

- a) constraint
- b) evaporate
- c) wind
- d) air pressure

- 8.** Which word means “to change from liquid to gas”?
- a) hazard
 - b) evaporate
 - c) front
 - d) drought
- 9.** Which word means “the layer of air that surrounds Earth”?
- a) wind
 - b) weather
 - c) atmosphere
 - d) meteorologist
- 10.** Which word means “a scientist who studies weather conditions and patterns”?
- a) prevailing winds
 - b) meteorologist
 - c) precipitation
 - d) atmosphere
- 11.** Which word means “a measure of the amount of water vapor in the air”?
- a) humidity
 - b) climate
 - c) criteria
 - d) evaporate
- 12.** Which word means “the weight of air as it presses on objects below or within it”?
- a) engineering design process
 - b) constraint
 - c) air pressure
 - d) wind direction

Answers

Lesson 1: The Atmosphere and Air Pressure

- 1. What do you think will happen when I turn this container of water upside down?**
Ideas may vary.
- 2. What is the weather like right now?**
Accept all reasonably accurate observations.
- 3. How quickly can weather change?**
It can change by the minute or hour.
- 4. What are some examples of different kinds of weather that occur in the atmosphere?**
Answers may vary but should include recognition of different temperatures, different amounts of precipitation, and possibly severe weather events.
- 5. What types of matter does the atmosphere contain?**
Gases, such as water vapor, dust
- 6. What is the force that pulls all matter toward the center of Earth?**
Gravity
- 7. How do we know if something is hot or cool?**
We measure the temperature.
- 8. What tool is used to measure temperature?**
A thermometer
- 9. What do the books represent in this model?**
Air
- 10. What does the clay represent?**
Any matter
- 11. How did the pressure change the closer to the surface you placed the clay?**
Pressure increases as altitude decreases.
- 12. What was the weather yesterday?**
» How quickly can weather change? (It can change by the minute or hour.)

Lesson 2: Water in the Atmosphere

- 1. Which types of weather need water to happen?**
Rain, snow, hail, fog
- 2. Where does the water that makes these types of weather come from?**
Clouds in the sky
- 3. Have you ever forgotten to water a plant at your house? What happened?**
The plant began to turn brown or droop.
- 4. Explain that most plants get water by absorbing it out of the soil with their roots. How does water get in the soil?**

It soaks into it when it rains.

5. **What happens to water that does not soak down into the soil?**

It flows to rivers or oceans or evaporates back into the air.

6. **What makes the types of precipitation that fall so different?**

The temperature

7. **How can the amount of precipitation that falls to the ground be measured?**

By measuring the height with a ruler

8. **What is the water that is on the outside of the pot?**

Condensation

9. **What is the water that is dripping off the pot?**

Precipitation

Lesson 3: Investigating Air Pressure and Precipitation

1. **What happened inside the beaker to cause the candle to go out?**

The oxygen was used up.

2. **What happened to the temperature inside the beaker?**

It increased because of the fire.

3. **What else do you know that forms by condensation?**

Dew, clouds

4. **What happens to the water after the condensation becomes too heavy to remain in the atmosphere?**

It will begin to precipitate.

5. **How does temperature affect precipitation?**

Sometimes precipitation will be liquid, and sometimes it will be frozen, depending on the temperature.

Lesson 4: Investigating Wind

1. **What caused the pinwheel to turn?**

Rising air

2. **Why did the air rise?**

It was heated by the candle.

3. **Can you see wind?**

No, but you may see those things that wind causes to move.

4. **What evidence can help you know that wind is there?**

You can see evidence of it in objects that are moving or by feeling it on your skin.

Lesson 5: Wind

1. **What does wind look like?**

It doesn't look like anything, but you can see objects that are moving in the wind.

2. **Is it windy outside today? How can you tell?**

Answers will vary.

3. **Can you smell wind?**

No, but wind can carry odors.

4. **What causes the wind to make sounds?**

When it blows through the trees or along leaves or loose sand, it causes them to vibrate, and this causes a sound.

5. **How does wind cause changes?**

It can move things or wear them down [such as rocks].

6. **How can wind be measured?**

By finding how fast it moves and the direction it comes from

7. **What tools can be used to measure wind?**

Anemometer, wind vane

8. **Why are prevailing winds easy to predict?**

They always blow in certain directions.

9. **What are some places where a warm air mass such as this may form?**

Answers will vary.

