Huntley High School
Invitational Tournament
Feb. 4, 2017

ECOLOGY

Team # _____

School Name _____

Team Members _____

_____

- You may write in this booklet but only the answers on the ANSWER SHEET will be graded.
- You may take this booklet apart but it MUST be put back in its correct order when you turn it in.
- Questions marked with a star (★) are designated as tie breaker questions.

GOOD LUCK!!

1. The difference between exponential and logistic growth rates is
    a. exponential growth depends on birth and death rates and logistic does not.
    b. in logistic growth, emigration and immigration are unimportant.
    c. that both are affected by density, but logistic growth is slower.
    d. that only logistic growth reflects density-dependent effects on births or deaths.

2. Which of the following is an example of density-dependent effect on population growth?
    a. An extremely cold winter
    b. A tornado
    c. An extremely hot summer in which cool burrow retreats are fewer than number of individuals in the population.
    d. A drought

3. If the size of a population is reduced due to a natural disaster such as a flood
    a. population growth rates may increase because the population is no longer near its carrying capacity
    b. population growth rates may decrease because individuals have trouble finding mates.
    c. both effects a. and b. may occur and whether population rates increase or decrease cannot be predicted.
    d. All of the above.

4. In populations subjected to high levels of predation
    a. individuals should invest little in reproduction so as to maximize their survival.
    b. individuals should produce few offspring and invest little in any of them.
    c. individuals should invest greatly in reproduction because their chance of surviving to another breeding season is low.
    d. individuals should stop reproduction altogether.

5. In a population in which individuals are uniformly distributed
    a. the population is probably well below its carrying capacity.
    b. natural selection should favor traits that maximize the ability to compete for resources.
    c. immigration from other populations is probably keeping the population from going extinct.
    d. None of the above.

6. The elimination of predators by humans
    a. will cause its prey to experience exponential growth until new predators arrive or evolve.
    b. will lead to an increase in the carrying capacity of the environment.
    c. may increase the population size of a prey species if that prey's population was being regulated by predation from the predator.

7. Which of the following is an example of commensalism?
    a. A tapeworm living in the gut of its host.
    b. A clownfish living among the tentacles of a sea anemone.
    c. An acacia tree and acacia ants.
    d. Bees feeding on nectar from a flower.

8. Parasitism differs from predation because
    a. the presence of parasitism doesn't lead to selection for defensive adaptations in parasitized species.
    b. parasites and the species they parasitize never engage in an evolutionary "arms race."
    c. parasites don't have strong effects on the populations of the species they parasitize.
    d. None of the above.

9. The presence of one species (A) in a community may benefit another species (B) if
    a. a commensalistic relationship exists between the two.
    b. The first species (A) preys on a predator of the second species (B).
    c. The first species (A) preys on a species that competes with a species that is eaten by the second species (B).
    d. All of the above.

10. Photosynthetic organisms
    a. fix carbon dioxide
    b. release carbon dioxide
    c. fix oxygen
    d. (a) and (b)
    e. (a) and (c)

11. Some bacteria have the ability to "fix" nitrogen. This means
    a. they convert ammonia into nitrites and nitrates
    b. they convert atmospheric nitrogen gas into biologically useful forms of nitrogen
    c. they break down nitrogen-rich compounds and release ammonium ions.
    d. they convert nitrate into nitrogen gas.

★12. Which of the following statements about the phosphorus cycle is correct?
    a. Phosphorus is fixed by plants and algae.
    b. Most phosphorus released from rocks is carried to the oceans by rivers.
    c. Animals cannot get their phosphorus from eating plants and algae.
    d. Fertilizer use has not affected the global phosphorus budget.

13. As a general rule, how much energy is lost in the transmission of energy from one trophic level to the one immediately above it?
    a. 1% b. 10% c. 90% d. 50%

14. Inverted ecological pyramids of real systems usually involve
    a. energy flow.
    b. biomass.
    c. energy flow and biomass.
    d. None of the above.

15. Species diversity
    a. increases with latitude as you move away from the equator to the arctic.
    b. decreases with latitude as you move away from the equator to the arctic.
    c. stays the same as you move away from the equator to the arctic.
    d. increases with latitude as you move north of the equator and decreases with latitude as you move south of the equator.

