

# Diagnostic Test

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The following diagnostic test will allow you to pinpoint your current strengths and weaknesses as you work toward the AP Environmental Science exam.

If you're just getting underway with your APES course, you may realize that you're already seen some of the topics found on the APES exam in other courses (AP Biology, AP Chemistry, etc.), but for many of you this will be your first exposure to this information.

Questions found on this diagnostic test reflect the actual percentage of questions that you will find for each topic; i.e., 10–15% of the questions on the actual APES exam cover earth science concepts (geology, tectonics, earthquakes, soil dynamics, etc.)—likewise, 10–15% of the questions on this diagnostic also cover these same topics). Furthermore, the questions on this diagnostic test are grouped into categories to make it easy for you and your teacher to identify areas in which you might need extra study. As on the actual APES exam, there is no penalty for guessing on this diagnostic test; however, for this practice diagnostic test *ONLY*, it is suggested that if you are not familiar with the question or answer choices, that you leave it blank. This will give you a clearer picture of where you currently are. Some students take this same diagnostic test again just before the actual APES exam, to see how far they have progressed—teachers refer to this as a “post” test.

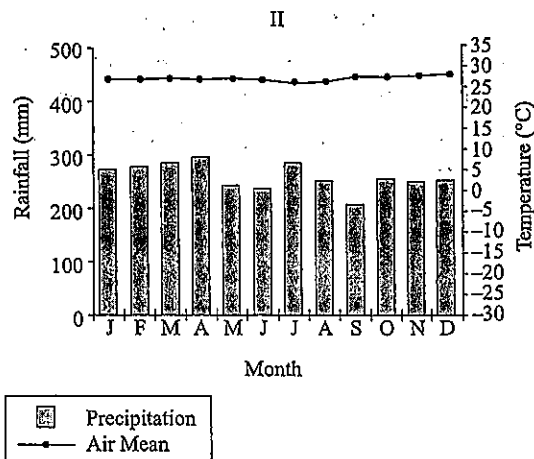
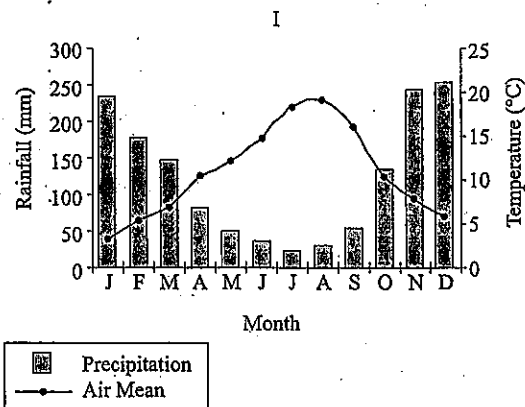
An answer key can be found directly following the test, and this will include a page number (where applicable) to bring you directly to that topic and question in the review sections of this book. Also included in the scoring section is a predictive scale developed and used by the College Board to predict what your actual APES score might be. Free-response (essay) questions are not included in this diagnostic test as that would involve subjective grading and furthermore, it is not part of the College Board's predictive rubric.

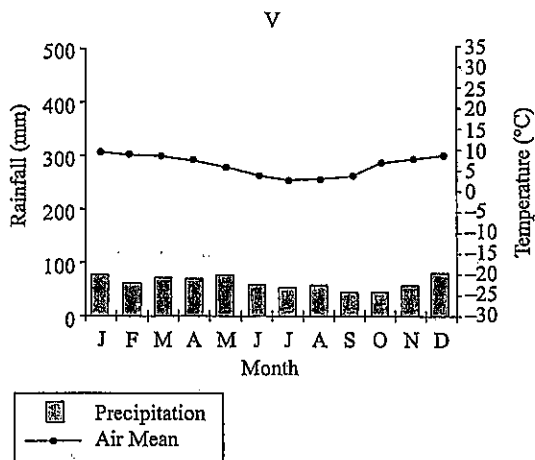
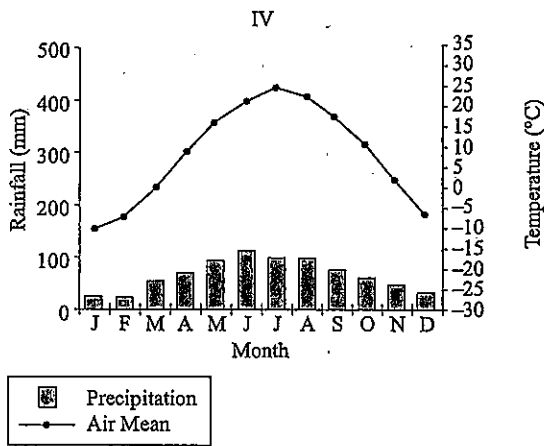
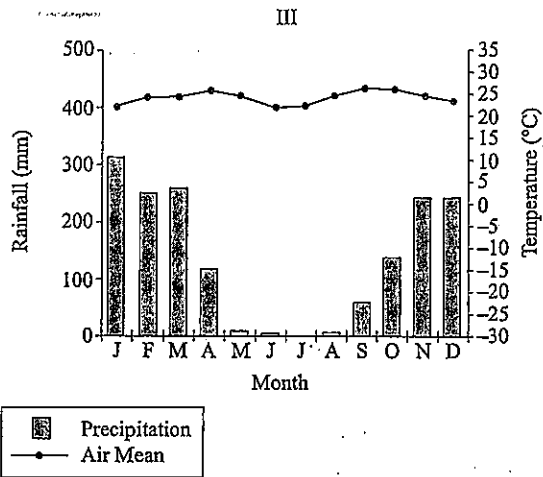
## DIAGNOSTIC TEST

1. The following is a typical description of a certain climate:

*Temperature patterns suggest a southern hemisphere location. The low temperature range indicates an oceanic climate and the low values suggest a fairly high latitude (or altitude). Agriculture may be limited because although the growing season (temperatures  $>5^{\circ}\text{C}$ ) is reasonably long, average temperatures are not often very high above the threshold. Consequently, daily temperatures could be too low for productive growth in almost any month of the year. Precipitation patterns suggest an oceanic climate with well-distributed rainfall. The low temperatures would suggest most of the precipitation is frontal, rather than convective. With the low temperatures, some of the precipitation will fall as snow especially in the winter months from May to September.*

Which of the following climate graphs is reflective of this description?



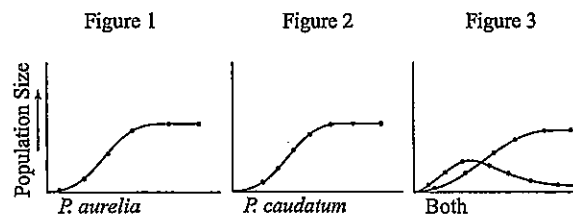


- (A) I
- (B) II
- (C) III
- (D) IV
- (E) V

2. An earthquake of Richter magnitude 5 is how many times larger on the Richter scale than an earthquake of Richter magnitude 3?
- (A) One-fourth
  - (B) One-half
  - (C) Twice
  - (D) Four times
  - (E) One hundred times
3. The interface where plates move apart in opposite directions is known as a
- (A) transform plate boundary
  - (B) convergent plate boundary
  - (C) divergent plate boundary
  - (D) subduction zone
  - (E) trench
4. Differences in the heating and cooling characteristics between land and water cause differences in climate. At 40°N latitude, land surfaces are \_\_\_\_\_ in the summer and \_\_\_\_\_ in the winter compared to ocean areas at the same latitude.
- (A) warmer, cooler
  - (B) cooler, warmer
  - (C) warmer, warmer
  - (D) cooler, cooler
  - (E) none of the above
5. 99% of the volume of gases in the lower atmosphere, listed in descending order of volume, are
- (A) O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>O
  - (B) H<sub>2</sub>O, N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>
  - (C) O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, H<sub>2</sub>O
  - (D) CO<sub>2</sub>, H<sub>2</sub>O, O<sub>2</sub>, N<sub>2</sub>
  - (E) N<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>O, CO<sub>2</sub>
6. The circulation of air in Hadley cells results in
- (A) low pressure and rainfall at the equator
  - (B) high pressure and rainfall at the equator
  - (C) low pressure and dry conditions at about 30° north and south of the equator
  - (D) high pressure and wet conditions at about 30° north and south of the equator
  - (E) both (A) and (C)

