Extreme Weather and Climate 2nd edition Ahrens Test Bank

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Extreme Weather and Climate (2nd)

ISBN 9780357976876 | Chapter 1: Turbulent Atmosphere

Total Questions: 80

Pool 1

Multiple Choice (20)

Q1. *[Multiple Choice] · Bloom's: Remember*

What maintains the average temperature of Earth at its surface?

a) Human activities
b) Greenhouse gases
c) Oceans' heat absorption
d) Solar energy ✓ correct

Q2. *[Multiple Choice] · Bloom's: Remember*

In a volume of air near Earth's surface, which gases cover 78 percent and nearly 21 percent, respectively?

a) Nitrogen, oxygen ✓ correct
b) Hydrogen, oxygen
c) Oxygen, hydrogen
d) Nitrogen, water vapor

Q3. *[Multiple Choice] · Bloom's: Remember*

The gas that shows the most variation from place to place and from time to time in the lower atmosphere is:

a) Ozone (O_3)
b) Carbon dioxide (CO_2)
c) Water vapor (H_2O) ✓ correct
d) Methane (CH_4)

Q4. *[Multiple Choice] · Bloom's: Remember*

The only substance near Earth's surface that is found naturally in the atmosphere as a solid, liquid, and gas is:

a) Carbon dioxide
b) Water ✓ correct
c) Molecular oxygen
d) Ozone

Q5. *[Multiple Choice] · Bloom's: Remember*

What is the primary source of carbon dioxide (CO_2) that enters the atmosphere?

a) Volcanic eruptions
b) Burning of fossil fuels
c) Animal exhalations
d) Decay of vegetation ✓ correct

Q6. *[Multiple Choice] · Bloom's: Remember*

What causes the increase in air density at Earth's surface?

a) The decrease in gravitational force
b) The expansion of air molecules due to heat
c) The compression of air molecules due to gravity ✓ correct
d) The decrease in the number of air molecules

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Q7. *[Multiple Choice] · Bloom's: Remember*

What atmospheric condition is characterized by an increase in air temperature with height?

a) Temperature lapse rate
b) Humidity surge
c) Temperature inversion ✓ correct
d) Atmospheric convection

Q8. *[Multiple Choice] · Bloom's: Understand*

Which of the following weather elements always decrease as we climb upward?

a) Wind
b) Temperature
c) Air pressure ✓ correct
d) Moisture

Q9. *[Multiple Choice] · Bloom's: Understand*

Earth's atmosphere is divided into layers based on the vertical profile of:

a) Air pressure
b) Air temperature ✓ correct
c) Air density
d) Air velocity

Q10. *[Multiple Choice] · Bloom's: Understand*

Which atmospheric layer is the primary site for almost all of Earth's weather?

a) Exosphere
b) Stratosphere
c) Mesosphere
d) Troposphere ✓ correct

Q11. *[Multiple Choice] · Bloom's: Remember*

In which atmospheric layer do we live?

a) Troposphere ✓ correct
b) Stratosphere
c) Thermosphere
d) Ionosphere

Q12. *[Multiple Choice] · Bloom's: Remember*

The gas that absorbs most of the harmful ultraviolet radiation in the stratosphere is:

a) Water vapor (H_2O)
b) Nitrous oxide (N_2O)
c) Carbon dioxide (CO_2)
d) Ozone (O_3) ✓ correct

Q13. *[Multiple Choice] · Bloom's: Remember*

The word “weather” is defined as:

a) The average of the weather elements
b) The climate of a region
c) The condition of the atmosphere at a particular time and place ✓ correct
d) Any type of falling precipitation

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Q14. *[Multiple Choice] · Bloom's: Understand*

What is the primary purpose of measuring relative humidity in weather studies?

a) To determine the absolute amount of water vapor in the air
b) To understand the effects of extreme weather on society
c) To assess how close the air is to being saturated ✓ correct
d) To compare temperature scales

Q15. *[Multiple Choice] · Bloom's: Remember*

Where cold surface air replaces warm air, the boundary separating the different bodies of air is termed a:

a) Parallel of latitude
b) Tornado
c) Cold front ✓ correct
d) Warm front

Q16. *[Multiple Choice] · Bloom's: Remember*

Which of the following is most likely associated with fair weather?

a) High-pressure area ✓ correct
b) Low-pressure area
c) Cold front
d) Warm front

Q17. *[Multiple Choice] · Bloom's: Understand*

Condensation is more likely to occur:

a) When the air cools ✓ correct
b) When the wind is calm
c) When winds blow from the ocean over land
d) When it is nighttime

