

ENVIRONMENTAL SCIENCE

Section I

Time—One hour and 30 minutes

Part A

**Directions:** Each set of lettered choices below refers to the numbered questions or statements immediately following it. Select the one lettered choice that best answers each question or best fits each statement and then fill in the corresponding oval on the answer sheet. A choice may be used once, more than once, or not at all in each set.

**Questions 1–5 refer to the following kinds of species interactions.**

- (A) Parasitism
- (B) Mutualism
- (C) Competition
- (D) Predator/prey
- (E) Commensalism

1. Cheetahs and antelope
2. Mycorrhizae and plant roots
3. Humans and tapeworms
4. A hawk eats a mouse
5. Two birds fight over a nest

**Questions 6–10 refer to the following kinds of federally owned lands.**

- (A) National Forests
- (B) National Resource Lands
- (C) National Wildlife Refuges
- (D) National Parks
- (E) National Wilderness Preservation Areas

6. These lands are reserved for recreation and fishing, but not for commercial use.
7. These multiuse lands can be logged and fished.
8. These lands provide a domestic energy and mineral supply.
9. Motor vehicles are banned from these hunting and fishing areas.
10. These habitats provide protected breeding areas for many animals.

**Questions 11–15 refer to the following environmental disasters.**

- (A) Chernobyl, Ukraine
- (B) Love Canal, New York
- (C) Bhopal, India
- (D) London, England
- (E) Chesapeake Bay, Maryland

11. When this chemical plant exploded, thousands of people died from inhaling pesticides.
12. Chemicals leaking out of a dump caused leukemia in local children.
13. The burning of coal produced smog so thick that many people died of respiratory illnesses.
14. This estuary is eutrophied, and many plant and animal species are now unable to live there.
15. An explosion in a nuclear reactor spread radioactive materials over thousands of hectares in this region.

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Questions 16–20 refer to the following waste disposal methods.

- (A) Landfill
- (B) Incineration
- (C) Chemical treatment
- (D) Biological treatment
- (E) Discharge into sewers and rivers

- 16. This method can produce leachate.
- 17. This method reduces the acidity of a solution.
- 18. This method can release toxic gases.
- 19. This method can cause high biological oxygen demand (BOD).
- 20. This method involves the use of bacteria and fungi.

Questions 21–25 refer to the following renewable energy sources.

- (A) Solar energy
- (B) Hydrogen fuel cells
- (C) Tidal energy
- (D) Geothermal energy
- (E) Wind energy

- 21. This source can harm migratory birds
- 22. Water and electricity are products of this source
- 23. This source of energy relies on water flowing in and out of bays
- 24. This source converts radiant energy into heat or electricity
- 25. This source utilizes heat or steam from deep underground

Questions 26–30 refer to the following forms of air pollution.

- (A)  $O_3$
- (B)  $SO_2$
- (C) Pollen
- (D) Soot
- (E) Hydrocarbons

- 26. This gas originates from the combustion of coal.
- 27. Produced by plants, this can cause allergic reactions.
- 28. This can be destroyed by CFCs.
- 29. One source of this is spilled gasoline.
- 30. Small particles that can irritate both the eyes and lungs.

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## Part B

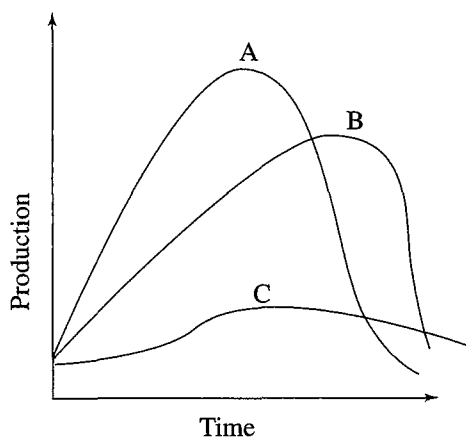
**Directions:** Each of the questions or incomplete statements below is followed by five suggested answers or completions. Select the one that is best in each case and then fill in the corresponding oval on the answer sheet.

31. Exposure to which of the following noises would cause the most damage to a person's hearing?

- (A) A vacuum cleaner
- (B) A chain saw
- (C) A factory
- (D) The firing of a rifle
- (E) A lawn mower

32. The phrase that best defines population density is

- (A) the number of individuals in a certain geographic area
- (B) the rate at which a population increases
- (C) the maximum number of individuals that a habitat can sustain
- (D) the time it takes for a population to increase to carrying capacity
- (E) one way that populations can be grouped in a certain geographic area



33. The graph above represents possible depletion curves of a nonrenewable resource. Curve C best describes the resource as it

- (A) has just been discovered and no technology exists to use the resource
- (B) is quickly used up and is not recycled
- (C) is newly discovered and in high demand
- (D) has expanding reserves and consumption is reduced
- (E) has some recycling and no reserves are being discovered

34. Which processes do scientists use to estimate environmental risks to humans?

- I. Animal studies
- II. Epidemiological studies
- III. Statistical Probabilities

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

35. Which of the following is a negative impact of overfishing a particular species of edible fish?

- I. Loss of so many fish that there is no longer a breeding stock
- II. The removal of non-target species
- III. The reduction of other species that rely on the edible species as food.

