

CHAPTER 19--CLIMATE DISRUPTION AND OZONE DEPLETION

Student: _____

1. Greenland's glaciers contain what percentage of the world's freshwater?
 - A. 2%
 - B. 3%
 - C. 5%
 - D. 10%
 - E. 12%
2. Scientists studying climate change estimate the average global sea level rise by the year 2100 may be as much as _____ or higher.
 - A. 3 inches
 - B. 6 inches
 - C. 24 inches
 - D. 39 inches
 - E. 50 inches
3. The minimum period of time for measuring climate, rather than weather, is which of the following?
 - A. 2 weeks
 - B. 6 months
 - C. 1 year
 - D. 10 years
 - E. 30 years
4. Which of the following best describes the earth's average surface temperature for the past 900,000 years?
 - A. a steady warming trend
 - B. fairly steady temperatures until recently
 - C. prolonged periods of cooling and warming
 - D. fairly steady with occasional cool spells
 - E. fairly steady with a recent cooling trend.

5. The earth's lower atmosphere is composed of all of the following greenhouse gases, *except*
- A. ozone
 - B. carbon dioxide
 - C. water vapor
 - D. methane
 - E. nitrous oxide
6. The concentration of carbon dioxide in the troposphere at the start of the Industrial Revolution was approximately
- A. 280 ppm
 - B. 290 ppm
 - C. 300 ppm
 - D. 310 ppm
 - E. 320 ppm
7. Carbon dioxide rates reached what level in 2010?
- A. 300 ppm
 - B. 332 ppm
 - C. 357 ppm
 - D. 389 ppm
 - E. 417ppm
8. During the past 275 years human activities have been responsible for 70% of methane emissions. Those activities included all of the following, *except*
- A. raising cattle and sheep
 - B. the use of modern fertilizers
 - C. extracting fossil fuels
 - D. creating landfills
 - E. flooding land to create reservoirs
9. Nitrous oxide (N_2O) levels are rising. Each nitrous oxide molecule has how much stronger a warming potential than does a molecule of carbon dioxide?
- A. 27
 - B. 298
 - C. 13
 - D. 306
 - E. 127

10. Scientific studies and models indicate we need to prevent CO₂ levels from reaching an irreversible tipping point of ____ ppm, which could set into motion large-scale, long-term changes.
- A. 450 ppm
 - B. 500 ppm
 - C. 550 ppm
 - D. 600 ppm
 - E. 650 ppm
11. If current rates of CO₂ emissions continue, the CO₂ level will be at what level by 2050?
- A. 275 ppm
 - B. 335 ppm
 - C. 380 ppm
 - D. 450 ppm
 - E. 560 ppm
12. NASA climate scientist James Hansen predicts we need to bring CO₂ levels down to the level we had in 1990 in order to maintain a climate similar to what we have had over the last 10,000 years. What is that 1990 CO₂ level?
- A. 500 ppm
 - B. 450 ppm
 - C. 380 ppm
 - D. 350 ppm
 - E. 280 ppm
13. One key component to a successful strategy to reduce the threat of projected climate disruption must be which of the following?
- A. reduce cattle belching
 - B. increased use of nitrogen fertilizers
 - C. global energy efficiency revolution
 - D. scattering iron particles in the oceans
 - E. harnessing the power of nuclear fission
14. Major climate models predict all of the following, *except*
- A. a 2- to 4.5-degree centigrade rise in earth's mean surface temperature by 2100
 - B. human role in the changes in global temperature
 - C. the falling of global sea levels
 - D. lower temperature rises are only possible with drastic greenhouse gas cuts
 - E. temperature increases of 3 degrees centigrade are most likely

15. Some people believe the sun has become hotter and is responsible for global warming. Data about which of the following disputes that claim?
- A. the stratosphere being cooler than the troposphere
 - B. projected surface temperature of the sun
 - C. air currents at high altitude
 - D. ocean currents
 - E. air currents at low altitude
16. The oceans absorb between 25-30% of the CO₂ in the lower atmosphere. As the oceans heat up, this absorption
- A. increases dramatically
 - B. increases somewhat
 - C. stays relatively stable
 - D. decreases
 - E. stops
17. Since the beginning of the industrial revolution, the acidity of the ocean surface has increased by what percentage?
- A. 10%
 - B. 20%
 - C. 30%
 - D. 40%
 - E. 50%
18. What is the big deal about the atmosphere getting a few degrees warmer?
- A. may raise the ocean level
 - B. may kill off the coral in the oceans
 - C. may cause warm weather plants to move further north or south
 - D. may move weather patterns around
 - E. may cause a rapid global change in climate
19. A 2007 study by NASA's Goddard Institute for Space Studies predicts how much of the world's land area could be experiencing extreme drought by 2059?
- A. 12%
 - B. 23%
 - C. 33%
 - D. 45%
 - E. 53%

