

CHAPTER 1--ENVIRONMENTAL PROBLEMS, THEIR CAUSES, AND SUSTAINABILITY

Student: _____

1. Which of the following is not a goal of *environmental science*?
 - A. learn how nature works
 - B. understand how we interact with the environment
 - C. find ways to deal with environmental problems
 - D. learn how to live more sustainably
 - E. learn how to persuade politicians to enact sustainability legislation
2. A key component of environmental science is
 - A. botany
 - B. political science
 - C. sociology
 - D. ecology
 - E. psychology
3. Natural capital includes all of the following *except*
 - A. solar energy
 - B. air
 - C. water
 - D. soil
 - E. nutrients
4. Using normally renewable resources faster than nature can renew them is called
 - A. nutrient cycling
 - B. nutrient deficit
 - C. sustainability
 - D. trade-offs
 - E. degrading natural capital
5. Solar energy is known as
 - A. renewable resource
 - B. recyclable resource
 - C. perpetual resource
 - D. reusable resource
 - E. nonrenewable resource

6. Scientists estimate we could recycle and reuse what percentage of the resources we now use?
- A. 50-60%
 - B. 60-70%
 - C. 70-80%
 - D. 80-90%
 - E. 90-100%
7. The annual market value of all goods and services produced by all businesses, foreign and domestic, operating within a country is called:
- A. per capita GNP
 - B. GNP
 - C. per capita GDP
 - D. PPP
 - E. GDP
8. The changes in a country's economic growth per person is measured by the
- A. per capita GDP
 - B. per capita GNP
 - C. per capita
 - D. per capita GDP
 - E. PPP
9. More-developed countries, including the US, Japan, and most European countries have _____ % of the world's population and use about _____ % of all the world's resources.
- A. 75, 25
 - B. 30, 70
 - C. 5, 25
 - D. 20, 88
 - E. 33, 68
10. Which of the following generalizations about developing countries is *true*?
- A. They make up about one-tenth of the world's population.
 - B. They have high average per capita GNP.
 - C. They include Canada, Japan, and Australia.
 - D. They use about 12% of the world's resources.
 - E. They are highly industrialized.
11. What is the primary difference between renewable resources and nonrenewable resources?
- A. how easily they are discovered
 - B. the amount of the resource
 - C. the length of time it takes for them to be replenished
 - D. how fast they are being used up
 - E. none of these

12. The highest rate at which a renewable resource can be used indefinitely without reducing its available supply is called
- A. conservation
 - B. sustainable yield
 - C. preservation
 - D. perpetual resource
 - E. degradation
13. Which of the following would *not* be considered a nonrenewable resource?
- A. copper
 - B. oil
 - C. fresh air
 - D. salt
 - E. sand
14. Which of the following is *not* a renewable resource?
- A. groundwater
 - B. trees in a forest
 - C. fertile soil
 - D. oil
 - E. crops
15. All non-renewable resources can theoretically be
- A. converted to nonmetallic minerals
 - B. converted to renewable ones
 - C. exhausted or depleted
 - D. recycled or reused
 - E. alive
16. Which of the following is an example of reuse?
- A. re-melting aluminum cans
 - B. making compost out of kitchen scraps
 - C. using plastic butter tubs to store leftovers
 - D. using waste heat to warm a room
 - E. making paper goods from previously used paper
17. Use of a natural resource based on sustainable yields applies to
- A. nonrenewable resources
 - B. renewable resources
 - C. perpetual resources
 - D. amenity resources
 - E. recycling

18. An average ecological footprint of an individual in a given country or area is called
- A. per capita gross GNP
 - B. ecological footprint
 - C. per capita GDP
 - D. sustainable yield
 - E. per capita ecological footprint
19. The U.N. *Millennium Ecosystem Assessment* reports that human activities have degraded what percentage of the earth's natural services, mostly in the last 50 years.
- A. 20
 - B. 40
 - C. 60
 - D. 80
 - E. 95
20. Which of the following is not one of the types of property or resource rights?
- A. private property
 - B. unusable property
 - C. open access renewable
 - D. common property
 - E. all of these are types of property rights
21. Which of the following is not a solution suggested by the author to the problem of the degradation of a shared common resource?
- A. Remove it from use by anyone.
 - B. Convert it to private ownership.
 - C. Use it as a rate well below estimated sustainable yields.
 - D. Regulate access to the resource.
 - E. All of these.
22. In 2008, the World Wildlife Fund estimated that humanity's *global ecological footprint* exceeded the earth's *biological capacity* by how much?
- A. 30%
 - B. 12%
 - C. 20%
 - D. 45%
 - E. 80%

23. If everyone on earth consumed at the same current level as the average U.S. citizens, we would need
- A. 30% more resources
 - B. 75% more resources
 - C. 100% more resources
 - D. two more earths
 - E. five more earths
24. The per capita ecological footprint of U.S. citizen is about ____ times as much as an average citizen of China.
- A. 2.1
 - B. 4.5
 - C. 6
 - D. 10
 - E. 30
25. According to the author, three of the following are major cultural changes (revolutions) that have occurred in human history, and one is *not*. Choose the one that is *not*.
- A. Information-Globalization
 - B. Transportation
 - C. Industrial-Medical
 - D. Agricultural
 - E. none of these
26. Pollution includes
- A. detergents dumped into streams
 - B. volcanoes spewing toxic gases into the atmosphere
 - C. CO₂ releases from coal burning power plants
 - D. fertilizer runoff from golf courses
 - E. all of these
27. Pollutants can have which of the following unwanted effects?
- A. degrade life-support systems for humans
 - B. damage wildlife
 - C. lower human health
 - D. unpleasant smells, sights, tastes
 - E. all of these
28. Which of the following would not be a type of nondegradable pollutant?
- A. lead
 - B. arsenic
 - C. toxic chemicals
 - D. mercury
 - E. human sewage

