

1. According to the second law of thermodynamics,
  - (A) energy can neither be created nor destroyed, only changed in form
  - (B) energy can be destroyed but not created
  - (C) the entropy of the universe is continually fluctuating between zero and infinity
  - (D) the entropy of the universe tends to increase
  - (E) the amount of energy in the universe is finite and steadily decreasing
  
2. Which of the following is NOT an example of high-quality energy?
  - (A) Electricity
  - (B) Heat in the Pacific Ocean
  - (C) Chemical energy in coal and gasoline
  - (D) Concentrated sunlight
  - (E) Nuclei of uranium-235 as fuel in power plants
  
3. Which of the following orders has the types of coal arranged from most moisture content to least moisture content ?
  - (A) Lignite, Bituminous, Peat, Anthracite
  - (B) Peat, Bituminous, Lignite, Anthracite
  - (C) Anthracite, Bituminous, Lignite, Peat
  - (D) Peat, Lignite, Bituminous, Anthracite
  - (E) Anthracite, Lignite, Bituminous, Peat
  
4. Which of the following measure(s) energy?
  - I. BTU's
  - II. Torr
  - III. Calories
  - IV. Candela
  - V. Joules
  - (A) I only
  - (B) I and III only
  - (C) I, III and V only
  - (D) I, II, III and V only
  - (E) I, III, IV and V only
  
5. The U.S. is highly vulnerable to energy crises because:
  - (A) About 50% of U.S. oil use is supported by imports.
  - (B) Only 4% of world oil reserves are U.S.-owned.
  - (C) The U.S. consumes 33% of the world's oil.
  - (D) all of the above
  - (E) none of the above
  
6. What percentage of the water on Earth is unsuitable for human use?
  - (A) 65%
  - (B) 75%
  - (C) 85%
  - (D) 95%
  - (E) 99%

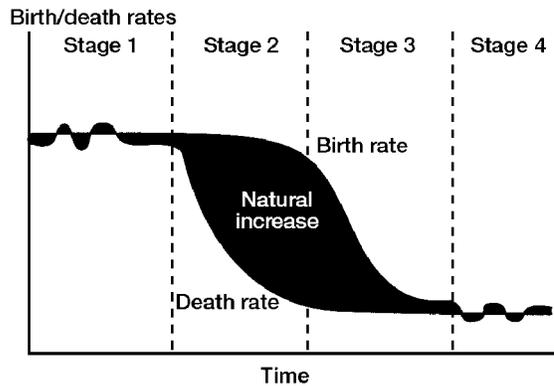
7. Human activities have dramatically changed the water cycle by
  - I. increasing infiltration
  - II. increasing surface runoff
  - III. increasing condensation
  - (A) I only
  - (B) II only
  - (C) III only
  - (D) I and II only
  - (E) II and III only
  
8. Clearing of vegetation from land, mining, and road building does NOT lead to which of the following?
  - (A) Increase in runoff
  - (B) Reduced infiltration that replenishes groundwater
  - (C) Increased flooding
  - (D) Accelerated soil erosion and landslides
  - (E) Intrusion of ocean water into underground water supplies
  
9. Phosphorus commonly occurs
  - I. in the gaseous phase
  - II. in an oxidized state
  - III. in compounds with metals
  - (A) I only
  - (B) II only
  - (C) III only
  - (D) I and III only
  - (E) II and III only
  
10. The greatest source of sulfur release into the environment is/are
  - (A) animal and plant biomass decomposition
  - (B) deep sea vents
  - (C) erosion
  - (D) fossil fuel combustion
  - (E) volcanic eruptions
  
11. According to most scientific evidence, the largest known extinction of living organisms occurred during which period?
  - (A) Cretaceous
  - (B) Devonian
  - (C) Ordovician
  - (D) Permian
  - (E) Triassic
  
12. Effects of the eruption of Mt. Saint Helens included all of the following EXCEPT
  - (A) flooding caused by glacial melting
  - (B) increased soil erosion
  - (C) tree removal and damage
  - (D) water retention caused by debris accumulation
  - (E) widespread ash distribution

13. The energy of an earthquake with Richter magnitude  $M$  is given by the formula  
 (A)  $1.74 + 10^{(5 + 1.44M)}$  (D)  $1.74 \times 10^{(1.44M)}$   
 (B)  $1.74 \times 10^{(5 + 1.44M)}$  (E)  $1.74 \times 10^{(5 \times 1.44M)}$   
 (C)  $1.74 \times 10^{(5 - 1.44M)}$
14. Which of the following developments in the Earth's early atmosphere most directly allowed animals to develop and live on the land?  
 (A) The formation of the ozone layer  
 (B) Introduction of methane and  $\text{CO}_2$  into the atmosphere  
 (C) Introduction of oxygen into the atmosphere  
 (D) A combination of lightning and UV radiation  
 (E) Introduction of helium and hydrogen into the atmosphere
15. Which of the following is the most accurate approximation of the composition of the atmosphere?  
 (A) Nitrogen, 78%; oxygen, 21%; argon, 1%  
 (B) Nitrogen, 21%; oxygen, 78%; carbon dioxide, 1%  
 (C) Nitrogen, 78%; oxygen 21%; carbon dioxide, 1%  
 (D) Nitrogen, 1%; hydrogen, 78%; oxygen, 21% ;  
 (E) Oxygen, 78%; carbon dioxide, 21%; argon, 1%
16. In the northern hemisphere, the prevailing winds travel  
 (A) from east to west  
 (B) from west to east  
 (C) from north to south  
 (D) from south to north  
 (E) in many directions depending on a number of factors
17. Precipitation distribution over land masses depends on all of the following factors EXCEPT  
 (A) surface-water temperatures of nearby bodies of water  
 (B) direction of winds  
 (C) distance from bodies of water  
 (D) moisture content of air  
 (E) longitudinal location
18. According to the Coriolis effect, the rotation of the earth would cause a Southern Hemisphere wind originally moving south to actually move  
 (A) east (D) south-east  
 (B) north-east (E) south-west  
 (C) north-west
19. Much of the animal life, particularly insects, bats, and birds live in which sunny layer of tropical rain forests?  
 (A) Emergent layer (D) Shrub layer  
 (B) Canopy layer (E) Ground layer  
 (C) Understory layer
20. Which two life zones in oceans are usually considered below the continental shelf?  
 (A) Bathyal and Euphotic (D) Euphotic and Abyssal  
 (B) Bathyal and Abyssal (E) Euphotic and Coastal  
 (C) Coastal and Abyssal
21. Which of the following is TRUE about predator-prey relationships?  
 (A) Prey at an individual level can benefit from predation.  
 (B) The prey population crash is always caused by a limited resource.  
 (C) The predator growth is always responsible for the prey population crash.  
 (D) Population level predation can benefit the prey species by improving the genetic stock of the prey population.  
 (E) Predators often kill the healthiest and choicest of the prey populations.
22. The least amount of useful energy flowing through a food chain is available to the  
 (A) herbivores (D) secondary consumers  
 (B) primary consumers (E) tertiary consumers  
 (C) producers
23. What organisms are the key elements in a pioneer community?  
 (A) Shrubs (D) Mosses  
 (B) Trees (E) Grasses  
 (C) Lichens
24. Allopatric speciation is the process by which  
 (A) a population that inhabits a particular area is divided into two or more geographically separated groups  
 (B) members of two distinct species interbreed  
 (C) evolution selects organisms for survival  
 (D) the gene pool is stabilized  
 (E) the background rate of extinction is doubled