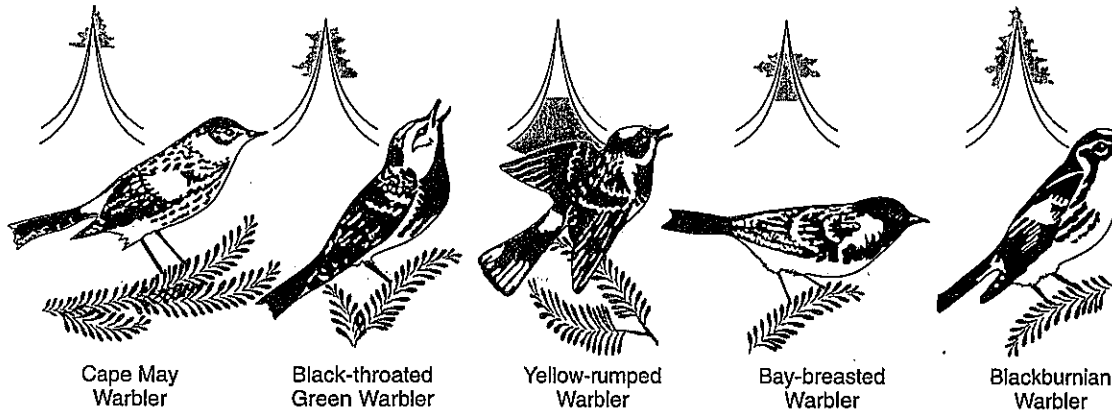
7. Of the freshwater on Earth that is not trapped in snow packs or glaciers, most of it (95%) is trapped in
- (A) lakes
  - (B) rivers
  - (C) aquifers
  - (D) dams
  - (E) estuaries, marshes, and bogs
8. Of the following methods of irrigation, the one that currently conserves the most water is
- (A) flooding fields
  - (B) irrigation channels
  - (C) sprinklers
  - (D) drip irrigation
  - (E) misters
9. Countries that are more likely to suffer from water stress would be located in
- (A) North America
  - (B) South America
  - (C) western Europe
  - (D) the Middle East
  - (E) Asia
10. The smallest particle of soil is known as
- (A) clay
  - (B) sand
  - (C) silt
  - (D) gravel
  - (E) humus
11. Which of the following lists soil particles in order of size (smallest to largest)?
- (A) sand—silt—clay—gravel
  - (B) clay—sand—silt—gravel
  - (C) gravel—sand—silt—clay
  - (D) clay—silt—sand—gravel
  - (E) silt—clay—sand—gravel

12. Acid rain affects soil by
- decreasing soil porosity
  - decreasing the pH
  - decreasing soil aeration
  - lowering nutrient capacity
  - all of the above
13. Which of the following ecosystems have forests of cold climates of high latitudes and high altitudes?
- Tropical rain forest
  - Temperate deciduous forest
  - Savanna
  - Taiga
  - Tundra
14. An experiment was done with two species of paramecium, *P. aurelia* and *P. caudatum*. Both species were raised separately and their population sizes recorded (Figures 1 and 2). Another experiment was done in which populations of both species were raised together (Figure 3). Figure 3 best represents what concept?



- Competitive Exclusion Principle
  - Supply and Demand
  - Natural Selection
  - Evolution
  - Carrying Capacity
15. All of the following are factors that increase population size EXCEPT
- ability to adapt
  - specialized niche
  - few competitors
  - generalized niche
  - high birthrate

16. Five different species of insect-eating warblers coexist in a forest made up of primarily spruce trees in Canada. The five species live in different parts of the tree as shown below:

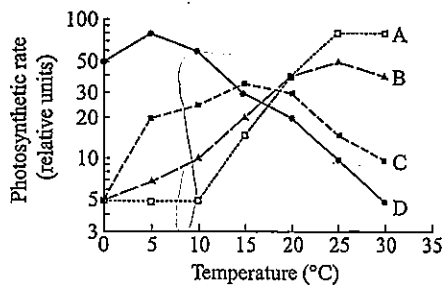


This phenomenon is best described as

- (A) intraspecific competition.
  - (B) natural selection.
  - (C) hybridization.
  - (D) resource partitioning.
  - (E) mutual exclusion.
17. Which of the following regions of the open ocean is MOST likely to contain photosynthetic organisms?

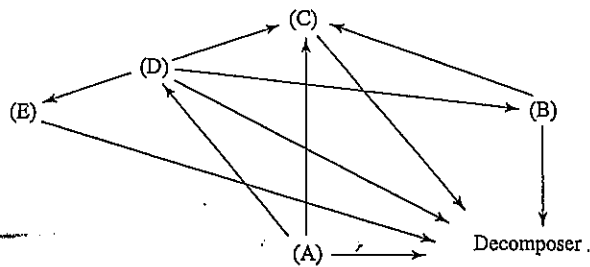
- (A) Euphotic zone
- (B) Disphotic zone
- (C) Aphotic zone
- (D) Benthic zone,
- (E) Abyssal zone,

18. The graph below shows the relationship between photosynthetic rate and temperature. Based on these results, which species is *best* adapted to arctic conditions where the mean temperature does not exceed 8°C during the growing season?



- (A) Species A
- (B) Species B
- (C) Species C
- (D) Species D
- (E) All species are equally well adapted.

19. Use the following diagram for Question 19:



Which of the following letters in the food web above would not represent a carnivore?

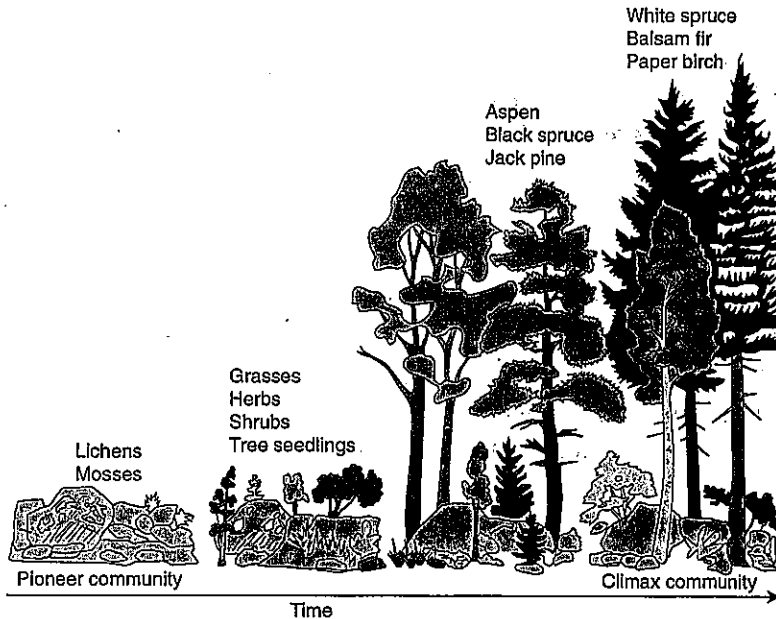
- (A) A
  - (B) B and E
  - (C) C
  - (D) A, C, and D
  - (E) E
20. Darwin noted that the Patagonian hare was similar in appearance and had a niche similar to the European hare. However, the Patagonian hare is not a rabbit. It is a rodent related to the guinea pig. This example illustrates the principle known as
- (A) allopatric speciation
  - (B) adaptive radiation
  - (C) divergent evolution
  - (D) coevolution
  - (E) convergent evolution
21. Which of the following would NOT be considered an ecological service of a marine ecosystem?
- (A) Climate moderation
  - (B) Nutrient cycling
  - (C) CO<sub>2</sub> absorption
  - (D) Genetic resources and biodiversity
  - (E) Pharmaceuticals



22. Which of the following examples does NOT demonstrate a positive feedback loop?

- (A) A warmer atmosphere will, due to increased evaporation and decreased condensation, contain more water vapor, which is a greenhouse gas and will warm the atmosphere further.
- (B) A warmer atmosphere will melt ice, and this changes the albedo, which further warms the atmosphere.
- (C) A colder climate will cause ice caps and glaciers to grow, changing the albedo and further cooling the atmosphere.
- (D) Methane hydrates can be unstable such that a warming ocean could release methane, which is a greenhouse gas.
- (E) All examples demonstrate a positive feedback loop.

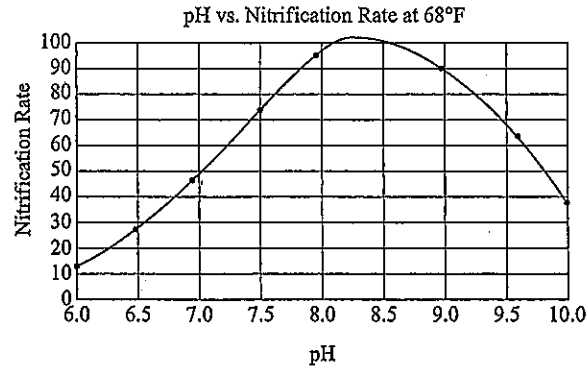
23. Refer to the diagram below.



The greatest species diversity would be found in

- (A) the pioneer community represented by the lichens and mosses.
- (B) the community composed primarily of grasses, herbs, shrubs, and tree seedlings.
- (C) the community composed primarily of aspen, black spruce, and jack pine.
- (D) the community composed primarily of white spruce, balsam fir, and paper birch.
- (E) all communities equally.

24. Refer to the following graph to answer question 24:



Nitrifying bacteria were subjected to varying pHs and their relative nitrification rates measured. The results of that experiment were plotted and presented above. In the human-altered process called acid precipitation, the main biogeochemical cycles that are altered are the \_\_\_\_\_ cycles and one effect in lakes is to \_\_\_\_\_ populations of nitrifying bacteria.