29. At our current average rate of use per person, we will need the equivalent of how many earth's to provide an endless supply of renewable resources.
- A. 0.88
 - B. 0.91
 - C. 1.15
 - D. 1.3
 - E. 2.1
30. According to data available in 2003, the average US citizen has an ecological footprint that is how many times that of the average citizen of the low-income countries?
- A. 13
 - B. 12
 - C. 11
 - D. 10
 - E. 4.5
31. Nonpoint sources of pollution include all of the following *except*
- A. wind carrying dirt and pesticides from croplands
 - B. runoff from a stockyard
 - C. a smokestack from a power plant
 - D. fertilizer runoff from lawns
 - E. runoff from cropland
32. Scientists have identified several problems with relying primarily on pollution cleanup. Which of the following is not one of those problems?
- A. It is only a temporary bandage as long as the situation remains the same.
 - B. Elimination of pollution at the time of production is expensive.
 - C. It often simply moves the pollutant from one place to another.
 - D. Once pollutants are released it is too expensive to remove them.
 - E. All of these are identified problems.
33. Which of the following is one of the root causes of environmental problems?
- A. rapid population growth
 - B. even distribution of wealth
 - C. increasingly sustainable use of resources
 - D. prices reflecting environmental costs
 - E. using nonrenewable resources sensibly

34. Which of the following is *not* normally an effect of poverty?
- A. premature death from normally nonfatal diarrhea
 - B. lack of clean drinking water
 - C. severe respiratory illness from openly burning wood indoors
 - D. diseases from poor sanitation
 - E. heart disease and diabetes from obesity
35. The harmful effects of poverty are serious but those of affluence are ____.
- A. a lot less serious
 - B. a little less serious
 - C. about the same
 - D. a little more serious
 - E. a lot more serious
36. The real prices of goods and services do not include
- A. the cost of raw materials
 - B. the cost of manufacturing
 - C. the environmental costs of resource use
 - D. the cost of distribution
 - E. the cost of advertising
37. Subsidies and tax breaks to companies are
- A. helpful to the environment
 - B. not helpful to the economy
 - C. not helpful to the company
 - D. not helpful to the environment
 - E. none of these
38. The set of assumptions and values reflecting how you think the world works and what you think your role in the world should be is called
- A. environmental worldview
 - B. environmental justice
 - C. environmental ethics
 - D. environmental economics
 - E. environmental capital
39. The idea that we should be responsible, caring managers of the earth is
- A. the planetary management worldview
 - B. the stewardship worldview
 - C. the environmental wisdom worldview
 - D. the environmental justice movement
 - E. all of these

40. Which of the following would be representative of an environmental wisdom worldview?
- A. Continuous rapid economic growth improves environmental conditions.
 - B. Learning how life sustains itself and do the same
 - C. More money should be directed to research for controlling the environment.
 - D. Human beings are the most important life forms on earth.
 - E. There is always more.
41. Research by social scientists suggests that it takes ____ percent of the population of a community, country, or the world to bring about major social change.
- A. 1-2
 - B. 5-10
 - C. 15-20
 - D. 25-35
 - E. 50-60
42. An irreversible shift in the behavior of a natural system is called a(n)
- A. ecological tipping point
 - B. overuse of resources
 - C. failure to recycle
 - D. renewable natural capital
 - E. ecological footprint
43. While heavily dependent on the environment, we are not dependent for everything we need to stay alive and healthy.
- True False
44. Environmental science is a branch of environmentalism and has the aim of protecting the earth's life-support systems.
- True False
45. The three overarching themes relating to the long-term sustainability of life on this planet are: solar energy, biodiversity, and energy cycling.
- True False
46. Natural services are functions of nature, such as purification of air and water, which support life and human economies.
- True False
47. In environmental science, individuals tend to matter less because the issues are global in nature.
- True False

48. Take away solar energy and all natural capital would collapse.
True False
49. More than 1.4 billion people in today's world struggle to live on an income of \$1.25 or less per day.
True False
50. Natural capital includes both natural resources and natural resources.
True False
51. If everyone on earth consumed at the rate of an average U.S. citizen, the earth could only support about 5 billion of the 6.9 billion now alive.
True False
52. A drainpipe of a factory that is releasing a pollutant, is an example of nonpoint source of pollution.
True False
53. The *Tragedy of the Commons* refers to a lack of agricultural resources available for the common (poor) people in a country.
True False
54. The amount of biologically productive land and water required to supply the people in a country with renewable resources and recycling wastes and pollution is the ecological footprint.
True False
55. An environmental problem that is not addressed can continue to grow until it reaches an often irreversible tipping point.
True False
56. Pollutants are all human-made; they can not enter the environment naturally.
True False
57. Species are becoming extinct at least 100 times faster than they were in pre-human times.
True False
58. Pollution cleanup is usually the best way of dealing with the release of a pollutant.
True False

59. The harmful environmental effects of poverty are much worse than those of affluence.

True False

60. Overall, the air quality is poorer and drinking water more polluted today than in the 1970s.

True False

61. A basic cause of environmental problems results from the fact that companies using resources have to pay for the cost of the harmful environmental costs of supplying their products.

True False

62. The old lesson that you should “protect your capital and live on the income it provides” applies to the use of the earth’s natural capital as well as financial resources.

True False

63. _____ is the capacity of the earth’s natural systems and human cultural systems to survive, flourish, and adapt to changing environmental conditions indefinitely.

64. Our lives and economies depend on energy from _____ and natural resources and natural services provided by the earth.

65. Natural Capital equals _____ plus _____.

66. The circulation of chemicals necessary for life, from the environment through organisms and back to the environment, is called _____.

67. Changes in a country's economic growth per person are measured by _____.

68. Some of the world’s countries are called low-income, _____ - _____ countries, and include Congo, Haiti, Nigeria, and Nicaragua.