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

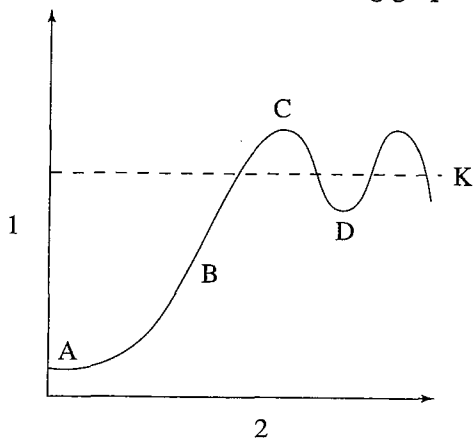
36. Which type of irrigation results in the greatest amount of water lost to evaporation?

- I. Flood irrigation
- II. Drip irrigation
- III. Low-pressure central pivot irrigation

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

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Questions 37–40 refer to the following graph.



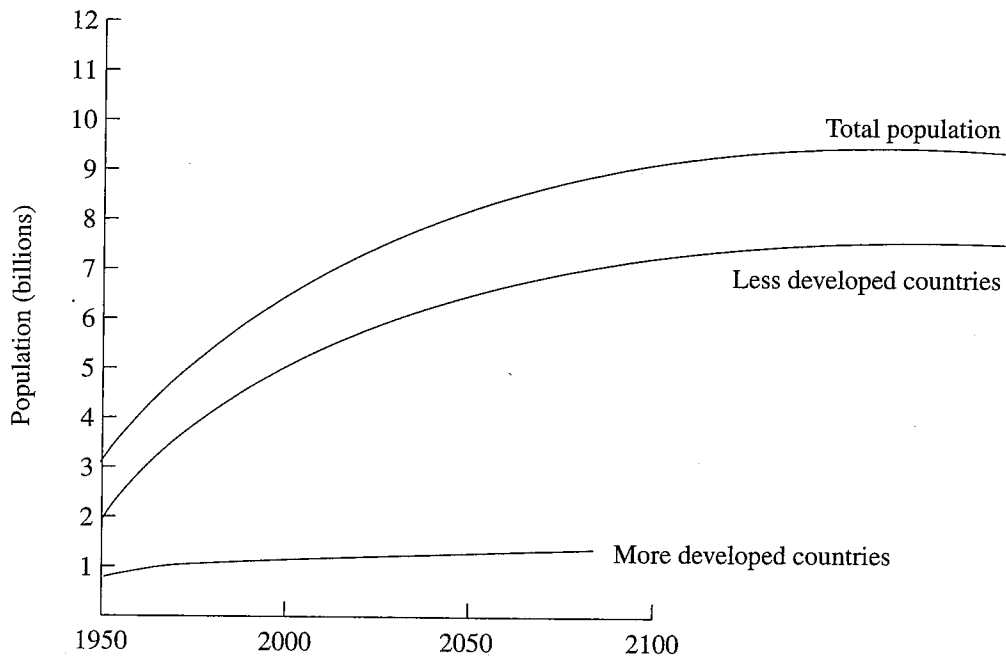
37. The population is growing at its highest rate at which point?
- (A) A  
(B) K  
(C) D  
(D) B  
(E) C
38. Which of the following statements best describes line K in the graph above?
- (A) The rate of population growth  
(B) The carrying capacity of the environment  
(C) The time it takes for the population to double in size  
(D) The number of individuals in the population at the beginning of the study  
(E) The birth rate of the population
39. The best label for the axis labeled 2 in the graph above is
- (A) time  
(B) population number  
(C) logistic growth rate  
(D) environmental resistance  
(E) birth rate
40. Which of the following statements is true concerning the events occurring at point D in the graph above?
- (A) Environmental resistance is high.  
(B) Environmental resistance is low.  
(C) The population will continue to fall.  
(D) The prey population will soon rise.  
(E) The population is above its carrying capacity.
41. The long-term storage of phosphorus and sulfur is in which of the following forms?
- (A) Bacteria  
(B) Rocks  
(C) Water  
(D) Plants  
(E) Atmosphere
42. The movement of sections of the Earth's lithosphere is known as
- (A) mass depletion  
(B) plate tectonics  
(C) background extinction  
(D) migration  
(E) emigration
43. Which of the following best defines the Green Revolution?
- (A) An international effort to stop the construction of nuclear power plants.  
(B) A group whose goal is to improve how nations affect the environment.  
(C) Increasing the yield of farmland by using more fertilizer, better irrigation, and faster growing crops.  
(D) A method of getting more people to recycle paper and cardboard.  
(E) A method that makes a viable soil conditioner by using household waste.
44. Which of the following best defines the phrase "infant mortality rate"?
- (A) How many children live in each square hectare  
(B) The number of births in a population  
(C) The number of infant deaths per 1,000 people  
(D) The difference between the birth rate and the death rate in a population  
(E) The total number of children in a population
45. The release of chemicals from underground storage tanks is most likely to pollute which of the following?
- (A) A landfill  
(B) The atmosphere  
(C) The ecotone  
(D) Aquifers  
(E) The hydrosphere

