

Topic 9: Ecology & Human Impact on the Environment

Ecology: Study of the interactions of organisms and their environment.
 biotic & abiotic

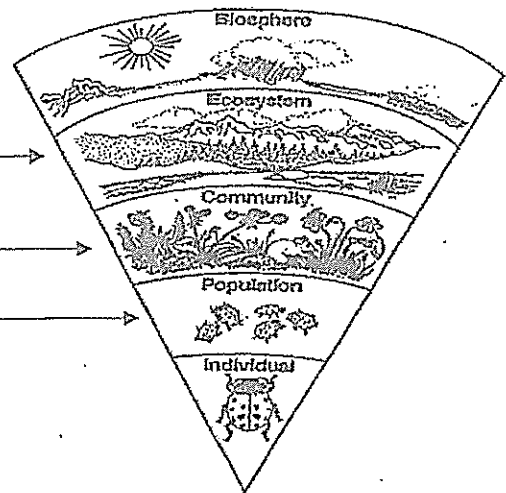
Levels of Organization:

all of Earth's ecosystems together

all the different populations that live and interact in the same environment along with the abiotic factors

all the populations that interact in a given area

all the organisms of a single species in a given area



Food Web Vocabulary:

Organism	Description	Examples
1. Autotrophs (producers)	Convert inorganic raw materials into organic compounds	Plants
2. Heterotrophs (consumers)	Obtain organic compounds by eating other organisms	Rabbit, Hawk (animals)
3. Decomposers (Saprobies)	Consumes dead organisms and organic wastes, important in recycling materials	Bacteria, fungi, earthworms
4. Scavengers	Carnivores that feed on the bodies of dead organisms	Vultures, Crows
5. Parasites	Lives and feeds on host organisms	fleas, tapeworms

fungi

Energy Flow:



• Sun: original source of energy for most ecosystems

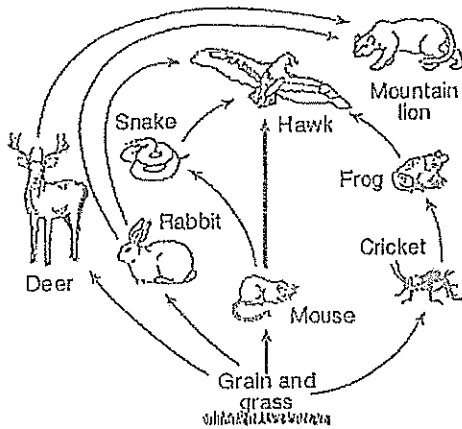
• The amount of available energy and biomass decreases as you move up through a food chain

• Food webs are more accurate than food chains in showing the relationships between organisms because they are more detailed and can show that organisms usually have more than one food source

Biodiversity: Having many different species

- increases stability within an ecosystem

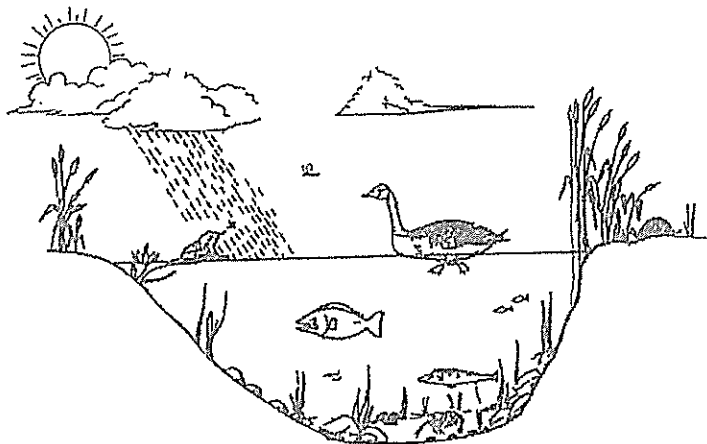
Food Web:



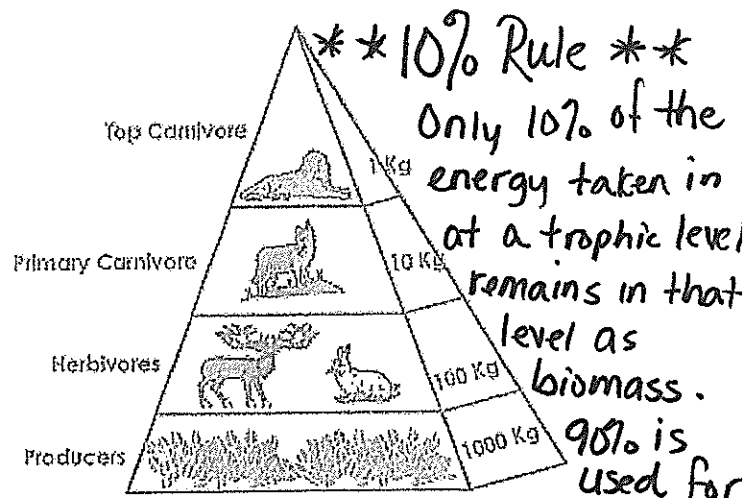
What would happen if the mice became extinct?

Snake / Hawk pop. would decrease

Ecosystem:

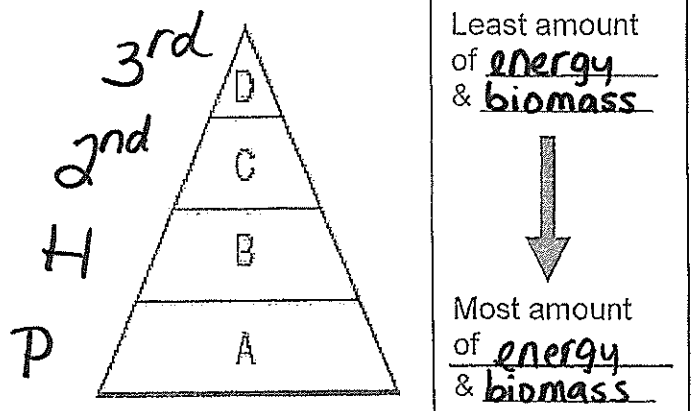


Ecological Pyramid:



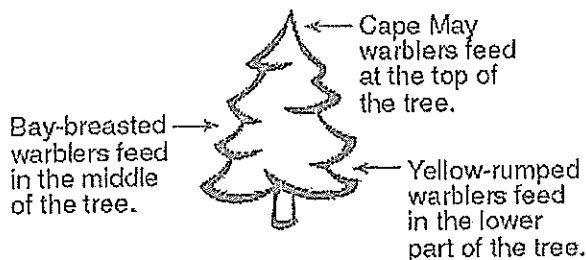
Upright Pyramid of biomass in a Terrestrial Ecosystem

The diagram below represents an energy pyramid.



Biological Magnification: the concentration of harmful chemicals increases as you move up an ecological pyramid (food chain)

Niche: an organism's role in the environment, where they are and what they do.



Why is it beneficial for the different species of warblers to live in different parts of this tree?

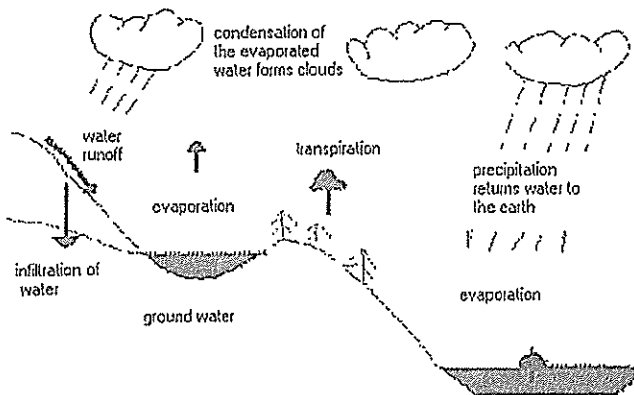
By filling slightly different niches, the decrease the competition between their species.