25. Which of the following statements concerning biodiversity and ecosystem stability is FALSE?
- (A) The more diverse an ecosystem is, the less redundancy there is with species occupying the same niches.
  - (B) There is a minimum threshold of species diversity below which ecosystems can't work.
  - (C) Without exception, the higher the species diversity of an ecosystem, the more stable that ecosystem is.
  - (D) Ecosystems with higher biodiversity tend to have lower net productivities.
  - (E) Ecosystems with higher biodiversity tend to fluctuate less widely than simpler ones.
26. Predatory-prey relationships are often examples of
- (A) coevolution
  - (B) commensalism
  - (C) parasitism
  - (D) convergent evolution
  - (E) divergent evolution
27. A country is going through the demographic transition. As the country enters negative growth rate, which of the following generally stops changing?
- (A) Fertility rate
  - (B) Population under age
  - (C) Average family size
  - (D) Birth rate
  - (E) Death rate
28. The exponential curve of human population growth is described as
- (A) a C-Curve
  - (B) a J-Curve
  - (C) a K-Curve
  - (D) an L-Curve
  - (E) an S-Curve
29. What percentage of oil can be recovered from a well using only primary production methods?
- (A) 0%
  - (B) 25%
  - (C) 50%
  - (D) 75%
  - (E) 100%
30. The global carrying capacity for human beings is estimated to be approximately
- (A) 5 billion
  - (B) 10 billion
  - (C) 15 billion
  - (D) 20 billion
  - (E) 25 billion
31. Which of the following species of fish is neither overfished nor depleted?
- (A) Atlantic Cod
  - (B) Albacore Tuna
  - (C) Alaska Pollock
  - (D) Silver Hake
  - (E) Shrimp

32. Base your answer to the following question on the demographic transition graph below.

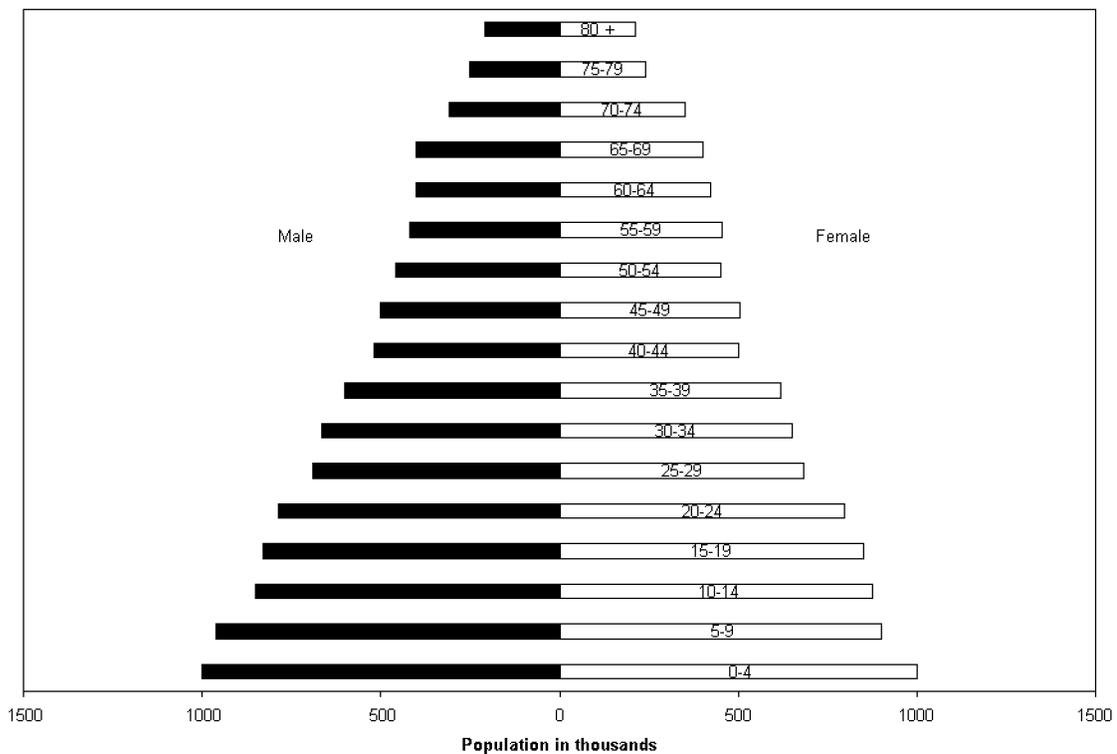
**The Classic Stages of Demographic Transition**



Note: Natural increase or decrease is produced from the difference between the number of births and deaths.

- Most of human history has been spent in which stage of transition?
- (A) Stage 1
  - (B) Stage 2
  - (C) Stage 3
  - (D) Stage 4
  - (E) Human population has not spent an inordinate amount of time in one specific stage.
33. The western industrial revolution would have been surprising to \_\_\_\_\_ in that \_\_\_\_\_.
- (A) Malthus; economic growth kept up with population growth
  - (B) Malthus; wages kept up with birth rates
  - (C) Ricardo; economic growth kept up with population growth
  - (D) Ricardo; wages kept up with death rates
  - (E) Malthus and Ricardo; the economy stopped growing while population continued to rise
34. Desalination as a method of producing fresh water
- (A) is cheaper and more energy efficient than most other methods of producing fresh water
  - (B) is used all widely in many coastal areas in developed countries
  - (C) is used mostly in coastal areas of arid countries such as Saudi Arabia
  - (D) produces a lot of harmful air pollutants near the desalination factories
  - (E) produces mountains of salt which are harmlessly disposed of into the ocean

35. The graph below represents the population of a city in which country?



- (A) Uganda, a less-developed country
- (B) United States, a highly-developed country
- (C) Canada, a less-developed country
- (D) Australia, a less-developed country
- (E) India, a highly-developed

36. Xeriscaping conserves water by
- (A) purifying water used industrially for cooling
  - (B) reducing household shower water consumption needs
  - (C) reducing household lawn irrigation needs
  - (D) reducing water leakage from fire hydrants
  - (E) purifying gray water and sewage for non-drinking use