16. Nitrogen is often a limiting nutrient in many ecosystems because
    a. there is much less nitrogen in the atmosphere than carbon.
    b. elemental nitrogen is very rapidly used by most organisms.
    c. nitrogen availability is being reduced by pollution due to fertilizer use.
    d. most organisms cannot use nitrogen in its elemental form.

17. Biological magnification occurs when
    a. pollutants increase in concentration in tissues at higher trophic levels.
    b. the effect of a pollutant is magnified by chemical interactions within organisms.
    c. an organism is placed under a dissecting scope.
    d. a pollutant has a greater than expected effect once ingested by an organism.

18. Which of the following is a point source of pollution?
    a. lawns
    b. smokestacks of coal-fired power plants
    c. factory effluent pipe-draining into a river
    d. acid rain

★ 19. If a pesticide is harmless at low concentrations (such as, DDT) and used properly, how can it become a threat to non target organisms?
    a. because after exposure to DDT, some species develop allergic reactions even at low levels of exposure
    b. because DDT molecules can combine so that their concentration increases through time
    c. because the concentration of chemicals such as DDT is increasingly concentrated at higher trophic levels.
    d. because global warming and exposure to UV-B radiation renders molecules such as DDT increasingly potent

20. If there are many greenhouse gases, why is only carbon dioxide considered a cause of global warming?
    a. The other gases do not cause global warming.
    b. Scientists are concerned about other causes; for example, release of methane from melting permafrost could have significant effects on global warming.
    c. Other gases occur in such low quantities that they have little effect on the climate.
    d. Carbon dioxide is the only gas that absorbs long-wavelength infrared radiation.

21. Historically, island species have tended to become extinct faster than species living on a mainland. Which of the following reasons can be used to explain this phenomenon?
    a. Island species have often evolved in the absence of predators and have no natural avoidance strategies.
    b. Humans have introduced diseases and competitors to islands, which negatively affect island populations.
    c. Island populations are usually smaller than mainland populations.
    d. All of the above.

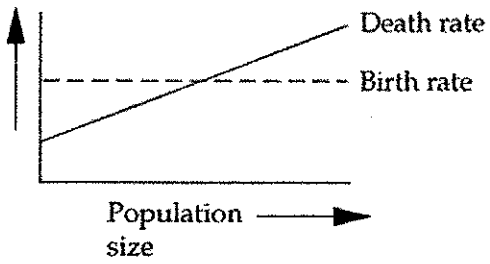
22. Ninety-nine percent of all the species that ever existed have gone extinct,
    a. serving as evidence that current extinction rates are not higher than normal.
    b. but most of these losses have occurred in the last 400 years.
    c. which argues that the world just had too many species.
    d. None of the above.

23. To effectively address the biodiversity crisis, the protection of individual species
    a. must be used in concert with a principle of ecosystem management and restoration.
    b. is a sufficient management approach that merely needs to be expanded to more species.
    c. has no role to play in addressing the biodiversity crisis.
    d. usually conflicts with the principle of ecosystem management.

24. The introduction of a non-native predator to an ecosystem could cause extinction by
    a. causing a top-down trophic cascade.
    b. outcompeting a native carnivore.
    c. transmitting parasites to which the native species are not adapted.
    d. all of the above.

25. In the graph below, what do we call the population size at which the curves for the birth and death rates intersect

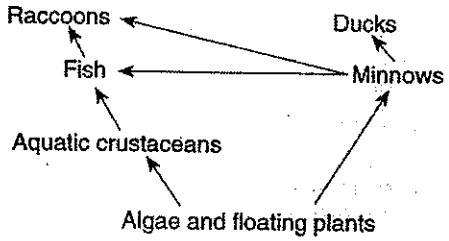
a. an estimate of the environmental carrying capacity
b. the point at which density-independent regulation begins
c. the point at which density-dependent regulation begins
d. an estimate of the biotic potential of the population



26. Plants and animals both obtain their nitrogen
    a. directly from the atmosphere
    b. after it has been fixed by bacteria
    c. during cellular respiration
    d. through symbiotic relationships