Symbiotic Relationships: Two organisms that live in, on, or near each other and at least **(one)** benefits from the relationship

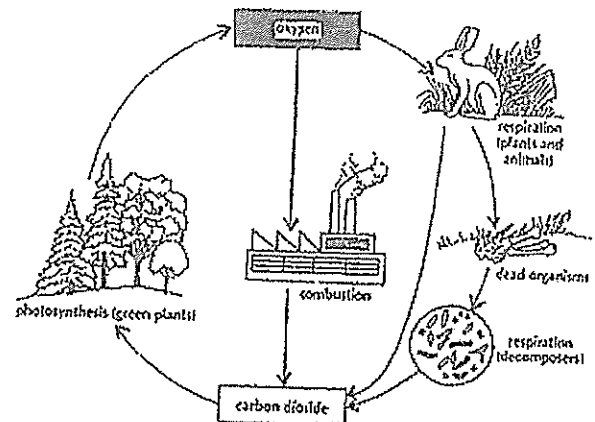
Symbiotic Relationship	Description	Examples	+/-/0
1. Mutualism	both organisms benefit	Protozoa in the termite gut	+, +
2. Commensalism	One benefits and the other is not affected	Barnacles on whales	+, 0
3. Parasitism	One organism benefits, the other is harmed or killed.	Tapeworms, mistletoe, athlete's foot	+, -

Cycling of Materials in an Ecosystem:

Water Cycle:



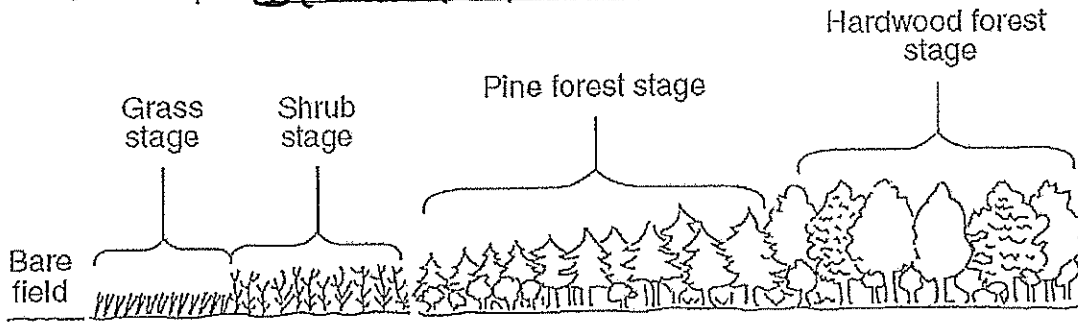
Carbon and Oxygen Cycle:



Nitrogen Cycle: decomposers like fungi and bacteria are very important in recycling nitrogen within ecosystem

Ecological Succession: one community is replaced by another over time

- o Pioneer Organisms: First organisms to inhabit a barren area
 - o Example: mosses and lichens
- o Climax Community: Stable, unchanging, dominant community
 - o Example: Deciduous forest



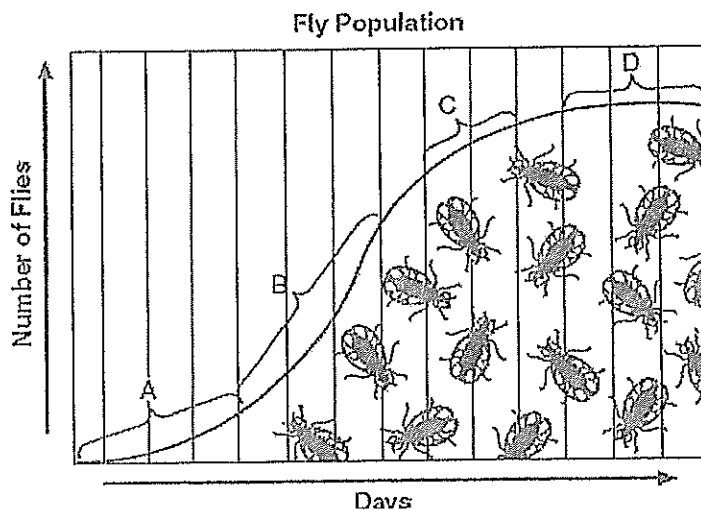
Population Growth:

1. Carrying Capacity	The largest population of any single species that an area can support
2. Limiting factor	Any factor in the environment that limits the size of a population
3. examples of limiting factors	Light, Water, Temperature Oxygen, Carbon dioxide

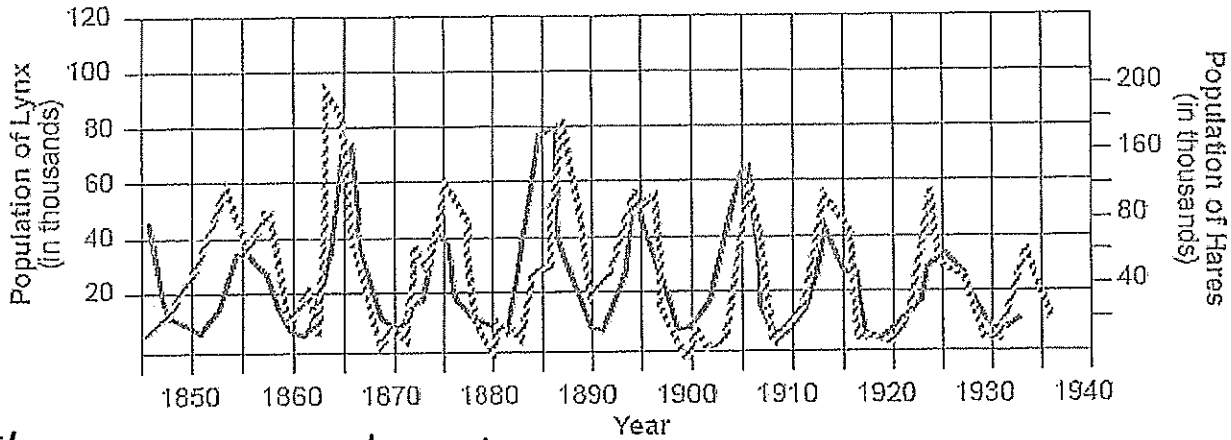
Analyze the graph show below and explain why the insect population doesn't keep increasing.

The population has reached the carrying capacity.

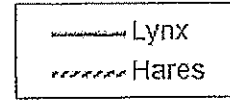
(They are running out of space and resources)



Predator / Prey relationship they each act as limiting factors to control the population size of each other



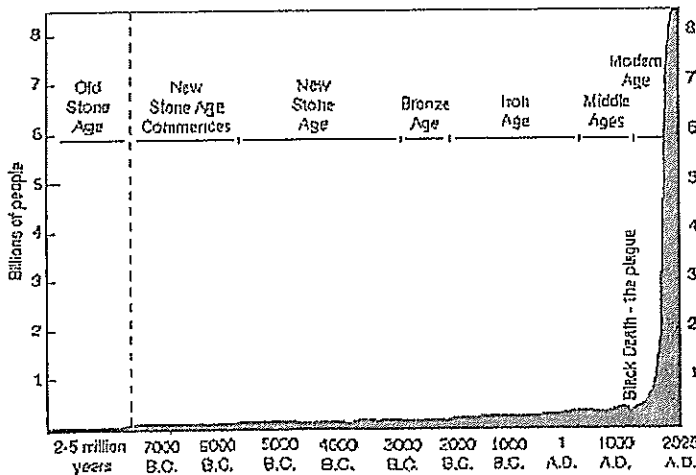
** The prey pop. has to increase before the predator pop. (Why?)



Human Population Growth: Analyze the graph showing the rate of growth of the human population. Will the human population continue to increase continuously? Why or why not?

No. There has to be enough resources to support a growing pop.

World Population Growth Through History



Why is it important to control the rate of population growth before it reaches its carrying capacity?
 Populations that exceed carrying capacities decrease drastically due to the extreme lack of resources.

Resources	Description
Renewable resources	Resources that replace themselves (Trees)
Nonrenewable resources	Resources that and not replaced (fossil fuels)

Classify each of the following as renewable or nonrenewable resources. (Check one)

Resources	Renewable	Nonrenewable
Oxygen	✓	
Coal		✓
Gasoline		✓
Fresh water	✓	
Fossil fuels		✓
Wind energy	✓	
Solar energy	✓	
Plant material	✓	
Minerals		✓

*Can a renewable resource become a nonrenewable resource? Explain.
 Trees are renewable resources - but if humans continue to cut down trees faster than they are replaced, then trees can become non-renewable.