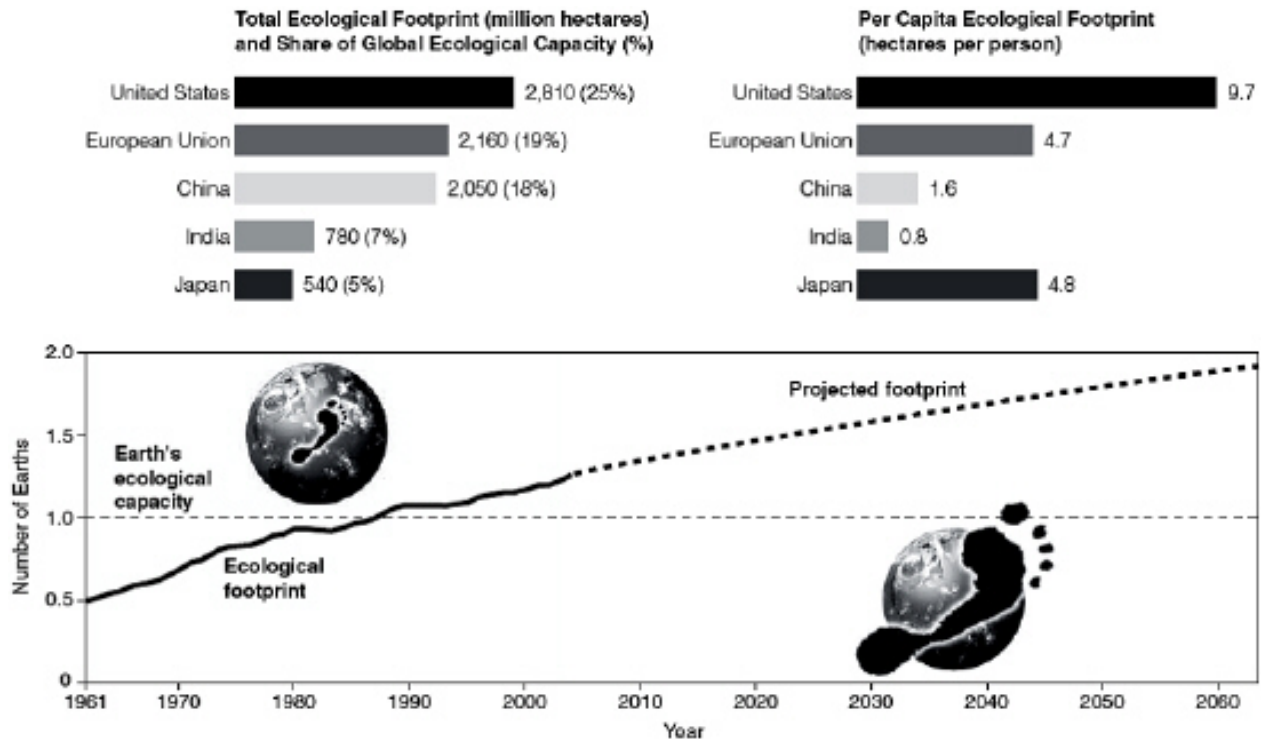
69. A resource such as solar energy, that is constantly available, is called a(n) _____.

70. Fish, fresh air, forests, and fertile soil are examples of _____.
- _____
71. Old drink bottles that are collected, washed, and refilled are an example of _____.
- _____
72. _____ is the amount of biologically productive land and water needed to supply the people in a particular country or area with an indefinite supply of renewable resources and to absorb and recycle the wastes and pollution produced by such resource use.
- _____
73. Approximately one-third of all land in the US is jointly owned by all US citizens and managed for them by the government. This type of property is called _____ and is often degraded.
- _____
74. Environmental degradation, also known as _____ is the process of wasting, depleting, and degrading the earth's natural capital at an accelerating rate.
- _____
75. The exhaust pipe of an automobile or the smokestack of a coal-burning powerplant are examples of _____ sources.
- _____
76. One way of dealing with pollution is to clean up pollutants after we have produced them, which is called _____.
- _____
77. If everyone consumed as much as the average American does today, the earth could indefinitely support only about _____ of the currently 6.9 billion people.
- _____
78. IPAT is a simple way of looking at how three factors influence the impact humans have on the environment. The formula is $\text{Impact} = \text{Population (P)} \times \text{_____} \times \text{Technology (T)}$.
- _____
79. _____ is the world's leading consumer of wheat, rice, meat, coal, fertilizers, steel, and cement.
- _____

80. An often irreversible shift in the behavior of a natural system is caused when an environmental problem builds slowly until it reaches an _____.

81. Your _____ is a set of assumptions and values reflecting how you think the world works and what you think your role in the world should be.

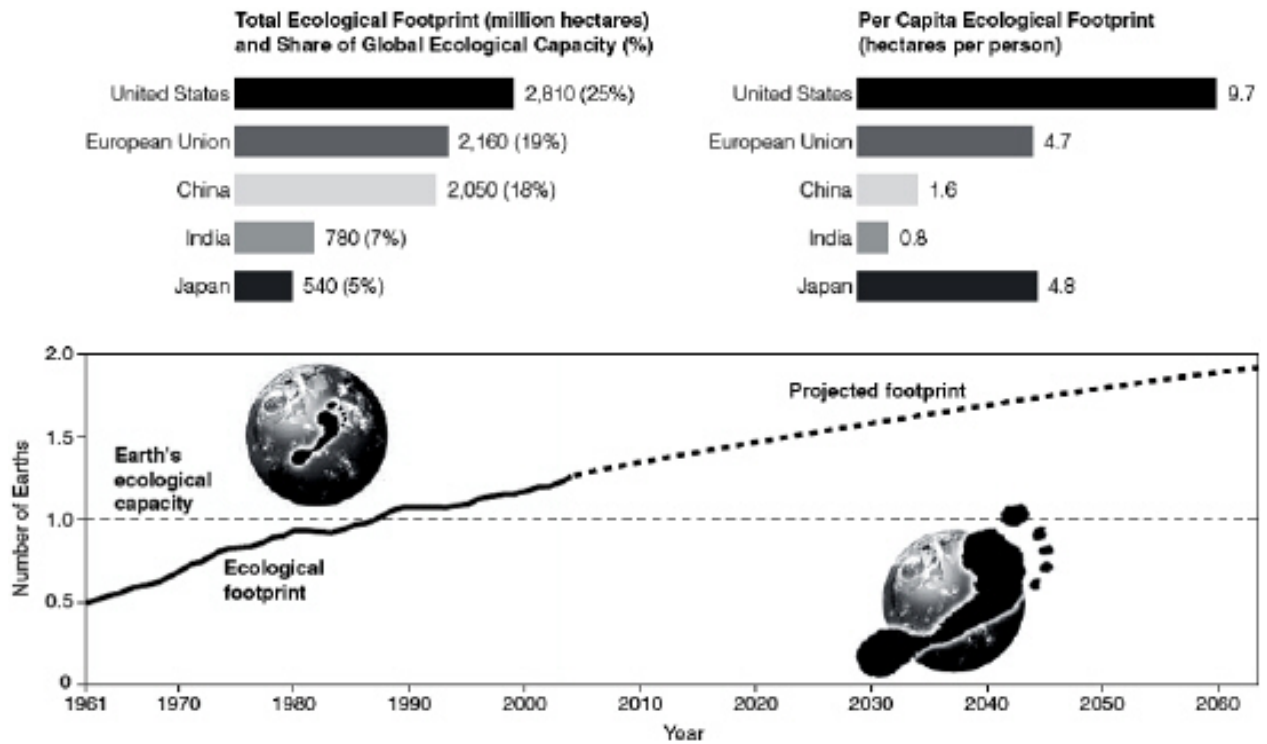
82.