- (A) phosphorus and nitrogen, increase
- (B) phosphorus and nitrogen, decrease
- (C) nitrogen and sulfur, decrease
- (D) nitrogen and sulfur, increase
- (E) phosphorus and sulfur, decrease

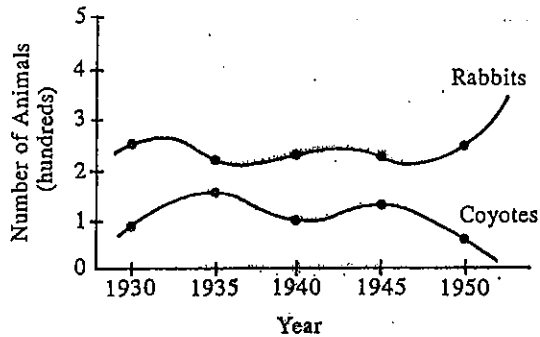
25. The major sink for phosphorus is

- (A) marine sediments
- (B) atmospheric gases
- (C) seawater
- (D) plants
- (E) animals

26. Which would be least likely to be affected by a density-dependent limiting factor?

- (A) A small, scattered population
- (B) A population with a high birth rate
- (C) A large, dense population
- (D) A population with a high immigration rate
- (E) None of the above

27. In 1940, ranchers introduced cattle into an area. The graph below shows the effect of cattle ranching on the populations of two organisms present in the area before the introduction of the cattle. Base your answers to questions 27 on the graph and on your knowledge of environmental science.



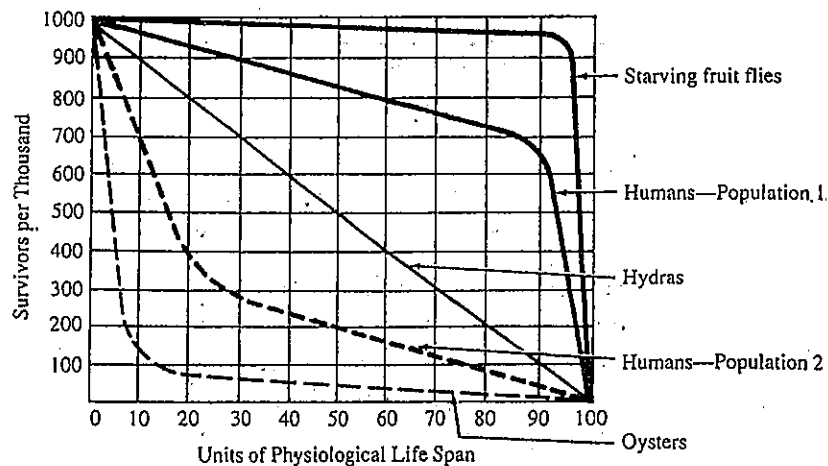
The most probable reason for the increase in the rabbit population after 1950 was

- (A) more food became available to the rabbits
  - (B) the coyote population declined drastically
  - (C) the cattle created a more favorable environment for the rabbits
  - (D) the coyotes and cattle competed for the same food
  - (E) the coyote population increased
28. Why is territoriality an adaptive behavior for songbirds maintaining populations at or near their carrying capacity?
- (A) Because songbirds expend a tremendous amount of energy defending territories, they spend less time feeding their young and fledgling mortality increases.
  - (B) Only the fittest males defend territories, and they attract the fittest females; therefore, the best genes are conveyed to the next generation.
  - (C) Songbird males defend territories commensurate with the size from which they can derive adequate resources for themselves, their mates, and their chicks.
  - (D) Many individuals are killed in the ritualistic conflicts that go along with territorial defense.
  - (E) Songbirds make improvements to the territories they inhabit so that they can all enjoy larger clutches and successfully fledged chicks.
29. All of the following are characteristics of *K*-strategists EXCEPT
- (A) mature slowly
  - (B) low juvenile mortality rate
  - (C) niche generalists
  - (D) Type I or II survivorship curve
  - (E) intraspecific competition due to density-dependent limiting factors

30. The following graph shows survival rates for five animal populations. When survival curves are calculated, the following assumptions are made:

- I. All individuals of a given population are the same age.
- II. No new individuals enter the population.
- III. No individuals leave the population.

These curves show the relationship of the number of individuals in a population to units of physiological life span. Base your answers to question 30 on the graph and on your knowledge of environmental science.



The survival curves indicate that

- (A) starving fruit flies live out their full life span
- (B) human populations are more vulnerable than hydras
- (C) human population 2 has a greater rate of survival than human population 1
- (D) the hydra has a longer life span than the oyster
- (E) fruit flies die directly after pupation

31. Demographic transition leads to stabilizing population growth and is generally characterized as having four separate stages. Place the following stages in the proper order as they would most likely occur.

- I. Birthrates equal mortality rates, and zero population growth is achieved. Birthrates and death rates are both relatively low, and the standard of living is much higher than during the earlier periods. In some countries, birthrates may actually fall below mortality rates and result in net losses in population.
- II. Living conditions are severe, medical care is poor or nonexistent, and the food supply is limited due to poor agricultural techniques, poor preservation, and pestilence. Birthrates are high to replace individuals lost through high mortality rates. The net result is little population growth.
- III. Urbanization decreases the economic incentives for large families. The cost of supporting an urban family grows, and parents are more actively discouraged from having large families. Educational and work opportunities for women decrease birth rates. Obtaining food is not a major focus of the day. Leisure time is available, and retirement safety nets are in place, reducing the need for extra children to support parents. In response to these economic pressures, the birthrate starts to drop, ultimately coming close to the death rate.
- IV. Occurs after the start of industrialization. Standards of hygiene and more modern medical techniques begin to drive the death rate down, leading to a significant upward trend in population size. Mortality rates drop as a result of advances in medical care, improved sanitation, cleaner water supplies, vaccination, and higher levels of education. The net result is a rapid increase in population.

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

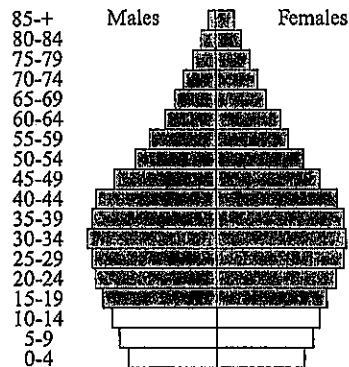
32. A country has a population of 700 million people and has an annual rate of growth of 1.75 percent. In one year, what would be the population of this country?

- (A) 12,250,000
- (B) 700,122,500
- (C) 701,225,000
- (D) 712,250,000
- (E) 712,500,000

33. If a population doubles in about 70 years, it is showing a \_\_\_\_\_% growth rate.

- (A) 1
- (B) 5
- (C) 35
- (D) 140
- (E) 200

34. Examine the following diagram.



Which of the following statements is true for this age-structure diagram *at this point in time*?

- (A) The working class has to support a large population of younger children.
- (B) The working class has to support a large population of older adults.
- (C) The working class can reasonably support a smaller population of younger children and older adults.
- (D) This diagram would be typical for a country such as Mexico.
- (E) This diagram would be typical for a country such as Japan.

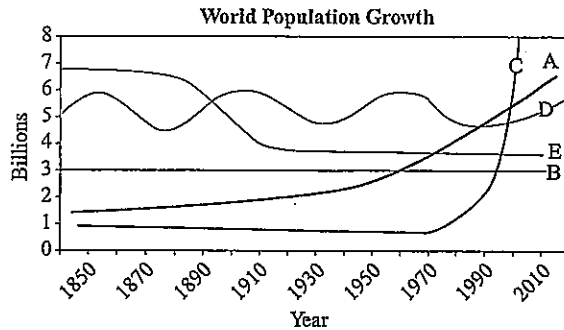
35. Refer to the following table to answer question 35.

Choice	Developed Countries	Less-Developed Countries
(A)	8/1,000 live births	63/1,000 live births
(B)	63/1,000 live births	8/1,000 live births
(C)	80/1,000 live births	630/1,000 live births
(D)	800/1,000 live births	63/1,000 live births
(E)	8/1,000 live births	8/1,000 live births

What is the average infant mortality rate in developed countries compared to that in less-developed countries?

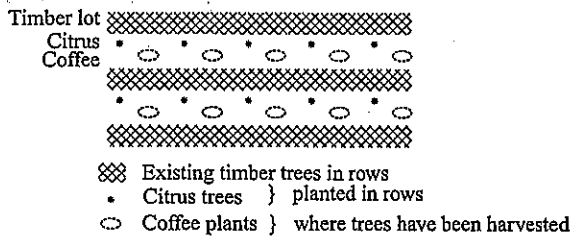
- (A) A
- (B) B
- (C) C
- (D) D
- (E) E

36. Which line of the graph below represents the world's population growth from 1850–2007?



- (A) A
- (B) B
- (C) C
- (D) D
- (E) E

- 37.



The diagram above shows how a small farmer in a small South American country had planned to grow crops on land that he had recently cleared. If the land was flat (no mountains, slopes, or hills), what type of farming is shown?

- (A) Strip cropping
  - (B) Contour farming
  - (C) Alley cropping
  - (D) Terracing
  - (E) Polycropping
38. A farmer was faced with several choices in controlling insect pests. After much reading and talking to other farmers he decided to try third-generation pesticide control. Which of the following are advantages of applying insect hormones over applying pheromones?
- (A) Insect hormones will immediately take effect to kill insects.
  - (B) Insect hormones are very effective in controlling large infestations.
  - (C) Insect hormones can be applied at any time in the targets' life cycle.
  - (D) All of the above.
  - (E) None of the above.