Preserving Resources:

The 3 R's	Action	Example
1. Reduce	Avoid using the resource	Carpooling
2. Reuse		Canvas bags, water bottles
3. Recycle	process of changing waste materials into new useful materials	Paper, metal, plastic, glass

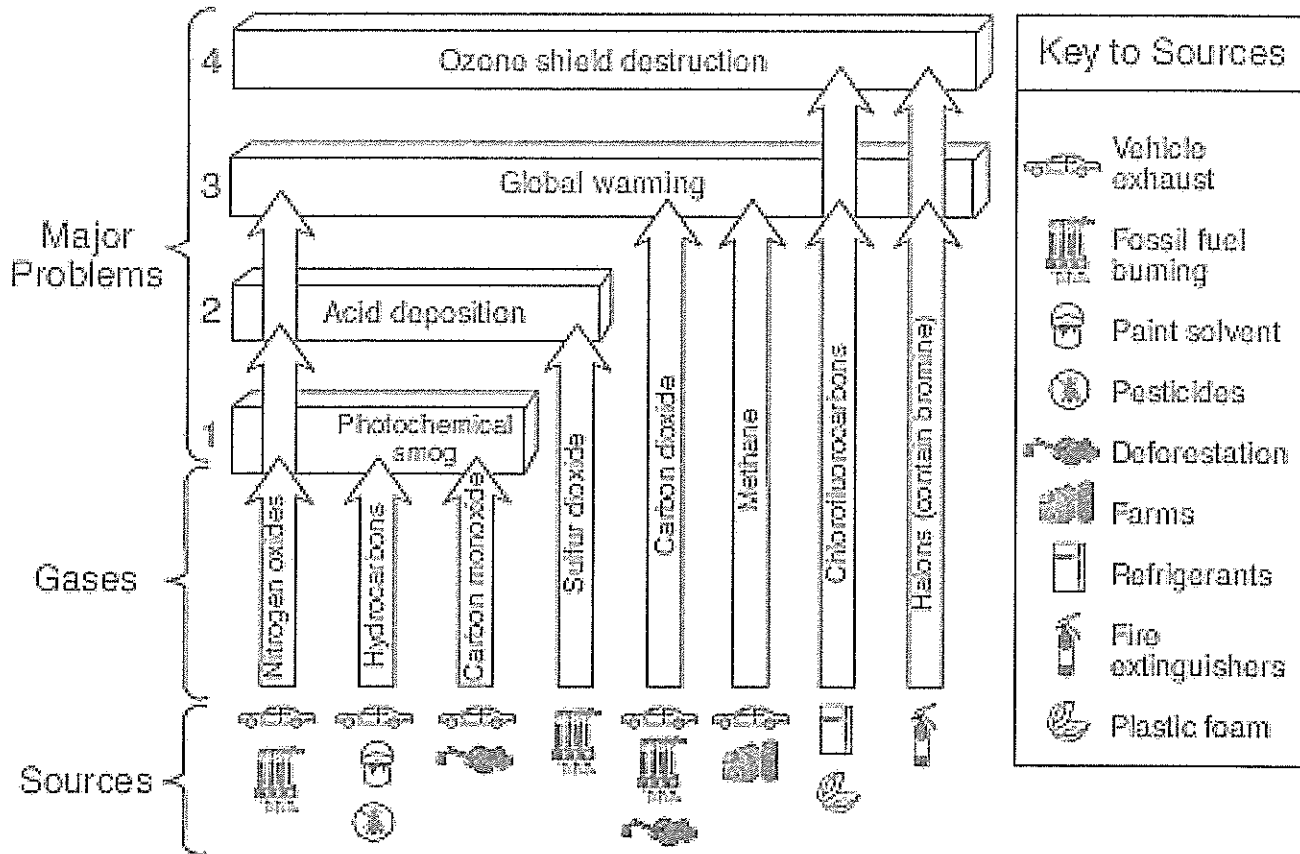
Human Activities and the Loss of Diversity:

1. Poaching	The destruction or removal of species from their habitats. This can result in endangerment or extinction of many species.
2. deforestation	clearing of a forest & converting to a non-forest use. (farm, ranch, urban area)
3. Exotic / Non-indigenous	Import and release a species from one environment into another. They usually become pests because there are no natural predators. Disrupts existing food webs. AKA: alien species, invasive species

Technology and Industrialization:

1. fossil fuels	burning causes CO ₂ emissions, a green house gas which leads to climate change.
2. Pollution	A harmful change in the chemical makeup of the soil, water or air
3. acid rain	Precipitation that has a low pH. Caused by emissions of Sulfur & Nitrogen
4. Climate Change	Earth's average temperature is increasing due to an increase in greenhouse gases such as carbon dioxide
5. Ozone depletion	Destruction of the ozone shield (the layer of ozone gas in the upper atmosphere) that protects Earth from the sun's radiation
6. CFC's	cause ozone depletion, banned in 1980's - found in aerosol cans & airconditioning

The diagram below shows some of the gases that, along with their sources, contribute to four major problems associated with air pollution.



Select one of the four major problems from the diagram and record the number of the problem on the line below. Identify a gas that contributes to the problem you selected and state one way in which the amount of this gas can be reduced.

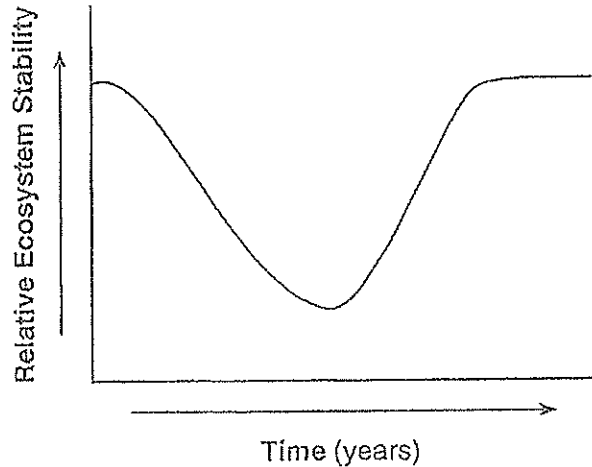
Problem #: _____

Gas: _____

Explain why damage to the ozone shield is considered a threat to many organisms.

* See page 120 *

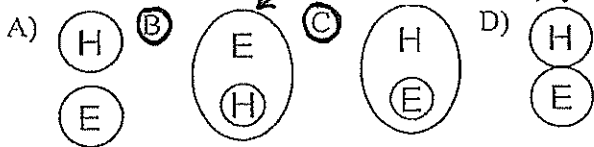
1. The graph below shows changes in the stability of an ecosystem over a period of time.



Which statement best describes the change in ecosystem stability shown in the graph?

- A) A stable ecosystem can be altered, then it can recover to a point of stability.
- B) An ecosystem remains unchanged as its stability decreases.
- C) The stability of an ecosystem remains unchanged but its biodiversity decreases.
- D) A stable ecosystem cannot recover after it is altered.

2. Which diagram best illustrates the relationship between humans (H) and ecosystems (E)?



any other species, no question

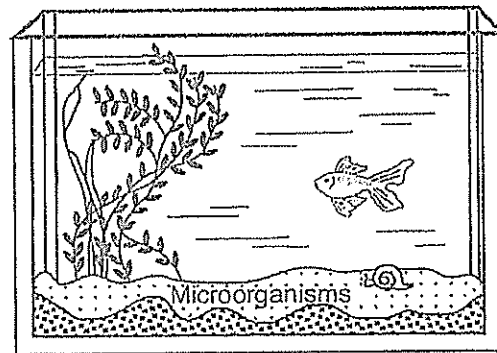
3. The science of ecology is best defined as the study of

- A) the classification of plants and animals
- B) the interactions of living organisms and their environment
- C) technology and its effects on society
- D) weather and its effects on food production in the ocean

4. A stable ecosystem would *not* contain

- A) materials being cycled
- B) consumers without producers
- C) decomposers
- D) a constant source of energy

5. Which statement most accurately predicts what would happen in the aquarium shown below if it were tightly covered and maintained in natural light for one month?



- A) The water temperature would rapidly decrease.
- B) The process of respiration in the snail would decrease.
- C) The rate of reproduction of the fish would be affected.
- D) The organisms would probably survive because materials would cycle.

6. The first living things to grow successfully on a newly formed sand dune are known as

- A) saprophytes
- B) pioneer organisms
- C) carnivorous plants
- D) heterotrophs

7. Which set of statements best illustrates a material cycle in a self-sustaining ecosystem?

- A) In summer, growing plants remove magnesium ions from the soil to make chlorophyll. In autumn, these plants release magnesium when they die and decompose. In spring, new plants will grow in this same area.
- B) Trees do not live in a desert ecosystem where there is not enough water present in the sandy soil to support their growth. Trees can live in a desert oasis.
- C) DDT is sprayed on a forest ecosystem to control the mosquito population. After a year, the level of DDT is found to be much higher in the tissues taken from a hawk than in the tissues taken from a mouse in this ecosystem.
- D) Plants trap the Sun's energy in the chemical bonds of organic molecules. This energy is then used for plant metabolic activities.

8. Which statement best describes a characteristic of an ecosystem?

- A) It must have producers and consumers but not decomposers.
- B) It is stable because it has consumers to recycle energy.
- C) It always has two or more different autotrophs filling the same niche.
- D) It must have organisms that carry out autotrophic nutrition.

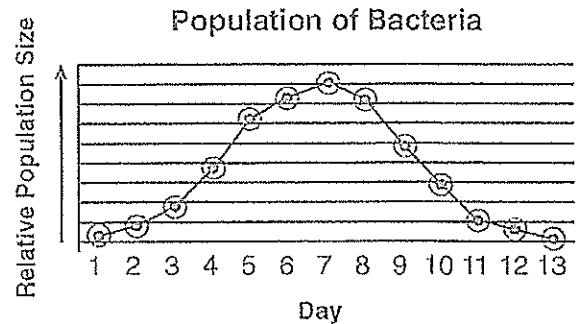
9. Compared to a natural forest, the wheat field of a farmer *lacks*

- A) heterotrophs
- B) significant biodiversity
- C) autotrophs
- D) stored energy

10. Which statement best illustrates the concept of the interrelationship of living things with the physical environment, as found in the definition of ecology?