Q18. *[Multiple Choice] · Bloom's: Apply.*

Which of the following statements relates to weather rather than climate?

a) The average temperature for the month of January is 28^{o}F
b) The lowest temperature ever recorded in Frozenlake, Minnesota, is -57^{o}F
c) The foggiest month of the year is December
d) Outside it is cloudy and snowing ✓ correct

Q19. *[Multiple Choice] · Bloom's: Understand*

At the 500 mb level, the amount of oxygen inhaled in a single breath is:

a) Nearly the same
b) Nearly one-quarter
c) Nearly one-half ✓ correct
d) Nearly three-quarters

Q20. *[Multiple Choice] · Bloom's: Remember*

What is the initial stage of Earth's hydrologic cycle?

a) Evaporation ✓ correct
b) Condensation
c) Precipitation
d) Transpiration

True/False (10)

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Q21. *[True/False] · Bloom's: Remember*

Stratospheric ozone is a health hazard for people with respiratory illnesses.

a) true

b) false ✓ correct

Correct answer: False

Q22. *[True/False] · Bloom's: Remember*

The ozone hole is an actual hole in the atmosphere, a region of complete vacuum.

a) true

b) false ✓ correct

Correct answer: False

Q23. *[True/False] · Bloom's: Remember*

The burning of sulfur-containing fuels (such as coal and oil) releases the colorless gas sulfur dioxide (SO_2) into the air.

a) true ✓ correct

b) false

Correct answer: True

Q24. *[True/False] · Bloom's: Remember*

Each degree on the Kelvin scale is exactly the same size as a degree in Celsius, and a temperature of 0K is equal to–273°C.

a) true ✓ correct

b) false

Correct answer: True

Q25. *[True/False] · Bloom's: Understand*

Heat waves are typically perceived as mere inconveniences and are not commonly associated with significant loss of life.

a) true

b) false ✓ correct

Correct answer: False

Q26. *[True/False] · Bloom's: Remember*

Turbulent wind shear zones and downbursts are hazards caused by thunderstorms.

a) true ✓ correct

b) false

Correct answer: True

Q27. *[True/False] · Bloom's: Remember*

Plants give up moisture by a process called transpiration.

a) true ✓ correct

b) false

Correct answer: True

Q28. *[True/False] · Bloom's: Remember*

Hurricanes inflict most of their damage after crossing from the ocean onto the land.

a) true ✓ correct

b) false

Correct answer: True

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Q29. *[True/False] · Bloom's: Understand*

The number 0 (zero) on the Celsius scale is assigned to the temperature at which pure water freezes,and the number 100 to the temperature at which pure water boils at sea level.

a) true ✓ correct

b) false

Correct answer: True

Q30. *[True/False] · Bloom's: Remember*

Water vapor shows more variation from place to place and time to time than any other atmospheric gas.

a) true ✓ correct

b) false

Correct answer: True

Essay (10)

Q31. *[Essay] · Bloom's: Understand*

Under what circumstances might a person breathe stratospheric air? How often is it likely to happen in a student's lifetime?

Suggested answer: *Answers will vary.*

Q32. *[Essay] · Bloom's: Apply*

Explain the process by which air density and air pressure are determined and illustrate how these parameters change as one ascends through Earth's atmosphere.

Suggested answer: *Answers will vary.*

Q33. *[Essay] · Bloom's: Apply*

Explain the characteristics of the mesosphere.

Suggested answer: *Answers will vary.*

Q34. *[Essay] · Bloom's: Apply*

Describe the relationship between gravity and weight.

Suggested answer: *Gravity and weight are interconnected; weight is the force exerted on an object due to gravity. Weight is directly proportional to gravity, meaning it increases with higher gravitational force. On Earth, weight is the mass of an object multiplied by the acceleration due to gravity (9.8 m/s²), forming this fundamental relationship.*

Q35. *[Essay] · Bloom's: Understand*

What is the Kelvin scale, and why is it considered convenient for scientific calculations?

Suggested answer: *The Kelvin scale is an absolute temperature scale starting from absolute zero. It's favored for scientific calculations because it lacks negative values and aligns with thermodynamic principles. This eliminates complications in calculations, ensuring consistency and precision in scientific endeavors, especially in fields like physics and chemistry.*

Q36. *[Essay] · Bloom's: Apply*

Only a tiny fraction of the atmosphere is carbon dioxide. Why is it so important?

