

Elemental Geosystems, 5e (Christopherson)

Chapter 7 Global Climate Systems

1) An area defined by characteristic, long-term weather patterns is called

- A) a biome.
- B) an average weather place.
- C) an ecosystem.
- D) a climatic region.

Answer: D

2) Climate is

- A) the weather of a region.
- B) the short-term condition of the atmosphere.
- C) the long-term condition of the atmosphere.
- D) a reference to temperature patterns only.

Answer: C

3) Global climate change

- A) has been linked to floods, droughts, and record high temperatures.
- B) in the next 50 years is expected to be greater than the last 18,000 years combined.
- C) is affecting weather patterns, plant and animal distributions, and melting glaciers.
- D) has increased the spread of infectious diseases.
- E) all of the above

Answer: E

4) Based on principles discussed earlier in the course, you know that as distance from the equator increases, seasonal variation in temperature tends to

- A) increase.
- B) decrease.
- C) remain constant.

Answer: A

5) Based on principles discussed earlier in the course, you know that if the earth's axial tilt were to decrease from 23.5 degrees to 21.5 degrees

- A) winters would become colder.
- B) summers would become hotter.
- C) seasonal temperatures would become less extreme.
- D) temperatures would not change at all from season to season.

Answer: C

6) Based on principles discussed earlier in the course, you know that the annual temperature range of places located in the interior of a continent is _____ those located along the coast at the same latitude.

- A) greater than
- B) less than
- C) the same as

Answer: A

7) In which of the following areas would the least amount of precipitation occur?

- A) in areas affected by maritime air masses
- B) along windward coasts
- C) in low-pressure regions
- D) on the leeward side of a mountain range in the interior of a continent

Answer: D

8) Based on principles discussed earlier in the course, you know that areas dominated by maritime air masses will be relatively _____, and that those dominated by cT air masses will be relatively _____.

- A) wet; wet
- B) wet; dry
- C) dry; wet
- D) dry; dry

Answer: B

9) As regards average annual precipitation, which of the following is correct?

- A) The highest amounts occur throughout subtropical latitudes.
- B) The drier regions are associated with the eastern portions of major landmasses.
- C) The precipitation tends to increase with latitude toward the poles.
- D) The highest average values occur along the equator.

Answer: D

10) "Hot and wet" temperature and precipitation patterns are characteristic of

- A) rain forests in the equatorial tropics.
- B) humid continental climates that have mild summers.
- C) highland climates.
- D) cold steppe climates.

Answer: A

11) "Cold and dry" temperature and precipitation patterns are characteristic of

- A) subtropical latitudes.
- B) humid continental climates that have mild summers.
- C) polar climates.
- D) taiga regions that have cool summers.

Answer: C

12) The events associated with the 1997-1998 ENSO

- A) did more than \$80 billion in damages worldwide.
- B) killed at least 30,000 people.
- C) displaced 300 million people.
- D) all of the above

Answer: D

- 13) Which is not true of The El Niño Southern Oscillation (ENSO) phenomenon?
- A) It creates the largest variation in climate from year to year on a global scale.
 - B) It involves higher than normal pressure in the western Pacific and lower than normal pressure in the eastern Pacific, reversing the trade winds.
 - C) It brings rain to some areas and drought to others, but these effects are neither predictable nor consistent.
 - D) It is linked to droughts in India, floods in the southwestern U.S., and droughts in South Africa and Australia.
 - E) It is completely understood now, and can be predicted decades in advance.

Answer: E

- 14) La Niña
- A) is usually stronger than El Niño.
 - B) occurs more frequently than El Niño.
 - C) usually creates the opposite conditions of El Niño, and in about the same strength.
 - D) requires temperatures in the eastern Pacific to be below normal.

Answer: D

- 15) The ancient Greeks thought that the _____ zone was the best to live in.
- A) torrid
 - B) temperate
 - C) frigid

Answer: B

- 16) An empirical classification is based on, among other factors, _____.
- A) the interaction of air masses
 - B) the origin or genesis of the climate
 - C) the mean annual temperature and precipitation of an area
 - D) causative factors

Answer: C

- 17) A genetic classification system can be based on, among other factors, _____.
- A) the interaction of air masses
 - B) statistics or other data used to determine general categories
 - C) mean annual temperature
 - D) mean annual precipitation

Answer: A

- 18) The author of the textbook describes the various climates of the world using a
- A) purely genetic system.
 - B) purely empirical system.
 - C) combination of both genetic and empirical criteria.

