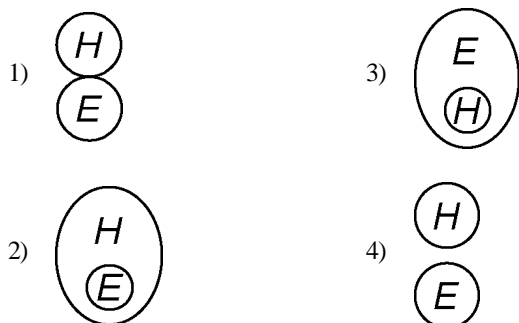


Name: \_\_\_\_\_

## UNIT: ECOLOGY

## TOPIC: COMPONENTS OF ECOSYSTEMS

- 1) Which diagram *best* illustrates the relationship between humans (*H*) and ecosystems (*E*)?



- 2) One biotic factor that affects consumers in an ocean ecosystem is
- 1) temperature variation
  - 2) number of autotrophs
  - 3) pH of water
  - 4) salt content
- 3) One biotic factor that limits the carrying capacity of any habitat is the
- 1) level of atmospheric oxygen
  - 2) amount of soil erosion
  - 3) availability of water
  - 4) activity of decomposers
- 4) Abiotic factors that characterize a forest ecosystem include
- 1) temperature and amount of available water
  - 2) pH and number of heterotrophs
  - 3) light and biodiversity
  - 4) types of producers and decomposers
- 5) In an ocean, the growth and survival of seaweed, small fish, and sharks depends on abiotic factors such as
- 1) number of herbivores, carbon, and food
  - 2) sunlight, temperature, and minerals
  - 3) number of decomposers, carbon dioxide, and nitrogen
  - 4) sunlight, pH, and type of seaweed

Questions 6 through 10 refer to the following:

The table below contains information about glucose production in a species of plant that lives in the water of a salt marsh.

Temperature (°C)	Glucose Production (mg/hr)
10	5
20	10
30	15
40	5

- 6) Which of the following terms describe temperature in the investigation shown?
- 1) abiotic factor and dependent variable
  - 2) biotic factor and dependent variable
  - 3) abiotic factor and independent variable
  - 4) biotic factor and independent variable
- 7) Based on the data provided, at which temperature would the plants most likely use the *greatest* amount of carbon dioxide?
- 1) 20°C
  - 2) 40°C
  - 3) 10°C
  - 4) 30°C
- 8) Based on the data shown, how much oxygen will plants that live in water at 10°C most likely produce?
- 1) the same amount of oxygen produced at 40°C
  - 2) the most oxygen produced at any temperature
  - 3) twice the amount of oxygen produced at 20°C
  - 4) more oxygen than is produced at 30°C
- 9) What evidence from the data table shows that a salt-marsh plant is sensitive to its environment?
- 10) State *one* possible reason for the change in glucose production when the temperature in the given investigation was increased from 30°C to 40°C.
- 11) The reason that organisms can *not* produce populations of unlimited size is that
- 1) there is no carrying capacity on Earth
  - 2) species rarely compete with one another
  - 3) the resources of Earth are finite
  - 4) interactions between organisms are unchanging

- 12) What impact do the amounts of available energy, water, and oxygen have on an ecosystem?
- 1) They recycle the residue of dead organisms.
  - 2) They act as limiting factors.
  - 3) They control environmental temperature.
  - 4) They are used as nutrients.

- 13) Which information concerning a desert is provided by the quotation below?

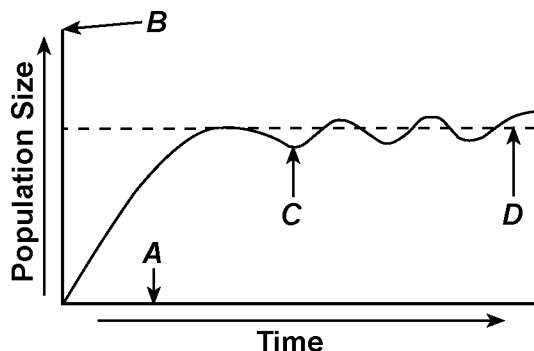
"The desert is arid, with less than 25 cm of rain per year. The plants are spaced far apart, or are grouped around water sources. Most of the animals are active at night."

- 1) identity of a limiting factor and behavior of heterotrophs
  - 2) type of nutrition in animals and distribution of autotrophs
  - 3) daily temperature range and types of autotrophs
  - 4) time of rainy season and type of food used by heterotrophs
- 14) Four environmental factors are listed below.

- A. energy
- B. water
- C. oxygen
- D. minerals

Which factors limit environmental carrying capacity in a land ecosystem?

- 1) A, C, and D, only
  - 2) A, only
  - 3) A, B, C, and D
  - 4) B, C, and D, only
- 15) The growth of a population is shown in the graph below.



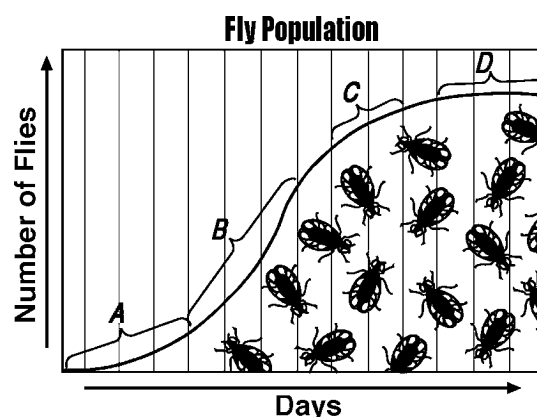
Which letter indicates the carrying capacity of the environment for this population?

- 1) A
  - 2) B
  - 3) C
  - 4) D
- 16) Ten breeding pairs of rabbits are introduced onto an island with no natural predators and a good supply of water and food. What will most likely happen to the rabbit population?
- 1) It will decrease and then increase indefinitely.
  - 2) It will increase until it exceeds carrying capacity.
  - 3) It will die out due to an increase in the mutation rate.
  - 4) It will remain relatively constant due to equal birth and death rates.

- 17) After a rabbit population reaches the carrying capacity of its habitat, the population of rabbits will most likely
- 1) decrease, only
  - 2) remain unchanged
  - 3) alternately increase and decrease
  - 4) increase, only

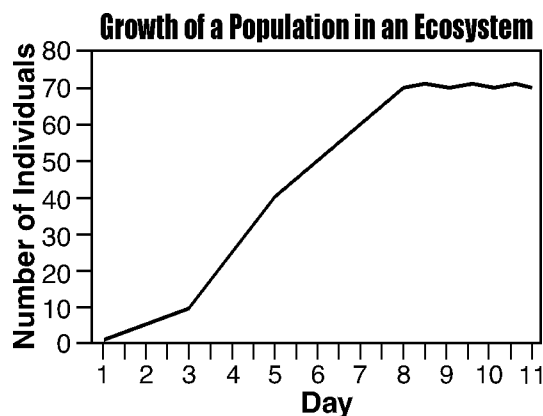
- 18) The size of a frog population in a pond remains fairly constant over a period of several years because of
- 1) environmental carrying capacity
  - 2) decreasing competition
  - 3) the depth of water
  - 4) excessive dissolved oxygen

- 19) The graph below represents the growth of a population of flies in a jar.



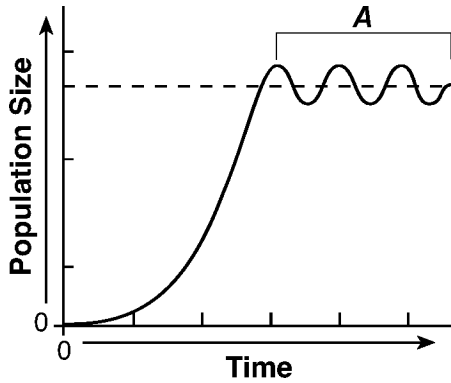
Which letter indicates the part of the graph that represents the carrying capacity of the environment in the jar?

- 1) A
  - 2) B
  - 3) C
  - 4) D
- 20) On which day did the population represented in the graph below reach the carrying capacity of the ecosystem?



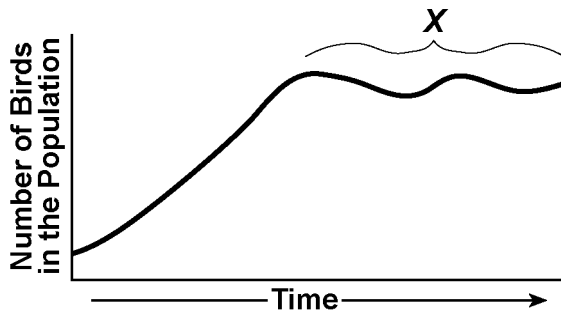
- 1) day 5
- 2) day 3
- 3) day 11
- 4) day 8

- 21) The size of a mouse population in a natural ecosystem tends to remain relatively constant due to
- 1) the lack of natural predators
  - 2) the carrying capacity of the environment
  - 3) increased numbers of decomposers
  - 4) cycling of energy
- 22) The graph below indicates the size of a fish population over a period of time.



The section of the graph labeled A represents

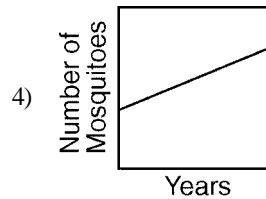
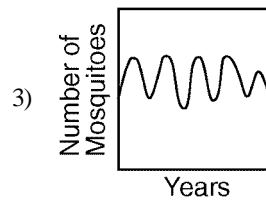
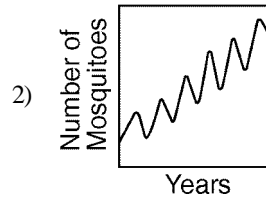
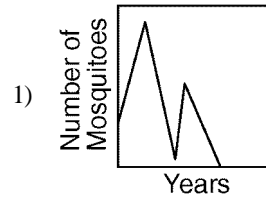
- 1) a population becoming extinct
  - 2) a population at equilibrium
  - 3) biodiversity within the species
  - 4) nutritional relationships of the species
- 23) The graph below shows the number of birds in a population.