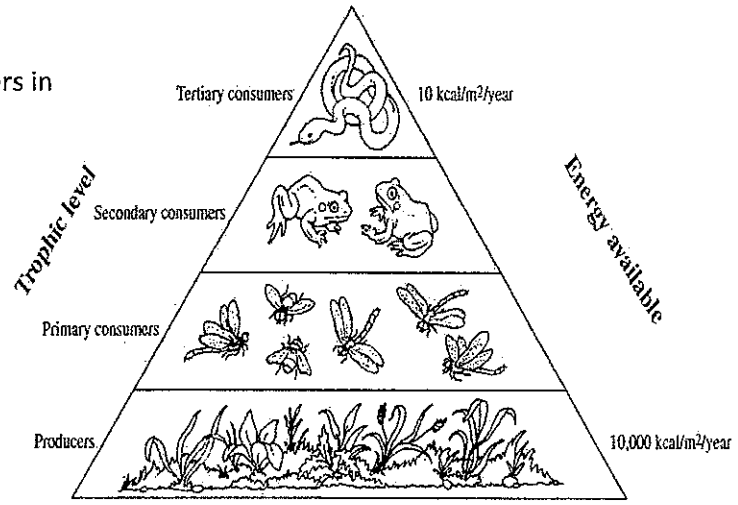
27. Using the diagram below, which of the following would be considered secondary consumers?

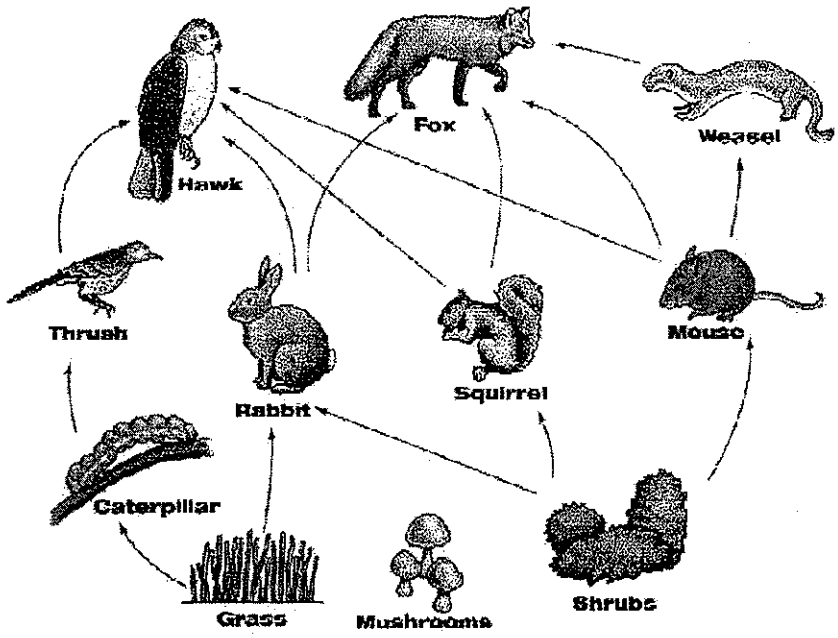
    a. minnows and aquatic crustaceans
    b. fish and ducks
    c. raccoons only
    d. all herbivores



28. Approximately how much energy is available to the secondary consumers in this energy pyramid?

    a. 10 kcal/m^2/year
    b. 100 kcal/m^2/year
    c. 1,000 kcal/m^2/year
    d. 5,000 kcal/m^2/year



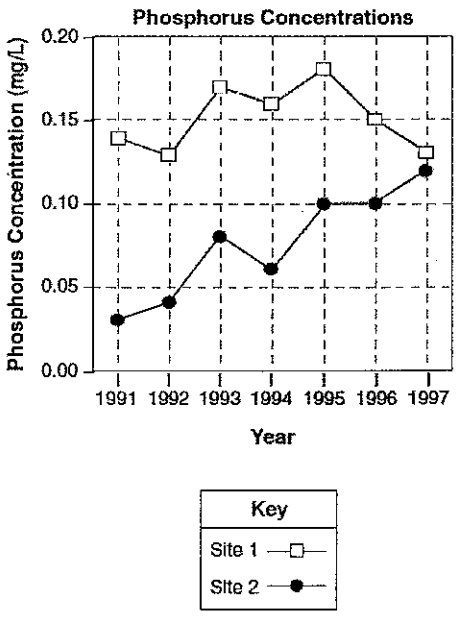


29. In the food web above, which organism has the least amount of energy available?
    a. shrubs b. fox c. caterpillar d. squirrel

30. European green crab is a species of whose population has rapidly increased, displacing other species. There are few predators of these crabs found in the San Francisco Bay. Which statement best explains this situation?
    a. European green crabs have a high metabolic rate.
    b. There is an increase in European green crab competitors.
    c. European green crab must be an invasive species.
    d. European green crab reproduces with other species.

