

# CHAPTER 12 STUDY GUIDE

## METEOROLOGY

### SECTION 12.1 The Causes of Weather

In your textbook, read about weather and climate.

In the space at the left, write true if the statement is true; if the statement is false, change the italicized word to make it true.

- |                                      |  |
|--------------------------------------|--|
| _____ <b>True</b> _____              | 1. <i>Meteorology</i> is the study of atmospheric phenomena.   |
| _____ <b>False, Atmosphere</b> _____ | 2. Weather is the current state of the <i>lithosphere</i> .  |
| _____ <b>True</b> _____              | 3. Long-term variations in weather for a particular area make up the <i>climate</i> of the area.             |
| _____ <b>False, Directly</b> _____   | 4. The tropics are hotter than the poles because the sun strikes this area of Earth more <i>indirectly</i> . |

In your textbook, read about air masses and source regions.

Circle the letter of the choice that best completes the statement.

5. A large parcel of air that takes on the characteristics of the area over which it forms is a(n)
- |                      |                              |
|----------------------|------------------------------|
| a. <del>cloud.</del> | e. <del>source region.</del> |
| b. air mass.         | d. <del>wind.</del>          |
6. An air mass takes on its source region's
- |                              |                                |
|------------------------------|--------------------------------|
| a. temperature and humidity. | e. <del>clouds and wind.</del> |
| b. <del>landforms.</del>     | d. <del>elevation.</del>       |
7. Maritime air masses originate over
- |                       |                          |
|-----------------------|--------------------------|
| a. <del>clouds.</del> | e. <del>glaciers.</del>  |
| b. oceans.            | d. <del>mountains.</del> |
8. When an air mass travels over land or water that has different characteristics than those of its source region, it undergoes
- |                                  |  |
|----------------------------------|--|
| a. <del>air source change.</del> | e. <del>air pressure modification.</del> |
| b. air mass modification.        | d. <del>temperature inversion.</del>     |

## SECTION 12.2 Weather Systems

In your textbook, read about global winds and how Earth's rotation affects their movement.

Use each of the terms below just once to complete the passage.

intertropical convergence zone	rotation	North America	jet streams
trade winds	southwest	polar jet streams	Coriolis effect
low pressure	prevailing westerlies	polar easterlies	northeast

The (1) **Coriolis Effect** deflects moving air to the right in the northern hemisphere and to the left in the southern hemisphere. The cause of this is Earth's

(2) **Rotation**.

Each hemisphere has three basic wind systems. The first, at 30° latitude north and south, is known as the (3) **Trade Winds**. There, air sinks, warms, and moves toward the equator from northeast to southwest in the northern hemisphere and from southeast to northwest in the southern hemisphere. When the air reaches the equator, it rises, then moves back toward 30° to start the cycle again. These winds from both hemispheres converge at the equator. They are forced upward, creating an area of (4) **Low Pressure**. This area near the equator is called the (5) **International Convergence Zone**.

The second wind system, called the (6) **Prevailing Westerlies**, flows between 30° and 60° latitude north and south of the equator. Its circulation pattern is opposite that of the wind system discussed above. These winds are responsible for the movement of many weather systems across much of (7) **North America**.

The third wind system, the (8) **Polar Easterlies**, lies between the poles and 60° latitude. In the northern hemisphere, these winds flow from the (9) **Northeast** to the (10) **Southwest**. They flow in the opposite direction in the southern hemisphere.

Narrow bands of fast, high-altitude, westerly winds called (11) **Jet Streams** flow at the boundaries between wind zones in the middle latitudes. These bands of wind steer weather systems in the middle latitudes. The most important one, the (12) **Polar Jet Stream**, separates the polar easterlies from the prevailing westerlies.

SECTION 12.2 **Weather Systems, continued**

**In your textbook, read about fronts and low pressure systems.**

Complete the table by filling in the type of weather system described. Use the following terms: front, cold front, occluded front, stationary front, warm front, low pressure system.

Description	Weather System
13. Cold, dense air that displaces warm air, forcing the warm air up	<i>Cold Front</i>
14. Narrow region separating two air masses of different densities	<i>Front</i>
15. Advancing warm air that displaces cold air	<i>Warm Front</i>
16. Pressure system that is associated with cloudy weather and precipitation	<i>Low-Pressure</i>
17. Cold air mass that moves rapidly and overtakes a warm front	<i>Occluded Front</i>
18. Two air masses that meet and do not advance	<i>Stationary Front</i>

**In your textbook, read about pressure systems.**

Complete the table by checking the correct column for each statement.

Statement	High-Pressure System	Low-Pressure System
19. Characterized by sinking air	X	
20. Characterized by rising air		X
21. Air flows toward center		X
22. Air flows away from center	X	
23. Air moves clockwise in the northern hemisphere	X	
24. Air moves counterclockwise in the northern hemisphere		X
25. Associated with fair weather	X	
26. Associated with clouds and precipitation		X

SECTION 12.3 **Gathering Weather Data**

In your textbook, read about weather instruments.

For each item in Column A, write the letter of the matching item in Column B.

Column A	Column B
<u>  E  </u> 1. Radio detecting and ranging	a. thermometer
<u>  C  </u> 2. An instrument that measures wind speed and direction	b. barometer
<u>  A  </u> 3. An instrument that measures temperature	c. anemometer
<u>  B  </u> 4. An instrument that measures air pressure	d. hygrometer
<u>  F  </u> 5. A balloon-borne package of sensors that gathers upper-level weather data	e. radar
<u>  D  </u> 6. An instrument that measures relative humidity	f. radiosonde

In your textbook, read about radar and weather satellites.

Answer the following questions.