20. Climate models predict that global warming will be most severe in which regions?
- A. Australia
 - B. North America
 - C. Polar regions
 - D. Africa
 - E. Euro-Asia
21. A rise in sea level is *least* likely to
- A. flood areas where one-third of the world's human population lives
 - B. save the coral reefs
 - C. accelerate coastal erosion
 - D. contaminate coastal aquifers
 - E. disrupt coastal fisheries
22. A warmer world is *least* likely to result in
- A. decreased food production
 - B. reductions in biodiversity
 - C. a rise in sea level
 - D. increased moderate weather
 - E. spread of tropical diseases
23. The 2003 U. S. National Academy of Sciences report outlined a worst-case scenario in which all of the following could occur, *except*
- A. collapse of ecosystems
 - B. floods in low-lying coastal cities
 - C. forests burning in vast wildfires
 - D. drinking and irrigation water drying up
 - E. mountain glaciers growing in size
24. Climate models indicate that we will have to deal with all of the following issues that will result from a rapidly changing climate, *except*
- A. where food can be grown
 - B. how much food can be grown
 - C. which areas will have increased drought or flooding
 - D. where people and wildlife will be able to live
 - E. what kinds of economies will exist
25. The western United States is currently experiencing its worst drought in how many years?
- A. 1000
 - B. 500
 - C. 300
 - D. 250
 - E. 150

26. Methane locked in the permafrost soils of the tundra contains ____ times the amount of carbon dioxide released from burning fossil fuels each year.
- A. 70-100
 - B. 50-60
 - C. 30-40
 - D. 20-30
 - E. 10-15
27. “Methane time bombs” is a phrase associated with which of the following?
- A. methane released from permafrost
 - B. methane released by cattle
 - C. methane released by decaying manure
 - D. methane released from glaciers
 - E. methane released from sewage treatment plants
28. The predicted rise in sea levels during the 21st Century will likely cause all of the following results, *except*
- A. saltwater contamination of coastal freshwater aquifers
 - B. flooding of some of the world’s largest coastal cities, including New York
 - C. flooding of low-lying barrier islands and gently sloping coastlines
 - D. replenishment of many coastal fisheries
 - E. destruction of many coastal estuaries, wetlands, and coral reefs
29. A 2009 study by the University of Maryland projects which of the following locations will see the biggest sea level rise in the world?
- A. north polar region
 - B. Netherlands
 - C. Louisiana
 - D. north eastern U.S
 - E. Florida
30. Scientific debate over whether the warming of the ocean would or would not result in more frequent and stronger tropical storms and hurricanes, was settled by consensus. The consensus stated there would be
- A. fewer and weaker hurricanes
 - B. more and weaker hurricanes
 - C. fewer and stronger hurricanes
 - D. more and stronger hurricanes
 - E. no change in the strength or frequency of hurricanes

31. Which of the following ecosystems is *least* likely to suffer disruption and species loss from climate change?
- A. temperate oak-pine and oak-hickory forests
 - B. coral reefs
 - C. coastal wetlands
 - D. high elevation mountaintops
 - E. alpine and Arctic tundra
32. In a warmer world, which of the following organisms are likely to decline in numbers?
- A. insects
 - B. microbes
 - C. humans
 - D. fungi and molds
 - E. weeds
33. Addressing climate change is difficult for all of the following reasons, *except*
- A. The problem is global, not regional.
 - B. Humans are not hard-wired to respond to long-term threats
 - C. Problems will be solved by long-term political solutions.
 - D. Many of the problems and solutions are controversial.
 - E. The benefits and harmful impacts are spread evenly.
34. Following is a list of possible climate change tipping points, except for one. Choose the one that is not a tipping point.
- A. atmospheric level of 450 ppm
 - B. collapse and melting of the Greenland ice sheet
 - C. expansion of Amazon rainforest
 - D. massive release of methane from Arctic permafrost
 - E. sharp drop in the ability of the oceans to absorb CO₂
35. According to John Sterman's Bathtub Model, how much of the CO₂ being emitted into the atmosphere is retained in the atmosphere for up to 200 years.
- A. 100%
 - B. 45%
 - C. 30%
 - D. 25%
 - E. <1%

36. Which of the following is *not* a strategy for reducing the threat of climate change?
- A. Improve energy efficiency.
 - B. Shift from fossil fuels to a mix of carbon-free energy resources.
 - C. Stop cutting down tropical forests.
 - D. Capture and store as much carbon dioxide as possible.
 - E. Continue with current practices.
37. All of the following are examples of reducing carbon dioxide levels by collecting greenhouse gas emissions and storing them somewhere, *except*
- A. massive planting of trees
 - B. draining wetlands
 - C. pumping it deep underground
 - D. growing more switchgrass
 - E. the use of biochar for fertilizer
38. Carbon capture and storage techniques have all of the following problems, *except*
- A. CCS requires large inputs of energy to accomplish
 - B. CCS promotes continued use of coal.
 - C. CCS operates on the precautionary principle.
 - D. CCS does nothing to reduce greenhouse gases coming from motor vehicles
 - E. CCS requires stored CO₂ to remain sealed away from the atmosphere forever
39. Prevention approaches to global warming include all of the following, *except*
- A. Increase beef production to strengthen public health.
 - B. Shift from coal to natural gas
 - C. Reduce deforestation
 - D. Slow population growth.
 - E. Improve energy efficiency.
40. It has been suggested that the threat of global warming can be addressed by all of the following geoengineering strategies, *except*
- A. adding iron to the oceans
 - B. build lots of chemical plants to remove ocean acidity
 - C. injecting sulfate particulates into the stratosphere
 - D. covering the oceans with Styrofoam chips
 - E. place giant mirrors in orbit above the earth to reflect sunlight