- A) Hawks and eagles often compete with each other.
- B) White-tailed deer shed their antlers.
- C) Algae release oxygen and absorb carbon dioxide from pond water.
- D) Frogs produce many eggs in a single reproductive cycle.

11. A sample of bacteria was added to a culture dish containing a food supply. The dish was kept in an incubator for two weeks, where temperature and other conditions that favored bacterial growth were kept constant. The graph below shows changes that occurred in the bacterial population over the two weeks.



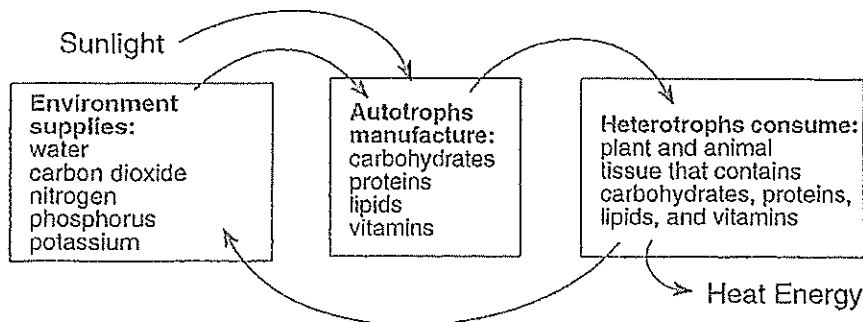
Which statement provides the best explanation for some of the changes observed?

- A) The bacteria were unable to reproduce until day 8.
- B) The bacteria consumed all of the available food.
- C) The culture dish contained an antibiotic for the first five days.
- D) The temperature increased and the bacteria died.

12. What impact do the amounts of available energy, water, and oxygen have on an ecosystem?

- A) They act as limiting factors.
- B) They are used as nutrients.
- C) They recycle the residue of dead organisms.
- D) They control environmental temperature.

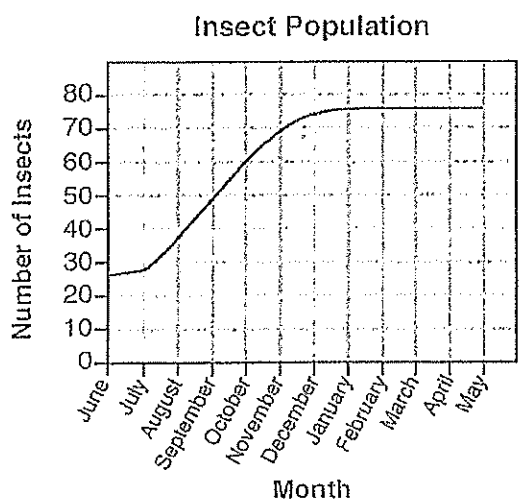
13. The diagram below provides some information concerning an ecosystem.



Which title is *most* appropriate for the diagram?

- A) Energy Flow and Material Cycles in an Ecosystem
- B) Evolution in an Ecosystem
- C) Succession in an Ecosystem
- D) The Water Cycle in an Ecosystem

14. 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?

- A) All the insects in the box are the same age.
- B) The insects hibernated from January to April.
- C) The population has carnivorous members.
- D) The population reached carrying capacity by January.

15. 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.”

- A) daily temperature range and types of autotrophs
- B) time of rainy season and type of food used by heterotrophs
- C) identity of a limiting factor and behavior of heterotrophs
- D) type of nutrition in animals and distribution of autotrophs

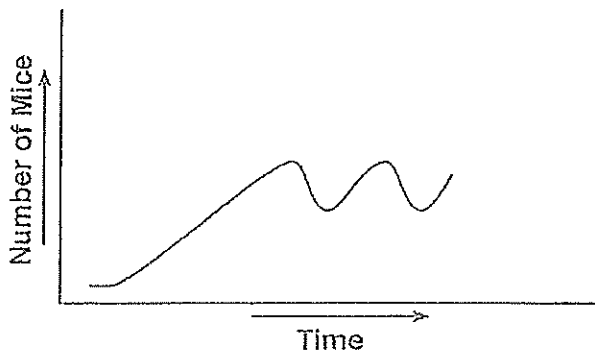
16. One biotic factor that limits the carrying capacity of any habitat is the

- A) availability of water
 - B) level of atmospheric oxygen
 - C) activity of decomposers
 - D) amount of soil erosion
- Abiotic

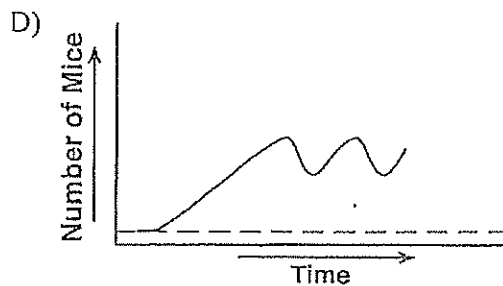
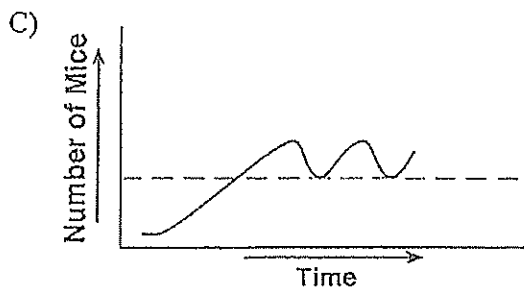
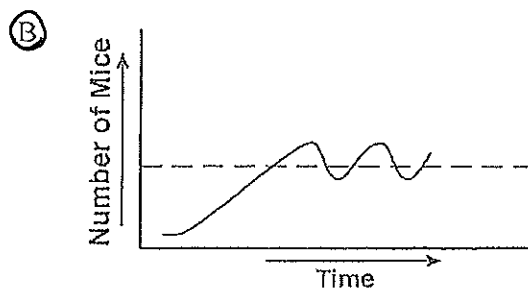
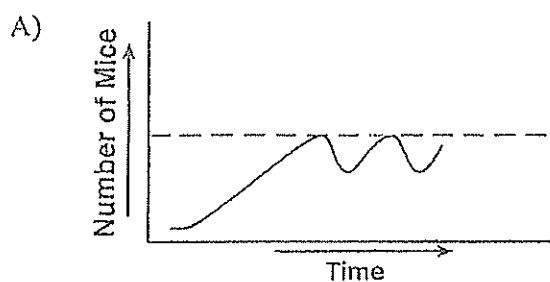
17. The reason that organisms can *not* produce populations of unlimited size is that

- A) the resources of Earth are finite
- B) there is no carrying capacity on Earth
- C) species rarely compete with one another
- D) interactions between organisms are unchanging

18. The graph below shows the growth of a field mouse population in an ecosystem over time.



The dashed line indicating the carrying capacity for the mouse population is correctly shown on which graph?



19. Which list includes only abiotic factors?

- A) soil, water, air, and sunlight
- B) ducks, fish, soil, and water
- C) humidity, temperature, rodents, and grasses
- D) trees, flowering plants, mosses, and ferns

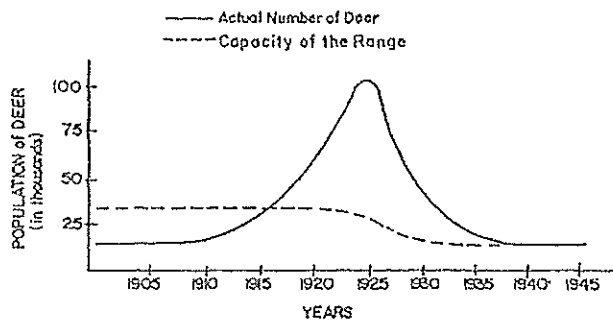
20. In an ecosystem, the calcium compounds found in rocks are best described as

- A) inorganic and abiotic
- B) inorganic and biotic
- C) organic and abiotic
- D) organic and biotic

21. In the marshlands of the northeastern United States, the purple loosestrife plant has replaced many native plants. The success of the purple loosestrife plant is most likely due to its ability to

- A) control secondary consumers
- B) conserve natural resources
- C) transfer energy from soil minerals
- D) compete for abiotic factors

Base your answers to questions 22 and 23 on the graph below and on your knowledge of biology. The graph represents the relationship between the capacity of the range (number of deer that could be supported by the range), the number of deer actually living on the range, and time.