37. Bottled water

- I. is frequently contaminated
- II. is far safer than tap water
- III. is tested by the FDA

- (A) I only
- (B) II only
- (C) III only
- (D) II and III only
- (E) I, II and III

38. Which of the following would have the best water holding capacity yet the poorest aeration?

- (A) Clay
- (B) Loam
- (C) Gravel
- (D) Silt
- (E) Sand

39. The greatest precipitation in the United States is found in

- (A) the Southwest
- (B) the Northeast
- (C) the Midwest
- (D) the Pacific Northwest
- (E) the Great Lakes Region

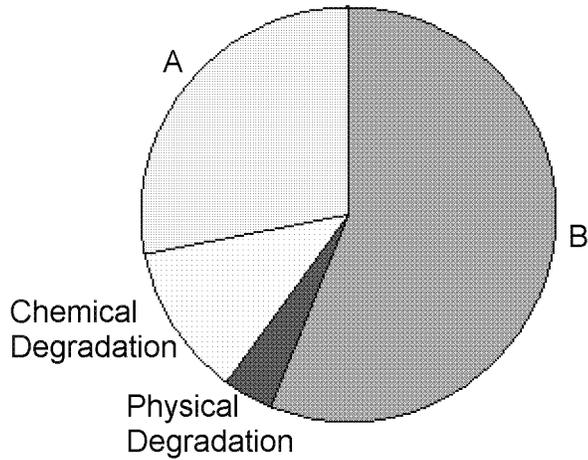
40. While searching for oil deposits, mining companies should look for what type of rocks?

- (A) Dolostone and agate
- (B) Coal and sandstone
- (C) Limestone and shale
- (D) Granite and basalt
- (E) Schist and marble

41. A forest that has large numbers of standing dead trees and fallen logs, providing habitats for large numbers of species is known as a

- (A) old-growth forest
- (B) primary growth forest
- (C) secondary growth forest
- (D) new growth forest
- (E) tertiary growth forest

42. The diagram below depicts soil degradation.



What type of degradation do A and B represent, respectively?

- (A) Wind erosion, Water erosion
  - (B) Water erosion, Wind erosion
  - (C) Water erosion, overgrazing
  - (D) Overgrazing, Row cropping
  - (E) Row cropping, wind erosion
43. The direct cause of the Irish Potato Famine of 1845 was
- (A) the fungal disease caused by *Phytophthora infestans*
  - (B) a variant of the tobacco mosaic virus
  - (C) widespread drought in the northern hemisphere
  - (D) unusually low temperatures during the early growing season
  - (E) the introduction of exotic pests through trade
44. The world's three most important food crops are
- (A) cereal grains
  - (B) ground crops
  - (C) fruits
  - (D) legumes
  - (E) leaf crops
45. To help feed the world's hungry, which of the following is the most viable solution?
- (A) Forcing countries to implement population control measures
  - (B) Irrigating more land to increase food production in areas such as China and India
  - (C) Slowing population growth using methods like mandatory family planning education and encouraging contraceptive use
  - (D) Cultivating more land by clearing tropical rain forests and irrigating arid land
  - (E) Increasing and expanding the green revolution greatly to underdeveloped countries

46. Which of the following is likely to occur if the entire US population shifts to vegetarianism?
- (A) Zero change in the net food energy flow and in the net fossil fuel energy flow
  - (B) A drastic reduction in fossil fuel energy usage and a drastic increase in food energy efficiency
  - (C) A reduction in the number of habitats being destroyed for agricultural purposes
  - (D) An increase in phosphate and nitrate pollution in streams and lakes
  - (E) A drastic change in the US population growth curve
47. The half-life of Uranium 238 is approximately
- (A) 25 years
  - (B) 10,000 years
  - (C) 3,000,000 years
  - (D) 50,000,000 years
  - (E) 4,500,000,000 years
48. Environmentalists are most concerned with using nuclear energy because
- (A) of the difficulties involved in disposing of nuclear waste
  - (B) of the extremely high cost to build nuclear reactors
  - (C) of the extremely high chance of reactor meltdowns
  - (D) of the greenhouse gas emissions that come from nuclear power plants
  - (E) of the land disruption that is involved in mining radioactive minerals
49. Which of the following best describes how a nuclear reactor works?
- (A) In a fusion chain reaction, neutrons are absorbed into the nuclei of heavy atoms and release energy as heat, producing steam that spins electric generating turbines.
  - (B) In a fission chain reaction, neutrons split the nuclei of heavy atoms and release energy as heat, producing steam that spins electric generating turbines.
  - (C) In a fission chain reaction, electrons split the nuclei of light atoms and release energy as electricity, producing steam that spins heat generating turbines.
  - (D) In a fusion chain reaction, protons split the nuclei of heavy atoms and release energy as electricity, producing heat that spins energy generating turbines.
  - (E) In a fission chain reaction, neutrons are absorbed into the nuclei of heavy atoms and release energy as heat, producing steam that spins electric generating turbines.

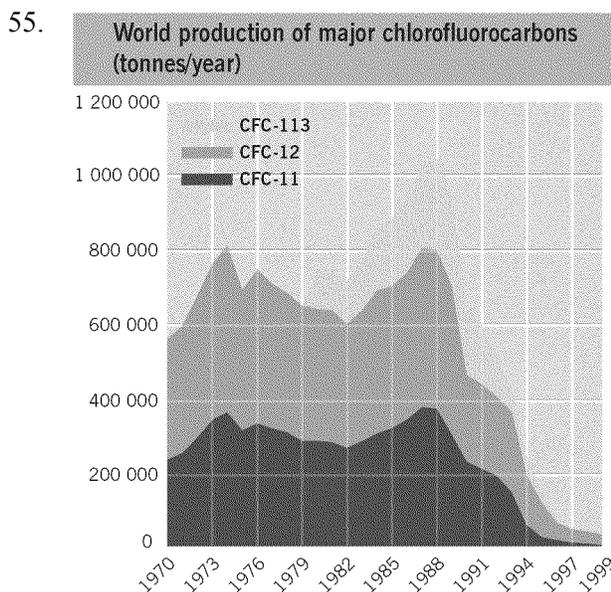
50. Which of the following is NOT a general conclusion that most scientists have reached concerning the future of the world's energy crisis?
- (A) There will be a shift from centralized power systems to smaller decentralized power systems.
  - (B) The best energy alternative is natural gas.
  - (C) Fossil fuels will continue to be used over the next 50 years.
  - (D) There is not enough financial capital to develop all energy alternatives.
  - (E) It is not possible to switch to all renewable sources of energy anytime soon.