41. There are six major methods governments can use to promote solutions to climate disruption, including all of the following, *except*
- A. strictly regulate carbon dioxide and methane as air pollutants
 - B. phase in carbon taxes or fees
 - C. place a cap on total human-generated carbon dioxide and methane emissions
 - D. increase subsidies to businesses that encourage energy efficient technologies
 - E. curb economic growth
42. The 1997 Kyoto Protocol went into effect in 2005 with only seven of the world's 194 nations not ratifying the agreement. Which of the following countries did not ratify it?
- A. Netherlands
 - B. Canada
 - C. United States
 - D. Germany
 - E. Switzerland
43. Which of the following countries intends to become the first carbon neutral country by cutting its net carbon emissions to zero by 2030?
- A. Canada
 - B. United States
 - C. Mexico
 - D. Nicaragua
 - E. Costa Rica
44. By 2009, how many U.S. states had set goals for reducing greenhouse gas emissions?
- A. 1
 - B. 5
 - C. 12
 - D. 22
 - E. 30
45. Which of the following companies has cut its greenhouse gas emissions by 72% and saved \$3 billion while increasing its business by almost a third?
- A. Alcoa
 - B. DuPont
 - C. Walmart
 - D. General Electric
 - E. British Petroleum

46. By the year 2050 the world needs to cut its greenhouse gas emissions by what amount in order to prevent the planet heating up by more than 3.6 degrees Fahrenheit?
- A. 5-15%
 - B. 15-25%
 - C. 25-50%
 - D. 50-80%
 - E. 100%
47. A layer of ozone in the lower stratosphere reduces the sun's harmful UV radiation by how much?
- A. 95%
 - B. 63%
 - C. 49%
 - D. 33%
 - E. 20%
48. The effects of ozone depletion on humans includes all of the following, *except*
- A. more cataracts
 - B. suppression of immune system
 - C. more brain cancers
 - D. worse sunburn
 - E. more skin cancers
49. Chlorofluorocarbons are
- A. nontoxic
 - B. corrosive
 - C. odorous
 - D. flammable
 - E. expensive
50. Researchers Rowland and Molina, in 1974, came to all of the following conclusions about CFCs except
- A. CFCs remain in the atmosphere once they are injected there
 - B. CFCs combine with water vapor and are responsible for acid rain
 - C. after 11-20 years CFCs rise into the stratosphere
 - D. once in the stratosphere CFCs break ozone down
 - E. each CFC molecule can last in the stratosphere from 65 to 385 years
51. Which of the following is not a precaution to follow in order to reduce exposure to UV radiation?
- A. do not use tanning parlors or sun lamps
 - B. limit exposure to UV radiation to overcast days
 - C. do not expose yourself to the sun if you are taking antibiotics or birth control pills
 - D. use sunscreen with a protection factor of at least 15
 - E. use UV-A and UV-B protective clothing and sunglasses

52. Chemicals capable of destroying ozone include all of the following, *except*
- A. chlorofluorocarbons
 - B. formaldehyde used as a preservative
 - C. halons in fire extinguishers and crop fumigants
 - D. carbon tetrachloride used as a solvent
 - E. methyl bromide used as a fumigant
53. If all of the ozone-depleting substances were banned tomorrow, it would take about ____ years for earth to recover to pre-1950 levels.
- A. 25
 - B. 50
 - C. 75
 - D. 100
 - E. 125
54. Greenland's glaciers contain about 10% of the world's fresh water.
- True False
55. Climate change affects the entire planet and will be long-term.
- True False
56. If Greenland's ice were to melt completely the global sea level would rise by 23 feet.
- True False
57. Estimates of global sea level rise by the year 2100 is from 39 to 78 inches.
- True False
58. Over the past 900,000 years the earth's atmosphere has been remarkably steady, not undergoing cycles of warming and cooling.
- True False
59. The world's economies are not dependent on the natural greenhouse effect.
- True False
60. It is possible to tell if the earth's climate is changing based on a few years, or a decade or two.
- True False
61. Methane levels in the atmosphere have tripled in the last 275 years.
- True False

62. Methane emissions over the past 275 years are the result of extracting fossil fuels, raising cattle and sheep, and constructing reservoirs behind large dams.
- True False
63. Summer ice in the Arctic Sea may be gone by 2040 or earlier.
- True False
64. Changes in the energy output of the sun are responsible for the majority of the rise in earth's temperature.
- True False
65. China and the United States together are the source of nearly half of the world's annual greenhouse gas emissions.
- True False
66. The United States, China, and Russia³/₄three of the world's major emitters³/₄agreed in 2001 to participate in a cap-and-trade program to slow global warming.
- True False
67. The oceans are the warmest they have been in the last 130 years.
- True False
68. The mild climate we have experienced for the past 10,000 years is likely to change rapidly in this century.
- True False
69. The area of the earth's land experiencing severe drought decreased in size from about 30% to about 15%.
- True False
70. Approximately 80% of all mountain glaciers in South America are shrinking in size.
- True False
71. Sea levels are rising more slowly than IPCC scientists thought in 2007.
- True False
72. Farming depends, more than any other human activity, on a wide variety of climate changes.
- True False