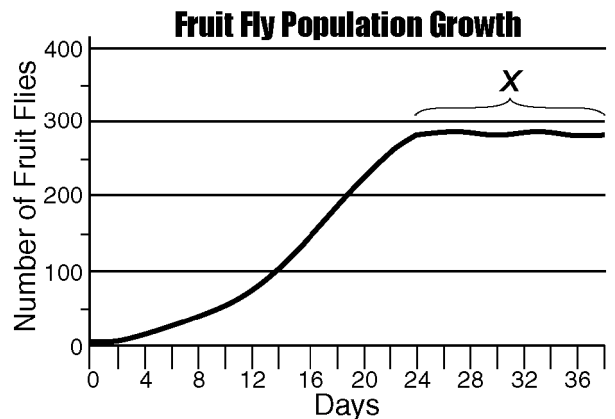
Which statement *best* explains section X of the graph?

- 1) The population reached a state of dynamic equilibrium due to limiting factors.
- 2) Interbreeding between members of this population increased the mutation rate.
- 3) Another species came to the area and provided food for the birds.
- 4) An increase in the bird population caused an increase in the producer population.

- 24) Which of the following graphs illustrates changes that indicate a state of dynamic equilibrium in a mosquito population?

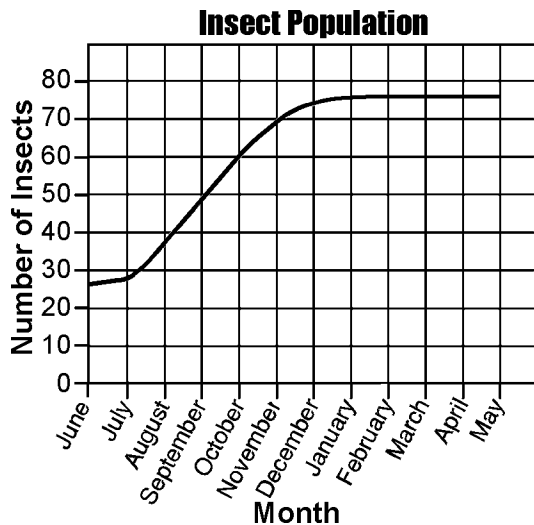


- 25) Which statement *best* describes the fruit fly population in the part of the curve labeled X in the graph shown below?



- 1) The fruit fly population has an average lifespan of 36 days.
- 2) The fruit fly population can no longer mate and produce fertile offspring.
- 3) The fruit fly population is no longer able to adapt to the changing environmental conditions.
- 4) The fruit fly population has reached the number of organisms the habitat can support.

- 26) Students conducting a study on an insect population placed 25 insects of the same size in a box. The amount of food, water, and shelter available to the insects was kept constant. Each month, students removed and counted the number of insects present, recorded the total, and returned the insects to the box. The graph below shows the number of insects in the box over a 12 month period.

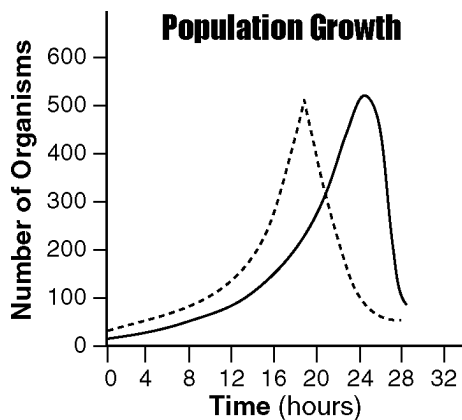


What inference can be made regarding this insect population?

- 1) The population has carnivorous members.
- 2) All the insects in the box are the same age.
- 3) The population reached carrying capacity by January.
- 4) The insects hibernated from January to April.

Questions 27 and 28 refer to the following:

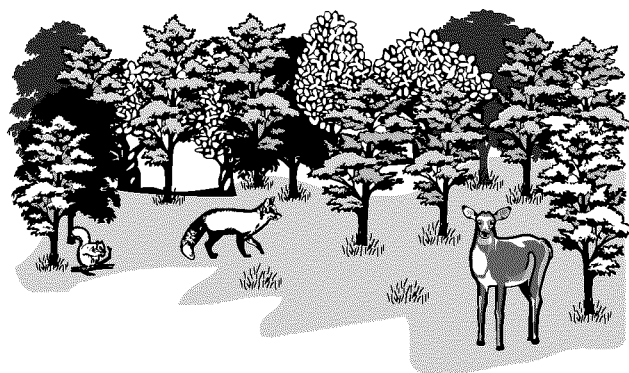
A population of paramecia (single-celled aquatic organisms) was grown in a 200-mL beaker of water containing some smaller single-celled organisms. Population growth of the organisms for 28 hours is shown in the graph below.



**KEY:**

- |       |                                 |
|-------|---------------------------------|
| —     | Paramecia                       |
| - - - | Smaller single-celled organisms |

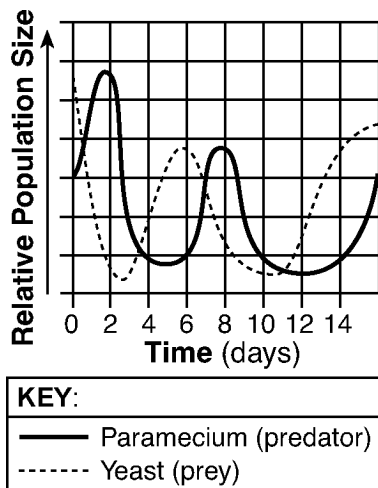
- 27) Which factor most likely accounts for the change in the paramecium population represented in the graph from 8 to 20 hours?
- 1) an increase in wastes produced
  - 2) an increase in available food
  - 3) an increase in water pH
  - 4) an increase in the nitrogen content of water
- 28) One likely explanation for the change in the paramecium population represented in the graph from 26 hours to 28 hours is that the
- 1) rate of reproduction increased
  - 2) carrying capacity of the beaker was exceeded
  - 3) oxygen level was too high
  - 4) time allowed for growth was not sufficient
- 29) Which statement describes the ecosystem represented in the diagram below?



- 1) This ecosystem would be the first stage in ecological succession.
  - 2) This ecosystem would most likely lack decomposers.
  - 3) All of the organisms in this ecosystem are producers.
  - 4) All of the organisms in this ecosystem depend on the activities of biological catalysts.
- 30) Which statement describes a situation that leads to stability within an ecosystem?
- 1) Organisms provide all the necessary energy for the maintenance of this ecosystem.
  - 2) Interactions between biotic and abiotic components regulate carbon dioxide and water levels.
  - 3) Animals provide the oxygen used by plants, and plants provide the nitrogen needed by animals.
  - 4) Carbon dioxide and water are released only by abiotic sources in the ecosystem.

- 31) Even before a flower bud opens, certain plant chemicals have colored the flower in patterns particularly attractive to specific insects. At the same time, these chemicals protect the plant's reproductive structures by killing or inhibiting pathogens and insects that may feed on the plant. Which statement about the plant and the other organisms mentioned is correct?
- 1) Organisms of every niche may be preyed on by herbivores.
  - 2) Chemicals affect plants, but not animals.
  - 3) Any chemical produced in a plant can protect against insects.
  - 4) Organisms may interact with other organisms in both positive and negative ways.
- 32) The dissolved carbon dioxide in a lake is used directly by
- 1) parasites
  - 2) decomposers
  - 3) fungi
  - 4) autotrophs
- 33) Carbon dioxide containing carbon-14 is introduced into a balanced aquarium ecosystem. After several weeks, carbon-14 will most likely be present in
- 1) the plants, only
  - 2) neither the plants nor animals
  - 3) both the plants and animals
  - 4) the animals, only
- 34) Which component of a stable ecosystem can *not* be recycled?
- 1) energy
  - 2) nitrogen
  - 3) water
  - 4) oxygen
- 35) Which of the following statements describes a role of fungi in an ecosystem?
- 1) They release oxygen into the ecosystem.
  - 2) They transfer energy to decaying matter.
  - 3) They recycle chemicals from dead organisms.
  - 4) They synthesize organic nutrients from inorganic substances.
- 36) What would most likely happen if most of the bacteria and fungi were removed from an ecosystem?
- 1) Energy provided for autotrophic nutrition would be reduced.
  - 2) Soil fertility would increase.
  - 3) The rate of mutations in plants would increase.
  - 4) Nutrients resulting from decomposition would be reduced.
- 37) Many species of plants interact with harmless underground fungi. The fungi enable the plants to absorb certain essential minerals and the plants provide the fungi with carbohydrates and other nutrients. This describes an interaction between a
- 1) producer and a consumer
  - 2) predator and its prey
  - 3) parasite and its host
  - 4) scavenger and a decomposer
- 38) Worms that had been invaded by bacteria were eaten by a species of bird. Many of these birds died as a result. The most likely explanation for this is that the
- 1) bacteria interfered with normal life functions of the birds
  - 2) disease that killed the birds was inherited
  - 3) birds produced antigens in response to the bacteria
  - 4) gene alterations in the bacterial cells killed the birds
- 39) Which statement describes all stable ecosystems?
- 1) Herbivores provide energy for the autotrophs.
  - 2) The number of autotrophs equals the number of heterotrophs.
  - 3) The populations of predators are dependent on the populations of their prey.
  - 4) Consumers synthesize ATP from light energy.
- 40) The removal of nearly all the predators from an ecosystem would most likely result in
- 1) a decrease in the size of decomposers
  - 2) an increase in the number of herbivores
  - 3) a decrease in new predators migrating into the ecosystem
  - 4) an increase in the number of carnivore species
- 41) When brown tree snakes were accidentally introduced onto the island of Guam, they had no natural predators. These snakes sought out and ate many of the eggs of insect-eating birds. What probably occurred following the introduction of the brown tree snakes?
- 1) The bird population began to seek a new food source.
  - 2) The insect population began to seek a new food source.
  - 3) The bird population increased.
  - 4) The insect population increased.
- 42) In 1859, a small colony of 24 rabbits was brought to Australia. By 1928, it was estimated that there were 500 million rabbits in a 1-million square mile section of Australia. Which of the following statements describes a condition that probably contributed to the increase in the rabbit population?
- 1) The rabbits were unable to adapt to the environment.
  - 2) The rabbits had no natural predators in Australia.
  - 3) The rabbits were affected by many limiting factors.
  - 4) The rabbits reproduced by asexual reproduction.