Suggested answer: *While carbon dioxide constitutes a small fraction of the atmosphere, its significance lies in its role as a greenhouse gas. Despite its low concentration, it efficiently traps heat, contributing to Earth's temperature regulation. Elevated CO_2 levels, primarily from human activities, intensify the greenhouse effect, driving climate change and global warming.*

Q37. *[Essay] · Bloom's: Apply*

Imagine you are a meteorologist tasked with explaining the impact of temperature inversions on air quality. Describe how temperature inversions occur within specific atmospheric layers, detailing their altitudes, temperatures, compositions, and the resulting consequences for air quality in a given region.

Suggested answer: *Answers will vary.*

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Q38. *[Essay] · Bloom's: Understand*

Explain the processes and instruments used to determine air density and air pressure.

Suggested answer: *Answers will vary.*

Q39. *[Essay] · Bloom's: Apply*

How does the interplay between air density and air pressure contribute to the movement of air molecules, influencing the phenomenon of wind? Provide a concise explanation, highlighting the key factors that drive the dynamic motion of air within the atmosphere.

Suggested answer: *Answers will vary.*

Q40. *[Essay] · Bloom's: Apply*

Describe the major types of extreme and severe weather events commonly experienced on Earth and explain how understanding them is crucial for disaster preparedness and mitigation strategies.

Suggested answer: *Answers will vary.*

Pool 2

Multiple Choice (20)

Q41. *[Multiple Choice] · Bloom's: Remember*

What maintains the average temperature of Earth at its surface?

a) Human activities
b) Greenhouse gases
c) Oceans' heat absorption
d) Solar energy ✓ correct

Q42. *[Multiple Choice] · Bloom's: Remember*

In a volume of air near Earth's surface, which gases cover 78 percent and nearly 21 percent, respectively?

a) Nitrogen, oxygen ✓ correct
b) Hydrogen, oxygen
c) Oxygen, hydrogen
d) Nitrogen, water vapor

Q43. *[Multiple Choice] · Bloom's: Remember*

The gas that shows the most variation from place to place and from time to time in the lower atmosphere is:

a) Ozone (O_3)
b) Carbon dioxide (CO_2)
c) Water vapor (H_2O) ✓ correct
d) Methane (CH_4)

Q44. *[Multiple Choice] · Bloom's: Remember*

The only substance near Earth's surface that is found naturally in the atmosphere as a solid, liquid, and gas is:

a) Carbon dioxide
b) Water ✓ correct
c) Molecular oxygen
d) Ozone

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Q45. *[Multiple Choice] · Bloom's: Remember*

What is the primary source of carbon dioxide (CO_2) that enters the atmosphere?

a) Volcanic eruptions
b) Burning of fossil fuels
c) Animal exhalations
d) Decay of vegetation ✓ correct

Q46. *[Multiple Choice] · Bloom's: Remember*

What causes the increase in air density at Earth's surface?

a) The decrease in gravitational force
b) The expansion of air molecules due to heat
c) The compression of air molecules due to gravity ✓ correct
d) The decrease in the number of air molecules

Q47. *[Multiple Choice] · Bloom's: Remember*

What atmospheric condition is characterized by an increase in air temperature with height?

a) Temperature lapse rate
b) Humidity surge
c) Temperature inversion ✓ correct
d) Atmospheric convection

Q48. *[Multiple Choice] · Bloom's: Understand*

Which of the following weather elements always decrease as we climb upward?

a) Wind
b) Temperature
c) Air pressure ✓ correct
d) Moisture

Q49. *[Multiple Choice] · Bloom's: Understand*

Earth's atmosphere is divided into layers based on the vertical profile of:

a) Air pressure
b) Air temperature ✓ correct
c) Air density
d) Air velocity

Q50. *[Multiple Choice] · Bloom's: Understand*

Which atmospheric layer is the primary site for almost all of Earth's weather?

a) Exosphere
b) Stratosphere
c) Mesosphere
d) Troposphere ✓ correct

Q51. *[Multiple Choice] · Bloom's: Remember*

In which atmospheric layer do we live?

a) Troposphere ✓ correct
b) Stratosphere
c) Thermosphere
d) Ionosphere

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Q52. *[Multiple Choice] · Bloom's: Remember*

The gas that absorbs most of the harmful ultraviolet radiation in the stratosphere is:

a) Water vapor (H_2O)
b) Nitrous oxide (N_2O)
c) Carbon dioxide (CO_2)
d) Ozone (O_3) ✓ correct

Q53. *[Multiple Choice] · Bloom's: Remember*

The word “weather” is defined as:

a) The average of the weather elements
b) The climate of a region
c) The condition of the atmosphere at a particular time and place ✓ correct
d) Any type of falling precipitation

Q54. *[Multiple Choice] · Bloom's: Understand*

What is the primary purpose of measuring relative humidity in weather studies?