73. Current levels of climate disruption account for the premature deaths of 300,000 people each year.
- True False
74. Approximately 70% of land-based species assessed so far could go extinct if the average global temperature increases beyond 3.5 degrees C.
- True False
75. Higher latitude countries such as Russia, Canada, and New Zealand would have more deaths and lower crop yields because of climate disruption, especially in the beginning.
- True False
76. Thomas Midgley Jr., discovered the first chlorofluorocarbon in 1930.
- True False
77. The tipping point for atmospheric concentrations of carbon is considered 450 ppm.
- True False
78. We are currently at an atmospheric concentration of carbon of 389 ppm.
- True False
79. Bill Gates, co-founder of Microsoft, is on record saying that climate change is the most important challenge we face.
- True False
80. Scientists accept there is nothing we can do to change the coming climate disaster.
- True False
81. Environmental economists agree that the most critical goal is to put a price on carbon emissions to get all emitters to pay all of the estimated harmful environmental and health costs of their carbon emissions.
- True False
82. Walmart is saving \$12 million a year by using energy-efficient LED bulbs in its refrigeration units.
- True False
83. Some U.S. states have plans on how to adapt to rising sea levels, as have some U.S. cities.
- True False

84. The ozone hole is a reduction in concentrations of ozone high above the earth in the stratosphere.

True False

85. The average rise in global sea level is likely to be at least _____ inches by the year 2100.

86. _____ is determined by the average weather conditions of the earth or a particular area over a long time.

87. Carbon dioxide concentrations in the atmosphere are higher than they have been in the last _____ years.

88. Since the beginning of the _____ human actions have led to significant increases in greenhouse gases in the lower atmosphere.

89. The United States emits almost _____ times more carbon dioxide emissions per person than the poorest countries emit.

90. According to an IPCC report, approximately _____% of the land-based plant and animal species assessed so far could disappear if the temperature change exceeds 3.5 degrees Celsius.

91. If human activities and natural factors combine to trigger new and abrupt climate and ecological changes, we would reach a _____, which would be too late to reverse catastrophic changes for tens of thousands of years.

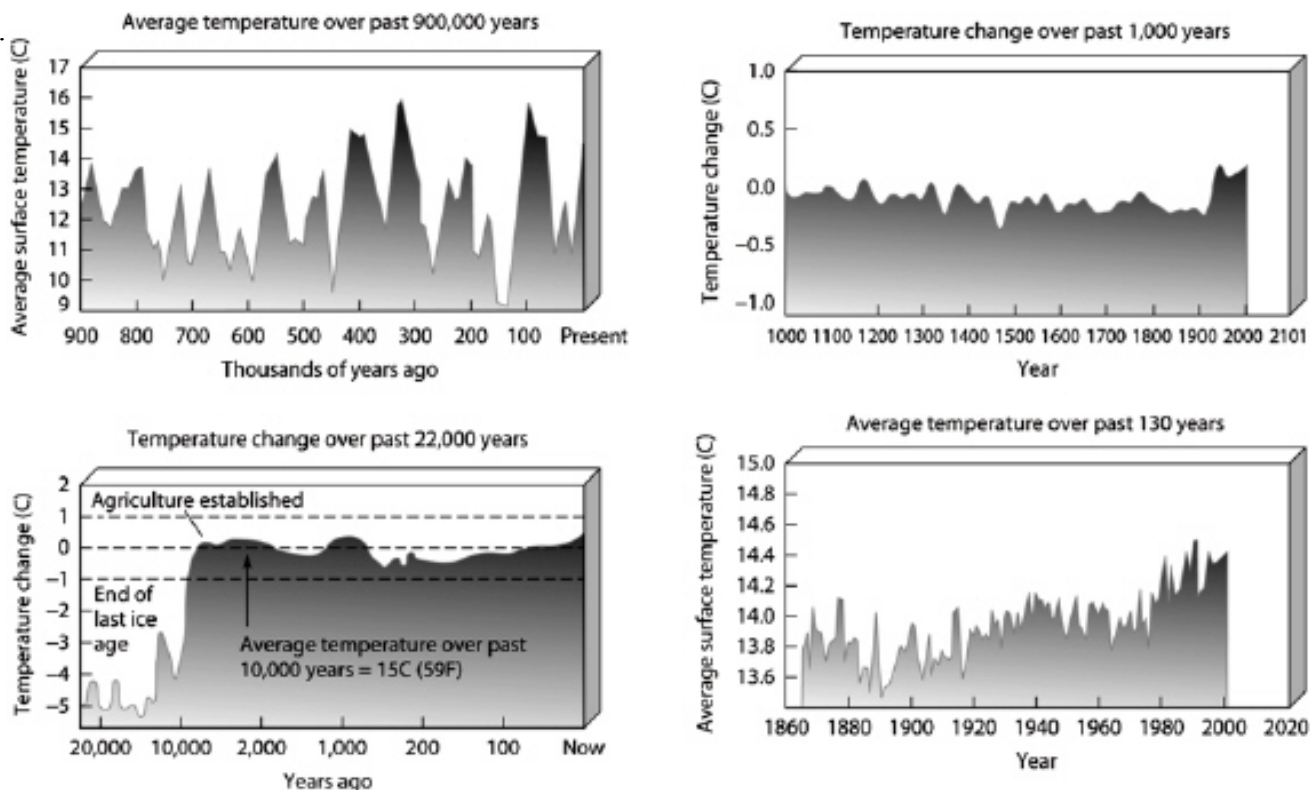
92. Coastal flooding from a sea level rise of _____ meters would affect 150 million people.