39. A type of pesticide that affects the nervous system by disrupting the enzyme that regulates acetylcholine, a neurotransmitter, is
- (A) Organophosphates
  - (B) Organochlorides
  - (C) Pyrethroids
  - (D) Plant-incorporated protectants (PIPS)
  - (E) Pheromones
40. In which of the following states or areas would you NOT find significant amounts of old-growth forests?
- (A) New England
  - (B) Appalachia
  - (C) British Columbia
  - (D) Washington State
  - (E) California

41. The following is a newspaper quote describing a recent fire that occurred:

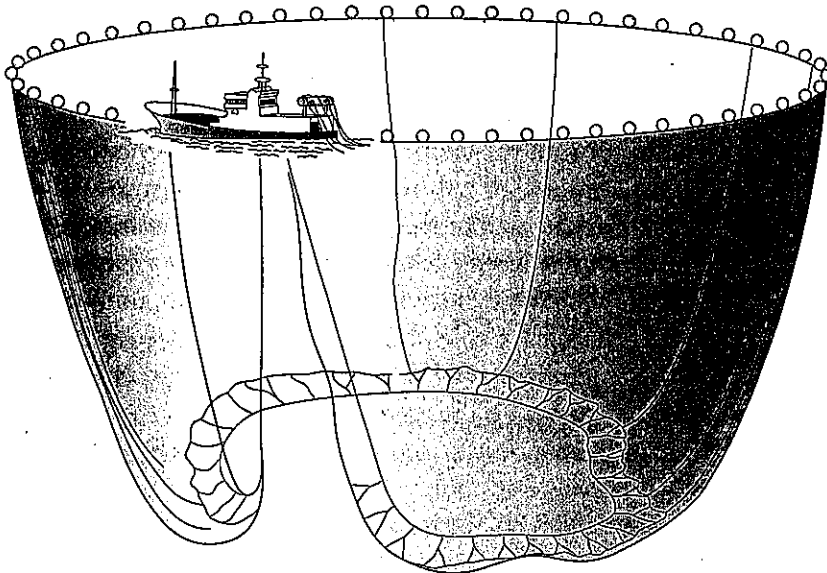
*The fire burned the upper litter layer and small branches that were on or near the ground. The fire moved rapidly through the area and did not consume the entire organic layer. Moisture in the organic soil horizons prevented ignition of the humus layer, and protected the soil and soil-inhabiting organisms from the heat. The heat pulse generated at the burning front of this fast-moving fire did not persist long enough to damage tissues underneath the thick bark of large trees. However, the fire did girdle the root collar of small trees and shrubs, and reduced small-diameter branches and other fine surface fuels.*

What type of fire was the article referring to?

- (A) Crown fire
  - (B) Ground fire
  - (C) Surface fire
  - (D) Underground fire
  - (E) Wildfire
42. An APES class went on a field trip into a coniferous forest. They discovered a very large section of land that had been completely logged. There were just stumps where large coniferous trees had once stood. There was also very little animal life in the area. Which method of logging had most likely been used in this section of land?
- (A) Strip cutting
  - (B) Clear cutting
  - (C) Seed-tree cutting
  - (D) Shelterwood cutting
  - (E) Selective cutting



43. The number one cause of worldwide tropical deforestation is
- (A) commercial logging.
  - (B) wildfires.
  - (C) clearing of land for agriculture.
  - (D) collection of firewood.
  - (E) building roads and clearing land for cities.
44. Which of the following is NOT a concept designed to create a sustainable city?
- (A) Conserve natural habitats
  - (B) Focus on energy and resource conservation
  - (C) Design affordable and fuel-efficient automobiles
  - (D) Provide ample green space
  - (E) All are correct
45. A process in which small holes are drilled into Earth and water-based chemical solvents are used to flush out desired minerals is known as
- (A) chemical leaching
  - (B) *ex-situ* leaching
  - (C) beneficiation
  - (D) heap leaching
  - (E) *in situ* leaching
46. Examine the following diagram:



The type of fishing represented above is known as

- (A) drift-net.
- (B) purse-seine.
- (C) long line.
- (D) drag line.
- (E) trolling.

47. For question 47, choose from the following choices:

- I. Build hatcheries upstream of dams and release juveniles from the hatcheries to underpopulated streams.
- II. Build fish ladders to enable adult salmon to bypass dams during their upstream migration to spawn.
- III. Use trucks and barges to transport juvenile wild salmon around dams and turn off turbines to allow juveniles to swim safely over dams during periods of heavy upstream migration.
- IV. Release extra water from dams to help wash juvenile salmon downstream at a faster rate closer to their natural migration rate.
- V. Place some streams off limits for hydropower development.

The ABC Power Company is in the developmental stage of building a dam for a growing community. However, a proactive citizen coalition of environmental groups is opposing the dam. A meeting was held in which various proposals to satisfy their environmental concerns were debated. Which of the choices above would NOT be consistent with techniques currently in use to protect wild salmon?

- (A) I
- (B) II
- (C) I and IV
- (D) II, IV, and V
- (E) All choices are consistent with current environmental mitigation techniques.

48. Which of the following statements is NOT consistent with "The Tragedy of the Commons" by Garret Hardin?

- (A) We will always add one too many cows to the village commons, destroying it.
- (B) The destruction of the commons will not be stopped by shame, moral admonitions, or cultural mores anywhere nearly so effectively as it will be by the will of the people expressed as a protective mandate, in other words, by government.
- (C) The "Tragedy of the Commons" is a modern phenomenon. Humans were not capable of doing too much damage until the population exceeded certain numbers and their technological tools became powerful beyond a certain point.
- (D) A free-market economy, based on capitalism, does not contribute to the tragedy of the commons.
- (E) We will always opt for an immediate benefit at the expense of less-tangible values such as the availability of a resource to future generations.

49. Which of the following forms of energy is a renewable resource?

- (A) Synthetic oil
- (B) Breeder fission
- (C) Biomass
- (D) Oil shale
- (E) Synthetic natural gas

50. For question 50, refer to the following information:

A town has 8,000 homes. A nearby coal-burning plant has a peak capacity of producing 20 megawatts of electricity. An average home consumes 10,000 kilowatt hours of electricity per year. Electricity costs \$0.12 per kWh. The power plant runs 8,000 hours per year.

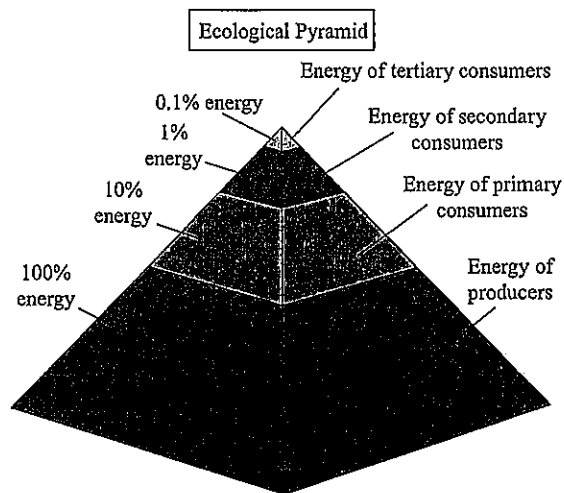
How many kWh of electricity is the plant capable of producing in one year?

- (A)  $9.0 \times 10^4$  kWh/yr
- (B)  $1.00 \times 10^5$  kWh/yr
- (C)  $4.50 \times 10^6$  kWh/yr
- (D)  $2.0 \times 10^7$  kWh/yr
- (E)  $1.6 \times 10^8$  kWh/yr

51. Two lightbulbs are for sale—a 15-watt fluorescent and a 60-watt incandescent. You know that a 15-watt fluorescent lightbulb will produce the same amount of light as a 60-watt incandescent lightbulb. If electricity costs \$0.10 per kWh and you run each lightbulb for 8,000 hours, how much money will you save in the cost of electricity by buying the fluorescent lightbulb?

- (A) \$4.00
- (B) \$8.00
- (C) \$12.00
- (D) \$36.00
- (E) \$48.00

52.