22. In what year was the number of deer living on the range equal to the capacity of the range?

- A) 1905 **B) 1915** C) 1920 D) 1930

23. What is the most likely reason why the capacity of the range to support deer decreased between 1920 and 1930?

- A) The deer population became too large.**
 B) The number of predators increased between 1915 and 1925.
 C) The deer population decreased in 1919.
 D) An unusually cold winter occurred in 1918.

24. In ecology, a population is defined as all the

- A) members of a single species in the biosphere
 B) members of a given genus inhabiting a given area
C) members of a single species inhabiting a given area
 D) abiotic and biotic factors in a given location

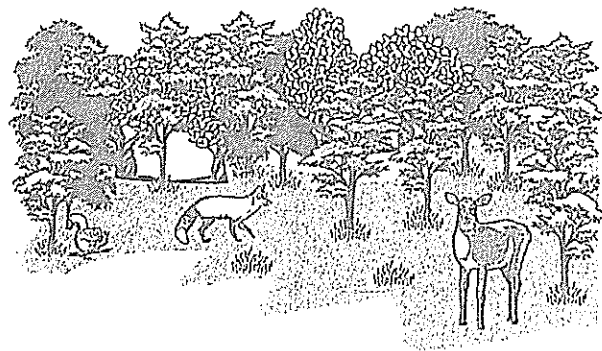
25. Base your answer to the following question on the information below and on your knowledge of biology.

An island in a river in New York State has a population of mice. In 1 year, the population density changed from 12 mice per 25 square meters to 20 mice per 25 square meters.

Which factor most likely caused the change in the population density of mice on the island?

- A) a decrease in the amount of precipitation
 B) migration of snakes to the island
 C) competition among mice for food
D) a decrease in the island's owl population

26. Which statement describes the ecosystem represented in the diagram below?



- A) This ecosystem would be the first stage in ecological succession.
 B) This ecosystem would most likely lack decomposers
 C) All of the organisms in this ecosystem are producers.
D) All of the organisms in this ecosystem depend on the activities of biological catalysts.

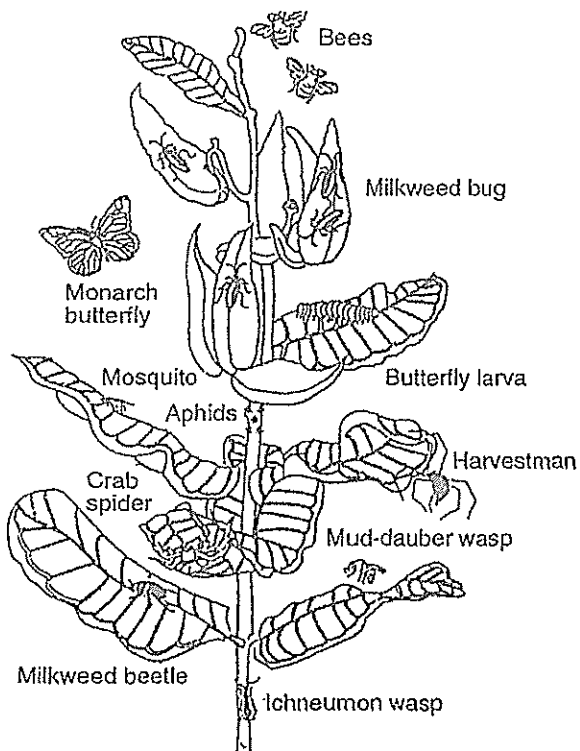
27. Which sequence shows increasing complexity of levels of ecological organization?

- A) biosphere, ecosystem, community
 B) biosphere, community, ecosystem
C) community, ecosystem, biosphere
 D) ecosystem, biosphere, community

28. A moss-covered log is overturned by a hungry bear looking for insects to eat. The bear disturbs an ant colony, and some chipmunks leave the hollow log to search for another home in the forest. Which relationship do these organisms have with each other?

- A) They are all of the same species.
 B) They all require the same type of food.
C) They are part of a community.
 D) They are abiotic factors in a forest.

29. The diagram below shows a milkweed plant and some of the insects that live on it or visit it.



Which term best describes the group of organisms in the diagram?

- A) biosphere
- B) community**
- C) habitat
- D) biome

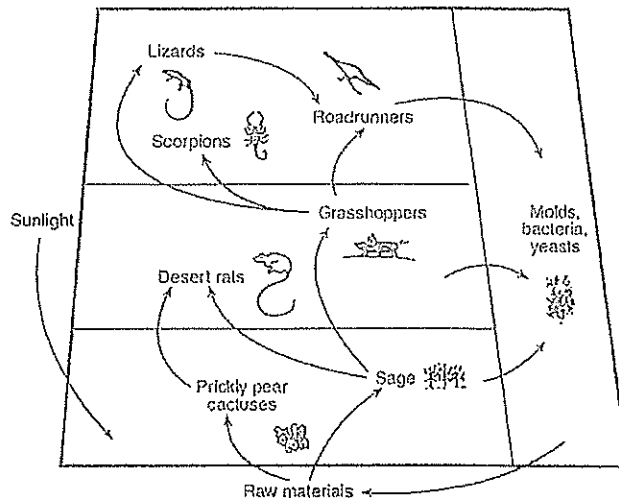
30. Competition between two species occurs when

- A) mold grows on a tree that has fallen in the forest
- B) chipmunks and squirrels eat sunflower seeds in a garden**
- C) a crow feeds on the remains of a rabbit killed on the road
- D) a lion stalks, kills, and eats an antelope

31. Rabbits are herbivores that are not native to Australia. Their numbers have increased steadily since being introduced into Australia by European settlers. One likely reason the rabbit population was able to grow so large is that the rabbits

- A) were able to prey on native herbivores
- B) reproduced more slowly than the native animals
- C) successfully competed with native herbivores for food**
- D) could interbreed with the native animals

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



Which statement is a valid inference based on the diagram?

- A) Certain organisms may compete for vital resources.**
- B) All these organisms rely on energy from decomposers.
- C) Organisms synthesize energy.
- D) All organisms occupy the same niche

33. Intense competition would most likely occur between

- A) owls and deer inhabiting the same forest
- B) squirrels and chipmunks using the same food source in a certain habitat**
- C) pine trees and grass seedlings growing in adjacent fields
- D) whales and sharks living in the same ocean

34. A scientist studied iguanas inhabiting a chain of small ocean islands. He discovered two species that live in different habitats and display different behaviors. His observations are listed in the table below.

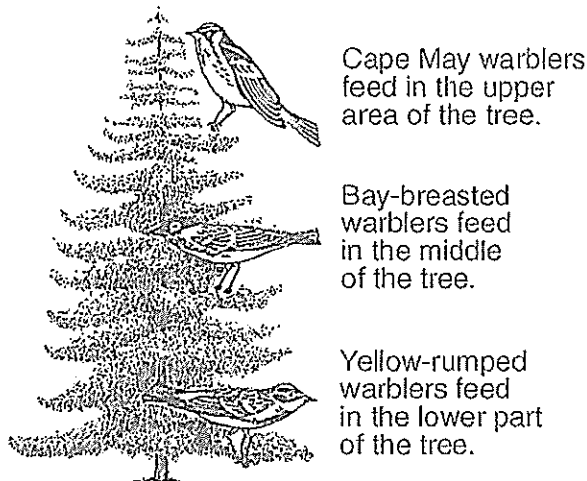
Observations of Two Species of Iguanas

Species A	Species B
spends most of its time in the ocean	spends most of its time on land
is rarely found more than 10 meters from shore	is found many meters inland from shore
eats algae	eats cactus and other land plants

Which statement best describes these two species of iguanas?

- A) Both species evolved through the process of ecological succession.
- B) Each species occupies a different niche.**
- C) The two species can interbreed.
- D) Species A is a scavenger and species B is a carnivore.

35. The ecological niches of three bird species are shown in the diagram below.



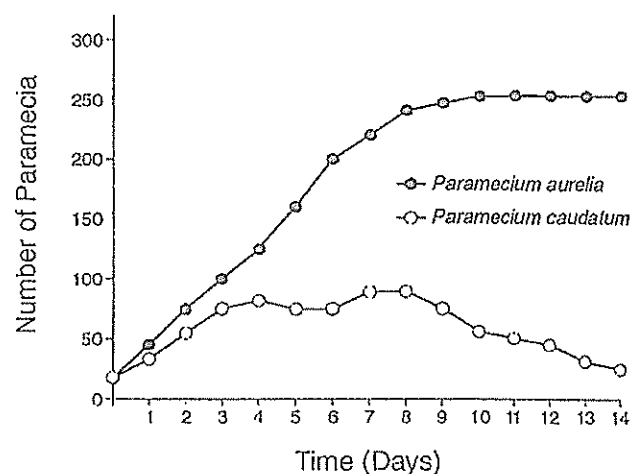
What is the advantage of each bird species having a different niche?