- 43) The graph below represents a predator-prey relationship.



What is the *most* probable reason for the increasing predator population from day 5 to day 7?

- 1) the extinction of the yeast on day 3
  - 2) an increasing food supply from day 5 to day 6
  - 3) the decreasing prey population from day 1 to day 2
  - 4) a predator population equal in size to the prey population from day 5 to day 6
- 44) Identify the relationship that exists between a virus and a human when the virus infects the human.

Questions 45 through 48 refer to the following:

A student uses a covered aquarium to study the interactions of biotic and abiotic factors in an ecosystem. The aquarium contains sand, various water plants, algae, small fish, snails, and decomposers. The water contains dissolved oxygen and carbon dioxide, as well as tiny amounts of minerals and salts.

- 45) Explain how oxygen is cycled between organisms in the ecosystem described in the paragraph.
- 46) Describe *one* specific way the fish population changes the amount of *one* specific abiotic factor (other than oxygen) in the ecosystem described in the paragraph.
- 47) Identify *one* source of food for the decomposers in the ecosystem described in the paragraph.
- 48) Describe *one* specific way the use of this food by the decomposers benefits the other organisms in the aquarium mentioned in the paragraph.

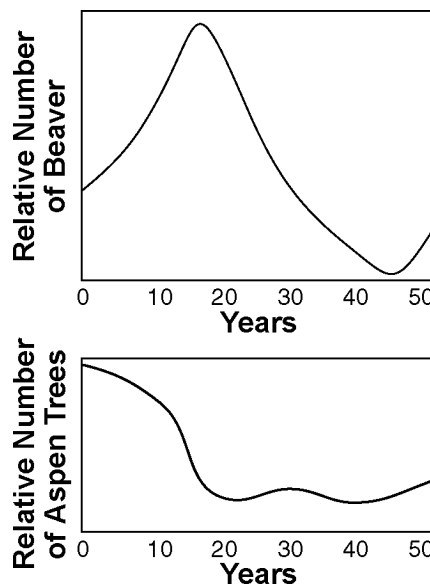
Questions 49 through 51 refer to the following:

A population of gray squirrels lived in the trees surrounding four houses in a city. The houses and trees were removed, and a tall office building was constructed in their place. Some of the squirrels were able to survive by relocating to the trees in a park nearby.

- 49) State *one* specific way the relocated squirrels described in the excerpt would most likely interact with a gray squirrel population that has lived in the park for many years.
- 50) State *one* specific way the relocated squirrels described in the excerpt will change an abiotic factor in the park ecosystem.
- 51) State *one* specific natural factor in the park ecosystem that will limit the growth of the squirrel population described in the excerpt. [*Support your answer.*]

Questions 52 and 53 refer to the following:

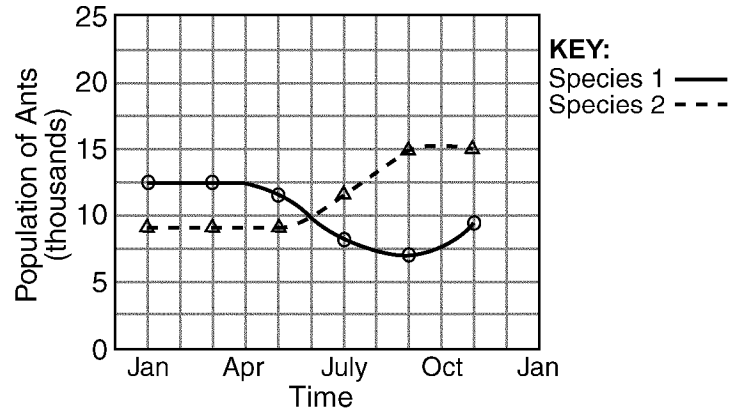
The graphs below show changes in the number of aspen trees and the beaver population in an area over a 50-year period.



- 52) (a) State the relationship that exists between the number of aspen trees and the beaver populations in the region described during the first 15 years.
- (b) State *one* possible reason for the relationship between the aspen tree and the beaver populations described in part (a).

- 53) Based on the given data, predict how the number of aspen trees would change if a parasite that targets the beaver population were introduced into the area during year 5.  
[*Explain your answer.*]

- 54) The graph below shows the populations of two species of ants. Ants of species 2 have a thicker outer covering than the ants of species 1. The outer covering of an insect helps prevent excessive evaporation of water.



Which statement would *best* explain the population changes shown in the graph?

- 1) Disease killed off species 1 beginning in May.
- 2) Mutations occurred from April through September in both species, resulting in both species becoming better adapted to the environment.
- 3) The weather was hotter and dryer than normal from April through September.
- 4) The food sources for species 1 increased while the food sources for species 2 decreased from January through November.

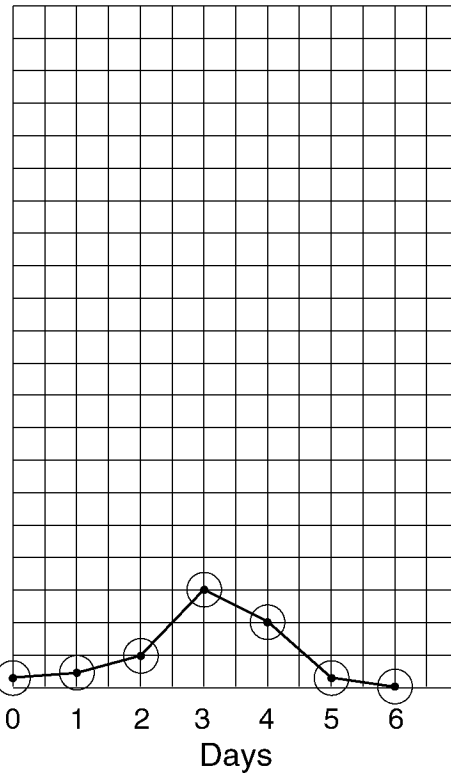
Questions 55 through 57 refer to the following:

A student added two species of single-celled organisms, *Paramecium caudatum* and *Didinium nasutum*, to the same culture medium. Each day, the number of individuals of each species was determined and recorded. The results are shown in the data table below.

Day	Number of <i>Paramecium</i>	Number of <i>Didinium</i>
0	25	2
1	60	5
2	150	10
3	50	30
4	25	20
5	0	2
6	0	0

Number of Individuals

**Culture Population**



**KEY:**

- Didinium* ○
- Paramecium* △

- 55) (a) On the given grid, mark a scale on the axis labeled "Number of Individuals" that is appropriate for the plotted *Didinium* population and for plotting the *Paramecium* population.
- (b) Plot the data for *Paramecium* on the grid. Surround each data point with a small triangle and connect the points.

**EXAMPLE:**



- 56) What evidence in the data shown indicates that *Didinium* could be a predator of the *Paramecium*?
- 57) State *two* possible reasons that the two populations in the experiment described died off between days 4 and 6.



Questions 58 through 61 refer to the following:

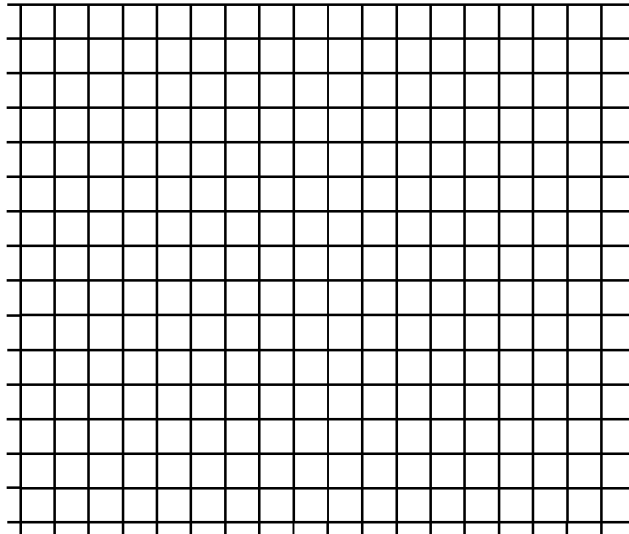
The amount of oxygen gas dissolved in water is important to the organisms that live in a river. The amount of dissolved oxygen varies with changes in both physical factors and biological processes. The temperature of the water is one physical factor affecting dissolved oxygen levels as shown in the data table below. The amount of dissolved oxygen is expressed in parts per million (ppm).

**Dissolved Oxygen Levels at Various Temperatures**

Water Temperature (°C)	Level of Dissolved Oxygen (ppm)
1	14
10	11
15	10
20	9
25	8
30	7

Level of Dissolved Oxygen (ppm)

**Dissolved Oxygen Levels at Various Temperatures**



Water Temperature (°C)

- 58) Using the information given in the table, construct a line graph on the grid following the directions below.
- (a) Mark an appropriate scale on each labeled axis.
  - (b) Plot the data for dissolved oxygen on the grid. Surround each point with a small circle and connect the points.



- 59) If the trend shown in the data continues, what would the dissolved oxygen level most likely be if the temperature of the water was 35°C?
- 60) State the relationship between the level of dissolved oxygen and water temperature for the information shown.
- 61) Identify *one* physical or biological process taking place within the river described (other than temperature change) that would affect the level of dissolved oxygen and state whether this process would increase or decrease the level of dissolved oxygen.

TOPIC: ENERGY FLOW

62) A food chain is represented below.

Grass → Cricket → Frog → Owl

This food chain contains

- 1) 1 predator, 1 parasite, and 2 producers
- 2) 2 carnivores and 2 herbivores
- 3) 4 consumers and no producers
- 4) 2 predators, 1 herbivore, and 1 producer

63) Two food chains are represented below.