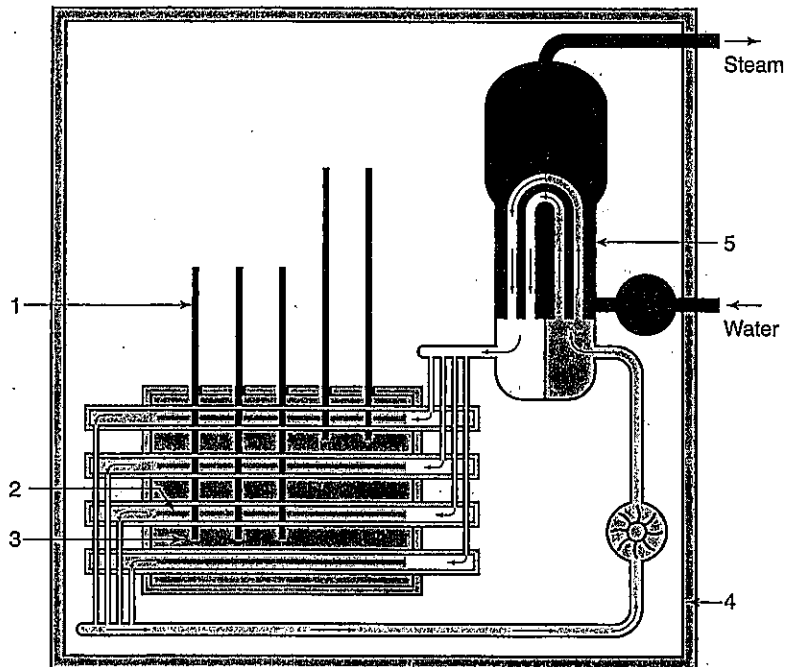
The diagram above best represents

- (A) the First Law of Thermodynamics
  - (B) the Second Law of Thermodynamics
  - (C) the Third Law of Thermodynamics
  - (D) biomass
  - (E) succession
53. At today's rate of consumption, known U.S. oil reserves will be depleted in about
- (A) 100 years
  - (B) 50 years
  - (C) 25 years
  - (D) 10 years
  - (E) 3 years
54. Which of the following alternatives would NOT lead to a sustainable energy future?
- (A) Phase out nuclear power subsidies.
  - (B) Create policies to encourage governments to purchase renewable energy devices.
  - (C) Assess penalties or taxes on continued use of coal and oil.
  - (D) Decrease fuel-efficiency standards for cars, appliances, and HVAC (Heating, Ventilation, and Air Conditioning) systems.
  - (E) Create tax incentives for independent power producers.
55. How long does it take for oil to form from the decomposition of plants and animals?
- (A) 100 years
  - (B) 1,000 years
  - (C) 10,000 years
  - (D) 100,000 years
  - (E) millions of years

56. Which country currently ranks number one in both coal reserves and use of coal as an energy source?

- (A) Russian Federation
- (B) United States
- (C) China
- (D) India
- (E) Brazil

57. Question 57 refers to the following diagram of a heavy water moderated nuclear reactor.



"1" in the diagram above represents the

- (A) control rods
- (B) moderator
- (C) fuel rods
- (D) concrete shields
- (E) condensers

58. For Question 58, choose from the following choices:

- I. Nuclear energy has a low net-energy yield.
- II. Nuclear energy has a high net-energy yield.
- III. Nuclear power plants have high construction costs.
- IV. Nuclear power plants have lower construction costs.
- V. Extremely limited supplies of uranium ore are available on Earth.

A small country that had depended on burning coal to generate power had recently decided to switch to nuclear power plants. Which of the choices above would need to be considered in switching to a nuclear power plant?

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

59. Which is NOT an advantage of using nuclear fusion?

- (A) Abundant fuel supply
- (B) No generation of weapons-grade material
- (C) No air pollution
- (D) No high-level nuclear waste
- (E) All are advantages

60. Which of the following is NOT an advantage of building a hydroelectric power plant?

- (A) Low pollution
- (B) High construction cost
- (C) Relatively low operating cost
- (D) Control flooding
- (E) Moderate-to-high net-useful energy

61. For question 61, choose from the following choices:

- I. Raise gasoline subsidies
- II. Reduce gasoline subsidies
- III. Increase federal gasoline taxes
- IV. Reduce federal gasoline taxes
- V. Increase emission penalties
- VI. Decrease emission penalties
- VII. Increase tariffs on imports of gasoline
- VIII. Decrease tariffs on imports of gasoline

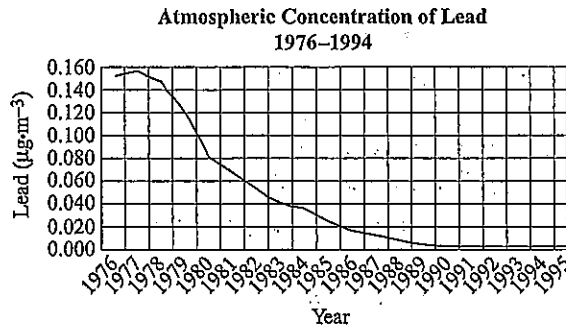
Which of the strategies above would provide incentives for people to switch to hybrid electric vehicles?

- (A) I, IV, VI, VIII
- (B) I, III, VI, VII
- (C) II, III, V, VII
- (D) II, IV, VI, VII
- (E) I, III, V, VIII

62. The sudden and dramatic rise in gasoline and diesel fuel prices that began in 2008 necessitated a large automobile manufacturing company to evaluate using alternative forms of energy for its vehicles. One of the designs proposes using hydrogen as an energy source. Which of the following statements about using hydrogen as a fuel is TRUE?

- (A) Hydrogen gas can be produced from water.
- (B) Water is the only waste product involved in using hydrogen power cars.
- (C) Hydrogen is more difficult to store than electricity.
- (D) The use of hydrogen results in positive net energy.
- (E) Hydrogen gas is more dangerous than gasoline or natural gas.

63. Atmospheric concentration of lead decreased significantly from 1976 to 1994 as seen in the following graph.



The factor that was probably most responsible for the decrease in atmospheric lead levels was

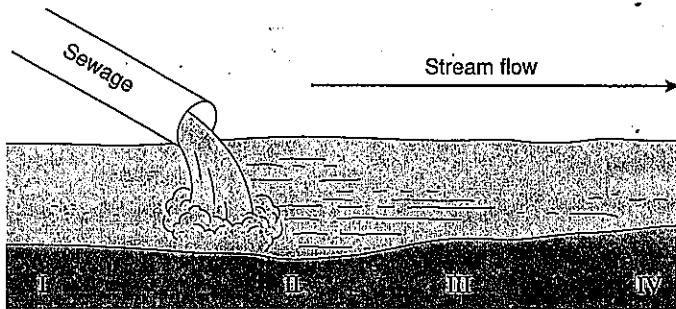
- (A) outlawing lead in paints.
  - (B) outlawing the use of lead in pencils.
  - (C) the phasing out of lead in gasoline.
  - (D) the increase in diesel cars and trucks that do not use leaded gasoline.
  - (E) mandating that scrubbers be used in power plants that use coal or oil.
64. Which mobile source pollutant cannot be currently controlled by emission control technology?
- (A) Ozone-forming hydrocarbons
  - (B) Carbon monoxide
  - (C) Carbon dioxide
  - (D) Air toxics
  - (E) Particulate matter
65. \_\_\_\_\_ contributes to the formation of \_\_\_\_\_ and thereby compounds the problem of \_\_\_\_\_.
- (A) ozone, carbon dioxide, acid rain
  - (B) carbon dioxide, carbon monoxide, ozone depletion
  - (C) sulfur dioxide, acid deposition, global warming
  - (D) nitrous oxide, ozone, industrial smog
  - (E) nitric oxide, ozone, photochemical smog



66. As urban environments become denser, noise pollution is becoming a major environmental issue as people deal with noise generated from flight paths, freeways, work environments, and neighborhoods. Which of the following is a TRUE statement?

- (A) Loud sound is not dangerous as long as you do not feel any pain in your ears.
- (B) Hearing loss after sound exposure is temporary.
- (C) Hearing loss is caused mostly by aging.
- (D) Loud sound damages only your hearing.
- (E) If you have a hearing loss already, you still have to protect your hearing.

67. Refer to the data below taken from a stream. The Roman numerals indicate collection sites.



Where would the lowest DO (dissolved oxygen) content be expected?

- (A) I
- (B) II
- (C) III
- (D) IV
- (E) Dissolved oxygen would not be affected by sewage effluent. Therefore, DO would be equal at all points.

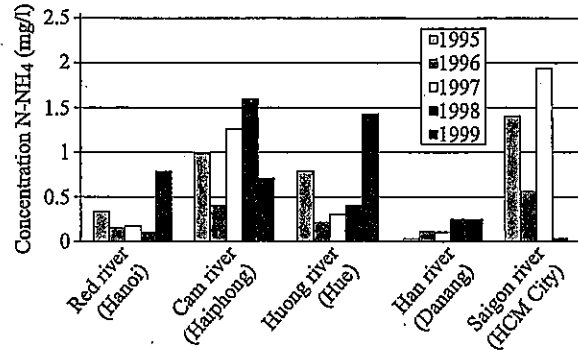
68. A certain pollutant has a concentration of 100 ppm in water. Which statement most accurately describes this concentration?

- (A) Out of 1,000,000 molecules of water, 100 would contain the pollutant.
- (B) There are 100 million molecules of pollutant in the water sample.
- (C) In one liter of water, there would be 100 million molecules of pollutant.
- (D) There are 100 molecules of pollutant in 999,900 molecules of water.
- (E) In 1 million liters of water, there would be 100 million molecules of pollutant.