51. Producing new steel from recycled scrap metal
- (A) costs more than producing steel from virgin materials
  - (B) creates more air pollution than producing steel from virgin materials
  - (C) creates more consumer waste than producing steel from virgin materials
  - (D) results in less water use than producing steel from virgin materials
  - (E) results in less valuable material than producing steel from virgin materials

52. The use of fertilizer rapidly increased from 1950 to 1990. More recently, the increase has slowed. Which of the following most accurately explains why?
- (A) Fertilizers have caused many pests to become extinct and are no longer a problem.
  - (B) Benefits of using fertilizer are not great due to the current expense of applying such treatments.
  - (C) People have become aware that the law of diminishing returns applies to fertilizer use.
  - (D) People do not have access to fertilizer since many countries have completely banned its sale.
  - (E) Farming has decreased more recently and therefore fertilizer use has decreased.

53. All of the following are considered green house gases EXCEPT
- (A) methane
  - (B) nitrous oxide (N<sub>2</sub>O)
  - (C) carbon dioxide
  - (D) helium
  - (E) carbon tetrafluoride

54. Which of the following is NOT a secondary air pollutant?
- (A) SO<sub>2</sub>
  - (B) O<sub>3</sub>
  - (C) SO<sub>3</sub>
  - (D) PANs
  - (E) H<sub>2</sub>O<sub>2</sub>



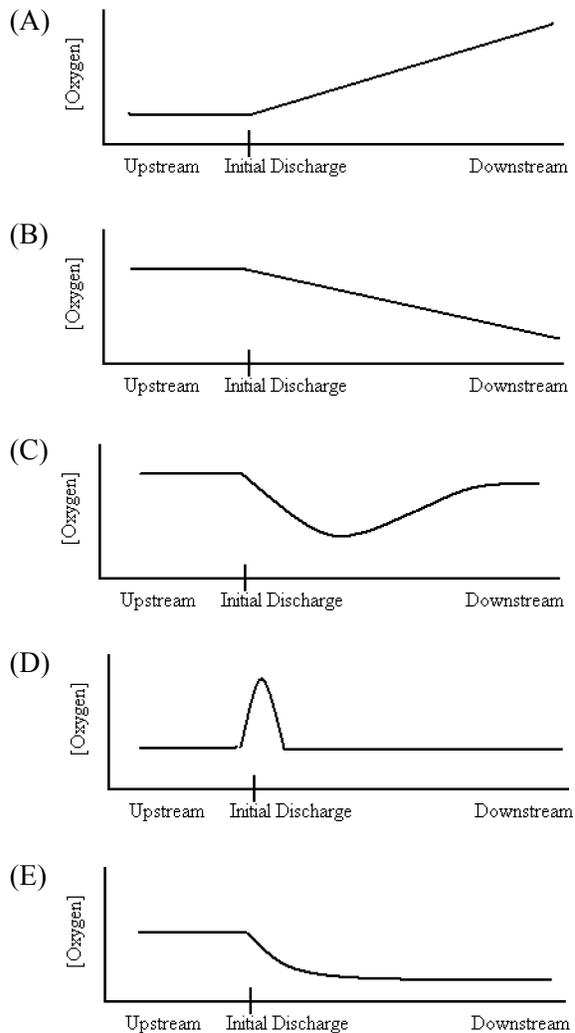
Source: AFEAS 2001

According to the graph above, which period is characterized by the greatest decrease in CFC emissions?

- (A) 1973-1976
  - (B) 1985-1881
  - (C) 1988-1991
  - (D) 1991-1994
  - (E) 1994-1997
56. DDT has been replaced nowadays with
- (A) organophosphates which are less toxic to humans but are more persistent
  - (B) organophosphates which are highly toxic to humans but are less persistent
  - (C) organophosphates which are less toxic to humans and less persistent
  - (D) chlorocarbons which are less toxic to humans but are more persistent
  - (E) chlorocarbons which are more toxic to humans but are less persistent
57. Thermal pollution
- (A) destroys aquatic life by increasing dissolved oxygen levels
  - (B) makes aquatic organisms more vulnerable to parasites and toxic chemicals
  - (C) is mainly a result of overexposure to the sun's rays
  - (D) can be prevented by the ample use of air conditioning
  - (E) none of the above

58. One gallon of gasoline can pollute  
 (A) 5,000 gallons of freshwater  
 (B) 50,000 gallons of freshwater  
 (C) 100,000 gallons of freshwater  
 (D) 1,000,000 gallons of freshwater  
 (E) 10,000,000 gallons of freshwater
59. Which of the following cities is regarded as having the worst air quality in the world?  
 (A) Los Angeles, USA (D) Bangkok, Thailand  
 (B) Beijing, China (E) Santiago, Chile  
 (C) Mexico City, Mexico
60. On December 3, 1984, a chemical plant involved in the production of the pesticide Carbaryl (sevin) released a plume of methyl isocyanate killing over 2000 people and injuring over 15,000 in the city of  
 (A) Nairobi, Kenya  
 (B) Ougadogo, Burkina Faso  
 (C) Bhopal, India  
 (D) Seviso, Italy  
 (E) Minimata Bay, Japan
61. Increased flooding due to global warming can  
 (A) purify water wells  
 (B) dilute nutrients in lakes  
 (C) spread disease-carrying pathogens  
 (D) lower concentrations of harmful chemicals in waterways  
 (E) decrease the rate at which microorganisms reproduce
62. Seawater is naturally acidic because it contains  
 (A) dissolved sodium chloride (salt)  
 (B) dissolved carbon dioxide  
 (C) dissolved oxygen  
 (D) phytoplankton  
 (E) none of the above
63. Which of the following is NOT a way in which deposition of chemicals such as  $H_2SO_4$  can harm vegetation?  
 (A) By releasing aluminum ions from insoluble compounds, hindering uptake of nutrients by plants  
 (B) By deoxygenating soil after reacting with calcium compounds  
 (C) By leaching plant nutrients such as magnesium from soils  
 (D) By promoting the growth of acid-loving mosses that kill trees  
 (E) By weakening trees so that they are more susceptible to disease

64. Runoff from a power plant is discharging pollution into a stream. Which of the following graphs accurately represent the distance from the discharge versus dissolved oxygen concentration?