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46. The United States Congress recently failed to ratify which of the following international agreements that is designed to control the release of carbon dioxide?
- (A) CITES agreement
  - (B) Kyoto Protocol
  - (C) Montreal Protocol
  - (D) Clean Air Act
  - (E) RCRA
47. Which of the following is the most sustainable way to ensure sufficient energy for the future?
- (A) Find more fossil fuels
  - (B) Develop more effective solar power generators
  - (C) Build more nuclear reactors
  - (D) Reduce waste and inefficiency in electricity use and transmission
  - (E) Increase the amount of electricity generated using natural gas
48. Which of the following best describes the goals of the CAFE standards?
- (A) Reduce pollution by coal fired power plants
  - (B) Increase habitat diversity in certain areas
  - (C) Improve the quality of air around cities
  - (D) Protect certain endangered species
  - (E) Improve the fuel efficiency of automobiles in the United States
49. Which of the following best describes the use of DDT?
- (A) It supplies needed nitrogen to plants
  - (B) It kills weeds and unwanted plants
  - (C) It decreases the amount of pollution from car exhaust
  - (D) It is a chemical involved in photosynthesis
  - (E) It is an insecticide

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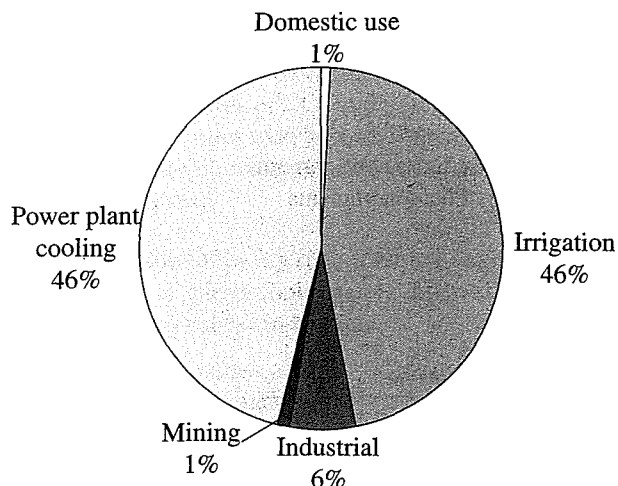
Questions 50–52 refer to the following world population graph.



50. Which of the answers below best describes the change in the population of less developed countries between the years 1950 and 2050?
- (A) There will be an increase of approximately 1 billion.
  - (B) There will be an increase of approximately 5 billion.
  - (C) There will be an increase of approximately 10 billion.
  - (D) There will be a decline of 1 billion.
  - (E) There will be a decline of 6 billion.
51. According to the graph, the total population of the world is most likely to increase due to which of the following?
- (A) The rise in populations of developed countries
  - (B) The continued emigration of people
  - (C) The use of more fossil fuels
  - (D) The rise in populations of developing countries
  - (E) An increase in the amount of food produced in less arable land
52. According to the graph, in the year 2000 the less developed countries had a population that was how many times bigger than the developed countries?
- (A) 12 times
  - (B) 8 times
  - (C) 4 times
  - (D) 1.5 times
  - (E) 0.5 times