69. What is the most frequent cause of beach pollution?

- (A) Polluted runoff and storm water
- (B) Sewage spills from treatment plants
- (C) Oil spills
- (D) Ships dumping their holding tanks into coastal waters
- (E) People leaving their trash on the beach

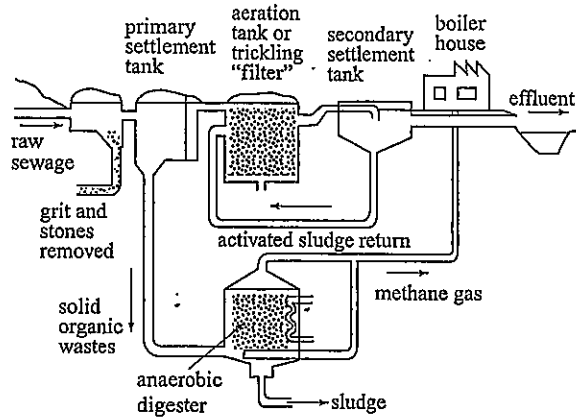
70. Studies were taken of ammonia-ammonium ion pollution in river waters in Vietnam from 1995 to 1999. The results are presented below.



The most likely source of the nitrogenous pollution in river water is

- (A) industrial
- (B) agricultural
- (C) residential
- (D) from landfills
- (E) most likely from feedlots

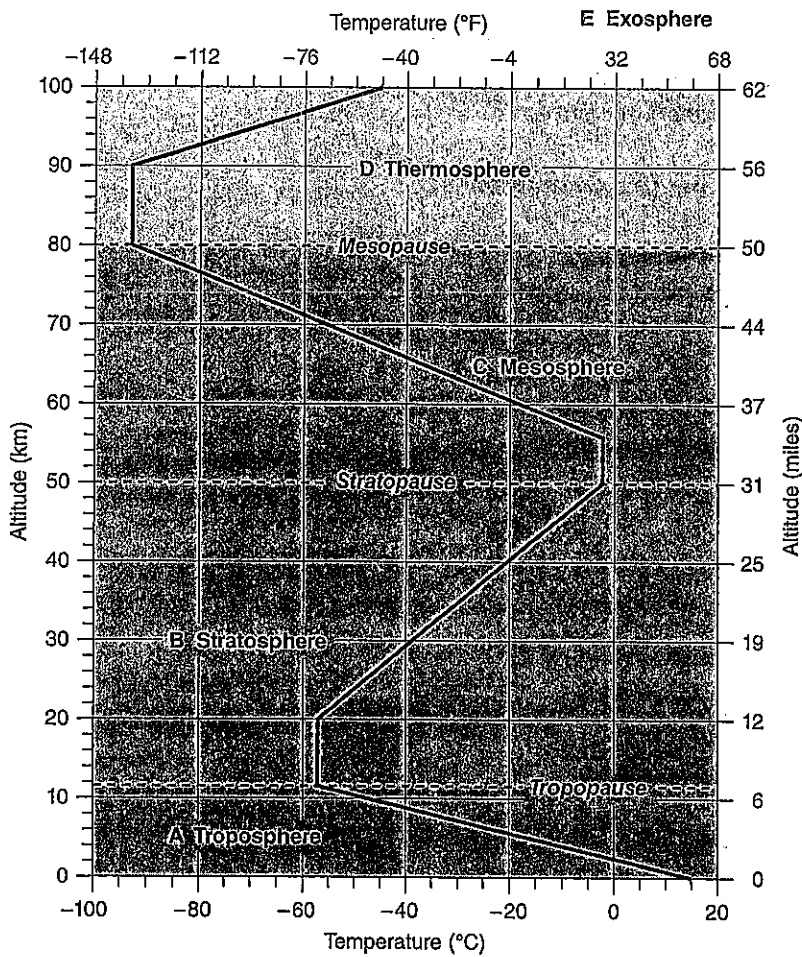
71. The city council of a large Midwestern city was studying the plans for a new sewage treatment plant. A major concern of the council was how the plant was going to control soluble organic wastes. The city engineer presented the plans below. At which point in the proposed treatment plant would this issue FIRST be addressed?



- (A) Primary settlement tank  
 (B) Aeration tank  
 (C) Secondary settlement tank  
 (D) Anaerobic digester  
 (E) Boiler house
72. The most common method of disposing of municipal solid wastes in the United States is
- (A) incineration  
 (B) ocean dumping  
 (C) sanitary landfills  
 (D) recycling  
 (E) exporting
73. Which act's primary goal is to protect human health and the environment from the potential hazards of waste disposal and calls for conservation of energy and natural resources, reduction in waste generated, and environmentally sound waste management practices?
- (A) RCRA  
 (B) FIFRA  
 (C) CERCLA  
 (D) OSHA  
 (E) FEMA

74. Which of the following methods of handling solid wastes is against the law in the United States?
- (A) Incineration
  - (B) Dumping it in open landfills
  - (C) Burying it underground
  - (D) Exporting the material to foreign countries
  - (E) Dumping the material in the open ocean
75. Excavating and hauling soil off-site to an approved soil disposal/treatment facility would be an example of
- (A) sustainability
  - (B) remediation
  - (C) conservation
  - (D) preservation
  - (E) mitigation
76. Which of the following statements is FALSE?
- (A) Evidence exists of a dose-response relationship between nonmelanoma skin cancer and cumulative exposure to UVB radiation.
  - (B) Individuals, usually those living in areas with limited sunlight and long, dark winters, may suffer severe photo-allergies to the UVB in sunlight.
  - (C) Increased absorption of UVB triggers a thickening of the superficial skin layers and an increase in skin pigmentation.
  - (D) There is a relationship between skin cancer prevalence and increases in ultraviolet radiation due to the depletion of tropospheric ozone.
  - (E) Acute exposure to UVB causes sunburn, and chronic exposure results in loss of elasticity and increased skin aging.
77. Which factor listed below is generally considered to be the primary cause of reduced human life span?
- (A) AIDS
  - (B) Infectious disease
  - (C) Cancer
  - (D) Poverty
  - (E) Heart disease

78. Question 78 refers to the layers of the Earth's atmosphere as shown below.



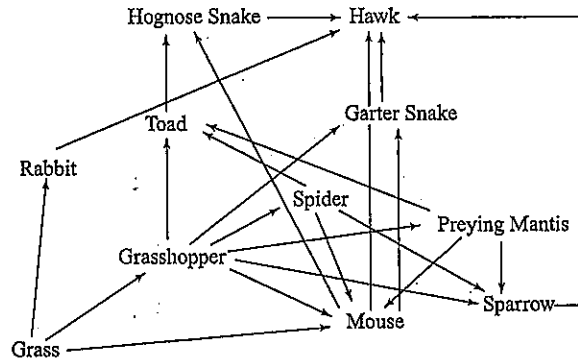
Which layer is the region where UVC is filtered out?

- (A) A  
 (B) B  
 (C) C  
 (D) D  
 (E) E
79. In 1989, the *Exxon Valdez* spilled 10.8 million gallons of crude oil into Prince William Sound in Alaska. What happened to most of the oil?
- (A) It was cleaned up by Exxon.  
 (B) It eventually evaporated into the air.  
 (C) It sank into the ground.  
 (D) It biodegraded and photolyzed.  
 (E) It dispersed into the water column.

80. Causes of sick building syndrome include all of the following EXCEPT

- (A) radon and asbestos
- (B) chemical contaminants from indoor sources
- (C) chemical contaminants from outdoor sources
- (D) biological contaminants
- (E) inadequate ventilation

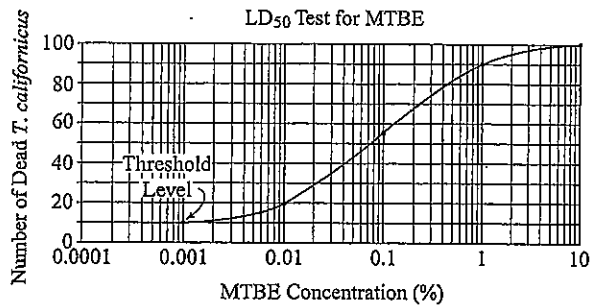
81. Examine the following food web:



Which organism in the food web accumulates the highest concentration of a fat-soluble pollutant?

- (A) Grass
- (B) Grasshopper
- (C) Sparrow
- (D) Spider
- (E) Hawk

82. Examine the following LD<sub>50</sub> chart:



A scientist wanted to study the effect of a gasoline additive MTBE (methyl tertiary butyl ether) on *Tigriopus californicus* (a common marine copepod). Six different concentrations of MTBE were prepared in separate test tubes, and 100 *T. californicus* were placed in each tube. After 24 hours, the number of organisms that died were counted and recorded. The results of the experiment are shown below.

MTBE Concentration (%)	Number of dead <i>T. californicus</i>
<0.0001	10
0.001	10
0.01	20
0.1	55
1	90
10	100

Which of the following conclusions would be true based only the information in the graph?

- (A) There should be 50 dead *T. californicus* in a population of 100.
- (B) There should be 55 dead *T. californicus* in a test population of 90.
- (C) There should be 100 dead *T. californicus* in a test population of 100.
- (D) Only 10 *T. californicus* would survive in a test population of 100.
- (E) 100 *T. californicus* would survive in a test population of 100.

83. For question 83, choose from the following choices:

- I. Phasing in governmental subsidies and tax breaks to industries that adopt eco-friendly manufacturing and business practices
- II. Implementing market barriers
- III. Charging user fees
- IV. Ecolabeling programs
- V. Levying ecotaxes

Which of these choice(s) represent a financial incentive to improve environmental quality and reduce resource waste?