a) To determine the absolute amount of water vapor in the air
b) To understand the effects of extreme weather on society
c) To assess how close the air is to being saturated ✓ correct
d) To compare temperature scales

Q55. *[Multiple Choice] · Bloom's: Remember*

Where cold surface air replaces warm air, the boundary separating the different bodies of air is termed a:

a) Parallel of latitude
b) Tornado
c) Cold front ✓ correct
d) Warm front

Q56. *[Multiple Choice] · Bloom's: Remember*

Which of the following is most likely associated with fair weather?

a) High-pressure area ✓ correct
b) Low-pressure area
c) Cold front
d) Warm front

Q57. *[Multiple Choice] · Bloom's: Understand*

Condensation is more likely to occur:

a) When the air cools ✓ correct
b) When the wind is calm
c) When winds blow from the ocean over land
d) When it is nighttime

Q58. *[Multiple Choice] · Bloom's: Apply.*

Which of the following statements relates to weather rather than climate?

a) The average temperature for the month of January is 28^oF
b) The lowest temperature ever recorded in Frozenlake, Minnesota, is -57^oF
c) The foggiest month of the year is December
d) Outside it is cloudy and snowing ✓ correct

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Q59. *[Multiple Choice] · Bloom's: Understand*

At the 500 mb level, the amount of oxygen inhaled in a single breath is:

a) Nearly the same
b) Nearly one-quarter
c) Nearly one-half ✓ correct
d) Nearly three-quarters

Q60. *[Multiple Choice] · Bloom's: Remember*

What is the initial stage of Earth's hydrologic cycle?

a) Evaporation ✓ correct
b) Condensation
c) Precipitation
d) Transpiration

True/False (10)

Q61. *[True/False] · Bloom's: Remember*

Stratospheric ozone is a health hazard for people with respiratory illnesses.

a) true
b) false ✓ correct

Correct answer: False

Q62. *[True/False] · Bloom's: Remember*

The ozone hole is an actual hole in the atmosphere, a region of complete vacuum.

a) true
b) false ✓ correct

Correct answer: False

Q63. *[True/False] · Bloom's: Remember*

The burning of sulfur-containing fuels (such as coal and oil) releases the colorless gas sulfur dioxide (SO_2) into the air.

a) true ✓ correct
b) false

Correct answer: True

Q64. *[True/False] · Bloom's: Remember*

Each degree on the Kelvin scale is exactly the same size as a degree in Celsius, and a temperature of 0K is equal to–273°C.

a) true ✓ correct
b) false

Correct answer: True

Q65. *[True/False] · Bloom's: Understand*

Heat waves are typically perceived as mere inconveniences and are not commonly associated with significant loss of life.

a) true
b) false ✓ correct

Correct answer: False

Q66. *[True/False] · Bloom's: Remember*

Turbulent wind shear zones and downbursts are hazards caused by thunderstorms.

a) true ✓ correct
b) false

Correct answer: True

Q67. *[True/False] · Bloom's: Remember*

Plants give up moisture by a process called transpiration.

a) true ✓ correct
b) false

Correct answer: True

Q68. *[True/False] · Bloom's: Remember*

Hurricanes inflict most of their damage after crossing from the ocean onto the land.

a) true ✓ correct
b) false

Correct answer: True

Q69. *[True/False] · Bloom's: Understand*

The number 0 (zero) on the Celsius scale is assigned to the temperature at which pure water freezes,and the number 100 to the temperature at which pure water boils at sea level.

a) true ✓ correct
b) false

Correct answer: True

Q70. *[True/False] · Bloom's: Remember*

Water vapor shows more variation from place to place and time to time than any other atmospheric gas.

a) true ✓ correct
b) false

Correct answer: True

Essay (10)

Q71. *[Essay] · Bloom's: Understand*

Under what circumstances might a person breathe stratospheric air? How often is it likely to happen in a student's lifetime?

Suggested answer: *Answers will vary.*

Q72. *[Essay] · Bloom's: Apply*

Explain the process by which air density and air pressure are determined and illustrate how these parameters change as one ascends through Earth's atmosphere.

Suggested answer: *Answers will vary.*

Q73. *[Essay] · Bloom's: Apply*

Explain the characteristics of the mesosphere.

Suggested answer: *Answers will vary.*

Q74. *[Essay] · Bloom's: Apply*

Describe the relationship between gravity and weight.

Suggested answer: *Gravity and weight are interconnected; weight is the force exerted on an object due to gravity. Weight is directly proportional to gravity, meaning it increases with higher gravitational force. On Earth, weight is the mass of an object multiplied by the acceleration due to gravity (9.8 m/s²), forming this fundamental relationship.*

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Q75. *[Essay] · Bloom's: Understand*

What is the Kelvin scale, and why is it considered convenient for scientific calculations?