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

What is the current percentage difference between humanity's ecological footprint and earth's ecological capacity?

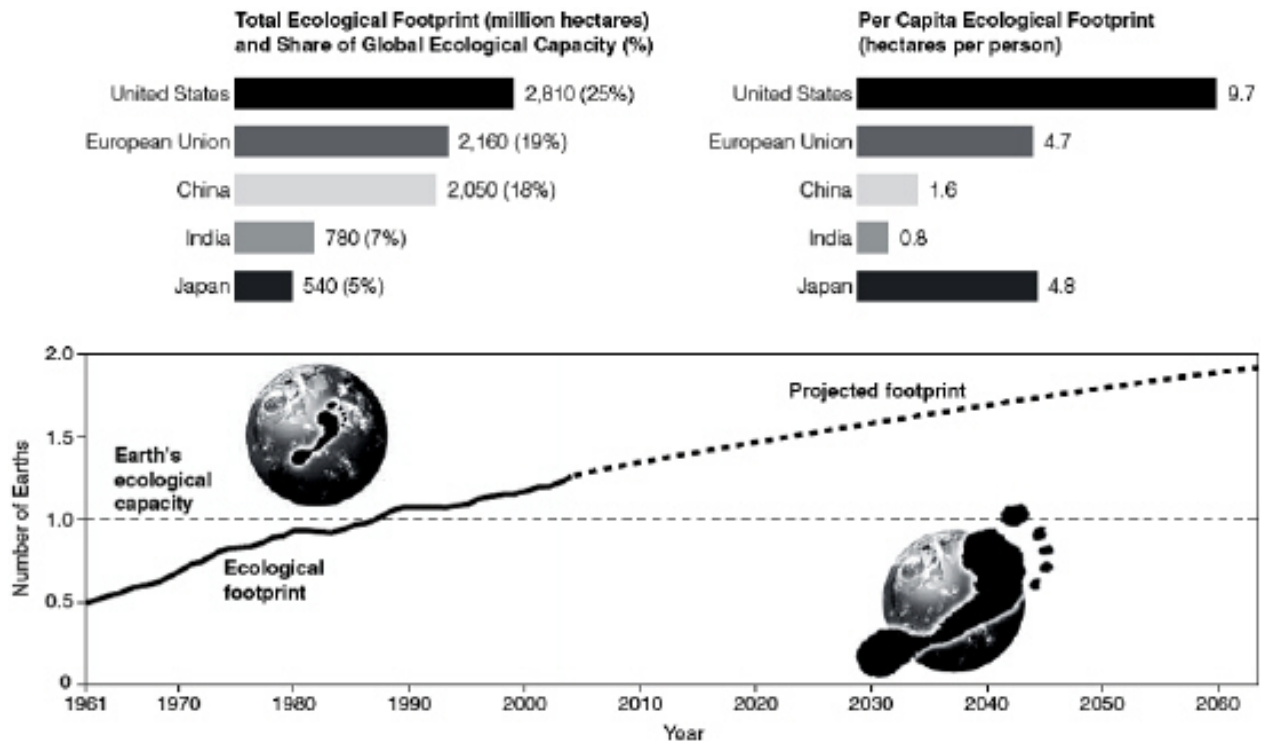
83.



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

What will happen if humanity's ecological footprint continues to be greater than earth's ecological capacity?

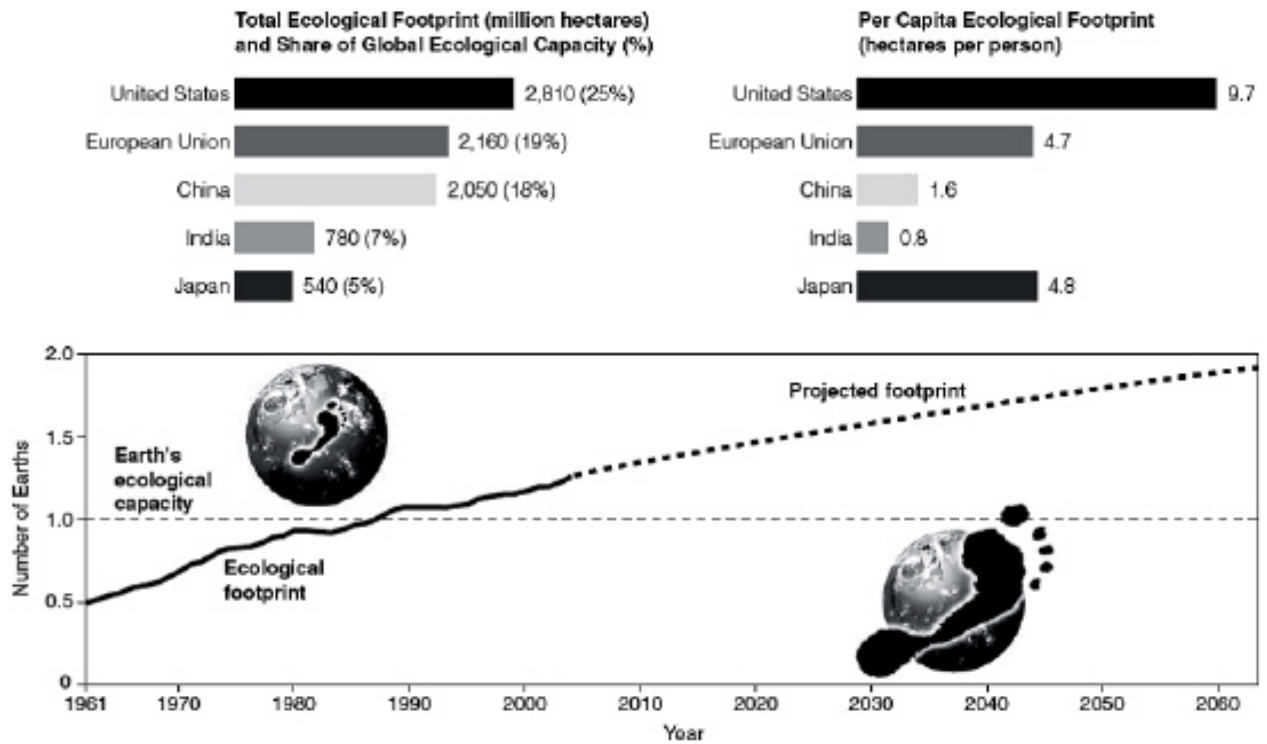
84.