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

84. Which of the following is NOT part of a cost-benefit analysis?

- (A) Judging whether public services provided by the private sector are adequate
- (B) Judging and assessing inefficiencies in the private sector and their impact on health, safety, and environmental need
- (C) Determining external costs to society
- (D) Meeting societal needs in a cost-effective manner
- (E) All are part of a cost-benefit analysis

85. Which of the following examples listed is a positive externality?

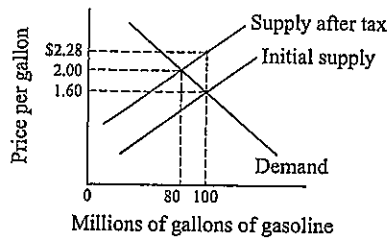
- (A) Anthropogenic climate change is attributed to greenhouse gas emissions from burning oil, gas, and coal.
- (B) Water pollution by industries that adds poisons to the water harms plants, animals, and humans.
- (C) Industrial farm animal production, on the rise in the 20th century, resulted in farms that were easier to run, with fewer and often less-highly-skilled employees, and a greater output of uniform animal products.
- (D) The harvesting by one fishing company in the ocean depletes the stock of available fish for the other companies, and overfishing may result.
- (E) A beekeeper raising bees for their honey on his property allows the bees to pollinate surrounding crops on other farmers' property.

86. Externalized costs of nuclear power include all of the following EXCEPT

- (A) disposing of nuclear wastes
- (B) government subsidies
- (C) costs associated with Three Mile Island
- (D) Price-Anderson Indemnity Act
- (E) all are external costs



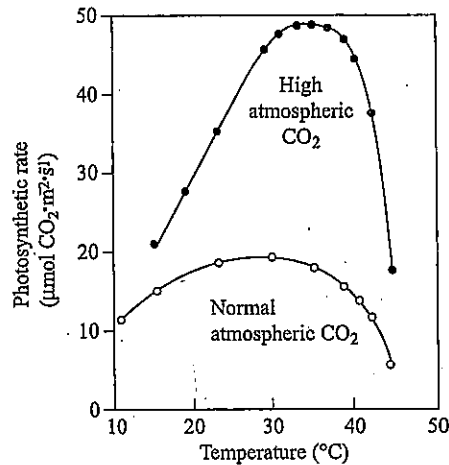
87. Examine the following figure:



A carbon tax was imposed on the price of a gallon of gasoline. The primary purpose of a carbon tax is to

- (A) reduce carbon emissions by imposing a tax equal to the marginal external cost of carbon.
  - (B) reduce carbon emissions by imposing a tax above the marginal external cost of carbon.
  - (C) reduce carbon emissions by imposing a tax below the marginal external cost of carbon.
  - (D) raise the price of gasoline so that the refineries and oil companies can make larger profits.
  - (E) bring social consciousness to those who use gasoline.
88. In addition to absorbing harmful solar rays, how do ozone molecules help to stabilize the upper atmosphere?
- (A) They release heat to the surroundings.
  - (B) They create a buoyant lid on the atmosphere.
  - (C) They create a warm layer of atmosphere that keeps the lower atmosphere from mixing with space.
  - (D) All of the above are correct.
  - (E) None of the above are correct.
89. The specific form of radiation largely responsible for the formation of ozone in the stratosphere is
- (A) UVA
  - (B) UVB
  - (C) UVC
  - (D) infrared
  - (E) gamma rays
90. Ozone depletion reactions that occur in the stratosphere are facilitated by
- (A)  $\text{NO}_2^-$
  - (B)  $\text{NH}_3$
  - (C)  $\text{NH}_4^+$
  - (D)  $\text{N}_2\text{O}$
  - (E)  $\text{NO}_3^-$

91. Increased levels of atmospheric  $\text{CO}_2$  result in the greenhouse effect and thus affect global climatic warming. The graph below shows the effect of these changes on photosynthesis. Which of the following statements about these processes is FALSE?



- (A) For most plants, temperatures over  $40^\circ\text{C}$  reduce photosynthesis.  
 (B) At temperatures below  $20^\circ\text{C}$ , high atmospheric  $\text{CO}_2$  concentrations reduce photosynthesis to values below those seen for plants growing in normal  $\text{CO}_2$  concentrations.  
 (C) One result of increased levels of atmospheric  $\text{CO}_2$  will be to increase rates of photosynthesis in most plants.  
 (D) At high  $\text{CO}_2$  concentrations, the highest rates of photosynthesis are measured at temperatures between  $30^\circ$  and  $35^\circ\text{C}$ .  
 (E)  $\text{CO}_2$  concentration is normally rate limiting for photosynthesis.
92. Place the following events in a logical order:

- I. Atmospheric  $\text{CO}_2$  increases  
 II. Warmer ocean  
 III. Warmer temperature  
 IV. Less  $\text{CO}_2$  uptake by the oceans

- (A) I  $\rightarrow$  II  $\rightarrow$  III  $\rightarrow$  IV  
 (B) II  $\rightarrow$  IV  $\rightarrow$  I  $\rightarrow$  III  
 (C) IV  $\rightarrow$  II  $\rightarrow$  I  $\rightarrow$  III  
 (D) II  $\rightarrow$  III  $\rightarrow$  I  $\rightarrow$  IV  
 (E) III  $\rightarrow$  II  $\rightarrow$  I  $\rightarrow$  IV

93. Refer to the following statements to answer question 93.
- I. Increased atmospheric concentrations of  $\text{CO}_2$  result in increased ocean temperatures.
  - II. Increased atmospheric temperatures by increasing evaporation rates could conceivably decrease ocean temperatures.

Which of the following statements is TRUE?

- (A) Statement I represents a positive feedback mechanism, while statement II represents a negative feedback mechanism.
  - (B) Statement I represents a negative feedback mechanism, while statement II represents a positive feedback mechanism.
  - (C) Both statements I and II represent positive feedback mechanisms.
  - (D) Both statements I and II represent positive negative mechanisms.
  - (E) Not enough information is available to determine whether the statements are either examples of positive or negative feedback mechanisms.
94. Which of the following effects would result from the shutdown or slowdown of the thermohaline circulation pattern?
- (A) A warmer Scandinavia and Great Britain
  - (B) Freshwater fish moving into the open ocean
  - (C) A colder Scandinavia and Great Britain
  - (D) A saltier ocean
  - (E) A drier Scandinavia and Great Britain
95. The federal department or agency that is ultimately responsible for oceanic and atmospheric monitoring and research is the
- (A) Environmental Protection Agency
  - (B) Department of the Interior
  - (C) Department of Commerce
  - (D) Department of State
  - (E) Department of Agriculture
96. The largest number of species are being exterminated per year in
- (A) grasslands
  - (B) deserts
  - (C) forests
  - (D) tropical rain forests
  - (E) the tundra
97. A certain species of plant is placed on the threatened species list. Several years later it is placed on the endangered species list. This is an example of
- (A) a negative-negative feedback loop
  - (B) a positive-negative feedback loop
  - (C) a negative-positive feedback loop
  - (D) a negative-feedback loop
  - (E) a positive-feedback loop

98. John Muir was responsible for developing (the)
- (A) Greenpeace
  - (B) Nature Conservancy
  - (C) Audubon Society
  - (D) Sierra Club
  - (E) Environmental Defense Fund
99. Managing game species for sustained yields would be consistent with what conservation approach?
- (A) Wildlife management approach
  - (B) Species approach
  - (C) Ecosystem approach
  - (D) Sustainable yield approach
  - (E) Holistic approach
100. A treaty that controls international trades in endangered species is known as (the)
- (A) Endangered Species Act
  - (B) CITES
  - (C) International Treaty on Endangered Species
  - (D) Lacey Act
  - (E) Federal Preserve System

## DIAGNOSTIC TEST ANSWERS AND EXPLANATIONS

*Directions: On the line to the left of each number, place a "C" if you got the question Correct, place an "X" if you answered the question incorrectly, and leave the line blank if you did not answer the question.*

### IMPORTANT NOTE

Most of the questions on this diagnostic test (including full answer explanations) are repeated elsewhere in the book. These questions have been selected as the best examples of the types of questions you are likely to find on the APES exam. The page references below will refer you directly to the topic associated with that question.

## I. Earth Systems and Resources (10–15 percent)

- \_\_\_\_\_ 1. (E) *Seasons*: See page 72.
- \_\_\_\_\_ 2. (E) *Earthquakes*: See page 67.
- \_\_\_\_\_ 3. (C) *Plate tectonics*: See page 63.
- \_\_\_\_\_ 4. (A) *Weather and climate*: See page 94.
- \_\_\_\_\_ 5. (E) *Composition*: See page 91.
- \_\_\_\_\_ 6. (A) *Circulation*: See page 101.
- \_\_\_\_\_ 7. (C) *Freshwater*: See page 119.
- \_\_\_\_\_ 8. (D) *Conservation*: See page 134.

- \_\_\_\_\_ 9. (D) *Global problems*: See page 132.  
 \_\_\_\_\_ 10. (A) *Soil components*: See page 74.  
 \_\_\_\_\_ 11. (D) *Soil components*: See page 74.  
 \_\_\_\_\_ 12. (E) *Air pollution*: See page 331.