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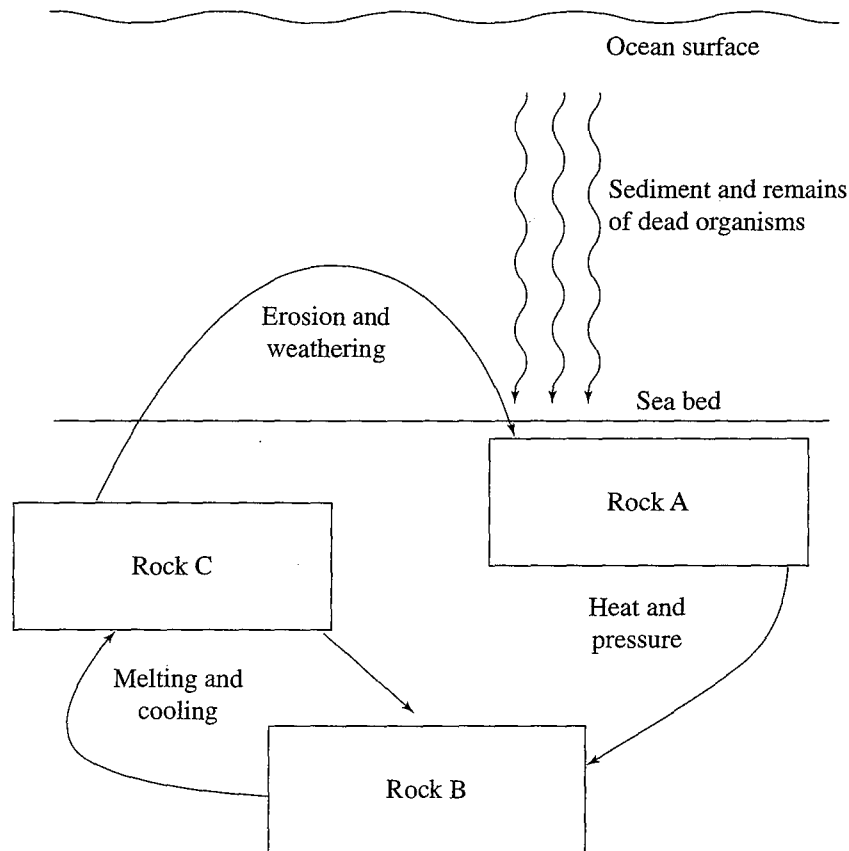
Fresh Water Usage, United States 2000



53. According to the diagram above, cooking, showering and using toilets accounted for approximately what percent of total water use?
- (A) 92 percent  
(B) 46 percent  
(C) 40 percent  
(D) 6 percent  
(E) 1 percent
54. One result of increased troposphere temperatures that are observed today is
- (A) an increase in skin cancers in people  
(B) an increase in the average global sea level of some 10 to 20 cm  
(C) more radon seepage into people's homes  
(D) a deeper permafrost in Arctic regions  
(E) lakes and ponds remaining frozen longer into the spring
55. All of the following gases contribute to rising global air temperatures EXCEPT
- (A) methane  
(B) nitrogen dioxide  
(C) ozone  
(D) carbon dioxide  
(E) water vapor
56. Which of the following is the root cause of habitat loss; especially in less developed nations?
- (A) road building  
(B) poverty  
(C) conversion of forest to farmland  
(D) capturing exotic animals for resale  
(E) a warm, moist habitat
57. Per capita income can best be defined as
- (A) how long the average person lives  
(B) the concentration of people in a city  
(C) the total amount of income in a country  
(D) how much money each person makes  
(E) how many people are worth more than one million dollars
58. The motion of tectonic plates accounts for most of Earth's
- (A) CO<sub>2</sub> emissions  
(B) formation of rivers  
(C) change of seasons  
(D) volcanic activity  
(E) oil formations
59. "K" and "r" are used to describe which of the following aspects of populations?
- (A) The place in a habitat where these organisms live  
(B) The number of males and females in the population  
(C) The number of predators each population has  
(D) The reproductive tactics used by populations  
(E) The time it takes a population to double
60. Convictional heating and cooling of the atmosphere transfers which of the following to other parts of the earth?
- I. Heat  
II. Moisture  
III. Nutrients
- (A) I only  
(B) II only  
(C) III only  
(D) I and II only  
(E) I, II, and III

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Questions 61 and 62 refer to the following diagram.



61. Which of the following gives the correct sequence in the rock cycle shown above?

- (A) Rock A—Metamorphic/Rock B—Igneous/Rock C—Sedimentary
- (B) Rock A—Sedimentary/Rock B—Metamorphic/Rock C—Igneous
- (C) Rock A—Igneous/Rock B—Sedimentary/Rock C—Metamorphic
- (D) Rock A—Metamorphic/Rock B—Sedimentary/Rock C—Igneous
- (E) Rock A—Sedimentary/Rock B—Igneous/Rock C—Metamorphic

62. Which of the following rock types would contain the greatest number of fossils?

- (A) Igneous rock only
- (B) Metamorphic rock only
- (C) Sedimentary rock only
- (D) Igneous and metamorphic rock
- (E) Sedimentary and igneous rock