- A) As the birds feed higher in the tree, available energy increases.
- B) More abiotic resources are available for each bird.
- C) Predators are less likely to feed on birds in a variety of locations.
- D) There is less competition for food.**

36. A new island formed by volcanic action may eventually become populated with biotic communities as a result of

- A) a decrease in the amount of organic material present
- B) decreased levels of carbon dioxide in the area
- C) the lack of abiotic factors in the area
- D) the process of ecological succession**

37. The graph below shows the growth of two populations of paramecia grown in the same culture dish for 14 days.



Which ecological concept is best represented by the graph?

- A) recycling
- B) equilibrium
- C) competition**
- D) decomposition

38. One advantage of biodiversity in an ecosystem is that it

- A) guarantees that the largest organisms will dominate the area
- B) ensures a large amount of identical genetic material
- C) develops relationships between organisms that are always positive over long periods of time
- D) increases the chance that some organisms will survive a major change in the environment**

39. Base your answer to the following question on the information below and on your knowledge of biology.

The dodo bird inhabited the island of Mauritius in the Indian Ocean, where it lived undisturbed for years. It lost its ability to fly and it lived and nested on the ground where it ate fruits that had fallen from trees. There were no mammals living on the island.

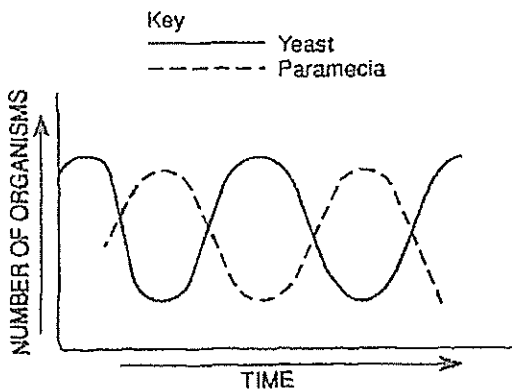
In 1505, the first humans set foot on Mauritius. The island quickly became a stopover for ships engaged in the spice trade. The dodo was a welcome source of fresh meat for the sailors and large numbers of dodos were killed for food. In time, pigs, monkeys, and rats brought to the island ate the dodo eggs in the ground nests.

Which statement describes what most likely happened to the dodo bird within 100 years of the arrival of humans on Mauritius?

- A) Dodo birds developed the ability to fly in order to escape predation and their population increased.
- B) The dodo bird population increased after the birds learned to build their nests in trees.
- C) Human exploitation and introduced species significantly reduced dodo bird populations.
- D) The dodo bird population became smaller because they preyed upon the introduced species.

40. Base your answer to the following question on the information below and on your knowledge of biology.

In an investigation, yeast was grown in a nutrient culture that was maintained at a constant temperature. After a few days, paramecia that feed on yeast were introduced into the culture medium. The numbers of yeast cells and paramecia were determined over a period of several weeks. A graph illustrating these data is shown below.



What might occur if another species of paramecium that feeds on the same species of yeast is introduced into the culture?

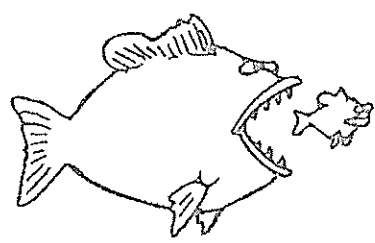
- A) competition between the two species of paramecia
- B) symbiosis between the two species of paramecia
- C) an increase in oxygen production by the yeast
- D) an increase in the reproductive rate of the yeast

Base your answers to questions 41 and 42 on the information below and on your knowledge of biology.

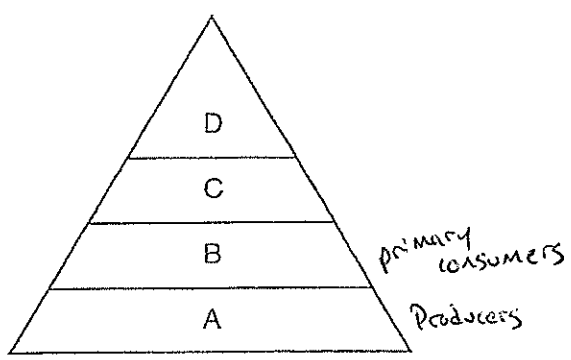
Lichens are composed of two organisms, a fungus that cannot make its own food and algae that contain chlorophyll. Lichens may live on the bark of trees or even on bare rock. They secrete acids that tend to break up the rock they live on, helping to produce soil. As soil accumulates from the broken rock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

41. What is the role of the algae component of a lichen in an ecosystem?
- A) decomposer
 - B) parasite
 - C) herbivore
 - D) producer
42. 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
- A) biological evolution
 - B) ecological succession
 - C) maintenance of cellular communication
 - D) differentiation in complex organisms
43. Carbon dioxide makes up less than 1 percent of Earth's atmosphere, and oxygen makes up about 20 percent. These percentages are maintained most directly by
- A) respiration and photosynthesis
 - B) the ozone shield
 - C) synthesis and digestion
 - D) energy recycling in ecosystems

44. Which group contains terms that are *all* directly associated with one of the organisms shown in the diagram below?

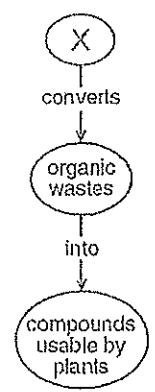


- A) herbivore, prey, autotroph, host
 - B) predator, scavenger, decomposer, consumer
 - C) carnivore, predator, heterotroph, multicellular
 - D) producer, parasite, fungus, fish
45. A symbiotic relationship exists between two organisms of different species. If only one organism benefits from the relationship and the other is not harmed, the relationship is known as
- A) commensalism
 - B) mutualism
 - C) parasitism
 - D) saprophytism
46. Which sequence shows a correct pathway for the flow of energy in a food chain?
- A) bacteria → grass → fox → owl
 - B) grass → grasshopper → frog → snake
 - C) fungi → beetle → algae → mouse
 - D) algae → snake → duck → deer
47. The diagram below represents an energy pyramid.



- Which organisms would most likely be found at level A?
- A) birds
 - B) worms
 - C) mammals
 - D) algae

48.

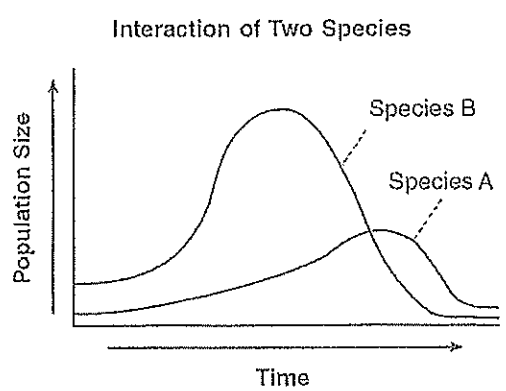


The process illustrated in the sequence below occurs constantly in the biosphere

Which type of organism is most likely represented by X?

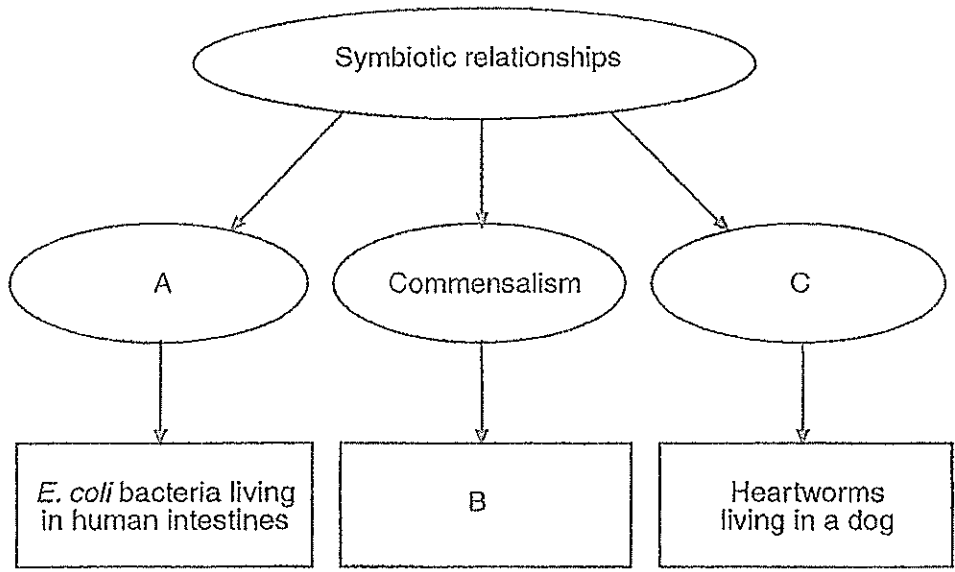
- A) decomposer
- B) producer
- C) herbivore
- D) carnivore

49. The graph below shows changes in the populations of two species that interact only with each other over a period of time.