Answer: C

- 19) Which of the following is not one of the six basic climate categories listed in the text?
- A) Torrid
 - B) Tropical
 - C) Mesothermal
 - D) Desert
 - E) Highland

Answer: A

- 20) Which of the following lists the correct, generalized sequence of climates from the equator to the poles?
- A) Highland → Microthermal → Mesothermal → Dry, Arid, and Semiarid → Tropical
 - B) Highland → Dry, Arid, and Semiarid → Mesothermal → Microthermal → Polar
 - C) Tropical → Dry, Arid, and Semiarid → Mesothermal → Microthermal → Polar
 - D) Polar → Microthermal → Mesothermal → Dry, Arid, and Semiarid → Tropical
 - E) Dry, Arid, and Semiarid → Tropical → Microthermal → Polar → Mesothermal

Answer: C

- 21) The tropical rain-forest climate receives most of its rainfall as a result of _____.
- A) frontal uplift
 - B) orographic uplift
 - C) convectional uplift

Answer: C

- 22) In terms of total land and ocean area, which of the following climate classifications is the most extensive at 36 percent percent of Earth's surface?
- A) Tropical climates
 - B) Dry, Arid, and Semiarid climates
 - C) Mesothermal climates
 - D) Microthermal climates

Answer: A

- 23) Which of the following is false regarding the tropical rain-forest climate?
- A) It is influenced by the ITCZ year-round.
 - B) It does not experience a winter season.
 - C) The annual temperature range is larger than the daily temperature range.
 - D) Thunderstorms occur almost daily.

Answer: C

- 24) Which of the following is false regarding the tropical rain-forest ecosystem?
- A) The soils are nutrient-poor.
 - B) Very little light reaches the forest floor.
 - C) Organic matter decomposes very rapidly.
 - D) Low-growing vegetation is dense on the forest floor.

Answer: D

- 25) The bulk of the Amazon River drainage basin is dominated by which one of the following climate classifications?
- A) Tropical Monsoon
 - B) Tropical Savanna
 - C) Tropical Rain Forest
 - D) Humid Subtropical, Hot Summer Climates, Moist All Year

Answer: C

- 26) The dry season in the tropical monsoon climate occurs when
- A) cold air masses dominate the region.
 - B) the ITCZ is not overhead.
 - C) the ITCZ is overhead.
 - D) cold ocean currents shift into the region.

Answer: B

- 27) The wet season monsoon of SE Asia occurs during the _____ season due to the presence of the _____ over the continent.
- A) winter; subtropical high
 - B) winter; ITCZ
 - C) summer; subtropical high
 - D) summer; ITCZ

Answer: D

- 28) The Tropical Savanna climate has
- A) the ITCZ in summer and the subtropical high in winter.
 - B) the polar front in winter and the subtropical high in summer.
 - C) the ITCZ all year-round.
 - D) the polar front all year-round.

Answer: A

- 29) The humid subtropical climate receives _____ precipitation during the summer and _____ precipitation in winter.
- A) convectional; frontal
 - B) frontal; convectional
 - C) orographic; frontal
 - D) convectional; ITCZ

Answer: A

- 30) The Pacific Northwest region of the U.S. is a moist environment because of
- A) the effect of maritime air masses.
 - B) the presence of mountains.
 - C) the predominant direction the winds blow at that latitude (about 45 to 50 degrees north).
 - D) all of the above
 - E) A and B only

Answer: D

- 31) Which of the following is not true of Marine West Coast climates?
- A) They are dominated by mP air masses.
 - B) The air masses in this region are unstable.
 - C) These climates experience very cold winters because of their high latitude (about 45 degrees to 55 degrees north).
 - D) The weather is quite unpredictable.

Answer: C

- 32) *Mediterranean dry-summer* climates
- A) experience dry conditions in summer due to the subtropical high overhead.
 - B) experience wet conditions in winter due to the ITCZ overhead.
 - C) are bordered poleward by steppe climates.
 - D) experience wet conditions in summer due to the ITCZ overhead.