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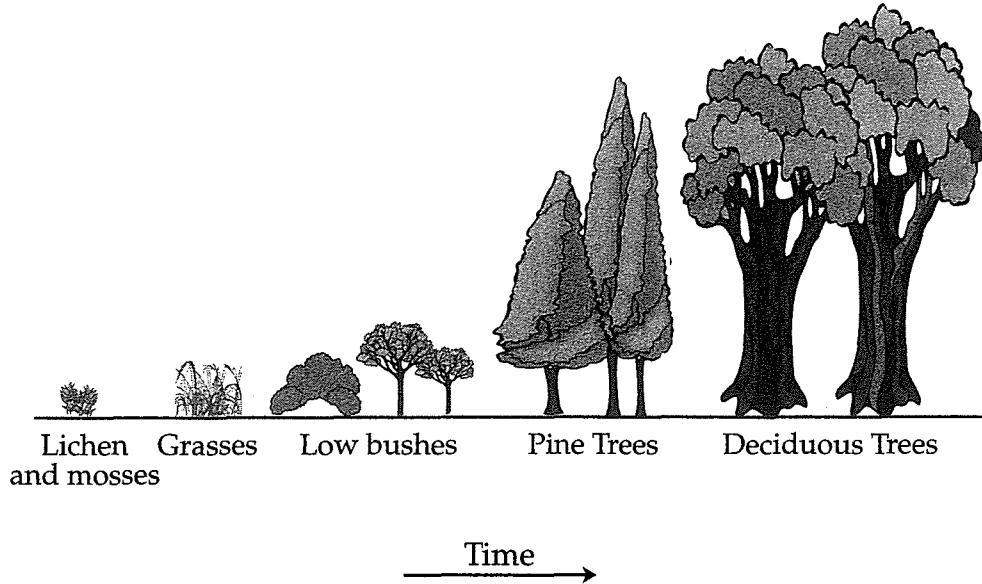
63. The North Atlantic Current provides which of the following for Europe and North America?
- (A) Fish to feed predators such as killer whales
  - (B) Warm water that moderates land temperatures
  - (C) Large amounts of  $\text{CO}_2$  to promote photosynthesis
  - (D) Cold saltwater to help form icebergs
  - (E) Mineral-rich waters to reduce depleted mineral reserves
64. Which of the following indoor air pollutants is composed of microscopic mineral fibers that can produce lung cancer in humans?
- (A) Nitrogen oxides
  - (B) Carbon monoxide
  - (C) Asbestos
  - (D) Radon
  - (E) Formaldehyde
65. Which of the following molecules is the primary catalyst in the destruction of ozone?
- (A) Fluorine
  - (B) Oxygen
  - (C) Mercury
  - (D) Platinum
  - (E) Chlorine
66. Transpiration is best defined as the
- (A) movement of water through aquifers
  - (B) evaporation of water from an ocean
  - (C) movement of water through the roots, stems, and leaves of plants
  - (D) condensation of water into rain
  - (E) heating of the atmosphere by the warmth of the earth
67. Nuclear reactors use which of the following to absorb neutrons in the reactor core?
- (A) Steam condenser
  - (B) Control rods
  - (C) Heat exchanger
  - (D) Fuel rods
  - (E) Turbines
68. Riparian areas are vital to the preservation of high-quality
- (A) mountain slopes
  - (B) grazing land
  - (C) feedlots
  - (D) rivers and streams
  - (E) ocean beaches
69. Which of the following fishing techniques is most damaging to ocean bottom ecosystems?
- (A) Trawling
  - (B) The use of drift nets
  - (C) Long lines
  - (D) Purse-seine
  - (E) Fish farming
70. Which of the following treaties is responsible for lower levels of CFC production world wide?
- (A) Montreal Protocol
  - (B) Kyoto Protocol
  - (C) Clean Air Act
  - (D) The Rio Earth Summit of 1972
  - (E) Comprehensive Environmental Response, Compensation and Liability Act
71. DDT is an insecticide sprayed to control insects. Years after it was introduced, DDT was found in large predatory birds, such as the osprey. Which of the following processes caused the DDT to be found in the osprey?
- I. Biomagnification
  - II. Bioremediation
  - III. Bioaccumulation
- (A) I only
  - (B) II only
  - (C) III only
  - (D) I and III only
  - (E) I, II, and III
72. Doing which of the following could most effectively reduce acid rain and acid deposition?
- (A) Reducing the use and waste of electricity
  - (B) Making taller smoke stacks
  - (C) Burning coal twice
  - (D) Adding lime to acidified lakes
  - (E) Moving power plants to desert areas
73. Which of the following forms of radiation is most harmful to humans?
- (A) Alpha
  - (B) Gamma
  - (C) Beta
  - (D) Infrared
  - (E) Radon