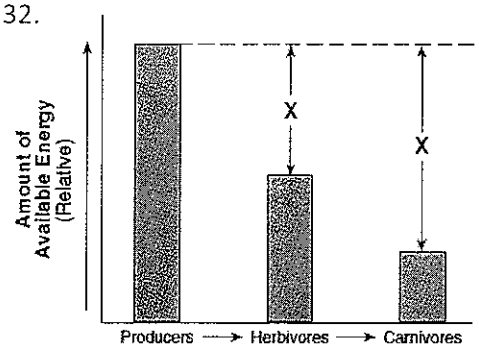
★ 31. Compounds containing phosphorus that are dumped into the environment can upset ecosystems because phosphorous acts as a fertilizer. The graph to the right shows measurements of phosphorus concentrations taken during the month of June at two sites from 1991-1997.

Which statement represents a valid inference based on information in the graph?



    a. There was no decrease in the amount of compounds containing phosphorous dumped at site 2 from 1991 to 1997.
    b. Pollution controls may have been put into operation at site 1 in 1995.
    c. There was most likely no vegetation present near site 2 from 1993 to 1994.
    d. There was greater variation in phosphorous concentration at site 1 than there was at site 2.

32.



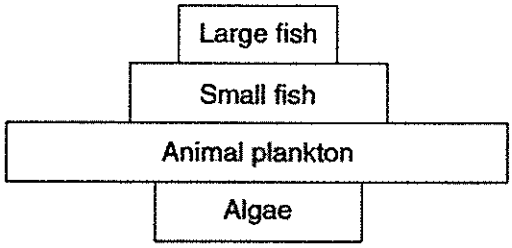
The graph on the left represents the amount of available energy at successive nutrition levels in a particular food web. The X's in the diagram represent the amount of energy that was most likely

a. changed into organic compounds
b. retained definitely by the herbivores
c. recycled back to the producers
d. lost as heat to the environment

33. Which statement best describes the ecosystem in the diagram on the right?

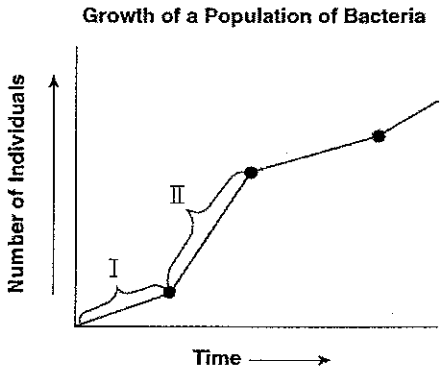
a. The ecosystem is most likely unstable.
b. Long-term stability of this ecosystem will continue.
c. The herbivore population will continue to increase in size for many years.
d. The producer organisms outnumber the consumer organisms.

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



34. The graph on the right shows the growth of a population of bacteria over a period of 80 hours. Which statement best describes section II of the graph?

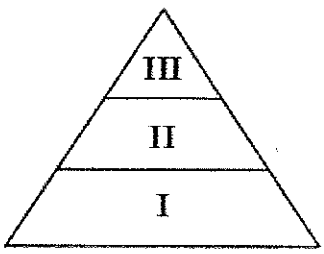
a. The population has reached the carrying capacity of the environment.
b. The rate of reproduction is slower than in section I.
c. The population is greater than the carrying capacity of the environment.
d. The rate of reproduction exceeds the death rate.



35. Carnivores would most likely be located in

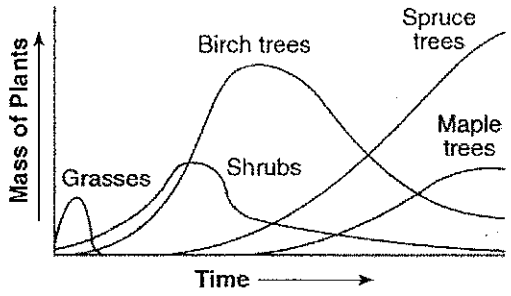
a. Level I only
b. Level I and II only
c. Level III only
d. Level II and III only

An energy pyramid containing autotrophs and other organisms from a food chain is represented below.