Suggested answer: *The Kelvin scale is an absolute temperature scale starting from absolute zero. It's favored for scientific calculations because it lacks negative values and aligns with thermodynamic principles. This eliminates complications in calculations, ensuring consistency and precision in scientific endeavors, especially in fields like physics and chemistry.*

Q76. *[Essay] · Bloom's: Apply*

Only a tiny fraction of the atmosphere is carbon dioxide. Why is it so important?

Suggested answer: *While carbon dioxide constitutes a small fraction of the atmosphere, its significance lies in its role as a greenhouse gas. Despite its low concentration, it efficiently traps heat, contributing to Earth's temperature regulation. Elevated CO_2 levels, primarily from human activities, intensify the greenhouse effect, driving climate change and global warming.*

Q77. *[Essay] · Bloom's: Apply*

Imagine you are a meteorologist tasked with explaining the impact of temperature inversions on air quality. Describe how temperature inversions occur within specific atmospheric layers, detailing their altitudes, temperatures, compositions, and the resulting consequences for air quality in a given region.

Suggested answer: *Answers will vary.*

Q78. *[Essay] · Bloom's: Understand*

Explain the processes and instruments used to determine air density and air pressure.

Suggested answer: *Answers will vary.*

Q79. *[Essay] · Bloom's: Apply*

How does the interplay between air density and air pressure contribute to the movement of air molecules, influencing the phenomenon of wind? Provide a concise explanation, highlighting the key factors that drive the dynamic motion of air within the atmosphere.

Suggested answer: *Answers will vary.*

Q80. *[Essay] · Bloom's: Apply*

Describe the major types of extreme and severe weather events commonly experienced on Earth and explain how understanding them is crucial for disaster preparedness and mitigation strategies.

Suggested answer: *Answers will vary.*

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Instructor Manual

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Chapter 1: Turbulent Atmosphere

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Purpose and Perspective of the Chapter

This chapter's purpose is to explore the multifaceted impacts of weather on society, emphasizing extreme conditions. It delves into the distinction between weather and climate, elucidates the critical roles of various gases and pollutants in Earth's atmosphere, and compares temperature scales. Additionally, the chapter comprehensively describes atmospheric layers, detailing their altitudes, temperatures, compositions, and functions. It examines how air density, pressure, and wind patterns fluctuate with altitude and influence atmospheric dynamics. The chapter analyzes Earth's hydrologic cycle, encompassing evaporation, condensation, precipitation, and transpiration. Lastly, it details major types of extreme weather, fostering a holistic understanding of atmospheric phenomena.

Chapter Objectives

The following objectives are addressed in this chapter:

1. List the effects that weather, particularly extreme weather, has on society.
2. Differentiate between weather and climate.
3. Explain the role of gases (including water vapor, carbon dioxide, oxygen, and other greenhouse gases) and pollutants in Earth's atmosphere.
4. Compare and contrast the Fahrenheit, Celsius, and Kelvin temperature scales.
5. Describe the layers of the atmosphere, including their altitudes, temperatures, compositions, and functions.
6. Describe how air density and air pressure are determined and how they vary as you move upward through Earth's atmosphere.
7. Explain wind and the role of air density and air pressure in driving the movement of air molecules in the atmosphere.
8. Analyze Earth's hydrologic cycle, including the functions of evaporation, condensation, precipitation, and transpiration.
9. List the major types of extreme and severe weather that are experienced on Earth.

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What's New in This Chapter

The following elements are improvements from the previous edition:

- Updated content incorporating recent examples, such as the 2021 Pacific Northwest heat wave, and exploring their comparative risks with other life hazards.
- Expanded insights into trends in greenhouse gas concentrations and Earth's increasing global average surface temperature.
- New Focus section: "Volcanoes' Importance in Shaping Earth's Atmosphere and Climate."

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Chapter Outline

The following outline organizes activities (including any existing discussion questions in PowerPoints or other supplements) and assessments by chapter (and therefore by topic), so that you can see how all the content relates to the topics covered in the text.

I. Threats from the Sky (01.01)

II. Reasons for Concern (01.02)

III. Earth's Atmosphere (01.03–01.08)

IV. Properties of the Atmosphere (01.04–01.08)
   a. Air Temperature
   b. Additional Layers of the Atmosphere
   c. Air Pressure
   d. Wind
   e. Moisture

V. Extremes of Weather and Climate (01.09)

VI. Summary

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