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74. Which of the following ecosystems does NOT use solar energy as its ultimate energy source?
- (A) Pond
  - (B) Deep-sea hydrothermal vent
  - (C) Rain forest
  - (D) Tundra
  - (E) Coniferous forest
75. All of the following are true about CO<sub>2</sub> sequestering EXCEPT
- (A) it can be accomplished by pumping CO<sub>2</sub> into carbonated beverages
  - (B) it can be accomplished by pumping CO<sub>2</sub> into crop lands
  - (C) it can be accomplished by pumping CO<sub>2</sub> deep under the ocean floor
  - (D) it can be accomplished by pumping CO<sub>2</sub> deep underground into dried up oil wells
  - (E) it can be accomplished by pumping CO<sub>2</sub> into immature forests
76. Which of the following is NOT true concerning invasive species?
- (A) They can out-compete native species in a habitat.
  - (B) They can reproduce more rapidly than native species.
  - (C) They are highly specialized and have narrow niches.
  - (D) They alter the biodiversity of the area they are invading.
  - (E) They are introduced into a habitat and are not native.
77. The Second Law of Thermodynamics is best described by which of the following?
- (A) The amount of solar radiation going into an ecosystem is equal to the total amount of energy going out of that system.
  - (B) The amount of carbon in the atmosphere has increased due to the combustion of fossil fuels.
  - (C) As electricity is transmitted through wires, some of the power is lost to the environment as heat.
  - (D) Wind-generated electricity has more power than electricity generated at a hydropower plant.
  - (E) The amount of electricity used to light a lightbulb is less than the amount of light that the bulb produces.
78. Salinization is a process that makes soil less productive because it
- (A) removes essential soil nutrients
  - (B) lowers the pH
  - (C) increases the salt content
  - (D) makes the soil waterlogged
  - (E) produces larger soil particles
79. Which of the following is true about early-loss populations, such as fish?
- (A) The chances of an adult dying are about the same as a child dying.
  - (B) The maturation process is slow.
  - (C) The populations are close to the carrying capacity.
  - (D) They are specialists.
  - (E) Many individuals die at an early age.

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Questions 80 and 81 refer to the illustration of succession below.



80. A farmer stops farming a certain tract of land, and small bushes soon grow there. The land then progresses to the deciduous tree stage. This process is known as

- (A) pioneer succession
- (B) wetland succession
- (C) secondary succession
- (D) primary succession
- (E) regressive succession

81. According to the diagram, low species diversity and small sized plants are characteristic of which stage of succession?

- I. Late stage succession
  - II. Midstage succession
  - III. Early stage succession
- (A) I only
  - (B) II only
  - (C) III only
  - (D) I and III only
  - (E) I, II, and III

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82. In this method of land preservation, countries promise they will preserve important habitats in return for the forgiveness of loans to other countries.
- (A) Ecotourism
  - (B) Establishment of biological reserves
  - (C) Small-scale sustainable farming
  - (D) Debt for nature swaps
  - (E) Phase-out economic practices such as farm subsidies
83. Ozone depletion is occurring most rapidly in the earth's polar regions because
- (A) there are more researchers studying the problem at the poles than at the equator
  - (B) the atmosphere is thicker at the poles, so ozone destruction is easier to observe
  - (C) large amounts of chlorofluorocarbons (CFCs) can accumulate on ice crystals formed in the cold atmosphere
  - (D) the upper atmosphere winds form a pattern of high and low pressure systems that can cause the destruction of ozone
  - (E) the solar UV radiation is stronger at the poles, promoting the breakdown of ozone
84. Smaller forest fires are beneficial to forests for all of the following EXCEPT
- (A) removal of competing plants
  - (B) combustion of dried leaves or needles, which reduces the threat of large fires
  - (C) burning the crowns of trees
  - (D) germinating seeds of certain plant species
  - (E) making burned matter available as a nutrient
85. What are the negative impacts of dams on ecosystems?
- I. Loss of silt in the river downstream from the dam
  - II. Generation of low pollution electricity
  - III. Loss of terrestrial biodiversity in areas surrounding the dam
- (A) I only
  - (B) II only
  - (C) III only
  - (D) I and III only
  - (E) I, II, and III
86. Which of the following best illustrates the process of evolution?
- (A) A parasite population becomes resistant to a drug
  - (B) Rabbits can have brown fur in summer and white fur in winter
  - (C) Frogs borrow deep into the mud during winter
  - (D) A baby is born and has a different color hair than its parents
  - (E) A squid changes color to hide from predators
87. Compounds such as water, can exist as a liquid, solid, or a gas. Changes between states of a substance are known as
- (A) phase changes
  - (B) chemical changes
  - (C) compound changes
  - (D) nuclear reactions
  - (E) aerobic respiration
88. The energy necessary to produce ozone comes from which of the following?
- (A) Oxygen
  - (B) Sunlight
  - (C) Radioactive decay
  - (D) Magma
  - (E) Wind
89. Which of the following chemicals can cause lung irritation in the troposphere but is very helpful to humans in the stratosphere?
- (A) O<sub>2</sub>
  - (B) O<sub>3</sub>
  - (C) Chlorofluorocarbons
  - (D) H<sub>2</sub>SO<sub>4</sub>
  - (E) DDT
90. Which of the following best describes the differences between a primary pollutant and a secondary pollutant?
- (A) Primary pollutants rise up the smoke stack before secondary pollutants are formed.
  - (B) Primary pollutants are formed from secondary pollutants interacting in the water.
  - (C) Secondary pollutants are formed from primary pollutants interacting in the atmosphere.
  - (D) Secondary pollutants are made by cars, while secondary pollutants are made by the burning of wood.
  - (E) Secondary pollutants are directly created by the burning of coal and primary pollutants from the burning of oil.