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

How much greater is India's total ecological footprint than that of Japan?

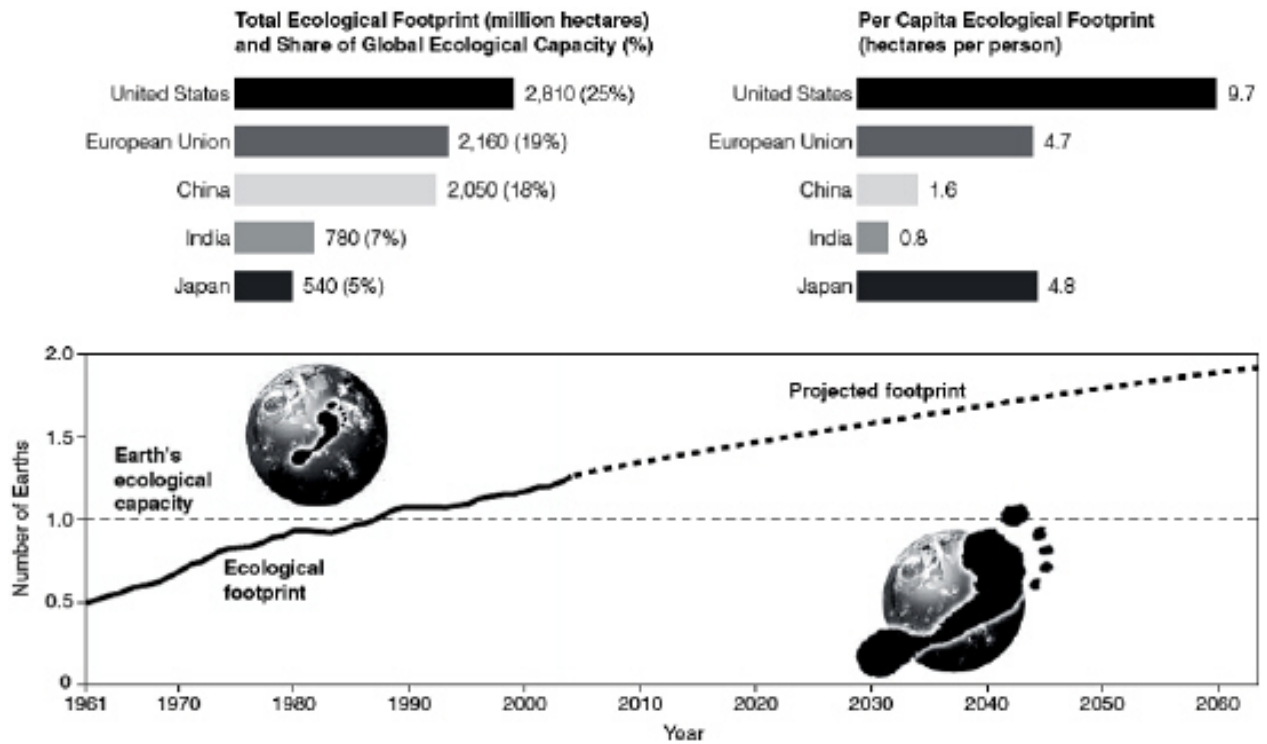
85.



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

What does the difference between the ecological footprint of India and Japan mean?

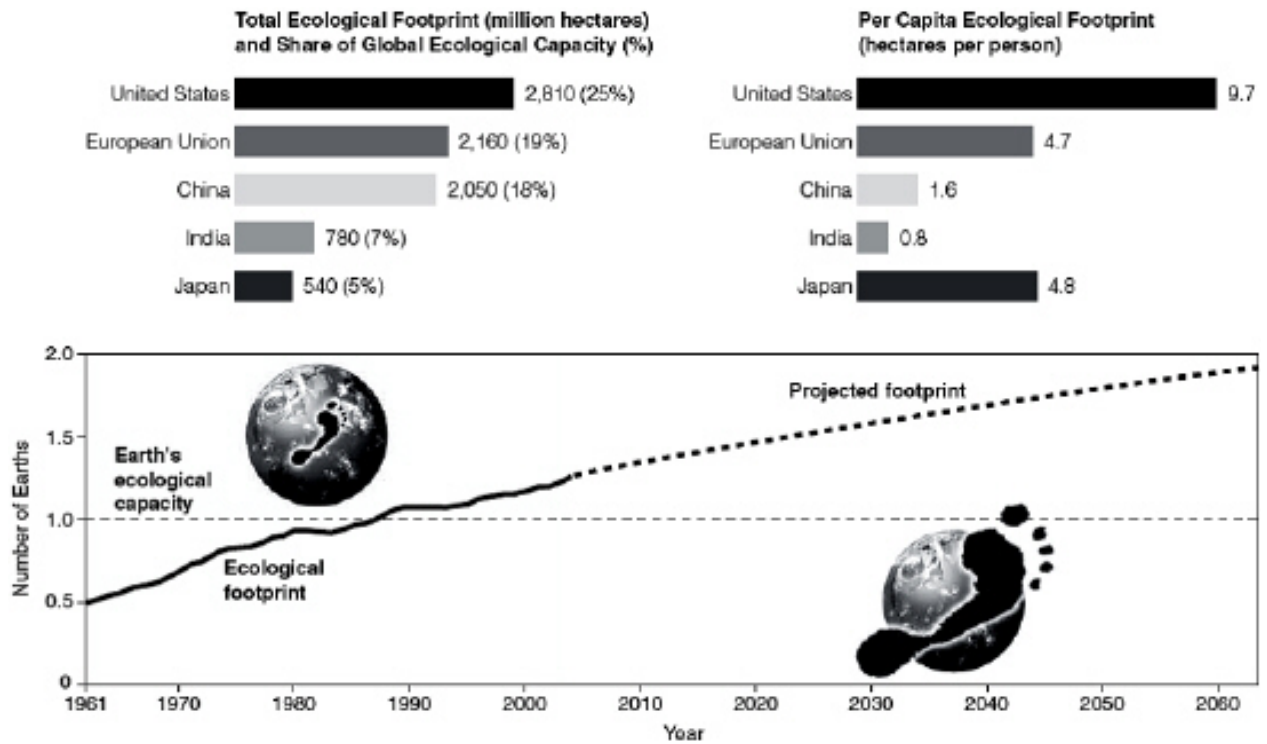
86.