- Which statement best describes these two species?
- A) Species A is a producer and species B is its consumer.
 - B) Species A is a host and species B is its parasite.
 - C) Species A is a predator and species B is its prey.
 - D) Species A is a scavenger and species B is its decomposer.

50. Base your answer to the following question on the diagram below and on your knowledge of biology.



Organisms that are always part of the relationship indicated by letter C may be classified as

- A) bryophytes **B) parasites** C) scavengers D) carnivores

51. Base your answer to the following question on the following directions:

Select the interaction, chosen from the list below, that is most closely associated with that description. An answer may be used more than once or not at all.

Interactions

- (1) Organism A \longrightarrow Organism B
Organism B \longrightarrow Organism A
- (2) Organism A \dashrightarrow Organism B
Organism B \longrightarrow Organism A
- (3) Organism A $\cdots\cdots\cdots\rightarrow$ Organism B
Organism B \longrightarrow Organism A
- (4) Organism A \dashrightarrow Organism B
Organism B \dashrightarrow Organism A

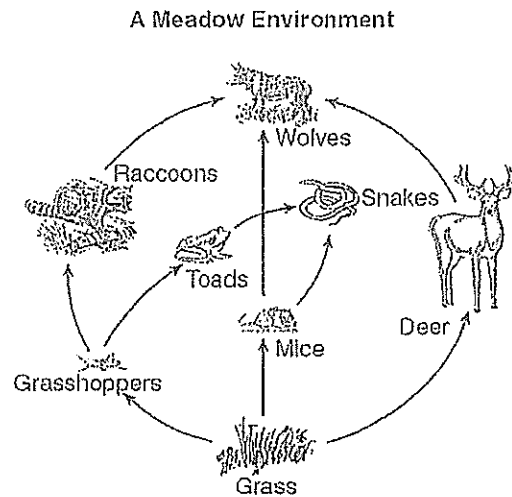
Key	
\longleftrightarrow	= Positive effect
\dashrightarrow	= Negative effect
$\cdots\cdots\cdots\rightarrow$	= No effect

- A \longleftrightarrow B
- A \rightarrow B
- A $\times \rightarrow$ B

Ants (organism A) defend acacia trees (organism B) from attacks by insects that are herbivores. The ants live in the hollow thorns of the trees.

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

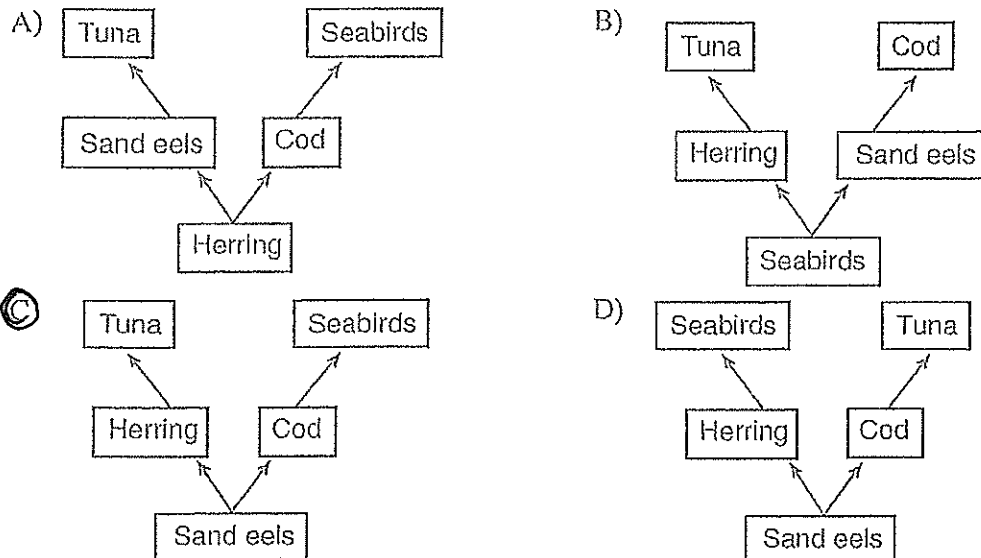
52. The diagram below represents a food web.



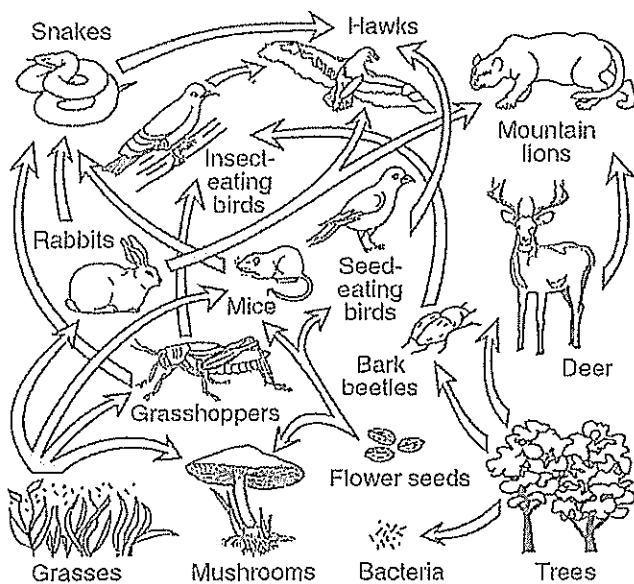
Two of the herbivores represented in this food web are

- A) toads and snakes
B) deer and mice
 C) wolves and raccoons
 D) grasshoppers and toads

53. 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 food web best represents the feeding relationships in this ecosystem?



54.

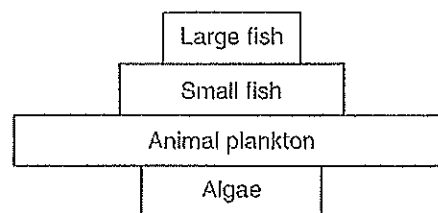


The diagram below represents a food web.

Which organisms are correctly paired with their nutritional roles?

- A) hawk—decomposer; insect-eating bird—parasite
 B) mouse—autotroph; flower seed—heterotroph
 C) mountain lion—predator; bark beetle—herbivore
 D) grasshopper—carnivore; grass—autotroph

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



Which statement best describes this ecosystem?

- A) The ecosystem is most likely unstable.
 B) Long-term stability of this ecosystem will continue.
 C) The herbivore populations will continue to increase in size for many years.
 D) The producer organisms outnumber the consumer organisms.

Base your answers to questions 56 through 58 on the information and graph below.

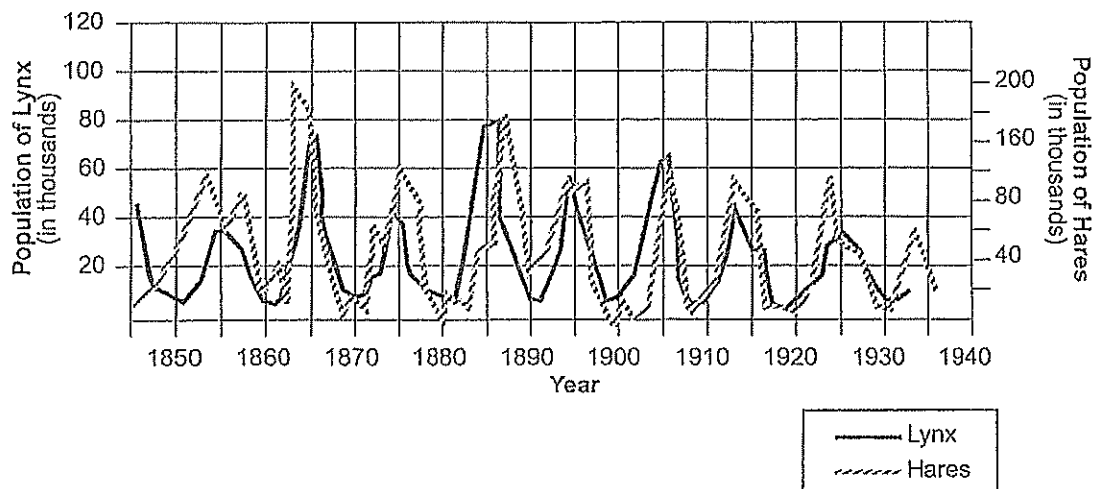
A Closer Look at Cycles in Predator and Prey Populations

Scientists have hypothesized that the populations of both lynx and snowshoe hares should show cyclic changes with increases in the predator population size lagging behind increases in prey population size, if the assumption is made that snowshoe hares are eaten only by lynx.