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91. An appliance operates at 120 volts and 10.0 amps for 1 hour. How many watt-hours does it use in that hour?
- (A) 1.2 watt-hours  
(B) 12 watt-hours  
(C) 100 watt-hours  
(D) 110 watt-hours  
(E) 1200 watt-hours
92. Coal, oil, and natural gas were all formed as a result of
- (A) the decay of organic matter  
(B) the movement of magma in volcanoes  
(C) sedimentary rock turning into metamorphic rock  
(D) the radioactive decay occurring inside Earth  
(E) the motion of the earth's core
93. All of the following are negative impacts of food production EXCEPT
- (A) increased erosion  
(B) air pollution from fossil fuels  
(C) bioaccumulation of pesticides  
(D) lower death rates  
(E) loss of biodiversity
94. Soils found in mid-latitude grasslands would be most accurately described as having
- (A) a high acid content with little organic matter  
(B) a deep layer of humus and decayed plant material  
(C) a layer of permafrost right below the O-horizon  
(D) a high content of iron oxides and very little moisture  
(E) a small amount of nutrients but an abundant decomposer food web
95. All of the following are useful methods for reducing domestic water use EXCEPT
- (A) using low-flow shower heads  
(B) using low-flush volume toilets  
(C) turning off water while brushing your teeth  
(D) fixing leaks as soon as they start  
(E) lowering the temperature of the water heater
96. Biodiversity is a direct result of which of the following?
- (A) Deforestation  
(B) Sanitization  
(C) Respiration  
(D) Erosion  
(E) Evolution
97. Students studying a river found high levels of fecal coliform bacteria. They concluded that
- (A) this water is fit to swim in  
(B) a nearby treatment plant added chlorine to the waste water  
(C) they can safely drink the water  
(D) untreated animal waste was put in the water  
(E) a factory was polluting the river
98. During an El Niño-Southern Oscillation, weather events change in which of the following areas?
- (A) The Pacific and Indian Oceans  
(B) The Atlantic and Indian Oceans  
(C) The Arctic Sea  
(D) The Indian and Antarctic Oceans  
(E) The Atlantic and Pacific Oceans
99. Which of the following pairs correctly matches the source of gray water with its most frequent use in the home?
- (A) Dishwasher and sink water used to flush toilets  
(B) Flushed toilet water used to irrigate garden plants  
(C) Dishwasher and sink water used to irrigate garden plants  
(D) Water collected from rainfall used to flush toilets  
(E) Water from showers used for dish washing
100. The Clean Water Act established all of the following guidelines EXCEPT
- (A) implemented pollution control programs  
(B) set water quality standards for all contaminants in surface waters  
(C) made it unlawful for any person to discharge any pollutant from a point source into navigable waters  
(D) demanded that an environmental impact statement be prepared for any major development  
(E) funded the construction of sewage treatment plants

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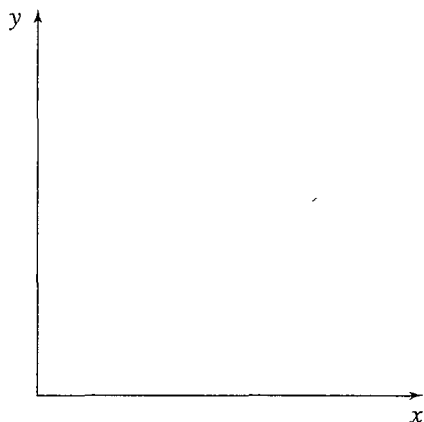
END OF SECTION I

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION.

**ENVIRONMENTAL SCIENCE**  
**SECTION II**  
**Time—One Hour and 30 minutes**  
**4 Questions**

**Directions:** Answer all four questions, which are weighted equally; the suggested time is about 22 minutes for answering each question. Write all your answers on the pages following the questions in the pink booklet. Where calculations are required, clearly show how you arrived at your answer. Where explanation or discussion is required, support your answers with relevant information and/or specific examples.