## RECAP FOR EARTH SYSTEMS AND RESOURCES

- \_\_\_\_\_ Total number correct for this section  
 \_\_\_\_\_ Percent correct for this section (number correct for this section / 12)  
 × 100%  
 \_\_\_\_\_ Number wrong for this section (questions you thought you knew)  
 \_\_\_\_\_ Number left blank for this section (questions you did not know)

## II. The Living World (10–15 percent)

- \_\_\_\_\_ 13. (D) *Major terrestrial biomes*: See page 153.  
 \_\_\_\_\_ 14. (A) *Interactions among species*: See page 148.  
 \_\_\_\_\_ 15. (B) *Biological populations*: See page 147.  
 \_\_\_\_\_ 16. (D) *Interactions among species*: See page 148.  
 \_\_\_\_\_ 17. (C) *Aquatic biomes*: See page 153.  
 \_\_\_\_\_ 18. (D) *Photosynthesis and cellular respiration*: See page 157.  
 \_\_\_\_\_ 19. (D) *Food webs and trophic levels*: See page 158.  
 \_\_\_\_\_ 20. (E) *Evolution*: See page 168.  
 \_\_\_\_\_ 21. (E) *Ecosystem services*: See page 170.  
 \_\_\_\_\_ 22. (E) *Changes in tropospheric weather patterns*: See page 389.  
 \_\_\_\_\_ 23. (D) *Ecological succession*: See page 171.  
 \_\_\_\_\_ 24. (C) *Natural Biogeochemical Cycles*: See page 185.  
 \_\_\_\_\_ 25. (A) *Natural Biogeochemical Cycles*: See page 185.

## RECAP FOR THE LIVING WORLD

- \_\_\_\_\_ Total number correct for this section  
 \_\_\_\_\_ Percent correct for this section (number correct for this section / 13)  
 × 100%  
 \_\_\_\_\_ Number wrong for this section (questions you thought you knew)  
 \_\_\_\_\_ Number left blank for this section (questions you did not know)

## III. Population (10–15 percent)

- \_\_\_\_\_ 26. (A) *Population ecology*: See page 203.  
 \_\_\_\_\_ 27. (B) *Population ecology*: See page 203.  
 \_\_\_\_\_ 28. (C) *Carrying capacity*: See page 204.  
 \_\_\_\_\_ 29. (C) *Reproductive strategies*: See page 206.  
 \_\_\_\_\_ 30. (A) *Survivorship*: See page 207.  
 \_\_\_\_\_ 31. (D) *Human population dynamics*: See page 208.  
 \_\_\_\_\_ 32. (D) *Population size*: See page 216.  
 \_\_\_\_\_ 33. (A) *Population size*: See page 216.  
 \_\_\_\_\_ 34. (C) *Population size*: See page 216.  
 \_\_\_\_\_ 35. (A) *Impacts of population growth*: See page 218.  
 \_\_\_\_\_ 36. (A) *Impacts of population growth*: See page 218.

## RECAP FOR POPULATION

\_\_\_\_\_ Total number correct for this section  
 \_\_\_\_\_ Percent correct for this section (number correct for this section / 11)  
 × 100%  
 \_\_\_\_\_ Number wrong for this section (questions you thought you knew)  
 \_\_\_\_\_ Number left blank for this section (questions you did not know)

## IV. Land and Water Use (10–15%)

37. (C) *Feeding a growing population*: See page 233.
38. (E) *Controlling pests*: See page 239.
39. (A) *Types of pesticides*: See page 239.
40. (A) *Old growth forests*: See page 242.
41. (C) *Forest fires*: See page 243.
42. (B) *Forest management*: See page 246.
43. (C) *Deforestation*: See page 244.
44. (C) *Urban land development*: See page 250.
45. (E) *Extraction*: See page 259.
46. (B) *Fishing techniques*: See page 263.
47. (E) *Overfishing*: See page 263.
48. (D) *Tragedy of the Commons*: See page 268.

## RECAP FOR LAND AND WATER USE

\_\_\_\_\_ Total number correct for this section  
 \_\_\_\_\_ Percent correct for this section (number correct for this section / 12)  
 × 100%  
 \_\_\_\_\_ Number wrong for this section (questions you thought you knew)  
 \_\_\_\_\_ Number left blank for this section (questions you did not know)

## V. Energy Resources and Consumption (10–15%)

49. (C) *Energy forms*: See page 282.
50. (E) *Power*: See page 283.
51. (D) *Conversions*: See page 283.
52. (B) *Law of Thermodynamics*: See page 286.
53. (C) *Present global energy use*: See page 289.
54. (D) *Future energy needs*: See page 289.
55. (E) *Formation of coal, oil and natural gas*: See page 292.
56. (C) *World resources and global demand*: See page 294.
57. (A) *Nuclear fission process*: See page 299.
58. (A) *Electricity production*: See page 298.
59. (E) *Nuclear fusion*: See page 301.
60. (B) *Dams*: See page 302.
61. (C) *Hybrid electric vehicles*: See page 305.
62. (A) *Hydrogen fuel cells*: See page 308.

## RECAP FOR ENERGY RESOURCES AND CONSUMPTION

- \_\_\_\_\_ Total number correct for this section  
 \_\_\_\_\_ Percent correct for this section (number correct for this section / 14)  
 × 100%  
 \_\_\_\_\_ Number wrong for this section (questions you thought you knew)  
 \_\_\_\_\_ Number left blank for this section (questions you did not know)

## VI. Pollution (25–30%)

63. (C) *Air pollution*: See page 326.  
 64. (C) *Air pollution*: See page 326.  
 65. (E) *Air pollution*: See page 326.  
 66. (E) *Noise pollution*: See page 334.  
 67. (C) *Water pollution*: See page 334.  
 68. (A) *Water pollution*: See page 334.  
 69. (A) *Water pollution*: See page 334.  
 70. (B) *Cultural eutrophication*: See page 338.  
 71. (B) *Water purification*: See page 339.  
 72. (C) *Solid waste*: See page 346.  
 73. (A) *Solid waste*: See page 346.  
 74. (E) *Solid waste*: See page 346.  
 75. (B) *Solid waste*: See page 346.  
 76. (D) *Hazards to human health*: See page 359.  
 77. (D) *Hazards to human health*: See page 359.  
 78. (B) *Hazards to human health*: See page 359.  
 79. (D) *Hazardous chemicals in the environment*: See page 364.  
 80. (A) *Hazardous chemicals in the environment*: See page 364.  
 81. (E) *Hazardous chemicals in the environment*: See page 364.  
 82. (B) *Hazardous chemicals in the environment*: See page 364.  
 83. (E) *Cost-benefit analysis*: See page 369.  
 84. (C) *Cost-benefit analysis*: See page 369.  
 85. (E) *Externalities*: See page 368.  
 86. (E) *Externalities*: See page 368.  
 87. (A) *Externalities or true costs*: See page 368.

## RECAP FOR POLLUTION

- \_\_\_\_\_ Total number correct for this section  
 \_\_\_\_\_ Percent correct for this section (number correct for this section / 25)  
 × 100%  
 \_\_\_\_\_ Number wrong for this section (questions you thought you knew)  
 \_\_\_\_\_ Number left blank for this section (questions you did not know)

## VII. Global Change (10–15%)

88. (D) *Formation of stratospheric ozone*: See page 382.  
 89. (C) *Ultraviolet radiation*: See page 382.  
 90. (D) *Causes of ozone depletion*: See page 405, Question 2.  
 91. (B) *Greenhouse gases and the greenhouse effect*: See page 387.

92. (B) *Impacts and consequences of global warming*: See page 389.  
 93. (A) *Impacts and consequences of global warming*: See page 389.  
 94. (C) *Impacts and consequences of global warming*: See page 389.  
 95. (C) *Relevant laws and treaties*: See page 397.  
 96. (D) *Habitat loss*: See page 394.  
 97. (E) *Endangered and extinct species*: See page 396.  
 98. (D) *Maintenance through conservation*: See page 396.  
 99. (A) *Maintenance through conservation*: See page 396.  
 100. (B) *Relevant laws and treaties*: See page 397.

### RECAP FOR GLOBAL CHANGE

\_\_\_\_\_ Total number correct for this section  
 \_\_\_\_\_ Percent correct for this section (number correct for this section /13)  
 × 100%  
 \_\_\_\_\_ Number wrong for this section (questions you thought you knew)  
 \_\_\_\_\_ Number left blank for this section (questions you did not know)

### Assess Your Strengths and/or Weaknesses

- I. Earth Systems and Resources: \_\_\_\_\_% correct  
 II. The Living World: \_\_\_\_\_% correct  
 III. Population: \_\_\_\_\_% correct  
 IV. Land and Water Use: \_\_\_\_\_% correct  
 V. Energy Resources and Consumption: \_\_\_\_\_% correct  
 VI. Pollution: \_\_\_\_\_% correct  
 VII. Global Change: \_\_\_\_\_% correct

### Score Approximator

\_\_\_\_\_ Total number correct on entire Diagnostic Test  
 Less than 50 correct: not passing  
 50 → 60 correct: 3 on the APES Exam  
 61 → 75 correct: 4 on the APES Exam  
 76+ correct: 5 on the APES Exam