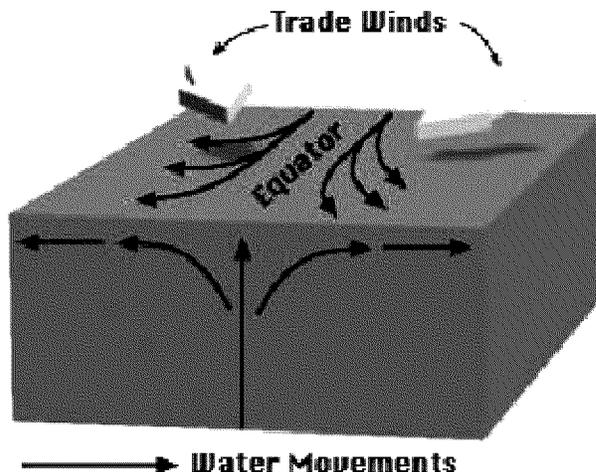


65. Stone decay occurs approximately twice as rapidly in cities as in rural areas and is due mainly to  
 (A) the absence of wildlife  
 (B) the preservative effects of synthetic pesticides on minerals  
 (C) the deteriorating effects of acid precipitation  
 (D) higher relative humidity  
 (E) none of the above
66. Which of the following is considered a greenhouse gas?  
 (A) Oxygen (D) Cobalt  
 (B) Nitrogen (E) Radon  
 (C) Methane

67. The depletion of stratospheric ozone increases the damage to biological tissues due to
- I. UVA radiation  
 II. UVB radiation  
 III. UVC radiation
- (A) I only (D) II and III only  
 (B) II only (E) I, II and III  
 (C) III only
68. Phytoremediation is the process by which
- (A) contaminated wastewater is concentrated through chemical and physical means  
 (B) organic contaminants in groundwater are destroyed by high-frequency radiation  
 (C) steam is forced into an aquifer to vaporize volatile and semivolatile contaminants  
 (D) plants are used to remove or destroy contamination in groundwater or surface water  
 (E) solutions of toluene or methane are injected into contaminated groundwater to support the co-metabolic breakdown of contaminants
69. After the Chernobyl incident, what was distributed to children and adults in nearby areas to prevent cancer?
- (A) iodine pills  
 (B) calcium pills  
 (C) radioactive shielded clothing  
 (D) vitamin B pills  
 (E) radioactive shielded shelters
70. Which of the following is the best way to reduce acid deposition in the US?
- (A) Making smokestacks higher  
 (B) Building more smokestacks  
 (C) Adding calcium carbonate into lakes  
 (D) Switching from fossil fuels to other types of energy  
 (E) Developing acid resistant phytoplankton
71. The term mixed waste refers to
- (A) wastes found in liquid mixture form  
 (B) waste containing both corrosive and ignitable wastes  
 (C) waste containing both hazardous and radioactive waste  
 (D) wastes that react violently when mixed with water  
 (E) highly acidic or alkaline wastes
72. The US produces approximately what percent of the world's solid waste?
- (A) 5% (D) 50%  
 (B) 10% (E) 75%  
 (C) 33%
73. In contrast to high-level radioactive waste, most low-level radioactive waste is currently
- (A) put into steel drums and shipped to landfills  
 (B) incinerated  
 (C) recycled  
 (D) stored at reactor sites  
 (E) dumped into deep ocean trenches
74. A pregnant mother imbibes alcohol while pregnant. The baby is consequently born with numerous birth defects. The alcohol in this case is a
- (A) teratogen (D) carcinogen  
 (B) hazardous chemical (E) endogen  
 (C) mutagen
75. A village in a tropical rainforest has cleared vegetation around the houses, cultivated fish that feed on mosquito larvae in nearby ponds, and search for food high in zinc and vitamin A. Which of the following diseases is the village most likely trying to avoid?
- (A) Malaria (D) Ebola virus  
 (B) Measles (E) Hepatitis B  
 (C) Smallpox
76. Which of the following places the risks below in proper order from least to greatest?
- A. Risk of dying from an earthquake or volcano  
 B. Risk of dying once infected with Ebola  
 C. Risk of dying in a car accident  
 D. Risk of dying while giving birth in Mali
- (A) A,C,D,B (D) B,A,C,D  
 (B) C,A,D,B (E) D,A,B,C  
 (C) A,D,C,B
77. Methane is removed from the atmosphere by
- (A) natural gas companies  
 (B) fungi  
 (C) ruminative animals  
 (D) stratospheric oxidation  
 (E) microbes in retreating glaciers

78. Increasing atmospheric carbon dioxide concentrations suggest that
- (A) carbon has increased in abundance
  - (B) atmospheric changes have favored the production of carbon dioxide to that of carbon tetrachloride
  - (C) anthropogenic causes have a noticeable effect upon the atmosphere
  - (D) global temperatures may not be life-sustaining by the end of the twenty-first century
  - (E) the overall rate of photosynthesis has decreased
79. Ozone depletion has all of the following effects upon the environment EXCEPT
- (A) a reduction in food-crop production
  - (B) a decrease in carbon dioxide concentration
  - (C) a disruption of marine food chains
  - (D) an increased occurrence of skin cancer
  - (E) a reduction in primary productivity in marine ecosystems
80. Which of the following most accurately describes the seasonal thinning process of ozone over Antarctica?
- (A) ODCs accumulate in the Antarctic water during the spring until the heat of the summer evaporates ODCs into the atmosphere to destroy ozone.
  - (B) Cl molecules accumulate in the form of clouds during the fall until the cold of Antarctic winter precipitates out CFCs to destroy ozone.
  - (C) ClO and Cl molecules collect on the surface of ice crystals which accumulate during Antarctic spring until light releases large amounts of ClO in the summer to destroy ozone.
  - (D) Cl<sub>2</sub>O<sub>2</sub> molecules accumulate in a swirling vortex during Antarctic winter until light releases large amounts of Cl in the spring to destroy ozone.
  - (E) Cl molecules accumulate in the form of ice crystals during Antarctic winter until light releases large amounts of Cl in the spring to destroy ozone.
81. Successful invader species are characterized by all of the following EXCEPT
- (A) high reproductive rate
  - (B) K-selection
  - (C) high genetic variability
  - (D) generalist niche
  - (E) high dispersal rate
82. The average species becomes extinct after
- (A) 500 to 1000 years
  - (B) 50,000 to 100,000 years
  - (C) 500,000 to 1,000,000 years
  - (D) 5,000,000 to 10,000,000 years
  - (E) 50,000,000 to 100,000,000 years