7. What is the Doppler effect? How do meteorologists use it to predict weather?

The Doppler effect is the change in wave frequency that occurs in energy, such as sound or light, as the energy moves toward or away from an observer. Meteorologists use Doppler radar (based on the Doppler effect) to find areas of precipitation and associated wind speeds by measuring the speed at which raindrops move toward or away from a radar station.

8. How do meteorologists combine data from weather radar and weather satellites to gather information about the atmosphere?

Meteorologists use weather radar to track precipitation and weather satellite images to track clouds. By combining data from these two types of technology, meteorologists can determine where both clouds and precipitation are occurring.

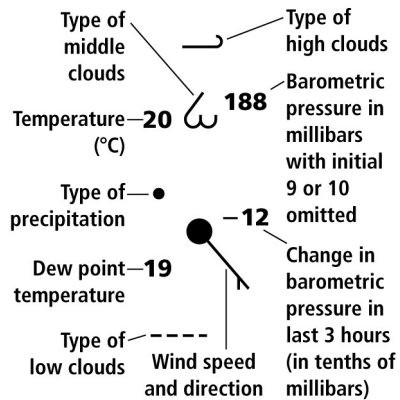
9. What is infrared imagery? How is it used?

Infrared imagery detects differences in thermal energy. These differences are used to map either cloud cover or surface temperatures. Objects that radiate warmth at slightly different frequencies show up in an infrared image as different colors. Infrared imagery is especially useful in detecting thunderstorms that show up as very cold areas on an infrared image.

## SECTION 12.4 Weather Analysis and Prediction

In your textbook, read about station models.

Study the station model. Then answer the questions that follow.



1. What is a station model?

It is a record of weather data for a particular site at a particular time.

2. What are the advantages of using station models?

Station models allow meteorologists to fit a good amount of data into a small space. They also give meteorologists a uniform way of communicating weather data.

3. List three types of information shown on a station model.

Types of clouds, temperature, type of precipitation, dew point temperature, barometric pressure, wind speed, and direction.

4. For the station shown, what is the temperature?

20 degrees Celsius

5. For the station shown, how has the barometric pressure changed in the last 3 hours?

It has decreased by .12 mb.

SECTION 12.4 **Weather Analysis and Prediction, continued**

**In your textbook, read about isopleths.**

*For each statement below, write true or false.*

\_\_\_\_\_ **True** \_\_\_\_\_

\_\_\_\_\_ **True** \_\_\_\_\_

\_\_\_\_\_ **True** \_\_\_\_\_

\_\_\_\_\_ **False** \_\_\_\_\_

\_\_\_\_\_ **True** \_\_\_\_\_

6. An isotherm is a line that connects points of equal temperature.
7. Lines of equal pressure are called isobars.
8. Isobars that are far apart indicate a small difference in pressure and light winds.
9. Contour lines are lines of equal temperature.
10. Isotherms are used to identify temperature gradients and, consequently, frontal systems.

**In your textbook, read about weather forecasting.**

*Use each of the terms below just once to complete the passage.*

**digital forecast**

**short term**

**long-term**

**analog forecast**

There are two major types of weather forecasts. A(n) **(11) \_\_\_ Digital Forecast \_\_\_** relies on numerical data. It is the main method used in modern weather forecasting. Another type of forecast, the **(12) \_\_\_ Analog Forecast \_\_\_**, involves comparing current weather patterns to patterns that took place in the past.

Regardless of the forecasting method, all forecasts are more reliable in the **(13) \_\_\_ Short Term \_\_\_**. Forecasts become less reliable as they attempt to predict **(14) \_\_\_ Long Term \_\_\_** weather changes.

# Teacher Guide and Answers

## Study Guide – Chapter 12 – Meteorology

### Section 12.1 The Causes of Weather

1. true
2. atmosphere
3. true
4. directly
5. b
6. a
7. b
8. b

### Section 12.2 Weather Systems

1. Coriolis effect
2. rotation
3. trade winds
4. low pressure
5. intertropical convergence zone
6. prevailing westerlies
7. North America
8. polar easterlies
9. northeast
10. southwest
11. jet streams
12. polar jet stream
13. cold front
14. front
15. warm front
16. low-pressure system
17. occluded front
18. stationary front
19. High-Pressure System
20. Low-Pressure System
21. Low-Pressure System
22. High-Pressure System
23. High-Pressure System
24. Low-Pressure System
25. High-Pressure System
26. Low-Pressure System

### Section 12.3 Gathering Weather Data

1. e
2. c
3. a
4. b
5. f
6. d
7. The Doppler effect is the change in wave frequency that occurs in energy, such as sound or light, as the energy moves toward or away from an observer. Meteorologists use Doppler radar (based on the Doppler effect) to find areas of precipitation and associated wind speeds by measuring the speed at which raindrops move toward or away from a radar station.
8. Meteorologists use weather radar to track precipitation and weather satellite images to track clouds. By combining data from these two types of technology, meteorologists can determine where both clouds and precipitation are occurring.
9. Infrared imagery detects differences in thermal energy. These differences are used to map either cloud cover or surface temperatures. Objects that radiate warmth at slightly different frequencies show up in an infrared image as different colors. Infrared imagery is especially useful in detecting thunderstorms that show up as very cold areas on an infrared image.

### Section 12.4 Weather Analysis and Prediction

1. It is a record of weather data for a particular site at a particular time.
2. Station models allow meteorologists to fit a good amount of data into a small space. They also give meteorologists a uniform way of communicating weather data.

# Teacher Guide and Answers

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3. Answers may include any of the following:  
types of clouds, temperature, type of precipitation, dew point temperature, barometric pressure, wind speed and direction.
4. 20°C
5. It has decreased by .12 mb.
6. true
7. true
8. true
9. false
10. true
11. digital forecast
12. analog forecast
13. short term
14. long-term