Answer: A

- 33) Which of the following is false regarding the Mediterranean climate classification?
- A) Summers are hot.
 - B) 70 percent of the precipitation occurs in the winter months.
 - C) It is also called the Midlatitude Hot Steppe climate.
 - D) The bulk of precipitation occurs in the winter months.

Answer: C

- 34) Los Angeles, located in a Mediterranean climate zone, is kept _____ during the summer because of the presence of _____.
- A) dry; mountains along the western side of the city
 - B) dry; the cold California current off the coast
 - C) wet; the ITCZ overhead
 - D) wet; the warm California current off the coast

Answer: B

- 35) Which type of vegetation grows in the Mediterranean climate?

- A) taiga
- B) chaparral
- C) rain forest
- D) boreal forest

Answer: B

- 36) Atlanta, Georgia, Buenos Aires, Argentina, and Nagasaki, Japan all share long hot summers, year round rainfall, and the following climate classification.

- A) Humid Continental, Hot Summer
- B) Humid Subtropical, Hot Summer, Moist All Year
- C) Mediterranean
- D) Midlatitude Cold Steppe

Answer: B

- 37) Which of the following is true of microthermal climates?

- A) They have a small seasonal temperature range, hence the term microthermal.
- B) Because of the latitude at which they occur, these climates occupy the largest land area of any climate.
- C) In the Southern Hemisphere, these climates develop only in highland regions.
- D) All of the subtypes of this climate have a uniform annual precipitation regime.

Answer: C

- 38) Which of the following is not true of the Humid Continental, Hot Summer climate region?

- A) It has mild winters.
- B) Most of the precipitation occurs in summer.
- C) It is influenced by maritime air masses in summer.
- D) It is one of the regions that experiences significant frontal activity because of the interaction of conflicting air masses in winter.
- E) It is dominated by cP air masses in winter.

Answer: A

- 39) The largest percentage of Earth's population lives within the

- A) Tropical climates.
- B) Dry, Arid, and Semiarid climates.
- C) Mesothermal climates.
- D) Microthermal climates.

Answer: C

40) Which climatic region contains and feeds the greatest number of people in the world?

- A) Tropical Rain Forest
- B) Tropical Savanna
- C) Mesothermal
- D) Microthermal

Answer: C

41) Bluefield, West Virginia, in the eastern United States, is within which climate classification despite its eastern location in the Appalachians?

- A) Marine West Coast
- B) Humid Subtropical Hot Summer, Moist All Year
- C) Highland
- D) Humid Continental Hot Summer

Answer: A

42) The coldest climate on Earth, outside of either polar region, is the

- A) Humid Subtropical Hot to Warm Summer, Dry Winter.
- B) Humid Continental Warm Summer.
- C) Ice Cap and Ice Sheet.
- D) Subarctic.

Answer: D

43) Which of the following is true of an Ice Cap and Ice Sheet climate?

- A) Its warmest month averages above 10 degrees C (50 degrees F).
- B) It is generally called the tundra.
- C) Its warmest month averages below 0 degrees C (32 degrees F).
- D) Its warmest month averages above 0 degrees C (32 degrees F).

Answer: C

44) If precipitation is more than 1/2 of the potential evapotranspiration, but not equal to it, the climate is

- A) Tropical Savanna.
- B) Desert.
- C) Mediterranean.
- D) Steppe.

Answer: D

45) In which climate region does corn, soybean, hog and cattle production dominate?

- A) Mediterranean
- B) Tropical Monsoon
- C) Humid Continental Warm Summer
- D) Low-Latitude Hot Steppe
- E) Humid Subtropical Hot Summer

Answer: C

46) Which of the following is not related to the 98th meridian in the United States?

- A) It corresponds closely to the 51 cm (20 in) isohyet of mean annual precipitation.
- B) Tall grass prairies occur to the east of it, and short grass prairies to the west.
- C) The area bordering this meridian was originally dominated by native grasses growing in a deep-sod cover.
- D) The land is drier to the east of the meridian, and wetter to the west.
- E) Corn, wheat, and soybean production occur in this area.