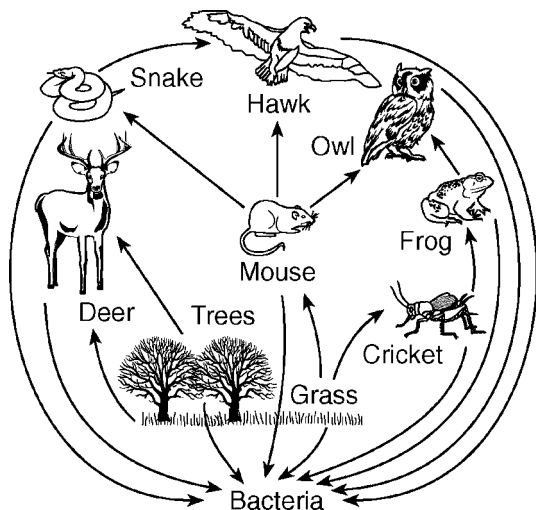
Food chain A: aquatic plant → insect → frog → hawk

Food chain B: grass → rabbit → hawk

Decomposers are important for supplying energy for

- 1) neither food chain A nor food chain B
- 2) food chain B, only
- 3) food chain A, only
- 4) both food chain A and food chain B

Questions 64 through 66 refer to the following:



64) What is an appropriate title for the diagram shown?

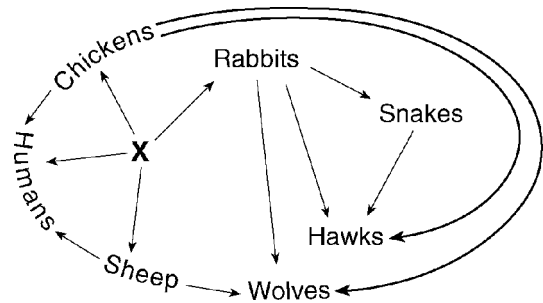
- 1) *Energy Flow in a Community*
- 2) *Biological Evolution*
- 3) *A Food Chain*
- 4) *Ecological Succession*

65) Which organism in the given diagram carries out autotrophic nutrition?

- 1) hawk
- 2) cricket
- 3) grass
- 4) deer

66) State what would most likely happen to the cricket population in the diagram shown if all of the grasses were removed.

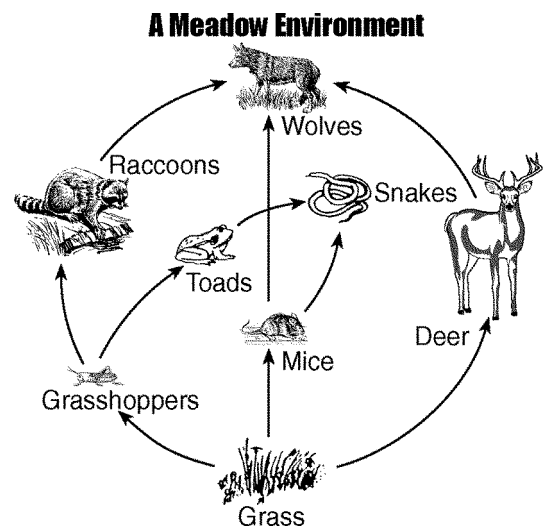
67) A partial food web is represented in the diagram shown.



Letter X most likely represents

- 1) autotrophs
- 2) parasites
- 3) carnivores
- 4) decomposers

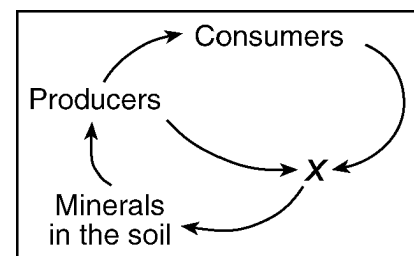
68) The diagram below represents a food web.



What are two of the herbivores represented in this food web?

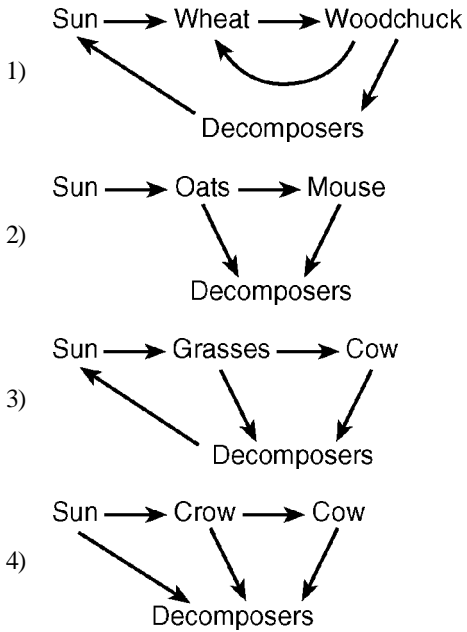
- 1) wolves and raccoons
- 2) grasshoppers and toads
- 3) toads and snakes
- 4) deer and mice

69) In the diagram below, what does X most likely represent?



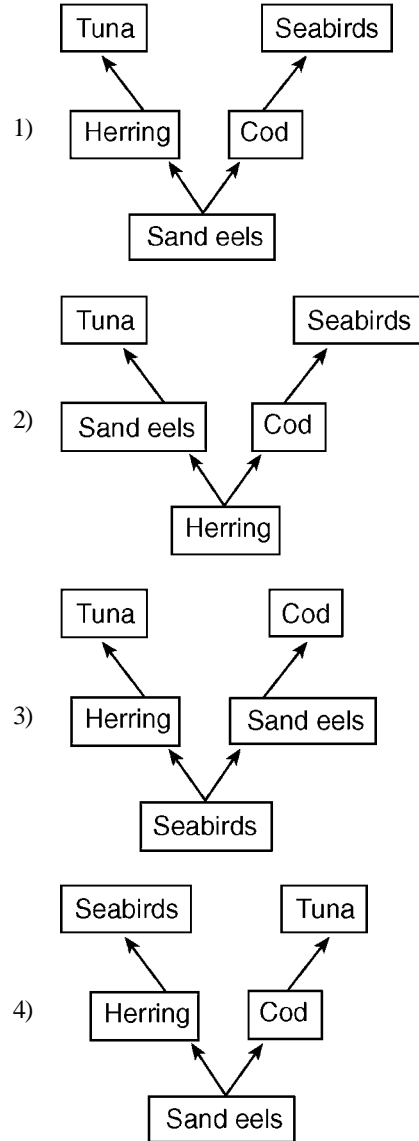
- 1) decomposers
- 2) carnivores
- 3) herbivores
- 4) autotrophs

70) Four students each drew an illustration to show the flow of energy in a field ecosystem. Which illustration is *most* accurate?

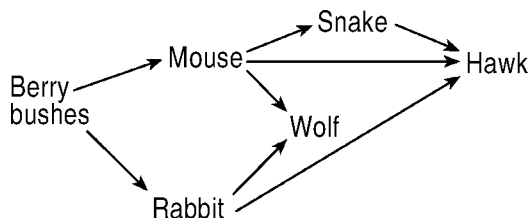


71) In an ecosystem, the herring population was reduced by fishermen. As a result, the tuna, which feed on the herring, disappeared. The sand eels, which are eaten by herring, increased in number. The fishermen then overharvested the sand eel population. Cod and seabirds then decreased.

Which of the following food webs *best* represents the feeding relationships in this ecosystem?

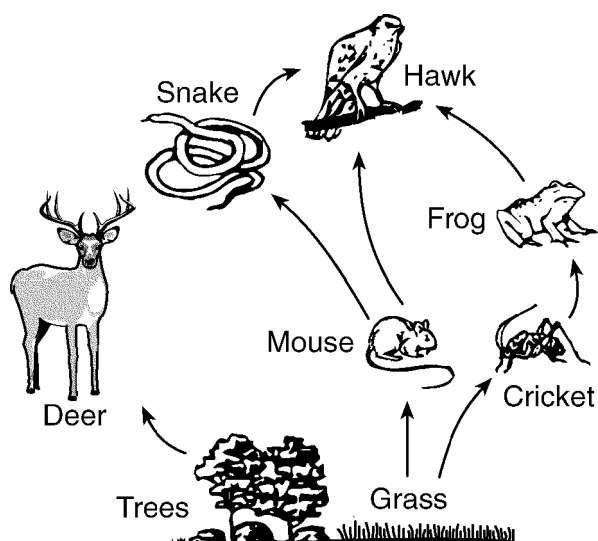


- 72) A food web is represented in the diagram below.



Which population in this food web would most likely be *negatively* affected by an increase in the mouse population?

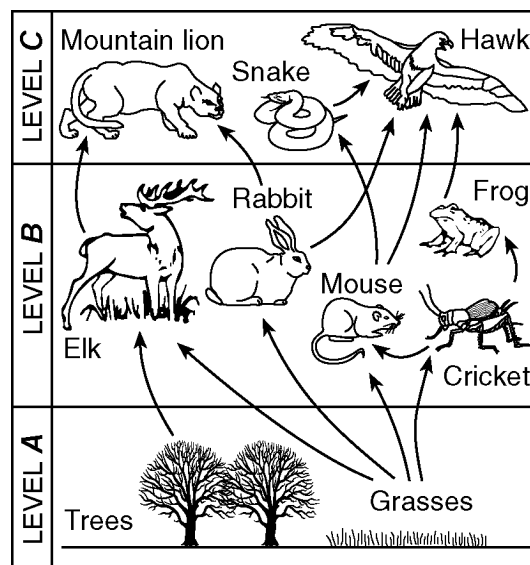
- 1) snake
  - 2) hawk
  - 3) wolf
  - 4) rabbit
- 73) Nutritional relationships between organisms are shown in the diagram below.



The mouse population would most likely decrease if there were

- 1) a decrease in the snake and hawk populations
- 2) an increase in the frog and tree populations
- 3) a decrease in the amount of available sunlight
- 4) an increase in the number of decomposers in the area

- 74) A food web is represented below.