93. Shallow and deep ocean currents that distribute CO₂ and warm and cool water between the surface and depths between the tropics and the poles comprise the _____.

94. Climate change models predict a decline in agricultural productivity in _____ and _____ regions.
- _____
95. One of the input strategies that are necessary to slow the rate and degree of global warming is to stop cutting down _____.
- _____
96. Any strategy for reducing global warming would be enhanced by reducing the human population and _____.
- _____
97. Environmental expert Lester R. Brown believes we must have an emergency plan to reduce CO₂ emissions by _____% by 2020.
- _____
98. According to climate scientist James Hansen, phasing out _____ is 80% of the solution to the global warming crisis.
- _____
99. One way to increase the uptake of CO₂ is to implement a massive global _____ program.
- _____
100. One of the most serious problems with carbon sequestration (CCS) solutions is that the stored CO₂ can never _____.
- _____
101. _____ intends to be the first country to become carbon neutral by having zero net emissions by 2030.
- _____
102. In 1995, _____ and _____ received the Nobel Prize in chemistry for their work indicating that CFCs were lowering the average concentration of ozone in the stratosphere.
- _____

103. Cataracts and skin cancers are serious problems resulting from ozone depletion, along with another serious threat, the UV radiation destroying _____.

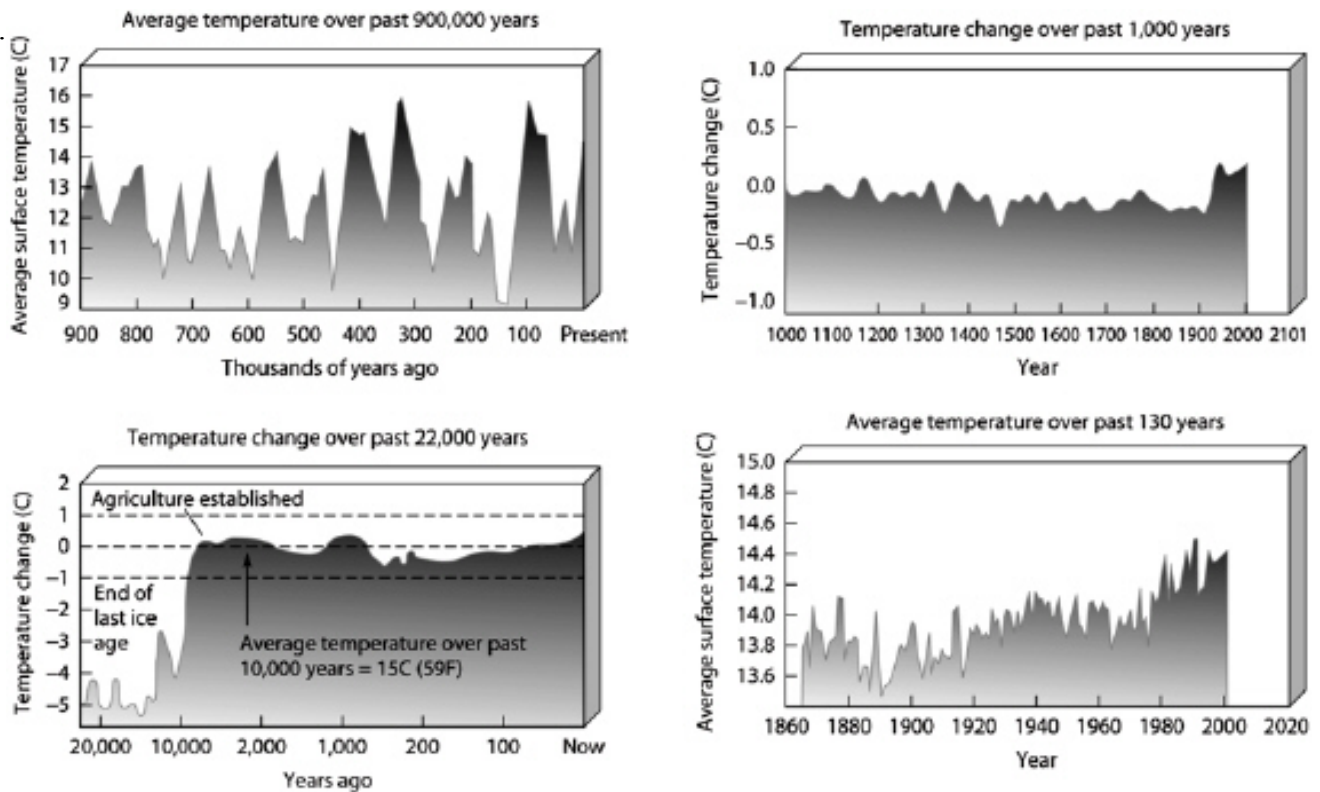
104.



Use the Figure above to answer the following question(s).

When has there been the most consistent temperature rise since the 1200s?