10. **Why did you need to feel the air quickly?**

The warm air rises, so it will not stay over the water when the cover is removed.

Lesson 6: Working with Wind Data

1. **What causes wind?**

Air moves from high pressure to low pressure.

2. **What is the difference between wind speed and wind direction?**

Speed is how fast the wind is blowing, and direction is the place from which the wind blows.

3. **Do you think that higher wind speed is associated with a certain type of weather?**

There can be higher wind speeds when weather is stormy, but it can blow strongly on clear days as well.

4. **Why do you think it is important to find patterns in the data?**

So that predictions can be made from them

Lesson 7: Using Weather Data to Predict Weather

1. **Based on what you have learned so far in this unit, what kinds of data do you think meteorologists collect?**

Remind students of earlier lessons, when they learned about air temperature, air pressure, wind speed, and wind direction. Meteorologists can collect data about all of these weather conditions.

2. **How does using data help meteorologists make reasonable predictions?**

Guide students to express that if scientists know what happened in the past, they can use that information to suggest what is likely to happen in the future. In other words, data are used as evidence in arguments and explanations.

3. **How did the temperature change from noon to 5 p.m. each day?**
It increased.
4. **What does a meteorologist explain with a map?**
How the weather prediction relates to the highs, lows, fronts, and other symbols on the map.
5. **What might a meteorologist say about the weather on either side of the blue-colored cold front?**
That cooler weather is behind the cold front and will bring cool weather wherever the front moves

Lesson 8: Patterns of Weather: Seasons and Climate

1. **Which season is best to visit Alaska for most visitors?**
Summer
2. **Which months are the warmest in Alaska?**
June, July, and August
3. **Which part of the year has the most hours of daylight?**
June/summer
4. **In which months can you see bears fishing for salmon in the Alaska rivers?**
June, July, and August
5. **Which three months have the lowest low temperatures?**
January, February, and December
6. **What season of the year is that?**
Winter
7. **Which three months have the highest high temperatures?**
June, July, and August
8. **Which three months have the most precipitation in Omaha?**
May, June, and July
9. **Which seasons of the year are those months in?**
Spring and summer
10. **Which three months have the least precipitation?**
January, February, and December
11. **At which point in Earth's trip around the sun would a person living where the sticker is feel warm weather?**
When the axis of Earth is pointing toward the sun
12. **Which season do you think that is?**
Summer
13. **At which point in Earth's trip around the sun would a person living where the sticker is feel cold weather?**
When the axis of Earth is pointing away from the sun
14. **How do the number of hours of sunlight in a day compare by season?**
There are fewer hours of sunlight in the winter, a medium amount in the spring and

fall, and the most hours in the summer.

15. **How does the pattern of hours of sunlight relate to the pattern of high temperatures?**

Temperatures are higher when there are more hours of sunlight.

16. **What is the weather today where we live?**

Answers will vary.

17. **What will the weather here be on this date next year?**

We don't know exactly, but we can predict based on the climate for this season of the year.

18. **What is the wettest season in San Jose? How do you know?**

Fall—I compared the average precipitation for all three years.

19. **What is the driest season in San Jose? How do you know?**

Winter—I compared the average precipitation for all three years.

20. **What is the coldest season in Fairbanks? How do you know?**

Winter—I compared the average high temperatures for all three years.

21. **What is the warmest season in Fairbanks? How do you know?**

Summer—I compared the average high temperatures for all three years.

22. **What is the best time of year to visit San Jose if you like warm, dry weather? How do you know?**

The best time is winter, because the temperatures are nearly as warm as all other months and there is less than one inch of precipitation in winter.

23. **How does the temperature change each season where we live?**

Answers will vary.

24. **How does the amount of precipitation change each season where we live?**

Answers will vary.

25. **How does our climate compare to that of San Jose, Costa Rica?**

Answers will vary.

26. **How does our climate compare to that of Fairbanks, Alaska?**

Answers will vary.