Which statement *best* describes energy in this food web?

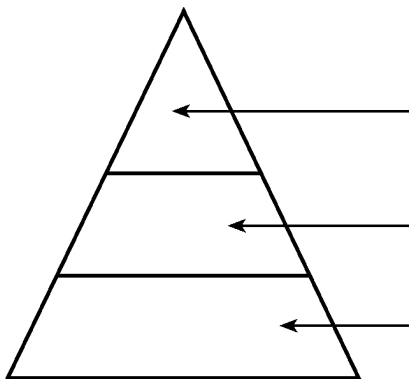
- 1) The energy content of level C is greater than the energy content of level A.
  - 2) The energy content of level B depends on the energy content of level C.
  - 3) The energy content of level B is transferred to level A.
  - 4) The energy content of level A depends on energy provided from an abiotic source.
- 75) In an ecosystem, the growth and survival of organisms are dependent on the availability of the energy from the Sun. This energy is available to organisms in the ecosystem because
- 1) all organisms in a food web have the ability to use light energy
  - 2) consumers have the ability to transfer chemical energy stored in bonds to plants
  - 3) producers have the ability to store energy from light in organic molecules
  - 4) all organisms in a food web feed on autotrophs

Questions 76 and 77 refer to the following:

Thirty grams of hay (dried grasses) were boiled in 500 milliliters of water, placed in a culture dish, and allowed to stand. The next day, a small sample of pond water was added to the mixture of boiled hay and water. The dish was then covered and its contents observed regularly. Bacteria fed on the nutrients from the boiled hay. As the populations of bacteria increased rapidly, the clear mixture soon became cloudy. One week later, microscopic examination of samples from the culture showed various types of protozoa (single-celled organisms) eating the bacteria.

- 76) The protozoa that fed on the bacteria in the reading passage can *best* be described as
- 1) herbivores
  - 2) consumers
  - 3) producers
  - 4) parasites

- 77) Label each level of the energy pyramid below with an organism mentioned in the reading passage that belongs at that level.



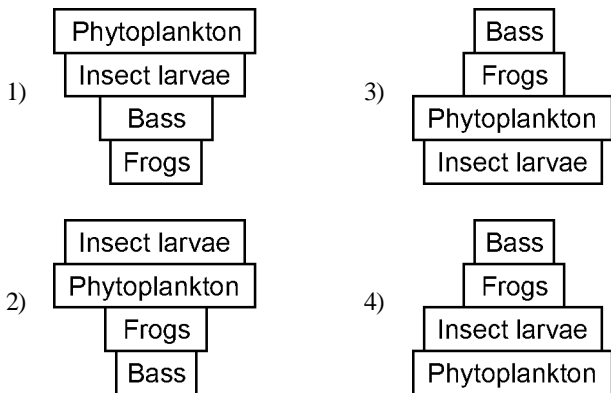
Questions 78 and 79 refer to the following:

Analysis of a sample taken from a pond showed variety in both number and type of organisms present. The data collected are shown in the table below.

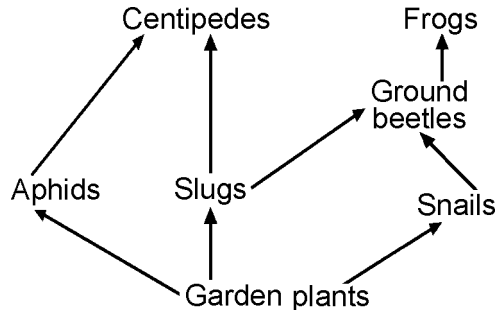
**Data Table**

Type of Organisms	Number Present
bass	two
frogs	forty
phytoplankton	thousands
insect larvae	hundreds

- 78) If the frogs feed on insect larvae, what is the role of the frogs in the pond ecosystem described?
- 1) herbivore
  - 2) consumer
  - 3) host
  - 4) parasite
- 79) Which diagram below *best* represents the organisms from the table arranged as an energy pyramid?



- 80) Gardeners sometimes use slug traps to capture and kill slugs. These traps were tested in a garden with a large slug population.



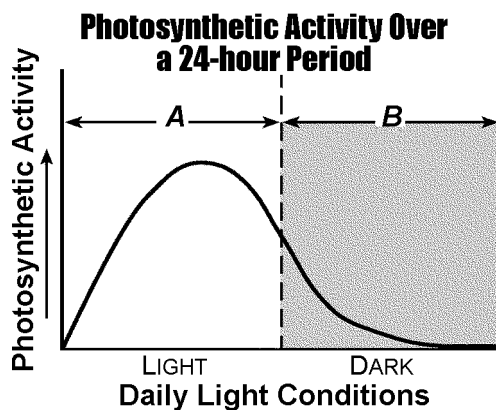
Organisms found in the trap after one week are shown in the table below.

**Organisms in Trap**

Organism	Number in Trap
slugs	8
snails	1
aphids	13
centipedes	1
ground beetles	98

Based on the given data table, how many organisms in the trap were herbivores?

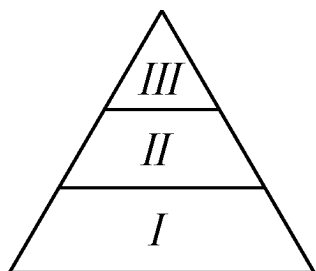
- 1) 99
  - 2) 5
  - 3) 22
  - 4) 9
- 81) The graph below shows photosynthetic activity in an ecosystem over a 24-hour period.



Data for a study on respiration in this ecosystem should be collected during

- 1) interval A only, from abiotic but not biotic components of the ecosystem
- 2) intervals A and B, from both the producers and consumers in the ecosystem
- 3) intervals A and B, from only the consumers in the ecosystem
- 4) interval A, from only the producers in the ecosystem

- 82) One season, there was a shortage of producers in a food web. As a result, the number of deer and wolves decreased. The reason that *both* the deer and wolf populations declined is that
- 1) more consumers than producers are needed to support the food web
  - 2) populations tend to stay constant in a food web
  - 3) producers are not as important as consumers in a food web
  - 4) organisms in this food web are interdependent
- 83) An energy pyramid containing autotrophs and other organisms from a food chain is represented below.

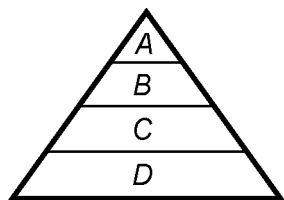


Carnivores would most likely be located in

- 1) level III, only
  - 2) level I, only
  - 3) level I and level II
  - 4) level II and level III
- 84) The table below contains information about glucose production in a species of plant that lives in the water of a salt marsh.

Temperature (°C)	Glucose Production (mg/hr)
10	5
20	10
30	15
40	5

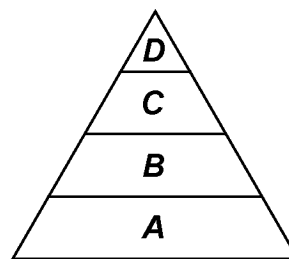
Which level of the energy pyramid below would contain the plant species of the salt marsh described?



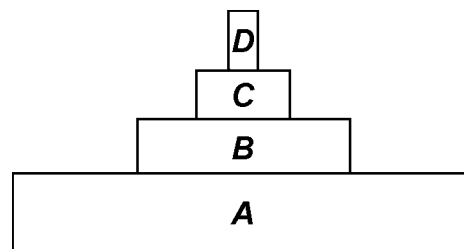
- 1) A
- 2) B
- 3) C
- 4) D

Questions 85 through 87 refer to the following:

The diagram below represents an energy pyramid.



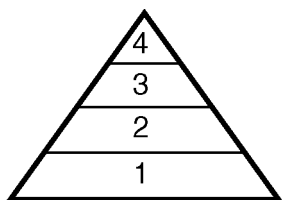
- 85) At each successive level from A to D in the energy pyramid, the amount of available energy
- 1) increases, then decreases
  - 2) increases, only
  - 3) decreases, only
  - 4) remains the same
- 86) Which statement about the energy pyramid shown is correct?
- 1) The total amount of energy at level D is less than the total amount of energy at level B.
  - 2) The amount of energy needed to sustain the pyramid enters at level D.
  - 3) The total amount of energy decreases with each successive feeding level from D to A.
  - 4) The amount of energy is identical in each level of the pyramid.
- 87) Which process provides the initial energy to support all the levels in the energy pyramid shown?
- 1) digestion
  - 2) photosynthesis
  - 3) active transport
  - 4) circulation
- 88) An energy pyramid is represented below.



How much energy would be available to the organisms in level C?

- 1) a percentage of the energy synthesized in level B and level D
- 2) a percentage of the energy contained in level B
- 3) all of the energy in level A, plus the energy in level B
- 4) all of the energy in level A, minus the energy in level B

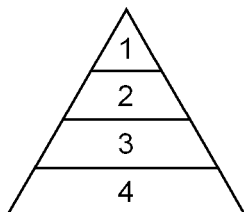
89) The diagram below represents a pyramid of energy that includes both producers and consumers.



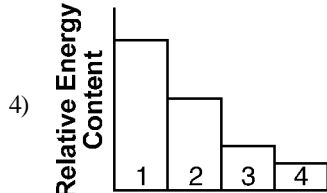
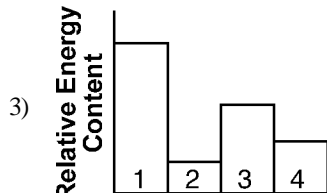
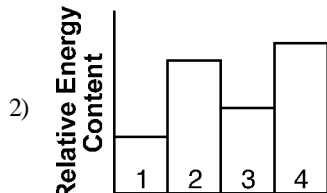
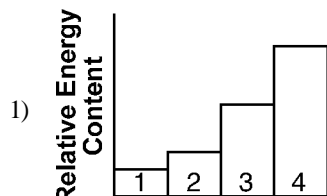
The *greatest* amount of available energy is found at which level?