83. Base your answer to the following question on the diagram below.



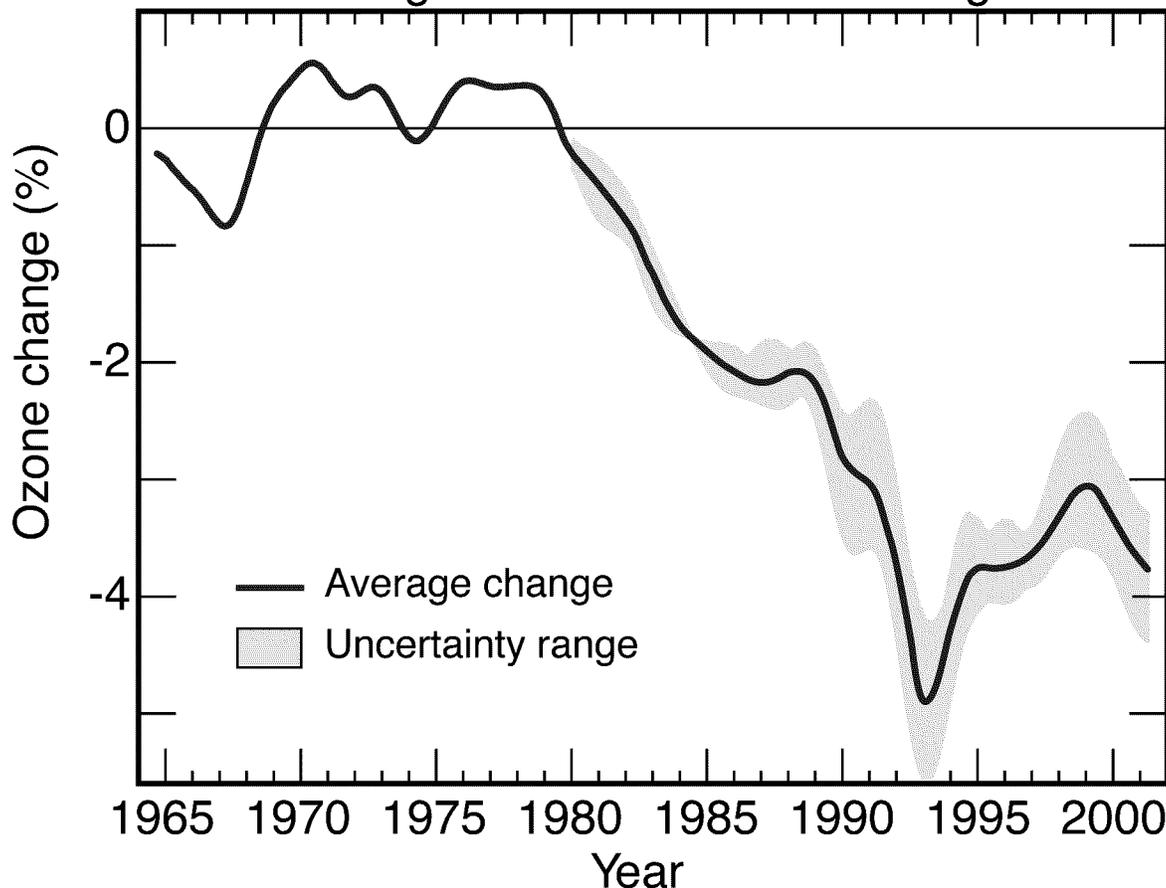
The diagram below represents which of the following?

- (A) Downwell
  - (B) Hurricane
  - (C) Upwell
  - (D) Warm water
  - (E) Any of the above
84. According to scientists which of the following describes how climate change is likely to affect biodiversity in the future?
- (A) Terrestrial ecosystems are expected to be more strongly affected than more robust freshwater ecosystems.
  - (B) Tropical areas will change in biodiversity more than arctic areas, being much more productive.
  - (C) Northern temperate ecosystems inhabited heavily by humans are expected to change in biodiversity the most.
  - (D) Invasive species are expected to dominate in freshwater systems, especially lakes.
  - (E) Biodiversity will increase because of changing habitats, allowing new species to evolve.
85. Increasing ultraviolet radiation is likely to have the greatest effect upon freshwater organisms in the
- (A) limnetic zone
  - (B) profundal zone
  - (C) benthic zone
  - (D) syntrophic zone
  - (E) hydrologic zone
86. The chance that a pesticide will be biomagnified is greatest if the substance has a high degree of
- (A) toxicity
  - (B) persistence
  - (C) water solubility
  - (D) volatility
  - (E) combustibility

87.

# Global Total Ozone Change

Changes from 1964-1980 average



Which of the following most likely caused the record low of ozone level in 1994?

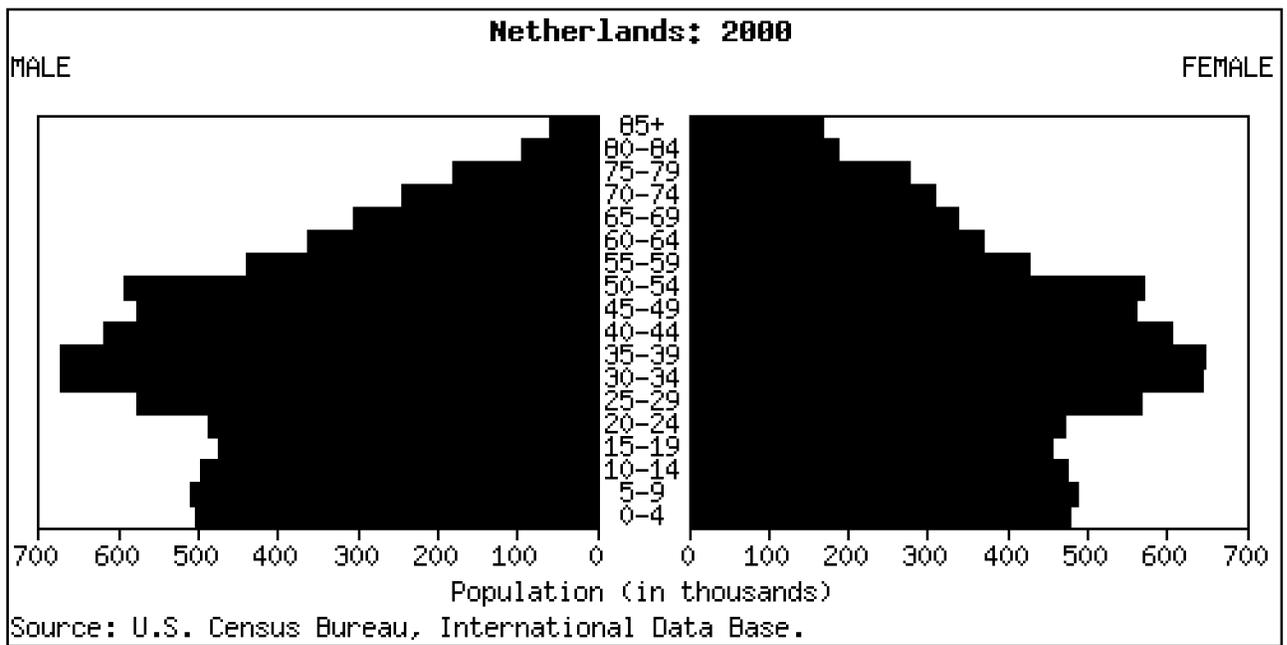
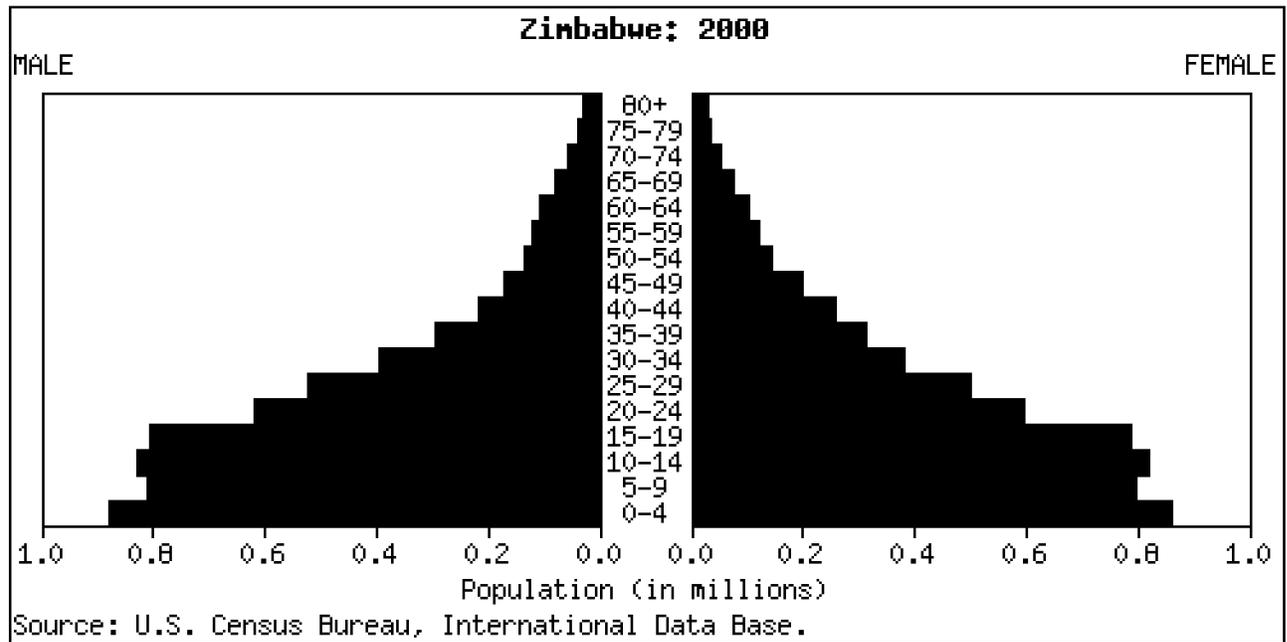
- (A) Eruption of Mt. Pinatubo in 1991  
 (B) Record high CO<sub>2</sub> emissions from heavy industries  
 (C) Sudden environmental policy change in 1990  
 (D) Eruption of Mount St. Helens in 1980  
 (E) Record high NO<sub>2</sub> emissions from chemical industries