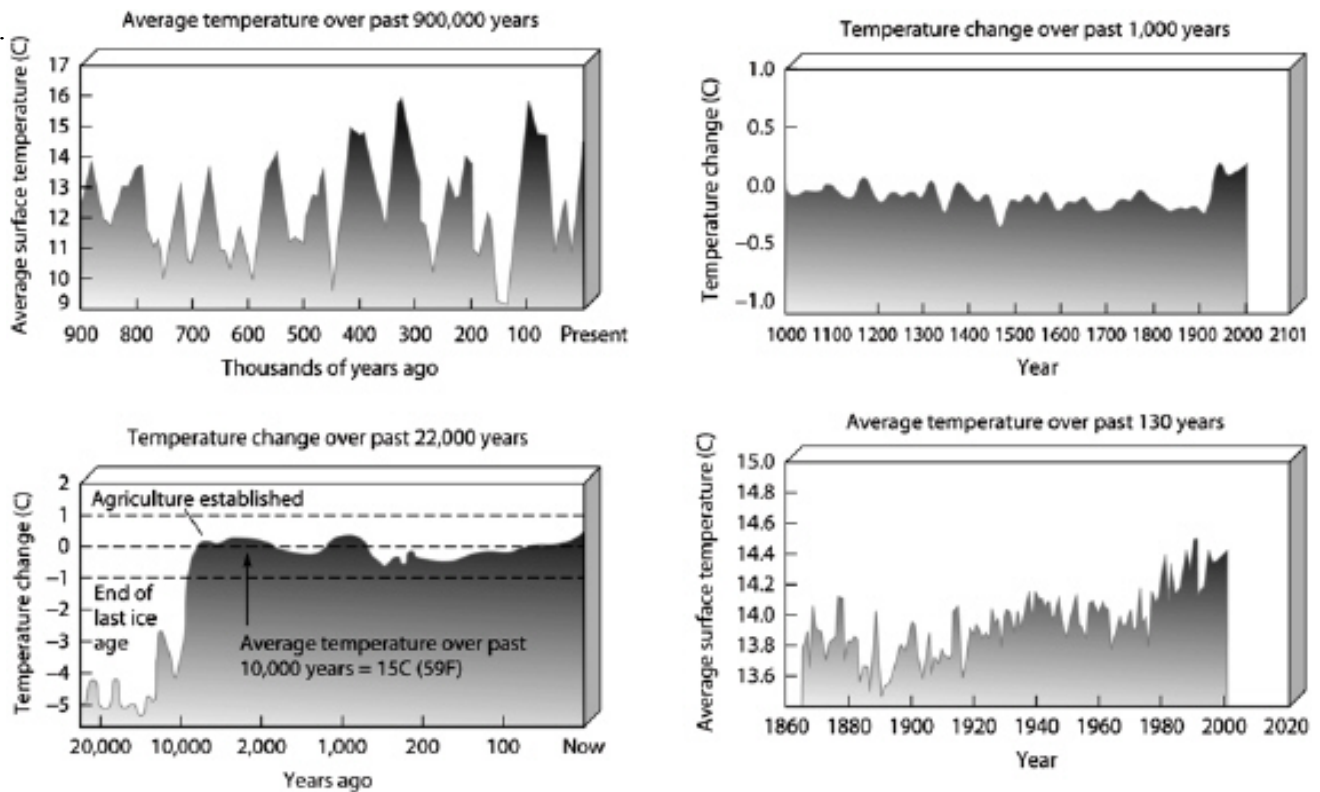
105.



Use the Figure above to answer the following question(s).

Before 150,000 years ago, when did the earth have high average surface temperatures?

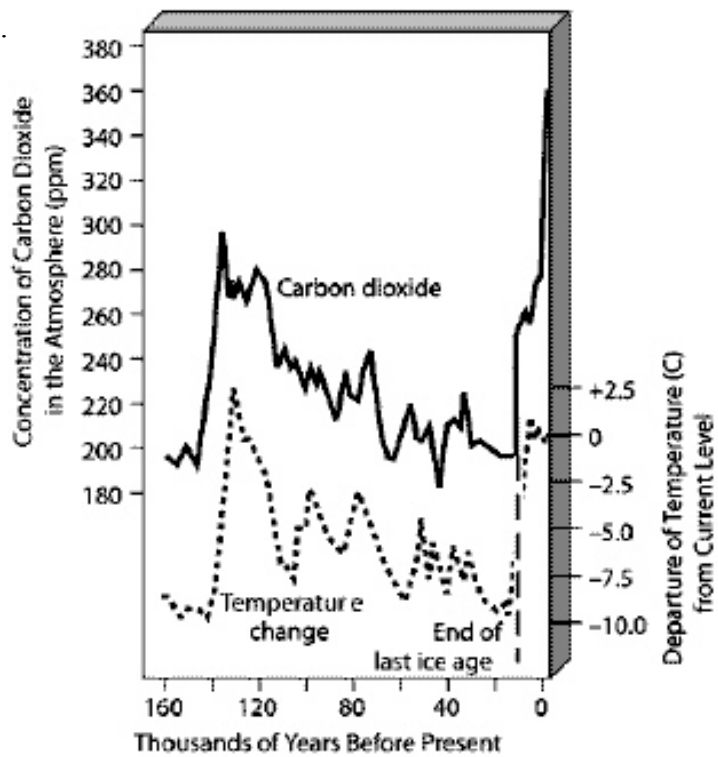
106.