- 1) 1
- 2) 2
- 3) 3
- 4) 4

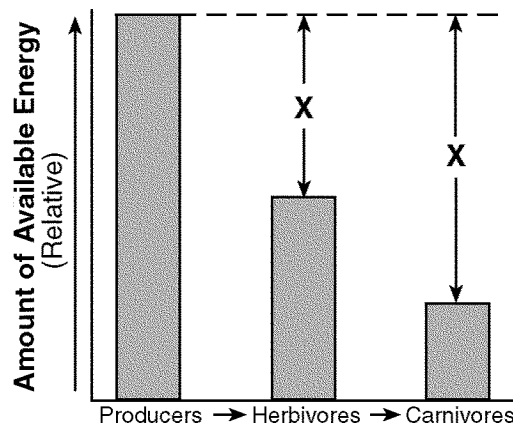
90) An energy pyramid is shown below.



Which graph *best* represents the relative energy content of the levels of this pyramid?



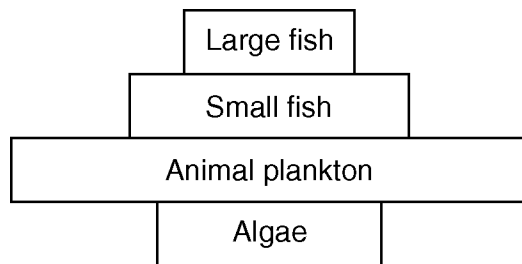
91) The graph below represents the amount of available energy at successive nutrition levels in a particular food web.



The **Xs** in the diagram represent the amount of energy that was most likely

- 1) retained indefinitely by the herbivores
- 2) lost as heat to the environment
- 3) recycled back to the producers
- 4) changed into inorganic compounds

92) The diagram below represents an energy pyramid constructed from data collected from an aquatic ecosystem.



Which of the following statements *best* describes this ecosystem?

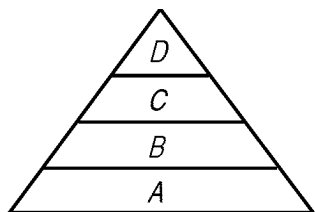
- 1) The ecosystem is most likely unstable.
- 2) The herbivore populations will continue to increase in size for many years.
- 3) Long-term stability of this ecosystem will continue.
- 4) The producer organisms outnumber the consumer organisms.

- 93) Species *A*, *B*, *C*, and *D* are all different heterotrophs involved in the same food chain in an ecosystem. The chart below shows the population of each species at the same time on a summer day.

Species	Population
<i>A</i>	847
<i>B</i>	116
<i>C</i>	85
<i>D</i>	6

Which statement *best* describes one of these species of heterotrophs?

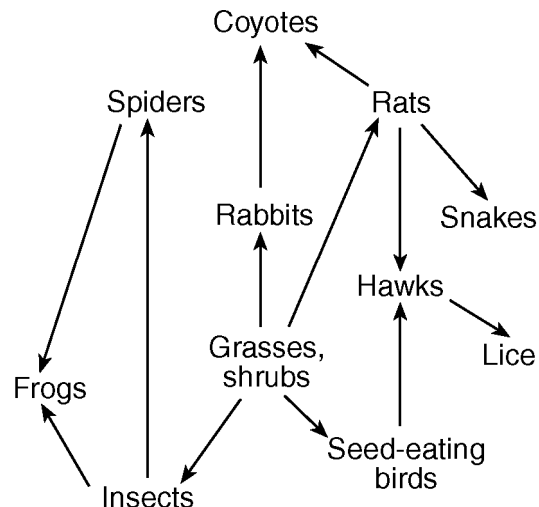
- Species *C* and *B* interbred to produce species *A*.
  - Species *B* probably feeds on species *D*.
  - Species *A* is the most numerous because it can make its own food.
  - Species *D* is most likely the top predator in the food chain.
- 94) The diagram below represents a food pyramid.



The concentration of the pesticide DDT in individual organisms at level *D* is higher than the concentration in individuals at level *A* because DDT is

- excreted by organisms at level *A* as a toxic waste
  - produced by organisms at level *C* which are eaten by organisms at level *D*
  - passed through levels *A*, *B*, and *C* to organisms at level *D*
  - synthesized by organisms at level *D*
- 95) The flow of materials through ecosystems involves the interactions of many processes and organisms. State how decomposers aid in the flow of materials in an ecosystem.

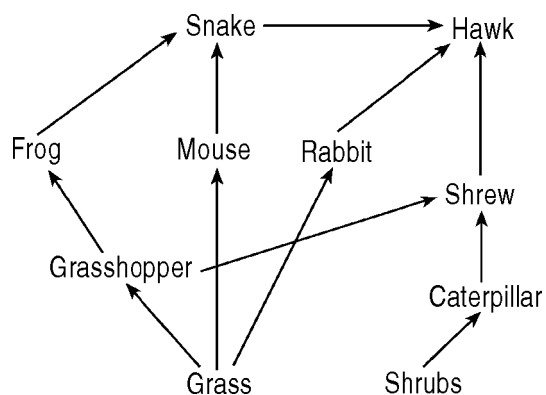
- 96) The diagram below represents a food web.



The arrows only point away from "Grasses, shrubs" and not toward them. State *one* biological reason that this is so.

Questions 97 and 98 refer to the following:

The diagram below shows some interactions between several organisms located in a meadow environment.

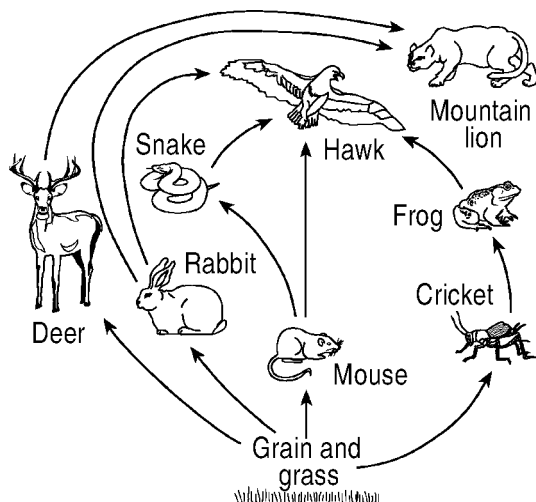


- 97) A rapid *decrease* in the frog population in the given diagram results in a change in the hawk population. State how the hawk population may change. [Support your answer.]
- 98) Identify *one* cell structure found in a producer in the given meadow ecosystem that is *not* found in the carnivores.



Questions 99 and 100 refer to the following:

The organisms in the food web below live near large cattle ranches. Over many years, mountain lions occasionally killed a few cattle. One year, a few ranchers hunted and killed many mountain lions to prevent future loss of their cattle. Later, ranchers noticed that animals from this food web were eating large amounts of grain from their fields.



- 99) Identify *two* specific populations that most likely increased in number after the mountain lion population in the situation described decreased. [Support your answer.]
- 100) Explain how killing many of the mountain lions in the given food web affected other ranchers in the community.

Questions 101 through 104 refer to the following:

#### **DECLINE OF THE SALMON POPULATION:**

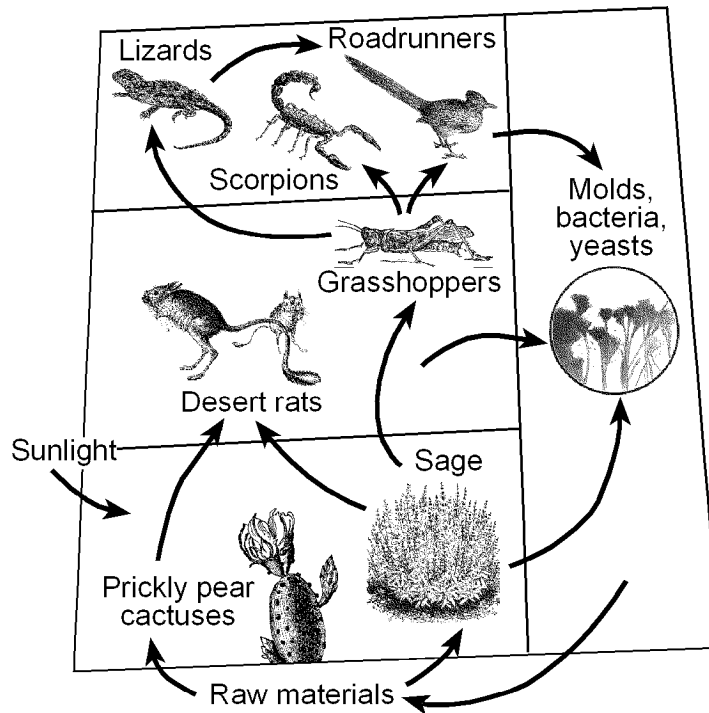
Salmon are fish that hatch in a river and swim to the ocean where their body mass increases. When mature, they return to the river where they were hatched and swim up stream to reproduce and die. When there are large populations of salmon, the return of nutrients to the river ecosystem can be huge. It is estimated that during salmon runs in the Pacific Northwest in the 1800s, 500 million pounds of salmon returned to reproduce and die each year. Research estimates that in the Columbia River alone, salmon contributed hundreds of thousands of pounds of nitrogen and phosphorus compounds to the local ecosystem each year. Over the past 100 years, commercial ocean fishing has removed up to two-thirds of the salmon before they reach the river each year.

- 101) Identify the process that releases the nutrients from the bodies of the dead salmon referred to in the reading passage, making the nutrients available for other organisms in the ecosystem.
- 102) Identify *one* organism, other than the salmon referred to in the reading passage, that would be present in or near the river that would most likely be part of a food web in the river ecosystem.
- 103) Based on the reading passage, identify *two* nutrients that are returned to the ecosystem when the salmon die.
- 104) State *one* impact, other than the reduction of the salmon population mentioned in the reading passage, that commercial ocean fishing has on the river ecosystem.
- 105) When living organisms obtain water and food from their environment, they may also take in toxic pesticides. Low concentrations of some pesticides may not kill animals, but they may damage reproductive organs and cause sterility. The data table below shows concentrations of a pesticide in tissues of organisms at different levels of a food chain.