88. Global warming conditions are likely to mimic El Niño conditions in that there will be  
 (A) a warming of the Atlantic tropical waters  
 (B) a cooling of Pacific equatorial waters  
 (C) a decrease in precipitation in Australia  
 (D) an increase in precipitation in the Amazon rainforest  
 (E) warmer than average winters in the Northeast United States
89. Which of the following is an example of risk-benefit analysis, or cost-risk analysis?  
 (A) Mine Safety Laws  
 (B) Automobile speed laws  
 (C) National health insurance coverage  
 (D) Clean Air Act  
 (E) None of the above

90. Repercussion costs to a polluting industry might include  
 (A) increased taxes  
 (B) losses from boycotting  
 (C) equipment maintenance costs  
 (D) rental costs on oil spill cleanup equipment  
 (E) gray water storage equipment purchases
91. Dematerialization is the process by which  
 (A) large unstable nuclei decay into smaller, more stable nuclei  
 (B) mass is lost during the fission of two nuclei and converted to radiant energy  
 (C) products decrease in weight over time with improved technology  
 (D) bulky ore deposits are reduced to minute fractions of pure metal  
 (E) none of the above



103. The graphs below show the age structure in 2000 in Zimbabwe and the Netherlands.



a) Compare and contrast the two age structure diagrams. Be sure to include birth rates and death rates relative to the two countries and relative to age ranges.

b) Name three factors that accounts for the shape of the age structure diagram in each country.

104. a) Contrast The Continental Drift Theory and The Sea-Floor Spreading Theory. Discuss evidence for each of the two theories.

b) Describe two methods in which plate tectonics may have led to evolution.

105. Phytoplankton are microscopic plants that live in oceanic waters. Many organisms feed on phytoplankton, including Pelagic decapods, Pelagic mysids, and Arctic cod. Arctic cod also eat Pelagic decapods and Pelagic mysids, and in turn serve as the food source for harp seals, as well as people. The pesticide DDT, dichlorodiphenyl trichloroethane, was banned in the United States in 1973. However, DDT has been detected in most test site water. DDT has been found in fish, such as Arctic cod.

- a) In the space below, diagram a food web based on the interactions of all of the organisms described in the above passage. Be sure to include trophic levels and identification of producers and consumers.
- b) Describe the past use of DDT and discuss the impact of DDT on the food supply and on humans.
- c) Discuss a strategy of integrated pest management to protect crops, as an alternative to pesticides.

Discuss a strategy of integrated pest management to protect crops, as an alternative to pesticides.

106. Biological oxygen demand, BOD, is a measure of the oxygen used by microorganisms to decompose organic waste.

- a) How do organic waste quantity and bacterial counts relate to the BOD?
- b) What is the relationship between BOD levels and dissolved oxygen, DO? What effect do these levels have on fish survival?
- c) What other factors contribute to the BOD levels?

107. The highest rate of tropical rain forest destruction is occurring in Asia. Destruction is also occurring in Latin America, Africa and tropical countries.

- a) List and describe three things tropical rain forests provide.
- b) Explain factors that reduce tropical rain forests.

108. The Exxon Valdez hit a reef in Alaska in 1989, spilling over 11 million gallons of oil into the Prince William Sound.

- a) How did this accident affect the gross domestic product (GDP)?

What methods were employed to help in the cleanup of the spill?

109. The Green Revolution was the name coined by U.S. Agency for International Development director William Gaud in 1968. It was a movement to increase crop yield and eliminate hunger through different methods.

- a) Describe different methods employed to reach the goals of the program.
- b) In the 1970s, a second Green Revolution gained momentum. In addition to the features of the first Revolution, what technique the second Revolution use? Be sure to describe the technique.
- c) What advantages does new technique of the second Green Revolution confer?