Answer: D

- 47) Which climate is characterized by the largest change in monthly average temperatures, i.e., the greatest change in temperatures from one month to the next?
- A) boreal forest
 - B) tundra
 - C) ice cap
 - D) dry-midlatitude

Answer: A

- 48) Duluth, Minnesota, Moscow and Saint Petersburg, Russia are within which climate classification?
- A) Humid Continental Warm Summer
 - B) Marine West Coast Climate
 - C) Tundra Climate
 - D) Humid Subtropical Hot to Warm Summer, Dry Winter

Answer: A

- 49) The moderating effects of the ocean on nearby polar climates is reflected in the
- A) Tundra climate classification.
 - B) Ice Cap and Ice Sheet climate classification.
 - C) Subarctic climate classification.
 - D) Polar Marine climate classification.

Answer: D

- 50) Which of the following is incorrect regarding tundra climates?
- A) They are a type of Polar climate.
 - B) There is no true summer in this region.
 - C) Precipitation is in excess of a very small potential evapotranspiration.
 - D) The land is under continuous snow cover from 8 to 10 months.
 - E) Spruce, fir and larch trees survive in this climate zone.

Answer: E

- 51) Potential evapotranspiration exceeds precipitation in all parts of which climate type?
- A) Tropical Savanna
 - B) Mediterranean
 - C) all Dry, Arid, and Semiarid climates
 - D) Polar

Answer: C

- 52) The most extensive climate types over land, dominating 35 percent of Earth's land area, are _____ climates.
- A) Tropical
 - B) Dry Arid and Semiarid
 - C) Mesothermal
 - D) Microthermal

Answer: B

- 53) If precipitation is less than 1/2 potential evapotranspiration, the climate is
- A) Tropical Rain Forest.
 - B) Desert.
 - C) Tropical Savanna.
 - D) Steppe.

Answer: B

54) Which type of plants grow in desert climates?

- A) taiga
- B) boreal forests
- C) xerophytic
- D) chaparral

Answer: C

55) Many of the desert regions of the southwestern U.S. have developed as a result of

- A) their interior position within the continent.
- B) the presence of mountains to the west of their location.
- C) their location within a low-pressure zone.
- D) all of the above
- E) A and B only

Answer: D

56) The Low-Latitude Hot Desert climates occur

- A) in the tropics and subtropics.
- B) in midlatitude rainshadow positions.
- C) in polar regions.
- D) along the midlatitude, west coasts of continents.

Answer: A

57) Global climate change

- A) has been dominated by global warming.
- B) includes shifting climate zones.
- C) is linked to rising sea levels.
- D) is evidenced by melting glaciers worldwide.
- E) all of the above

Answer: E

58) Which is false regarding global warming?

- A) There is a surprising lack of correlation between CO_2 levels and temperatures.
- B) The last two decades have been the warmest ever recorded.
- C) The warmest year ever recorded was 1998, followed by 2001, and 1997.
- D) The rate at which global temperatures are rising is higher than anywhere else in the entire measured temperature record.
- E) Earth is within 1°C (1.8°F) of the warmest temperature of the last 125,000 years.

Answer: A

59) According to global climate change predictions made by the Intergovernmental Panel on Climate Change (IPCC), temperatures by the year AD 2100 will be

- A) from 1.4C (2.5F) to 5.8C (10.4F) degrees higher than 1990.
- B) about the same as the 1950 to 1980 period.
- C) 4.5C degrees lower than the 1950 to 1980 period.
- D) warmer and by the same amount at the equator as in the polar regions.

Answer: A

60) Greenhouse gases act to _____ temperatures by _____ thermal infrared radiation.

- A) increase; trapping
- B) increase; reflecting
- C) decrease; blocking
- D) decrease; trapping

Answer: A

61) Greenhouse gasses act to increase temperatures by absorbing and releasing

- A) shortwave energy travelling from Earth into space.
- B) shortwave energy from entering Earth's energy system.
- C) longwave energy travelling from Earth into space.
- D) longwave energy from entering Earth's energy system.