Use the Figure above to answer the following question(s).

Between 10,000 years ago and 1000 years ago, when did the temperature reach a maximum?

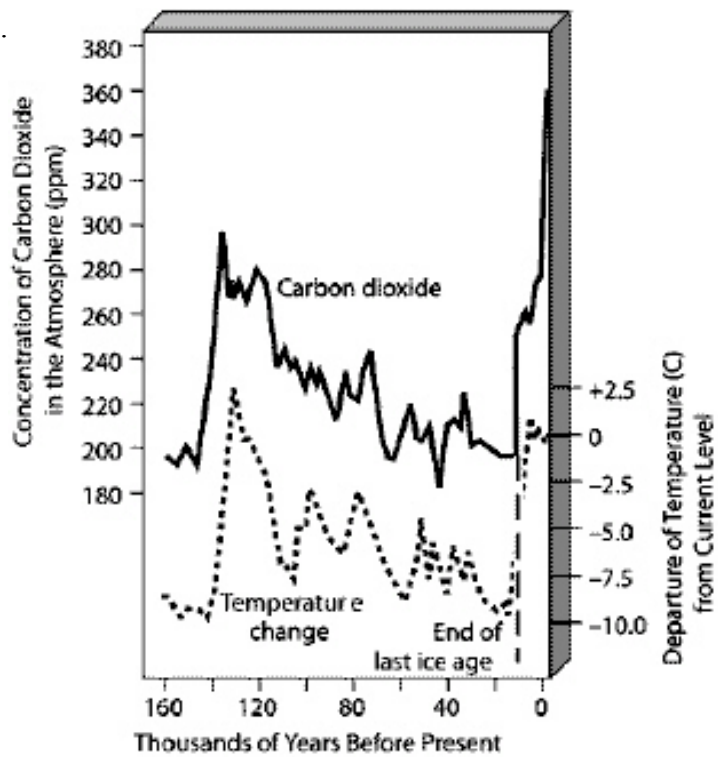
107.



Use the Figure above to answer the following question(s).

What correlation is there between temperature change and concentration of carbon dioxide in the atmosphere for the last 10,000 years?

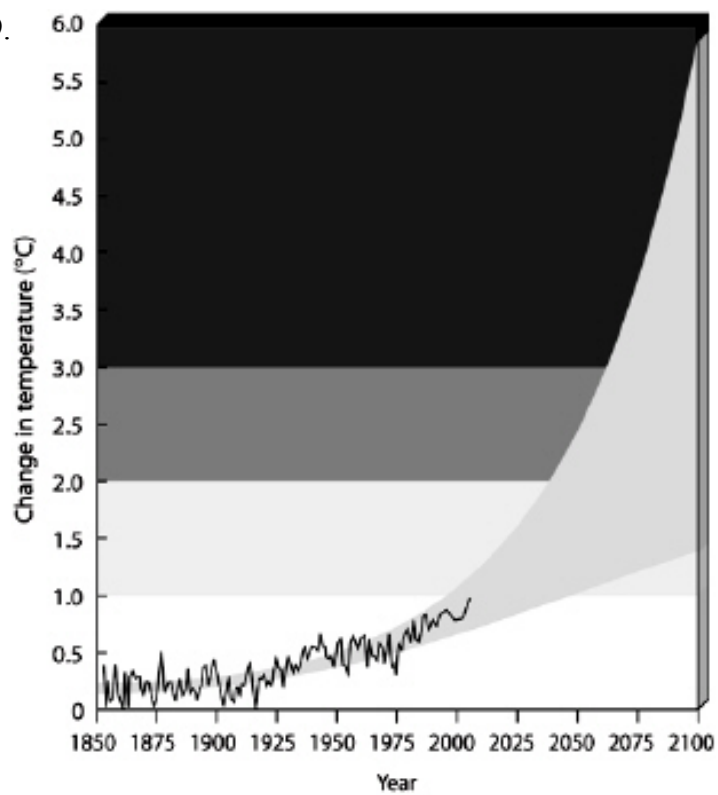
108.



Use the Figure above to answer the following question(s).

When the temperature decreased 120,000 years ago, what happened to the carbon dioxide concentration?

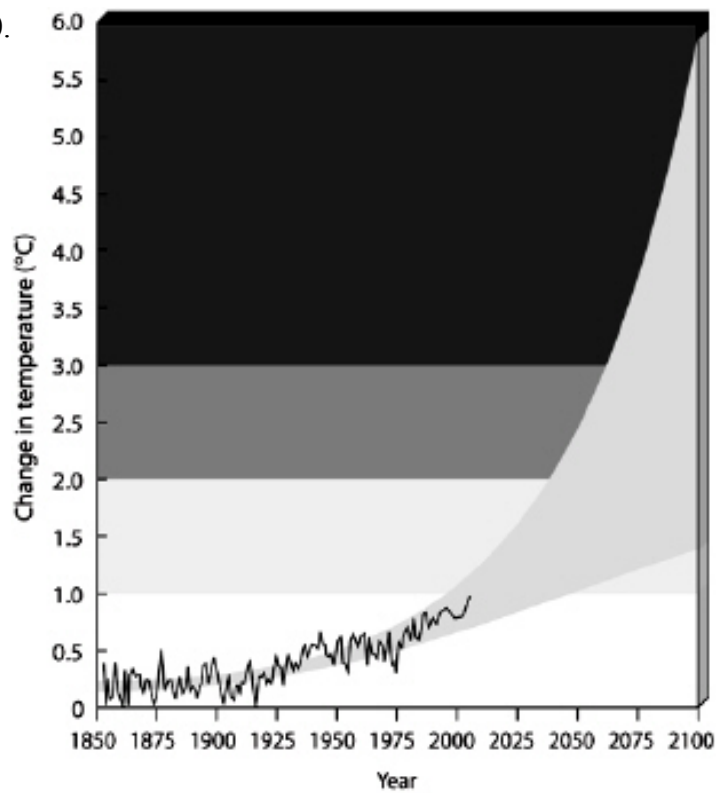
109.