Answer Key

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

28.   B
29.   B
30.   C
31.   D
32.   A
33.   A
34.   C
35.   A
36.   C
37.   A
38.   A
39.   D
40.   E
41.   A
42.   A
43.   A
44.   A
45.   C
46.   B
47.   E
48.   A
49.   B
50.   B
51.   D
52.   C
53.   D
54.   A

Answer Key

- 55.   C
- 56.   B
- 57.   B
- 58.   D
- 59.   C
- 60.   C
- 61.   C
- 62.   B
- 63.   B
- 64.   C
- 65.   C
- 66.   C
- 67.   E
- 68.   D
- 69.   A
- 70.   D
- 71.   C
- 72.   C
- 73.   A
- 74.   A
- 75.   A
- 76.   A
- 77.   D
- 78.   C
- 79.   B
- 80.   D
- 81.   A

- 82.   D
- 83.   C
- 84.   D
- 85.   A
- 86.   B
- 87.   A
- 88.   E
- 89.   B
- 90.   B
- 91.   C
- 92.   D
- 93.   D
- 94.   B
- 95.   A
- 96.   D
- 97.   C
- 98.   A
- 99.   E
- 100.   A
- 101.   B
- 102.   E

103. Answers should include a detailed description of some of the following information:  
a) Birth rate is affected by: use of children in the work force, birth control, abortion, average age at marriage, cost of supporting children, urbanization, etc.  
Death Rate is affected by: food supply, nutrition, medical technology, water supply quality, sanitation, etc.  
Zimbabwe: pyramid shaped age structure, with a large percentage of the population at younger ages.  
Netherlands: Fairly uniform age distribution.  
b) Zimbabwe: high population rate due to high birth mortality rate, aversion to birth control, lack of medical

Answer Key

technology, disease, etc.

Netherlands: birth control, social welfare programs, medical technologies, etc.

104. Answer should include some or all of the following:

a) The Continental Drift Theory: Present-day continents were originally one landmass called Pangaea, which later broke up into smaller continents. Evidence includes: fossilized tropical plants, the continents seem to fit together as a puzzle, similarities between the East coast of the Americas and the West coast of Africa and Europe.

The Sea-Floor Spreading Theory: Alternating magnetic properties were found in rocks on the sea floor, as well as on sides of midoceanic ridges. The theory states that new crust was created at volcanic rift zones, as rocks moved away from the ridge. Evidence includes dating of rocks.

b) Geographic separation leads to the evolution of one species into two. Divergent plate boundaries or faulting may lead to geographic separation. Climate change leads to evolution. Adaptive radiation following mass extinction from large volcanic activity leads to evolution.

105. Answers should include at least the following information:

a) Drawing should include the producer phytoplankton (1st trophic level), eaten by the primary consumers Pelagic decapods, Pelagic mysids and Arctic cod (2nd trophic level). The secondary consumers, Arctic cod, eat Pelagic decapods and Pelagic mysids (3rd trophic level). The tertiary consumers humans and Harp seals consume the secondary consumers (4th trophic level). Correct arrows and labels are necessary for full credit.

b) DDT was used as an insecticide, especially during World War II. It was used to combat mosquitoes, which carried malaria and typhus. However, in 1973 it was banned because it was discovered to be a carcinogen, or cancer-causing agent. DDT enters the food chain directly, and affects all levels. Humans are impacted by eating fish containing the chemical. Integrated pest management strategies include intercropping, pheromones, genetically engineered crops with insect-resistance, natural predators, adding mulch.

106. Answers should include a detailed description of the following information:

a) As the quantity of organic waste in a water supply increases, bacterial counts also increase. This causes the demand for oxygen to be high as well. BOD levels drop as organic waste is consumed or dispersed.

b) When BOD levels are high, DO levels decrease. This is due to increased consumption levels, and therefore less free oxygen available in the water. As DO levels fall, fish and aquatic organisms often do not survive because they require oxygen to carry out respiration.

c) Nitrates and phosphates in water cause high BOD levels. They cause plants and algae to grow because they are nutrients

used by the plants.

107. a) Tropical rain forests provide:

Biodiversity- Drugs and other commercial products are continuously being discovered in tropical rain forests. Destruction will only eliminate possible medicines and products. Climate- Rain forests stabilize climate. They also consume some of the carbon dioxide in the atmosphere, helping stabilize the amount of greenhouse gases. Protection from erosion. Protection from flooding- Rain forests absorb excess water. Fisheries- Rain forests protect fisheries by providing essential nutrients and sanctuaries for fish to breed and develop.

b) Expanding populations, development of land for residential purposes, fuelwood and charcoal supplies, conversion of land to agriculture, ranching, and pasture development all lead to tropical rain forest destruction

108. Answers should include at least the following information:

a) The GDP, which measures the market value of goods and services within a country, increased because of the necessary expensive cleanup. Over 11,000 workers helped with the cleanup. The ship was repaired, oil was cleaned-up, workers were compensated, and lawsuits were settled. In addition, money was spent to protect animals and water from any further damage.

b) Hot water high-pressure sprays were used. Burning was attempted but was only used in an initial trial. The mechanical cleanup involved using skimmers to collect oil. Chemical dispersants were used to break apart the petroleum oil into oil droplets. Bioremediation, which introduces oil-eating microorganisms into the oil polluted water, was also used.

109. Answers should include at least the following information:

a) New crop cultivar, irrigation, pesticides, fertilizers, and use of high-yield crops were all used in the first Green Revolution.

b) The second Green Revolution involved the use of genetically engineered crops, in addition to the techniques employed in the first Revolution. Genetic engineering involves moving genes from one species to another, or designing gene sequences with desirable characteristics.

c) Genetically engineered crops can have any of the following features: pest resistance, drought resistance, mold resistance, high protein yield, high vitamin yield, etc.

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81. V. GLOBAL CHANGES AND THEIR CONSEQUENCES / A. First-order Effects (Changes) / 3. Biota / b. Introduced exotics : 0000451
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96. VI. ENVIRONMENT AND SOCIETY / D. History, Laws and Regulations / 1. History, Laws and Regulations / a. History, laws and regulations : 0000805
97. V. GLOBAL CHANGES AND THEIR CONSEQUENCES / A. First-order Effects (Changes) / 1. Atmosphere / b. CH<sub>4</sub> : 0000952
98. III. RENEWABLE AND NONRENEWABLE RESOURCE / B. Minerals / 1. Minerals / a. Minerals : 0000462
99. IV. ENVIRONMENTAL QUALITY / A. Air, Water and Soil Pollution / 1. Major Pollutants / c. Measurement and units of measure : 0000792
100. IV. ENVIRONMENTAL QUALITY / A. Air, Water and Soil Pollution / 1. Major Pollutants / c. Measurement and units of measure : 0000813
101. II. HUMAN POPULATION DYNAMICS / A. Human History and Global Distribution / 1. Numbers / a. Numbers : 0000122
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107. VII. PART II / A. Part II / 1. Part II / a. Part II : 0001183
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