Answer: C

62) The gas that is thought to be responsible for more than half of the anthropogenic warming of the atmosphere is

- A) methane.
- B) water vapor.
- C) carbon dioxide.
- D) CFCs.

Answer: C

63) Which of these statements is/are true regarding carbon dioxide?

- A) CO₂ levels are now 31% higher than before the Industrial Revolution.
- B) The rate of increase is greater than any time in the last 20,000 years, while the total amount is greater than any time in the last 420,000 years.
- C) It is responsible for 64% of global warming.
- D) Global emissions in 2000 were 400% greater than in 1950, and the U.S. produced 24% of that total.
- E) They are all true.

Answer: E

64) General circulation models (GCMs) of the atmosphere

- A) produce very specific results as to time and place.
- B) are now in operation at over a dozen places in the United States.
- C) are based on statistical three-dimensional boxes that characterize portions of the atmosphere and ocean in terms of climate-related variables.
- D) are essentially unrelated to mathematical models originally established for forecasting weather.

Answer: C

65) Which is false regarding the Intergovernmental Panel on Climate Change (IPCC) reports?

- A) They state that global temperatures are expected to continue to rise under all climate models.
- B) They show the lack of scientific agreement about whether the climate is changing.
- C) They state that glacial ice is melting worldwide, and river and lake ice is melting sooner in the spring.
- D) They include new and stronger evidence that most of global warming is human caused.
- E) The Third Assessment Report was authored by 17 lead authors, 515 contributing authors, 420 reviewers, and 2500 peer review scientists.

Answer: B

- 66) Which of the following is not a consequence of a potential global warming over the next century?
- A) Poleward climate region shift of 150-550 km (90 -350 mi.).
 - B) An average of 30% of forests will undergo major species shifts.
 - C) Tropical diseases will spread to the subtropics and midlatitudes.
 - D) High latitude ice fields will gradual increase in thickness and area.
 - E) Sea level rise of .11-.88 m (4.3-34.6 in.).

Answer: D

- 67) Which of the following is a predicted consequence of the greenhouse effect?
- A) flooding of low-lying coastal areas
 - B) spread of tropical diseases to regions now unaffected by them
 - C) change in species composition of forest ecosystems
 - D) change in international trade relationships especially those pertaining to food
 - E) all of the above

Answer: E

- 68) Which of the following is true regarding the concentration of CO_2 in the lower atmosphere?
- A) From 1750 to the present it has increased by more than 33% .
 - B) It has stabilized.
 - C) It is presently at 150 ppm.
 - D) It is unrelated to the replacement rate for harvested and cleared forests.

Answer: A

- 69) Which of the following is incorrect relative to a rise in sea level?
- A) About 25 percent of the rising level is due to thermal expansion.
 - B) Concern is focused on the contribution from the melting of already floating ice.
 - C) The largest contributor to the sea level rise is the melting of ice on land.
 - D) Sea level has risen an estimated 10 to 20 cm (4 to 8 in) this century.

Answer: B

- 70) The warmest years in the history of weather instruments were
- A) recorded during the period 1910 to 1921.
 - B) recorded during the last two decades.
 - C) observed in the 1880s and 1890s.
 - D) recorded in the first half of this century.

Answer: B

- 71) Which of the following is not true regarding the November 1990 pledge agreement reached by 130 nations?
- A) They agreed to a reduction of carbon dioxide and other radiatively active gas emissions.
 - B) There was a recognition that human activities are forcing a greenhouse warming.
 - C) The United States, as the largest single producer of excessive CO_2 , signed the initial agreement.
 - D) The agreement recognized the importance of governmental policies on energy conservation and fossil fuel use patterns.

Answer: C

- 72) Which of the following is false regarding carbon dioxide in the atmosphere?
- A) The present concentration is higher than any time in the last 420,000 years.
 - B) The present rate of increase is higher than any time in the last 20,000 years.
 - C) It is responsible for 65 percent of global warming.
 - D) The rate of increase is decreasing.

Answer: D

- 73) Which of these statements is/are true regarding carbon dioxide?
- A) CO₂ levels are now 33% higher than before the Industrial Revolution.
 - B) The rate of increase is greater than any time in the last 20,000 years, while the total amount is greater than any time in the last 420,000 years.
 - C) It is responsible for 64% of global warming.
 - D) Global emissions in 2000 were 400% greater than in 1950, and the U.S. produced 24% of that total.
 - E) They are all true.