Does this out-of-phase population cycle of predators and prey actually occur in nature? A classic example of such a cycle was observed by counting all the fur pelts (skins) from northern Canada lynx and snowshoe hares purchased by the Hudson Bay Company between 1845 and 1935. Population cycles of snowshoe hares and their lynx predators, based on the number of pelts received by the Hudson Bay Company, are shown in the graph below.

As with any field investigation, many variables could influence the relationship between hare and lynx. One problem is that hare populations have been shown to fluctuate even without lynx present, possibly because the carrying capacity of their environment had been exceeded.

To test this hypothesis about population cycles more scientifically, investigators turned to controlled laboratory studies on populations of small predators and their prey.



56. The phrase "carrying capacity" refers to

- A) storing extra food for the winter
- B) the number of organisms a habitat can support
- C) transporting food to organisms in an area
- D) the maximum possible weight of an individual organism

57. Identify *two* variables other than the size of the lynx population that can affect the size of the hare population.

58. Why would scientists want to have a laboratory study on populations of different predators and their prey?

Studying predator/prey relationships helps scientists better understand their interactions and role in the community.

Base your answers to questions 59 through 61 on the quotation below and on your knowledge of biology.

“Today I planted something new in my vegetable garden — something very new, as a matter of fact. It’s a potato called the New Leaf Superior, which has been genetically engineered — by Monsanto, the chemical giant recently turned “life sciences” giant — to produce its own insecticide. This it can do in every cell of every leaf, stem, flower, root, and (here’s the creepy part) spud [the potato].”

Source: *New York Times Sunday Magazine*, Michael Pollan, 10/25/98

59. State *one* possible *disadvantage* of the synthesis of an insecticide by potatoes.

There may be side effects. (Unknown effects)

60. State *two* reasons that a gardener might choose to grow this new variety of plant.

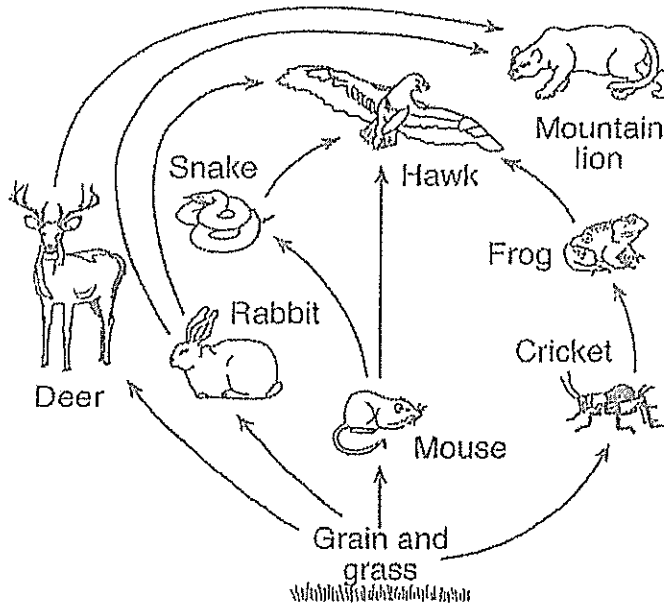
1- Plants will be pest resistant (no chemicals) 2- Yield more crops

61. Explain why every cell in the New Leaf Superior potato plant is able to produce its own insecticide.

Every cell has a copy of the gene that codes for the pesticide.

62. Base your answer to the following question on the information and food web below and on your knowledge of biology.

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.



Identify *two* specific populations that most likely increased in number after the mountain lion population decreased. Support your answer.

Rabbit & Deer

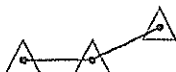
- Mountain lion is their predator

Base your answers to questions 63 through 66 on the information and data table below and on your knowledge of biology.

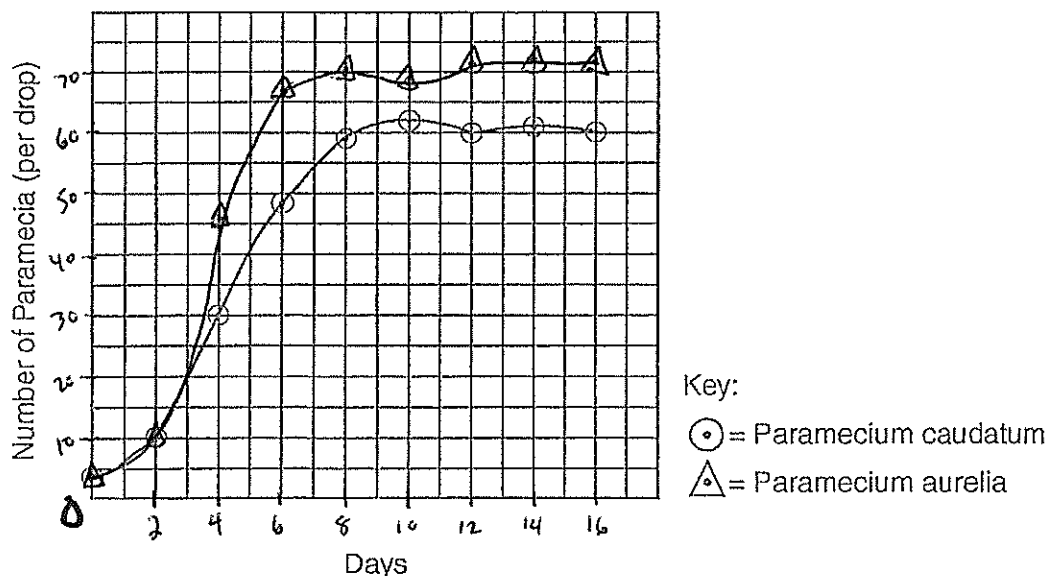
A student grew two separate cultures of single-celled organisms. One culture contained *Paramecium caudatum* and the other contained *Paramecium aurelia*. The cultures were grown under the same conditions and the number of paramecia (per drop) in each culture was estimated every 2 days for a period of 16 days. The results are shown in data table 1 below.

Data Table 1: Growth of *Paramecium aurelia* and *Paramecium caudatum* in Individual Cultures

Days	Number of <i>Paramecium caudatum</i> (per drop)	Number of <i>Paramecium aurelia</i> (per drop)
0	4	4
2	10	10
4	30	46
6	48	66
8	58	70
10	62	69
12	60	71
14	61	71
16	60	71

Example: 

Growth of *Paramecium aurelia* and *Paramecium caudatum* in Individual Cultures



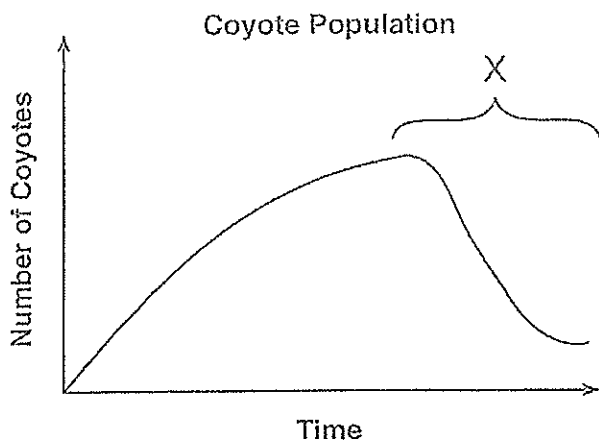
63. Describe the change in the two populations between days 0 and 8.

Between 0 and 8 days, the populations increased.

64. Plot the data for *Paramecium aurelia* on the grid. Surround each point with a small triangle and connect the points.
65. Using the information in the data table, construct a line graph on the grid provided above, following the directions below.

Mark a scale on each labeled axis appropriate for the data for *Paramecium caudatum* that has already been plotted on the grid.

66. State one possible reason for the difference in the rates of change in the two populations of paramecia between days 0 and 8.
One species was better adapted to the environment.
67. The graph below shows the growth of a population of coyotes in a wilderness area.

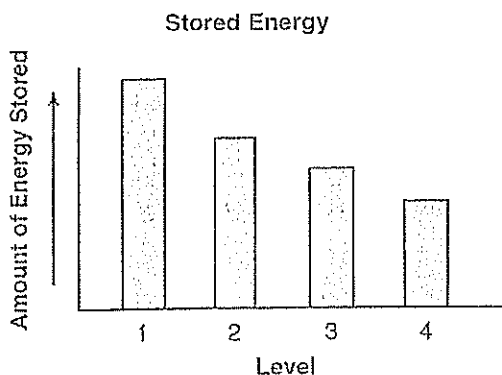


State *one* possible cause for the population decrease at X.

The coyote population exceeded the carrying capacity.

Base your answers to questions 68 and 69 on the information below and on your knowledge of biology.

The graph below represents the amount of energy stored in each level of an energy pyramid.



68. Which level most likely represents the autotrophs in the energy pyramid? Support your answer.
69. State *one* reason why the amount of energy in level 3 is greater than that in level 4.

1

Available energy decreases at higher trophic levels