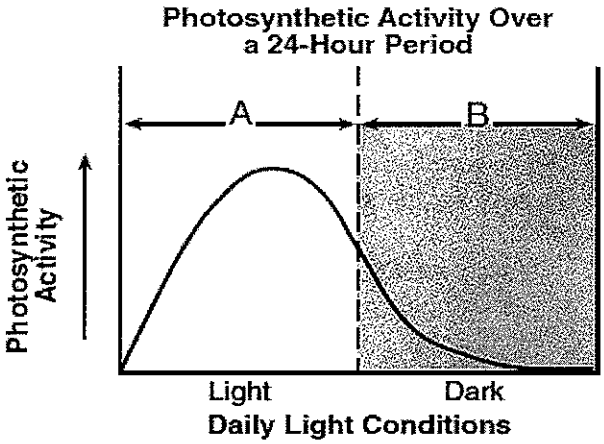
36. concept is represented in the diagram at the right.

a. ecological succession in a community
b. cycling of carbon and nitrogen in a forest
c. energy flow in a food chain over time
d. negative human impact on the environment



37. Data for the study on respiration in this ecosystem should be collected during

a. interval A, from only the producers in the ecosystem
b. intervals A and B, from only the consumers in the ecosystem.
c. interval A only, from abiotic but not biotic components of the ecosystem
d. intervals A and B, from both the producers and consumers in the ecosystem



38. Which two species would most likely be able to live in the same habitat without competing with each other for food?

a. A and C
b. B and C
c. B and D
d. C and E

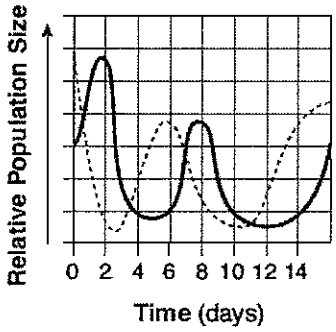
Dietary Preferences of Finches

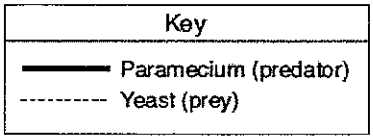
Species of Finch	Preferred Foods
A	nuts and seeds
B	worms and insects
C	fruits and seeds
D	insects and seeds
E	nuts and seeds

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

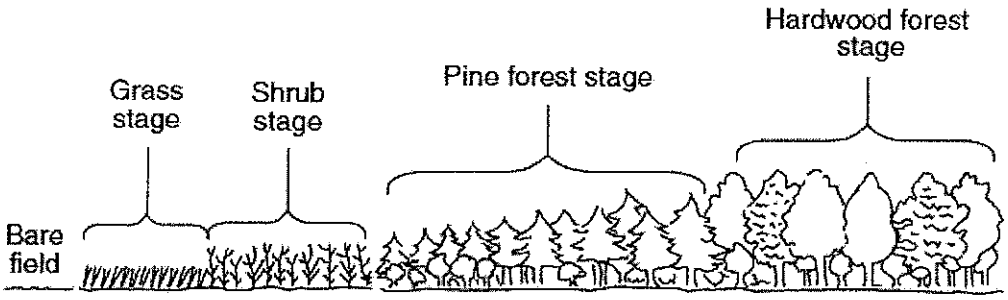
a. an increasing food supply from day 5 to day 6
b. a predator population equal in size to the prey population from day 5 to day 6.
c. the decreasing prey population from day 1 to day 2
d. the extinction of the yeast on day 3

The graph below represents a predator-prey relationship.