Use the Figure above to answer the following question(s).

How much did the surface temperature of the earth change between 1950 and 2004?

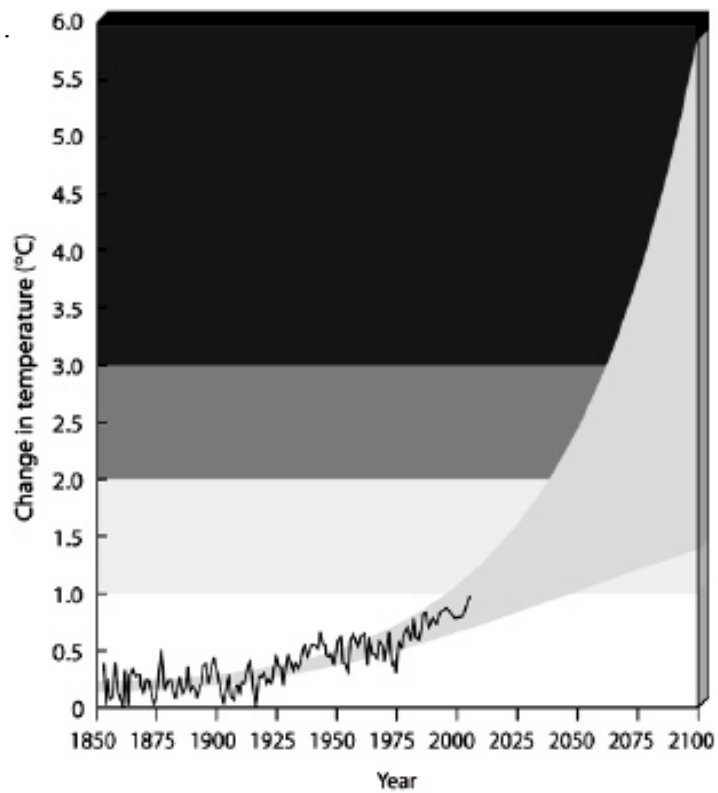
110.



Use the Figure above to answer the following question(s).

What change of the surface temperature of the earth is projected for 2025?

111.



Use the Figure above to answer the following question(s).

Is the projected change of the surface temperature of the earth worrisome? Why?

CHAPTER 19--CLIMATE DISRUPTION AND OZONE DEPLETION **Key**

1. D
2. D
3. E
4. C
5. A
6. A
7. D
8. B
9. B
10. A
11. E
12. D
13. C
14. C
15. A
16. D
17. C
18. E
19. D
20. C
21. B
22. D
23. E
24. E
25. B
26. B
27. A
28. D
29. D

- 30. C
- 31. A
- 32. C
- 33. E
- 34. C
- 35. B
- 36. E
- 37. B
- 38. C
- 39. A
- 40. D
- 41. E
- 42. C
- 43. E
- 44. E
- 45. B
- 46. D
- 47. A
- 48. C
- 49. A
- 50. B
- 51. B
- 52. B
- 53. D
- 54. TRUE
- 55. TRUE
- 56. TRUE
- 57. TRUE
- 58. FALSE
- 59. FALSE
- 60. FALSE
- 61. TRUE
- 62. TRUE
- 63. TRUE

64. FALSE
65. TRUE
66. FALSE
67. TRUE
68. TRUE
69. FALSE
70. TRUE
71. FALSE
72. FALSE
73. TRUE
74. TRUE
75. FALSE
76. TRUE
77. TRUE
78. TRUE
79. TRUE
80. FALSE
81. TRUE
82. TRUE
83. TRUE
84. TRUE
85. 39 *or* thirty nine
86. climate
87. 800,000
88. Industrial Revolution
89. 200 *or* two hundred
90. 70
91. tipping point
92. 0.5
93. North Atlantic conveyor belt
94. tropical; subtropical *or* subtropical; tropical
95. tropical forests
96. poverty
97. 80

- 98. coal
- 99. tree-planting
- 100. leak
- 101. Costa Rica
- 102. Rowland; Molina
- 103. phytoplankton
- 104. since 1930
- 105. between 350,000 and 330,000 years ago.
- 106. about 1,000 years ago
- 107. As the temperature has risen, so have carbon dioxide levels.
- 108. Carbon dioxide concentration decreased also.
- 109. The temperature increased by 1.0 degrees Celsius.
- 110. The temperature is expected to increase by 0.6 degrees Celsius.
- 111. Yes, because the increase is faster than ever before.