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

Assuming you will retire at age 70, how many earths will be necessary to support the earth's human population at that time?

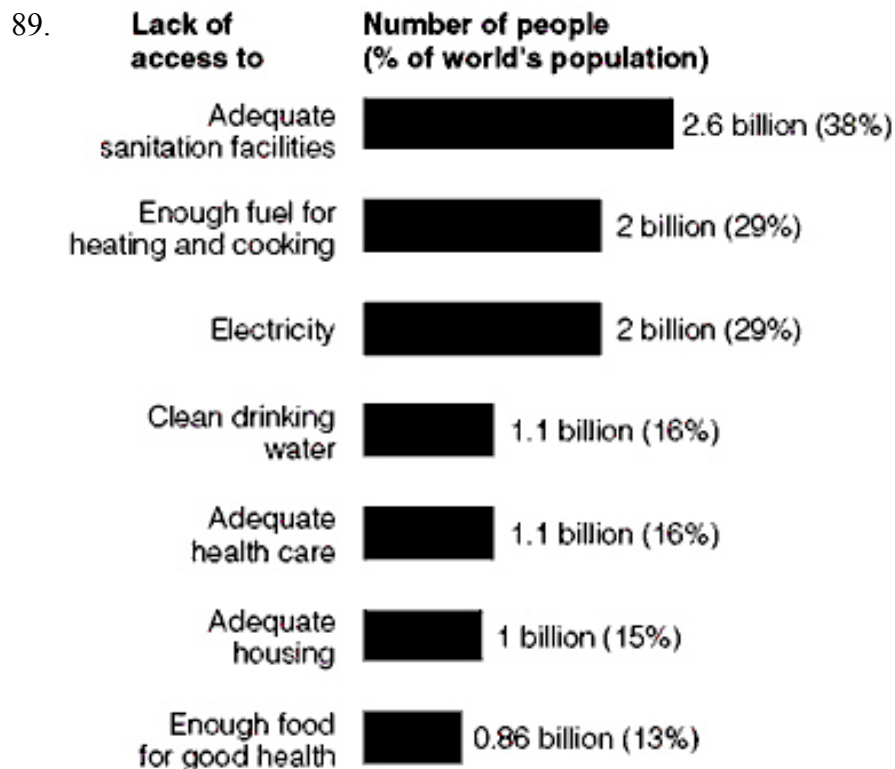
87.



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

What is the percentage of the per capita ecological footprint for a person in China as compared to a person in the United States?

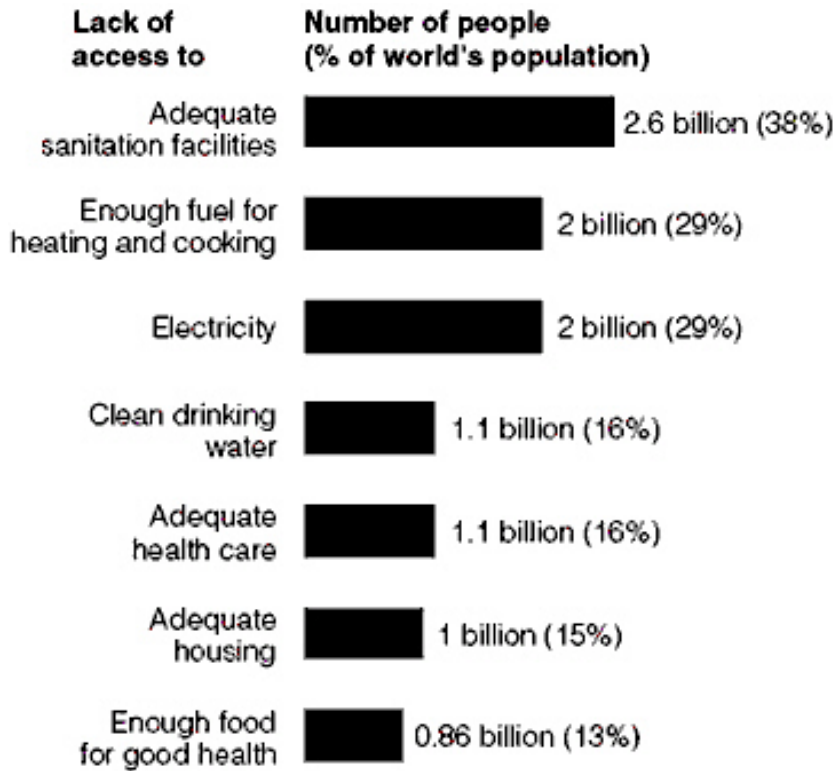
88. What percentage of the world's pollution is the responsibility of developed countries?



Use the Figure above to answer the following question. Assume that the total world population is 6.9 billion people, and the total population of the United States is 310 million people.