Concentration of Pesticide in Tissues	
Organisms	Pesticide Concentration (parts per million)
producers	0.01–0.03
herbivores	0.25–1.50
carnivores	4.10–313.80

What does this information suggest to a person who is concerned about health and is deciding on whether to have a plant-rich or an animal-rich diet? [Support your answer using the information provided.]

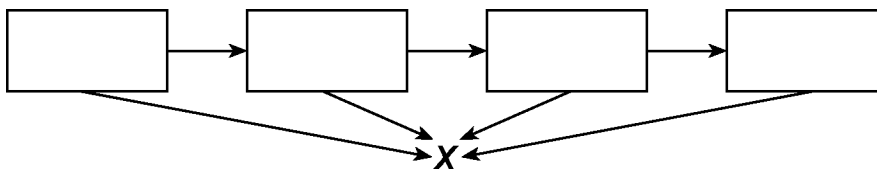
106) Some interactions in a desert community are shown in the diagram below.



Which statement is a valid inference based on the diagram?

- 1) All these organisms occupy the same niche.
- 2) All these organisms rely on energy from decomposers.
- 3) Organisms synthesize energy.
- 4) Certain organisms may compete for vital resources.

107) The diagram below represents some energy transfers in an ecosystem.



Which type of organism is most likely represented by letter X?

- 1) producer
- 2) decomposer
- 3) autotroph
- 4) herbivore

Questions 108 through 110 refer to the following:

The Pine Bush ecosystem near Albany, New York, is one of the last known habitats of the nearly extinct Karner Blue butterfly. The butterfly's larvae feed on the wild green plant, lupine. The larvae are in turn consumed by predatory wasps. The four groups below represent other organisms living in this ecosystem.

Group A	Group B	Group C	Group D
algae	rabbits	hawks	soil bacteria
mosses	tent caterpillars	moles	molds
ferns	moths	hognosed snakes	mushrooms
pine trees		toads	
oak trees			

108) Based on the data shown, the Karner Blue larvae belong in which group?

- 1) A
- 2) B
- 3) C
- 4) D

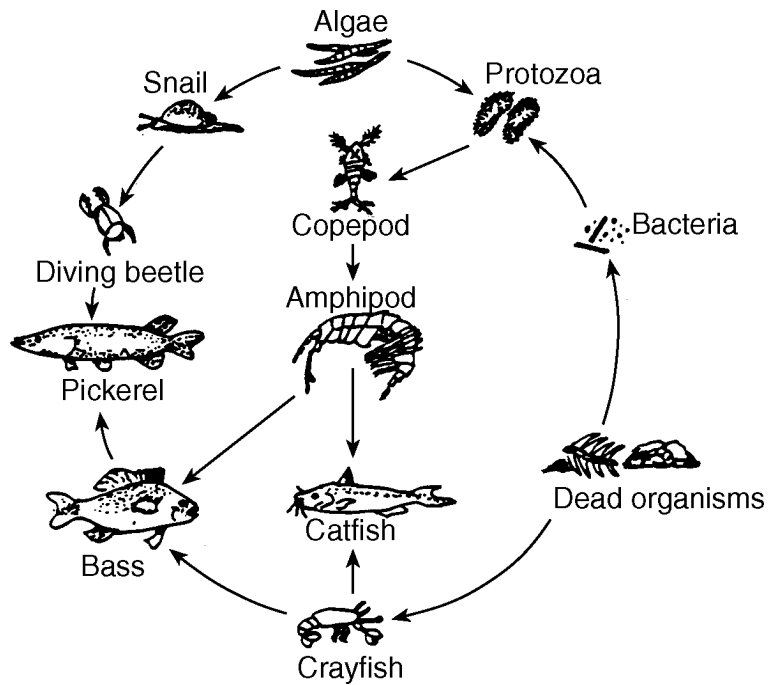
109) Which food chain *best* represents the information in the reading passage?

- 1) Karner Blue larvae → lupine → wasps
- 2) lupine → wasps → Karner Blue larvae
- 3) lupine → Karner Blue larvae → wasps
- 4) wasps → Karner Blue larvae → lupine

110) Which group in the given table contains decomposers?

- 1) A
- 2) B
- 3) C
- 4) D

111) A food web is shown below.

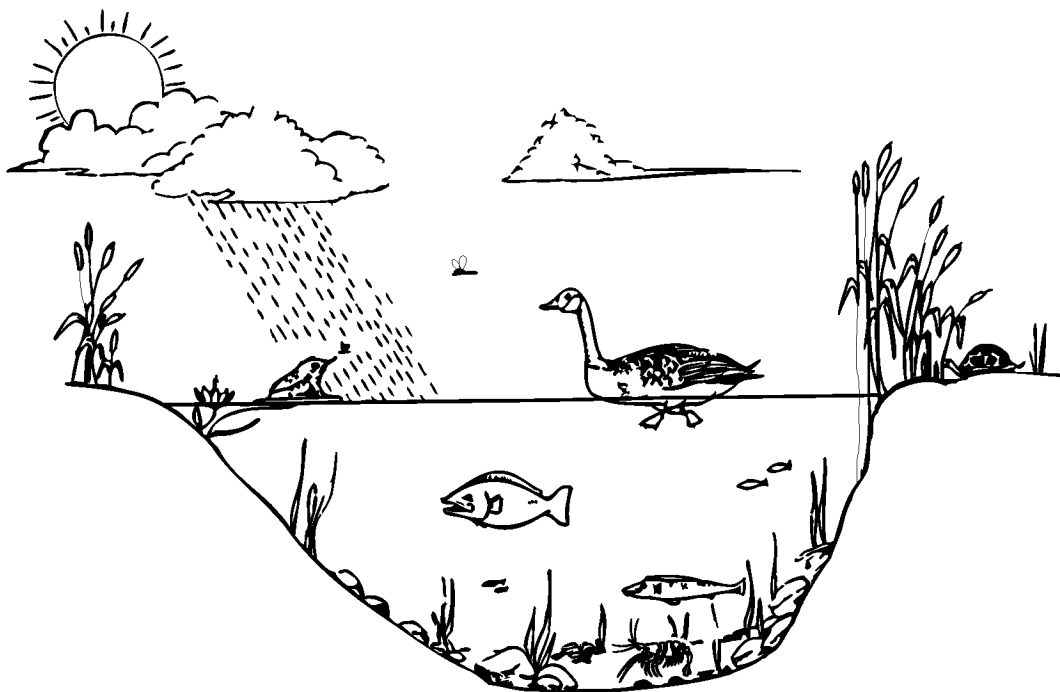


Which organisms feed on *both* producers and decomposers?

- 1) protozoa
- 2) crayfish
- 3) amphipods
- 4) catfish

Questions 112 through 115 refer to the following:

The diagram below represents a lake ecosystem.



- 112) Identify *one* organism represented in the diagram shown that provides the vital link for the transfer of energy from the Sun to the other organisms in the ecosystem.
- 113) Identify *one* predator/prey relationship that may occur in the ecosystem shown.
- 114) State *one* piece of evidence from the diagram shown that indicates that light penetrates to the bottom of the lake.
- 115) Identify the type of organism that is *not* visible in the diagram shown, but must be present in this ecosystem to recycle the remains of dead organisms.

Questions 116 through 118 refer to the following:

The variety of organisms known as plankton contributes to the unique nutritional relationships in an ocean ecosystem. Phytoplankton include algae and other floating organisms that perform photosynthesis. Plankton that cannot produce food are known as zooplankton. Some nutritional relationships involving these organisms and several others are shown in the table below.

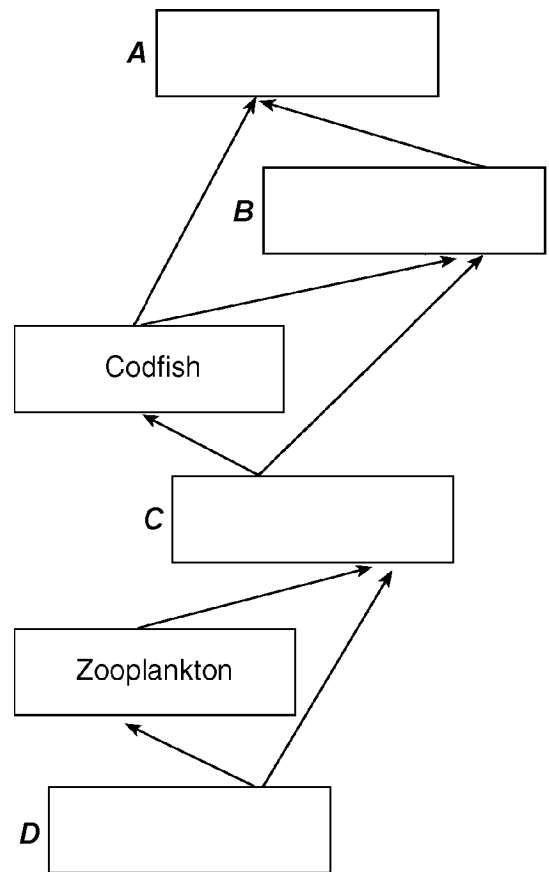
**Nutritional Relationships in a North Atlantic Ocean Community**

Animals in Community	Food Eaten by Animals in Community				
	Codfish	Phytoplankton	Small Fish	Squid	Zooplankton
codfish			X		
sharks	X			X	
small fish		X			X
squid	X		X		
zooplankton		X			

116) Humans are currently overfishing codfish in the North Atlantic. Explain why this could endanger *both* the shark population and the squid population in this community.

117) According to the table, which organism can be classified as *both* an herbivore and a carnivore?

118) Complete the food web below by placing the names of the organisms from the table into the correct locations.