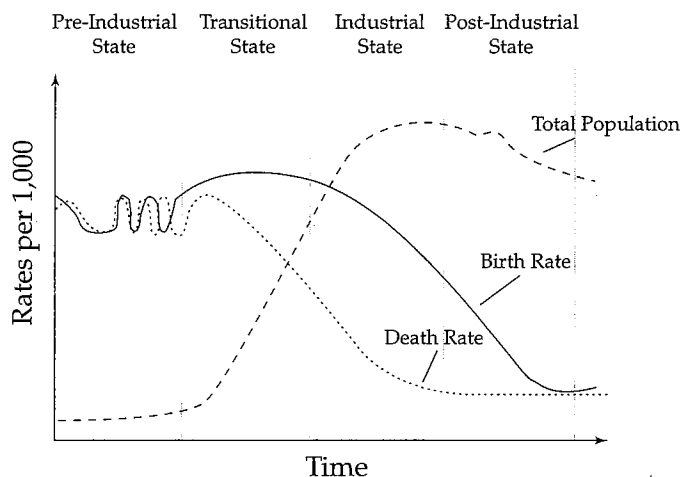
1. A class wished to determine the  $LD_{50}$  of a particular herbicide, Chemical X. Using standard laboratory apparatus and glassware, they accurately made the following dilutions: 1.0M,  $10^{-1}$ M,  $10^{-2}$ M,  $10^{-3}$ M,  $10^{-4}$ M, and  $10^{-5}$ M. They grew the seedlings under standard conditions, varying only the concentrations of Chemical X. Finally they determined the percentage of seedlings that germinated at each concentration.
- (a) Name a reasonable hypothesis that this experiment could test. Describe the experimental control group and give one method for performing repeated trials.
- (b) Using the axes below, graph a set of hypothetical results. Indicate the  $LD_{50}$  concentration. Properly label the axes and provide a title for the graph.



- (c) Describe one positive outcome and one negative outcome of using herbicides in the environment.

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2. The diagram below illustrates the demographic transition model of the relationship between economic status and population.



- = Total Population  
 ————— = Birth Rate  
 ..... = Death Rate

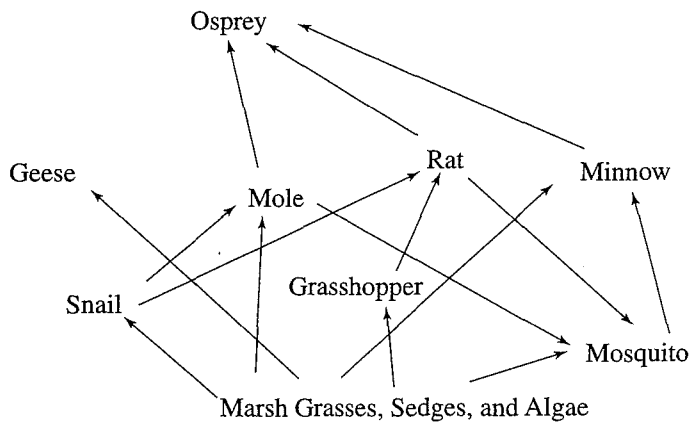
- (a) In phases 2 and 3, there is a large difference between the birth rate and the death rate. Describe the effects on the overall population as a result of this difference. Explain why the population doubling time during these phases is short.
- (b) Choose one of the four phases and describe an economic factor that would account for the differences between birth rate and death rate.
- (c) Describe one biological method of birth control.
- (d) Population experts have reported that in some developing countries, the population is experiencing a reverse transition from phase 2 to phase 1. Describe what would happen to a country's population and describe one event that would cause this reverse transition.

3. Under certain conditions, an internal combustion car engine produces approximately 3 grams of  $\text{NO}_x$  per kilometer driven. In Country C there are 300 million cars and each car is driven only 20,000 km per year.

- (a) Calculate the number of metric tons of  $\text{NO}_x$  produced by the cars in Country C in one year. 1 metric ton = 1,000,000 g.
- (b) Describe a secondary pollutant that is derived from the  $\text{NO}_x$  produced by country C, and how that pollutant travels to adjacent countries.
- (c) Describe one abiotic and one biotic impact that the  $\text{NO}_x$  pollution will have on any countries adjacent to Country C.
- (d) Describe one method that Country C could employ to reduce the amount of emitted  $\text{NO}_x$ .

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4. The diagram below is of a hypothetical food web found in an estuary.



- Describe two abiotic factors of the aquatic component of this estuary that change twice daily.
- Draw an energy pyramid based on the food web. For each trophic level, give two examples of the organisms that would occupy that level.
- Cultural eutrophication can cause breakdowns in this type of food web. Give one example of how cultural eutrophication might occur and give one detrimental effect of this process.

**STOP**

END OF SECTION II

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS SECTION.