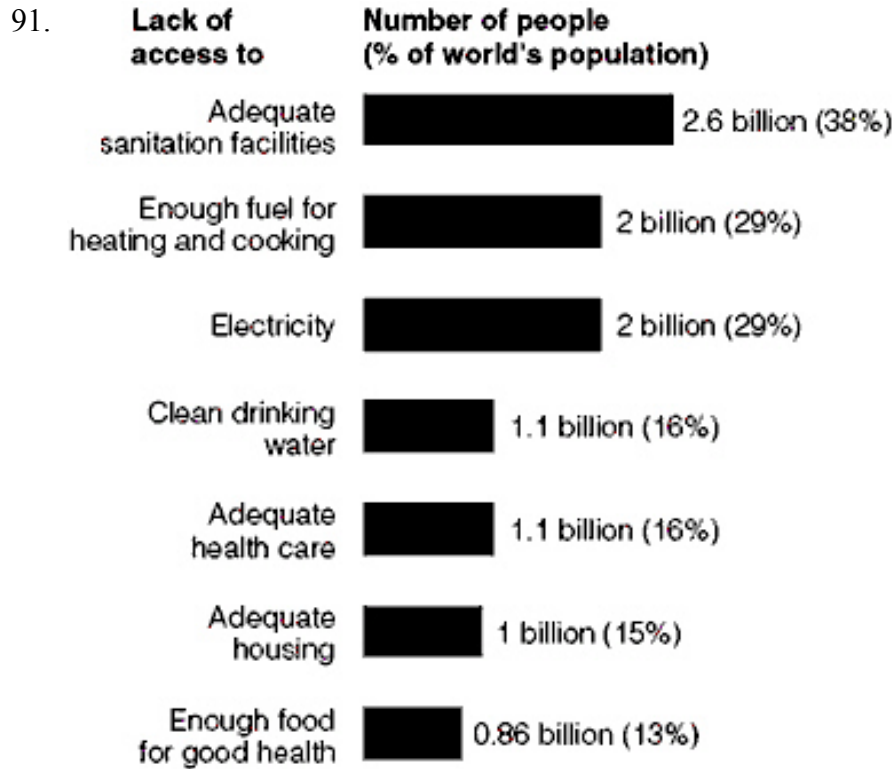
Those people who lack clean drinking water are equal to what percentage of the population of the United States?

90.



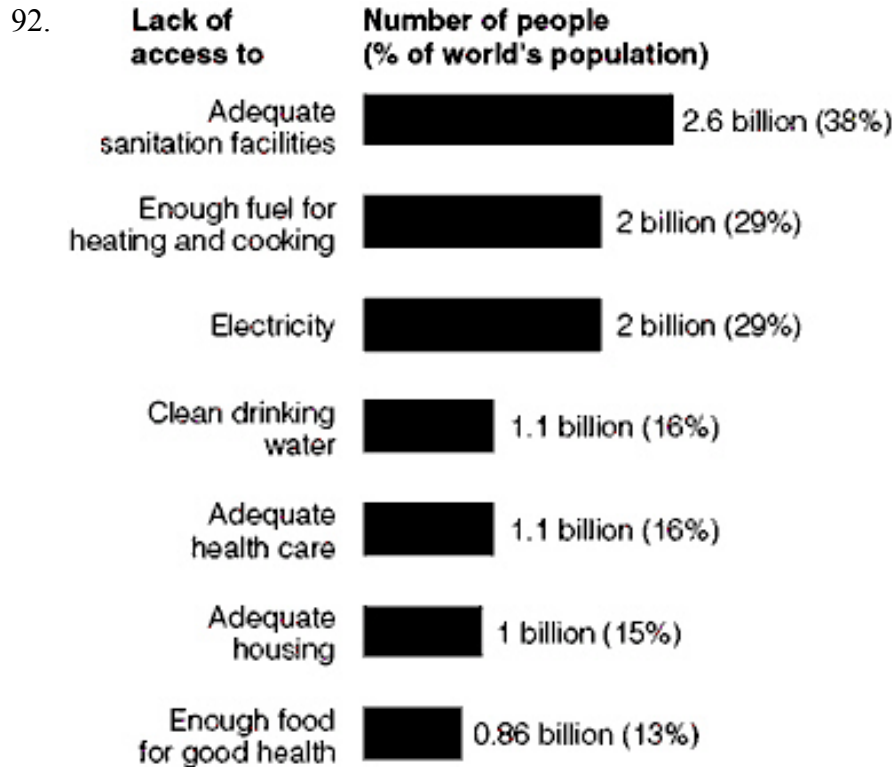
Use the Figure above to answer the following question. Assume that the total world population is 6.9 billion people, and the total population of the United States is 310 million people.

What percentage of the world's total population lacks adequate sanitation facilities?



Use the Figure above to answer the following question. Assume that the total world population is 6.9 billion people, and the total population of the United States is 310 million people.

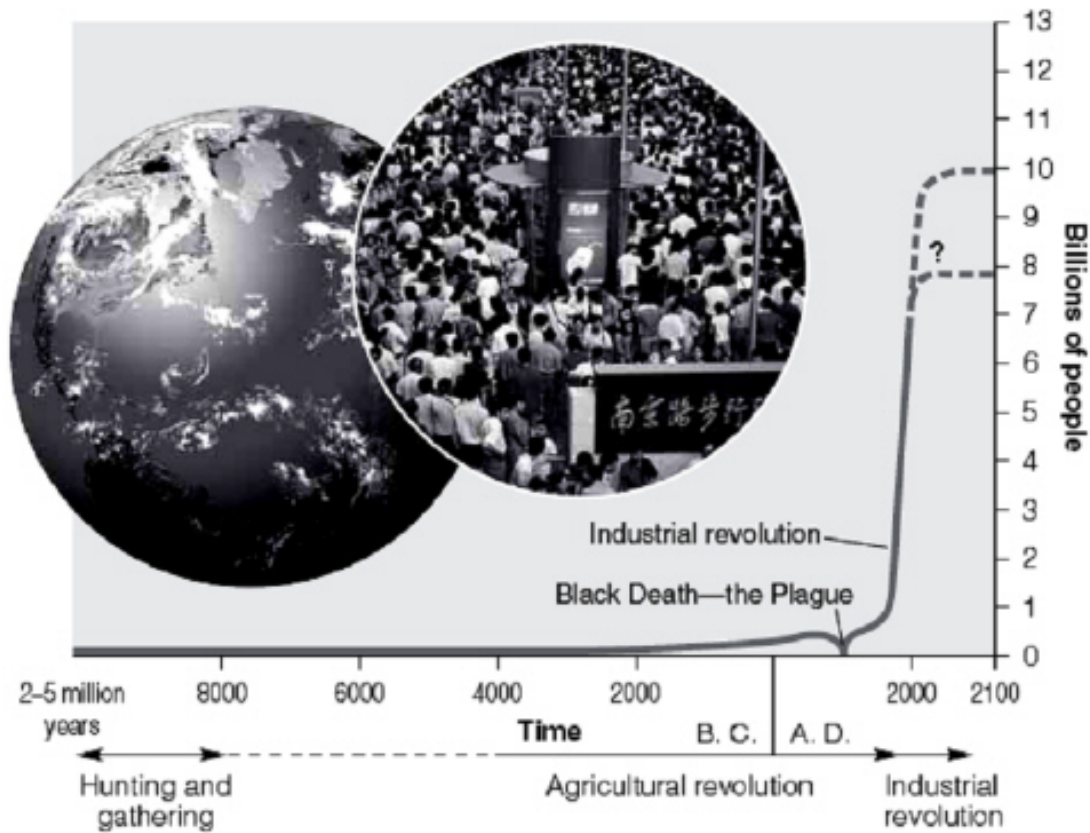
What is the significance of those who lack adequate sanitation facilities, lack clean drinking water, and lack adequate health care?