## TOPIC: BIODIVERSITY

- 119) Ecosystems will have a greater chance of maintaining equilibrium over a long period of time if they have
- 1) organisms imported by humans from other environments
  - 2) a diversity of organisms
  - 3) a sudden change in climate
  - 4) predators eliminated from the food chains
- 120) A greater stability of the biosphere would most likely result from
- 1) decreased finite resources
  - 2) increased deforestation
  - 3) decreased consumer populations
  - 4) increased biodiversity
- 121) An established ecosystem may remain stable over hundreds of years because
- 1) there is a lack of variety in the species
  - 2) no competition exists between the species
  - 3) species interdependence is absent
  - 4) there are natural checks on species
- 122) A stable pond ecosystem would *not* contain
- 1) more consumers than producers
  - 2) oxygen
  - 3) materials being cycled
  - 4) decomposers
- 123) Which condition would most likely upset the stability of an ecosystem?
- 1) energy constantly entering the environment
  - 2) a cycling of elements between organisms and the environment
  - 3) a greater mass of animals than plants
  - 4) green plants incorporating sunlight into organic compounds
- 124) Cutting down a rain forest and planting agricultural crops, such as coffee plants, would most likely result in
- 1) a decrease in biodiversity
  - 2) an increase in the amount of energy recycled
  - 3) an increase in the amount of photosynthesis
  - 4) a decrease in erosion

Questions 125 and 126 refer to the following:

Research indicates that many plants prevent the growth of other plants in their habitat by releasing natural herbicides (chemicals that kill plants). These substances are known as allelochemicals and include substances such as quinine, caffeine, and digitalis. Experiments have confirmed that chemicals in the bark and roots of black walnut trees are toxic, and when released into the soil they limit the growth of crop plants such as tomatoes, potatoes, and apples. Allelochemicals can alter growth and enzyme action, injure the outer cover of a seed so the seed dies, or stimulate seed growth at inappropriate times of the year. Studies on allelochemical effects help explain the observation that almost nothing grows under a black walnut tree even though light and moisture levels are adequate for growth.

- 125) Based on the reading passage, which phrase *best* predicts the relative numbers of different plant species in regions A, B, and C in the diagram shown below?

Black walnut tree



- 1) greater in A than B
  - 2) greater in A than C
  - 3) greater in C than B
  - 4) greater in B than C
- 126) Based on the reading passage, the release of allelochemicals into the soil under a black walnut tree will result in
- 1) an increase in biodiversity and a competitive advantage for the tree
  - 2) an increase in biodiversity and a competitive disadvantage for the tree
  - 3) a decrease in biodiversity and a competitive advantage for the tree
  - 4) a decrease in biodiversity and a competitive disadvantage for the tree

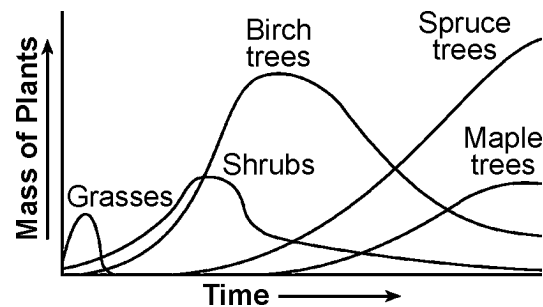
## TOPIC: ECOLOGICAL SUCCESSION

- 127) In December 2004, a tsunami (giant wave) destroyed many of the marine organisms along the coast of the Indian Ocean. What can be expected to happen to the ecosystem that was most severely hit by the tsunami?
- 1) Succession will continue in the ecosystem until one species of marine organism is established.
  - 2) The ecosystem will change until a new stable community is established.
  - 3) Ecological succession will no longer occur in this marine ecosystem.
  - 4) The organisms in the ecosystem will become extinct.
- 128) Many years ago, a volcanic eruption killed many plants and animals on an island. Today the island looks much as it did before the eruption. Which statement is the *best* possible explanation for this?
- 1) Destroyed ecosystems always return to their original state.
  - 2) Geographic barriers prevent the migration of animals to island habitats.
  - 3) Destroyed environments can recover as a result of the process of ecological succession.
  - 4) Altered ecosystems regain stability through the evolution of new plant species.
- 129) A volcanic eruption destroyed a forest, covering the soil with volcanic ash. For many years, only small plants could grow. Slowly, soil formed in which shrubs and trees could grow. These changes are an example of
- 1) ecological succession
  - 2) evolution of a species
  - 3) manipulation of genes
  - 4) equilibrium
- 130) Years after the lava from an erupting volcano destroyed an area, grasses started to grow in that area. The grasses were gradually replaced by shrubs, evergreen trees, and finally, by a forest that remained for several hundred years.

This entire process is an example of

- 1) deforestation
- 2) ecological succession
- 3) plant preservation
- 4) biological feedback

- 131) Which concept is represented in the graph below?



- 1) negative human impact on the environment
  - 2) cycling of carbon and nitrogen in a forest
  - 3) energy flow in a food chain over time
  - 4) ecological succession in a community
- 132) Lichens and mosses are the first organisms to grow in an area. Over time, grasses and shrubs will grow where these organisms have been. The grasses and shrubs are able to grow in the area because the lichens and mosses
- 1) are at the beginning of every food chain in a community
  - 2) make the environment suitable for complex plants
  - 3) provide the enzymes needed for plant growth
  - 4) synthesize food needed by producers in the area

Questions 133 and 134 refer to the following:

Lichens are composed of two organisms, a fungus that cannot make its own food and algae that contain chlorophyll. Lichens may live on the bark of trees or even on bare rock. They secrete acids that tend to break up the rock they live on, helping to produce soil. As soil accumulates from the broken rock and dead lichens, other organisms, such as plants, may begin to grow.

- 133) Based on the reading passage, the ability of lichens to alter their environment, enabling other organisms to grow and take their places in that environment, is one step in the process of
- 1) ecological succession
  - 2) biological evolution
  - 3) differentiation in complex organisms
  - 4) maintenance of cellular communication
- 134) Based on the reading passage, what is the role of the algae component of a lichen in an ecosystem?
- 1) decomposer
  - 2) parasite
  - 3) herbivore
  - 4) producer

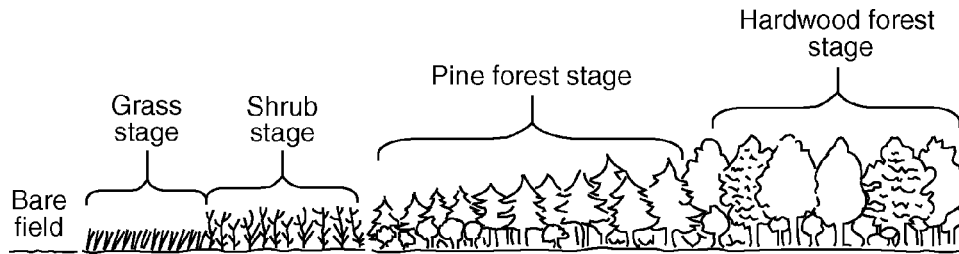
- 135) As succession proceeds from a shrub community to a forest community, the shrub community modifies its environment, eventually making it
- 1) less favorable for itself and less favorable for the forest community
  - 2) more favorable for itself and less favorable for the forest community
  - 3) more favorable for itself and more favorable for the forest community
  - 4) less favorable for itself and more favorable for the forest community
- 136) A fire burns an oak forest down to bare ground. Over the next 150 years, if the climate remains constant, this area will most likely
- 1) remain bare ground
  - 2) return to an oak forest
  - 3) become a rain forest
  - 4) become a wetland

Questions 137 and 138 refer to the following:

A pond in the Adirondack Mountains of New York State was once a fishing spot visited by many people. It was several acres in size, and fishermen in boats were a common sight. Over time, the pond has become smaller in area and depth. Places where there was once open water are now covered by grasses and shrubs. Around the edges of the pond there are cattails and other wetland plants.

- 137) Identify the ecological process responsible for the changes to the pond referred to in the reading passage.
- 138) Predict what will most likely happen to the area of the pond over the next hundred years if the process described in the reading passage continues.

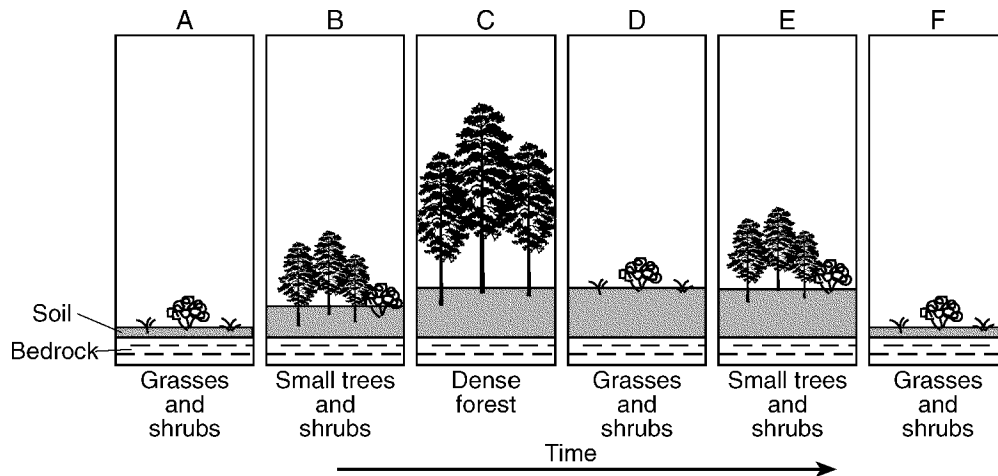
- 139) Which of the stages in the diagram below consists of plant species that modify the environment, eventually making it more suitable for another community?



- 1) grass, shrub, and pine forest stages
- 2) hardwood forest stage, only
- 3) shrub, pine forest, and hardwood forest stages
- 4) grass stage, only

Questions 140 through 142 refer to the following:

The diagram below represents the changes in an ecosystem over a period of 100 years.





140) State *one* biological explanation for the changes in types of vegetation observed from *A* through *C* in the diagram shown.

141) Identify *one* human activity that could be responsible for the change from *C* to *D* in the diagram shown.

142) Predict what would happen to the soil *and* vegetation of the ecosystem shown after stage *F*, assuming no natural disaster or human interference.