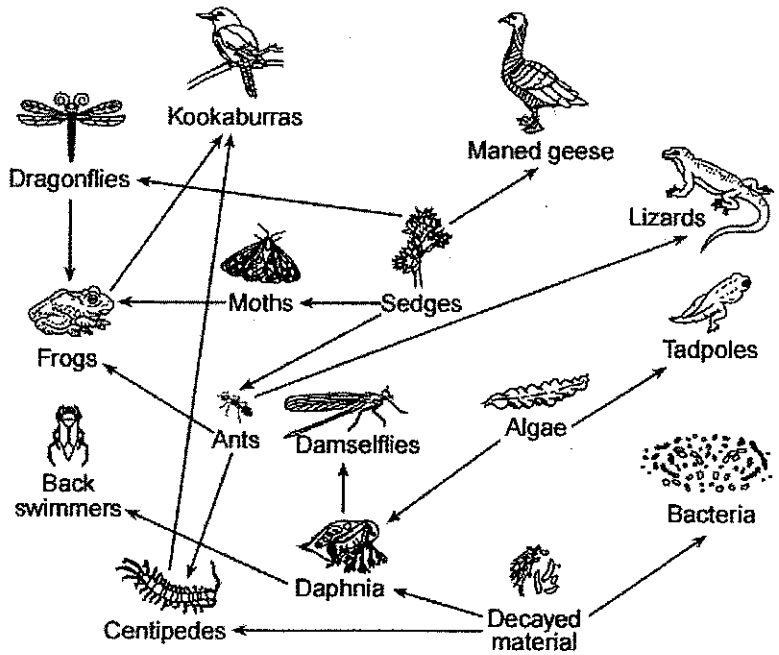




The diagram below represents a biological process taking place in an area of New York State unaffected by natural disasters.



40. Which statement correctly describes a stage in this process?
    a. The grass stage is the most stable stage and exists for thousands of years.
    b. The shrub stage modifies the ecosystem, making it more suitable for the pine forest.
    c. The pine forest stage has no biodiversity and the least competitions.
    d. The hardwood forest stage will be replaced by a pine forest.



41. Which sequence of organisms represents a food chain within this food web?
    a. tadpoles → algae → daphnia → back swimmers
    b. sedges → ants → frogs → kookaburras
    c. algae → daphnia → decayed material → bacteria
    d. dragonflies → sedges → ants → centipedes

42. Which population would be most immediately affected by the removal of the lizard population?
    a. sedges b. algae c. ants d. centipedes

43. Which sequence shows a correct pathway for the flow of energy in a food chain?
    a. algae → snake → duck → deer
    b. fungi → beetle → algae → mouse
    c. grass → grasshopper → frog → snake
    d. bacteria → grass → fox → owl

44. How is an ecosystem organized, from least to most comprehensive?
    a. Individual, community, population, biome
    b. Individual, population, community, biome
    c. Individual, population, niche, community
    d. Individual, niche, community, population

45. Which is true of ecological succession?
    a. Pioneer species move into new communities first.
    b. Climax communities have lower total biomass than preceding communities.
    c. Species diversity is greatest in the early stages of succession.
    d. Climax communities shift constantly.

46. Tundra is characterized by
    a. trees such as beech, maple, and oak
    b. high biodiversity
    c. barrenness
    d. a short growing season following rainfall

47. A broad based, pyramid-shaped age structure is characteristic of a population that is
    a. growing rapidly.
    b. at carrying capacity.
    c. stable.
    d. limited by density-dependent factors.

48. The biome which is characterized by coniferous forests, long, severe winters, and a permanent cover of snow is the
    a. temperate grasslands
    b. temperate deciduous forest
    c. tundra
    d. taiga

★ 49. The three principal steps in the nitrogen cycle are
    a. ammonification, nitrification, and ecological succession
    b. ammonification, assimilation, and phosphorylation
    c. ammonification, nitrification, and assimilation
    d. phosphorylation, hydration, and assimilation

50. Living factors that play a role in an ecosystem are referred to as _____, while nonliving factors are referred to as _____ (respectively).
    a. resources, nutrients
    b. biotic, abiotic
    c. nutrients, resources
    d. abiotic, biotic

51. After all of the new species have taken hold a community we stop seeing the movement of new species into or out of this environment. What type of community, then, is the result of succession?
    a. Mature Community
    b. Stable Community
    c. Climax Community
    d. Invasive Species

52. Open flames, auto and factory emissions, animal respiration, volcanoes, and the burning of fossil fuels are all ways that...
    a. Pollution occurs
    b. Acid Rain is created
    c. Carbon is put into the atmosphere
    d. Carbon is taken out of the air

53. What is the name of the only process that takes carbon out of our atmosphere?
    a. Photosynthesis
    b. Chemosynthesis
    c. Respiration
    d. Forest Fires