Use the Figure above to answer the following question. Assume that the total world population is 6.9 billion people, and the total population of the United States is 310 million people.

What is the likely result if the portion of the world's population that lack adequate sanitation had their problem resolved?

93. The word "sustainability" is becoming a commonly used slogan. Many people who use the word may not understand the complexities involved in the concept. Explain how the author uses the concept of natural capital to argue for sustainability.
94. The author's suggest humans need to mimic the three strategies nature has followed toward sustainability. Explain why they suggest this.
95. The people of the United States are often said to have more of an impact on the environment than the citizens of other countries. Using the concepts of per capita resource use and per capita degradation, explain why that is true.



In the figure above note that following the Black Death, the line representing the total human population rose dramatically. This rise indicates a fundamental relationship between births, deaths, and growth rates. Discuss this relationship, indicating why the steep rise occurred, and why an expected leveling off may occur soon.

97. Describe what Garrett Hardin meant by the *Tragedy of the Commons*, and give an example.
98. It has been estimated (Rees and Wackemagel) that it would take the land area of five additional planet earths to meet the consumption of the people now on earth if they all consumed at the level of the United States. Discuss what the implications are of this statistic and any solutions that you see.
99. The "biological capacity" is the ability of the natural world to replenish its renewable resources and absorb the resulting waste products and pollution. Exceeding the biological capacity creates an "ecological deficit." Discuss the potential future implications for the earth resulting from the fact that we are currently exceeding the earth's biological capacity by about 25 percent.

100. As China and India become developed nations, their combined populations of nearly 3 billion people will be approximately 10 times more than that of the United States. As their per capita ecological footprint nears that of the United States, competition for resources will become more intense. What, if anything, should the developed countries of today do to lessen or avoid potential conflicts in the future?

101. According to Lester R. Brown concerning the western economic model:

"The western economic model—the fossil fuel-based, automobile-centered, throwaway economy—is not going to work for China. Nor will it work for India, which by 2033 is projected to have a population even larger than China's, or for the other 3 billion people in developing countries who are also dreaming the 'American dream'."

Do we, in the developed western world, have a responsibility to address this impending crisis, or should we merely strengthen our defenses and let the rest of the world work it out?

CHAPTER 1--ENVIRONMENTAL PROBLEMS, THEIR CAUSES, AND SUSTAINABILITY Key

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

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

64. the sun
65. natural resources, natural services
66. nutrient cycling
67. per capita GDP
68. least-developed
69. perpetual resource
70. renewable resources
71. reuse
72. Ecological footprint
73. common property
74. natural capital degradation
75. point
76. output pollution control
77. 1.3 billion
78. Affluence
79. China
80. ecological tipping point
81. environmental worldview
82. approximately 25% above ecological capacity
83. Humans will destroy their environment.
More and more animal and plant species will be lost.
Poverty and disease will increase.
84. 240 million hectares
85. India's overall effect on the environment is more severe than that of Japan.
86. Depends on their age
87. $1.6/9.7 = 16\%$
88. 75%
89. 355% (1100/100)
90. 38%
91. The interaction of these factors result in increased disease without the likelihood of proper intervention to prevent or cure them, making those populations vulnerable to difficult survival and/or death.
92. People would be living healthier, longer lives, and would likely be interested in becoming part of the developed world.
93. (page 8) The authors state: "natural capital can support the earth's diversity of species as long as we use its natural resources and services in a sustainable fashion."
94. (page 7) The author's state "To learn how to live more sustainably and thus more wisely, we need to find out how life on the earth has sustained itself. Our research leads us to believe that in the face of drastic environmental changes, there are three overarching themes relating to the long-term sustainability of life on this planet: solar energy, biodiversity, and chemical cycling."

95. (page 18) The author's state "In more-developed countries, high rates of per capita resource use and the resulting high per capita levels of pollution and resource depletion and degradation usually are the key factors determining overall environmental impact."

96. Death rate fell without a drop in birth rates. Leveling off will result when birth rate drops.

97. (Page 15) Hardin uses the term to indicate a resource that no one owns individually, that is held "in common," and which is available for exploitation. Open range land, owned by the government but used by ranchers to graze cattle, is an example.

98. (page 17) As countries move toward developed status their populace wishes to attain the level of affluence of the U.S. That level of affluence requires immense consumption of resources and is not physically possible. The pressure to attain U.S. levels of affluence will lead to heightened competition for the resources. Either alternative means of attaining affluence will have to be found, or increasing competition will lead to conflict for the resources, or both.

99. (page 16) Overuse of a resource will result in its degradation and ultimately its permanent loss. The pollution levels resulting from the use of the resource will overcome the biological capacity to cleanse the earth and societies will suffer from both results.

100. (page 18+) Steps taken today to become more sustainable, that is to emphasize sustainability, may reduce the competition that would be inevitable. Without taking those steps, we will have no moral justification for overconsumption and advocating for sustainability will be all the more difficult.

101. (page 18) This answer depends on the worldview of the individual. If the person believes the U.S. has a right to anything it wants, then he/she will likely suggest beefing up the military and claiming "our right" to what we want. If the person sees the world in terms of sharing or justice, then sustainability leading to a more egalitarian distribution may be the direction.