Answer: E

- 74) Which of the following is incorrect relative to a rise in sea level?
- A) About 25 percent of the rising level is due to thermal expansion
 - B) Concern is focused on the contribution from the melting of already floating ice.
 - C) The largest contributor to the sea level rise is the melting of ice on land.
 - D) Sea level has risen an estimated 10 to 20 cm (4 to 8 in.) this century.

Answer: B

- 75) Which is false regarding the Kyoto protocol?
- A) Canada, the European Union, and Australia have promised to cut carbon emissions by 6% - 8%.
 - B) European carbon emissions could be reduced to less than half the 1990 levels with a negative cost.
 - C) The U.S. could reach the Kyoto carbon reduction goals and save \$7 to \$34 billion.
 - D) The U.S. National Research Council shares President Bush's feeling that "the science is 'incomplete' on global climate change."
 - E) It calls for reducing greenhouse gas emissions to 5.2% lower than 1990 levels.

Answer: D

- 76) The condition of the atmosphere at any given time and place is called climate.

Answer: True False

- 77) Climates are usually stable over several human generations, but usually change over longer time periods (thousands to millions of years).

Answer: True False

- 78) Climate change over the next 50 years may be greater than that experienced during the last 18,000 years, i.e., since the peak of the last ice age.

Answer: True False

- 79) Climatic regions are characterized by distinctive weather patterns.

Answer: True False

- 80) The climate of an area can be classified in different ways depending upon the criteria used to define it.

Answer: True False

- 81) Once developed, a climate classification system can be considered complete; i.e., it needs no further revision.

Answer: True False

- 82) A climograph is a mechanical instrument used for measuring climates.

Answer: True False

- 83) The soils in tropical environments are nutrient-rich as indicated by the vast amount of vegetation that grows there.

Answer: True False

84) The ITCZ migrates with the high Sun and influences the Tropical Monsoon climates.

Answer: True False

85) The Mediterranean climate requires the use of irrigation for most crops.

Answer: True False

86) Marine west coast climates occur only along the west coasts of continents.

Answer: True False

87) The bulk of the world's population lives within the Tropical climates.

Answer: True False

88) Despite its location of 49° north latitude, Vancouver, British Columbia does not experience a single month that averages below freezing.

Answer: True False

89) Chaparral is a type of vegetation that is very tolerant of extreme cold.

Answer: True False

90) Tundra can occur on high mountains as well as in the coastal margins of the subarctic realm.

Answer: True False

91) Antarctica is buried under thousands of feet of ice because heavy snowfalls occur there each year.

Answer: True False

92) The largest repository of freshwater in the world is in ice-covered Antarctica.

Answer: True False

93) The Midlatitude Cold Desert climates are more moist than the Low-Latitude Hot Steppe climates.

Answer: True False

94) The true tropical and subtropical deserts on Earth fall within the Low-Latitude Hot Desert climate type.

Answer: True False

95) Cold deserts experience more precipitation than warm deserts.

Answer: True False

96) Earth is within 1 degree C of equaling the highest average temperature of the past 125,000 years.

Answer: True False

97) The U.S. produces more carbon dioxide than any other country in the world.

Answer: True False

98) According to GCMs, the polar regions are expected to experience a greater change in temperature than the tropics.

Answer: True False

99) Some studies have shown that adopting policies to limit global climate change will be economically beneficial, even if climate change itself is not considered part of the financial equation.

Answer: True False

- 100) The Intergovernmental Panel on Climate Change (IPCC) has not yet reached a preliminary conclusion or consensus as to the occurrence of a global warming.
Answer: True False
- 101) Even a small rise in sea level of only a few feet will have major economic consequences in coastal areas.
Answer: True False
- 102) La Niña always occurs in the year following an El Niño.
Answer: True False
- 103) Some scientists expect climatic patterns to shift poleward by at least 100 kilometers during the 21st century.
Answer: True False
- 104) The Kyoto Protocol called for a reduction in the emissions of greenhouse gases.
Answer: True False