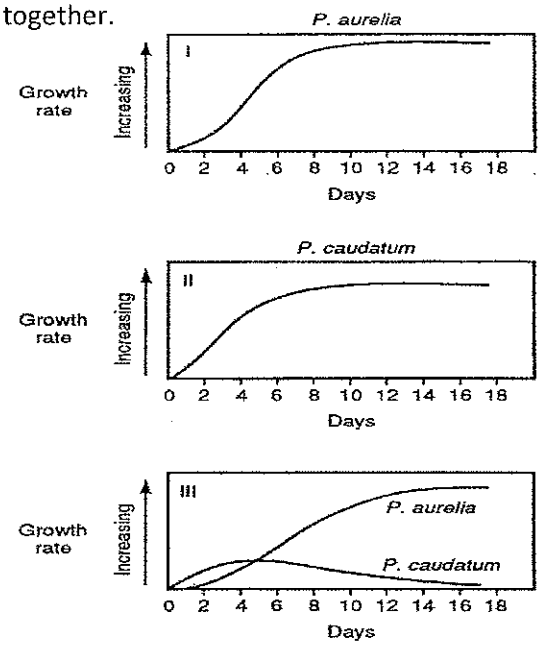
54. *Salvinia molesta*, a floating aquatic plant from South America, first entered Lake Naivasha in Africa when a farmer's artificial fish ponds flooded. The *Salvinia molesta* population quickly grew in Lake Naivasha, and native species disappeared as a result. This is an example of ecological problems due to:
    a. global climate change.
    b. exotic species.
    c. habitat fragmentation.
    d. water pollution

Use the following pieces of information to match answers together for questions 55-58.

A. I am an elf owl living in the desert. I hope to find a ready-made home I can move into. Maybe there is one an animal abandoned.
B. I am a flower with lots of yellow pollen. I need some help getting my pollen to another flower so that I can fertilize it and make seeds.
C. I am a tomato plant. I need lots of room to grow big, healthy tomatoes. Is something close by drinking up some of my water?
D. I am a dog. There is something on me that is making me itch. I keep scratching it. I do not like it. I wish I could get rid of it.
E. I am a thirsty squash plant. I need more water in order to produce big, healthy squash. I am growing longer roots to soak up more water.
F. I am a flea. I am looking for an animal with fur so that I can crawl down to its skin and be hidden while I drink its blood for my food.
G. I am a saguaro cactus with a hole in me a woodpecker made for a home. It did not really hurt me, but it left, and now my hole is empty.
H. I am a bee. I like to drink nectar from flowers. To get enough to eat, I need to visit a lot of different flowers.

55. Choose the combination of scenarios that demonstrates commensalism.
56. Choose the combination of scenarios that demonstrates competition.
57. Choose the combination of scenarios that demonstrates parasitism.
58. Choose the combination of scenarios that demonstrates mutualism.

Graph I shows the growth curve for a culture of *Paramecium aurelia*. Graph II shows the growth curve for a culture of *Paramecium caudatum*, a larger species. Graph III shows the growth curves of both species when they are grown together.



59. What is the growth curve of *P. aurelia* in the Graph I?
    a. Exponential growth b. No growth c. Logistic growth d. Age Structure growth

60. Looking at Graph II, about how many days did it take for *P. caudatum* to reach its maximum growth?
    a. Day 2 b. Day 6 c. Day 8 d. Day 16

61. What is the most likely explanation for the decline of the *P. caudatum* shown in Graph III?
    a. Competition exists between both species
    b. *P. caudatum* has a disease
    c. *P. caudatum* does not have much room to grow
    d. There have always been less *P. caudatum* than *P. Aurelia*

62. Why does the growth curve seem to flatten out after 6-8 days for graphs I & II?
    a. The organisms are dying
    b. Competitive Exclusion Principle
    c. The populations have reached their carrying capacity
    d. The organisms have too many resources available to them

Organisms A, B, C, D, are counted in three different areas, and the results appear below.

Area	# A	# B	#C	# D
1	17	6	1	2
2	15	8	9	1
3	8	9	15	9
Total	40	23	25	12

63. What percent of organisms in area 2 are Type A?

64. What percent of the total organisms are Type C?

65. Which area has the greatest biodiversity?

66. Name one continent that doesn't have Tundra on it.

67. Of the following trees: **larch, fir, maple, birch, and spruce,** all but one are likely to be found in the Taiga. Which one is NOT found in the taiga?

68. True or False. Coniferous forests are typically located at higher altitudes than deciduous forests.

69. Taiga ecosystems with leaning trees are nicknamed "drunken forests." What causes the trees to lean this way?

70. IPAT is an equation that expresses the idea that environmental impact (I) is the product of three factors. What are these factors?

71. All populations become small before going extinct. Is smaller population size really a cause of extinction, or just something that happens as a result of other factors that cause extinction? Explain.