Lesson 10: Working with Climate Data

1. **Where can you find the climate data for each park?**

From books, encyclopedias, websites

2. **How can you use it to predict which month is best for visiting each park?**

By using the climate data and looking for patterns

Lesson 11: Extreme Weather

1. **What is weather?**

The state of the atmosphere at a certain place and time

2. **What kinds of things does weather include?**

Temperature, precipitation, humidity, wind

3. **Does weather always stay the same, or does it change from one day to the next?**
It changes.
4. **Can you study weather data to look for patterns in weather over time?**
Yes
5. **What are some hazards caused by tornadoes?**
Destructive winds, power outages
6. **Why can hail be dangerous?**
If it is large, it can damage objects or hurt people.
7. **Where do hurricanes form?**
Over large bodies of water
8. **What parts of land do hurricanes threaten the most?**
Coastal areas
9. **What kinds of destructive things did you see in the video that were caused by the hurricane?**
Flooding, a roof being torn apart, large structures being broken
10. **What did you notice about the tornado?**
Debris flying, high winds, that the tornado was moving/traveling, lightning
11. **Is lightning dangerous?**
Yes
12. **Why is lightning dangerous?**
It is a bolt of electricity that can kill people.
13. **What should you do if there is lightning?**
Stay indoors, avoid isolated trees
14. **How are thunderstorms, tornadoes, and hurricanes similar?**
How are thunderstorms, tornadoes, and hurricanes different?

Lesson 12: Engineering for Extreme Weather

1. **What are some types of extreme weather that involve a lot of rain?**
Thunderstorms, hurricanes
2. **What are some types of extreme weather that involve a lot of wind?**
Thunderstorms, hurricanes, tornadoes
3. **What are some types of extreme weather that involve periods of dryness?**
Droughts
4. **What are some types of extreme weather that involve snow?**
Blizzards and ice storms
5. **What is the problem caused by hurricanes?**
They can destroy homes and buildings.
6. **What are engineers trying to solve?**
Ways for homes and buildings to stay safe during hurricanes

7. **What are some solutions that engineers can try?**
They can design buildings to be a certain shape or size; they can design buildings to be made out of certain materials.
8. **What problem is solved by lightning rods?**
Lightning striking buildings and causing damage
9. **How does a lightning rod work?**
It draws energy from lightning into it.
10. **How does a lightning rod keep people safe?**
By drawing energy into it, that energy does not harm people or property.
11. **What problem does a sandbag solve?**
Flooding
12. **What is a seawall?**
A structure that blocks water from getting onto shore
13. **What does a levee prevent?**
Flooding
14. **How can a snow fence help during strong snowstorms?**
It prevents snow from blowing onto the road.
15. **What are the criteria and constraints of using sandbags?**
» What are the criteria and constraints of building levees and seawalls?
CHALLENGE—If time permits, challenge students to think about how sandbags, levees, and seawalls can be tested to see whether they are effective solutions to solve the problem of flooding. Ask: How do you think an engineer tests whether a seawall works? (An engineer can create a model of a seawall and reenact a flood to see whether the seawall really does keep the water away from the shore.) Page 34

Lesson 13: Evaluating Extreme Weather Solutions

1. **What makes something a hazard?**
It is dangerous.
2. **What are some examples of weather hazards?**
Blizzards, tornadoes, hurricanes, thunderstorms, droughts
3. **What is the difference between criteria and constraints?**
Criteria are needs or wants, and constraints are limitations or restrictions.
4. **What is the difference between a problem and a solution?**
A problem is something that is wrong or needs to be fixed, and the solution is the thing that will fix the problem.
5. **How can we evaluate whether a solution works?**
We can test the solution to see if it works. If it does not, we can make changes to it and test it again. We can do this over and over until it works.
6. **Go over the big question again: How can we evaluate design solutions to weather hazard problems? Ask: Why do you think that it is important to evaluate design solutions?**

So that the best solutions can be used; so that we can improve solutions if they do not work

Lesson 14: Weather-Related Technology

1. **What do you think life would be like if we did not have the technology to study weather data?**

Sample answer: We wouldn't know what the temperature would be or if it would rain today.

2. **Is it helpful for us to have technology that lets us study the weather and collect weather data?**

Yes

3. **How can studying weather data keep people safe?**

Sample answer: Weather data can tell us whether a location is in danger of extreme weather or weather hazards.

4. **Which is the worst category of tornado?**

EF5

5. **What does the abbreviation SM mean on the scale?**

Strip mall

6. **Online Resources If the degree of damage for a softwood tree is 4, what will you expect to see?**

Trees with their trunks snapped

Unit quiz key

1. c 2. d 3. a 4. b 5. c 6. a 7. a 8. b 9. c 10. b 11. a 12. c