SUMMER ASSIGNMENT PART 1:
ECOLOGY TERMINOLOGY AND MULTIPLE-CHOICE QUESTIONS

To be submitted on a Google Form by midnight on Friday, September 15th
30-point assignment based on accuracy.
Breakdown is as follows: 95-100 questions correct = 30 points, 85-94 questions correct = 27 points, 65-84 questions correct = 25 points, < 65 = 15 points

Terminology Check: After reading through the notes provided by your teacher, you will have reviewed many of the terms and concepts that you have already learned in previous coursework. Keep in mind that the hybrid structure of school during your 8th and 9th grade years may have created some gaps in learning. You may not remember some of this material, while some of your previous teachers may also have adjusted/truncated curricula because of changes in course requirements during those years. Use the information in the notes provided to fill in the Google form with the correct term from the "word box" provided. To be very clear: ***Make sure that you spell each term correctly and do not use any capital letters or your answer will be marked incorrect***. For the multiple-choice questions, make sure that you do not omit any of the questions and only choose one answer to each question.

ECOLOGY TERMINOLOGY

Fill in the blank with the most appropriate term. Not all terms will be used, and each term may only be used once.

specialist species	keystone species	invasive species
generalist species	indicator species	habitat
community	intraspecific competition	interspecific competition
ecotone	ecosystem	population
mutualism	parasitism	commensalism
optimal zone	range of tolerance	limiting factors
niche	abiotic conditions	abiotic resources
zone of stress	zone of intolerance	saprophyte
chemosynthesis	photosynthesis	detritivores
scavenger	predator	autotrophs
heterotrophs	lithosphere	hydrosphere
atmosphere	troposphere	stratosphere
biomass		

1. leeches attach to and feed off the blood of animals to gain nutrition to the detriment of the other organism _____

2. layer of the atmosphere containing the ozone layer _____

3. an overlapping zone between ecosystems _____

4. turbidity, temperature, transparency _____

5. hunts for its food _____

6. range of conditions with the highest population density _____

7. range of conditions in which organisms survive, but do not thrive _____

8. anything that inhibits the growth, and development of a population; examples: climate, too many predators _____

9. process by which producers convert sunlight to glucose _____

10. fungi and bacteria _____

11. layer of the atmosphere where people and animals live _____

12. have a broad niche; adapt well to changing conditions _____

13. groups of different interacting species _____

14. Asian long-horned beetle in NY _____

15. when two different species fight for a food source or territory _____

16. the combined dry weight of all organic matter per trophic level _____

17. frogs, lichens, birds of prey _____

18. grey wolves, sea otters, sea stars _____

19. the role of an organism in an ecosystem _____

20. process by which deep sea bacteria convert hydrogen sulfide gas into nutrition _____

21. carpenter ants, termites, worms _____

22. contribute to the ecosystem by consuming "leftovers" which aids in the decomposition process _____

23. consists of the Earth's crust and upper mantle _____

24. prone to endangerment when environmental conditions change _____

25. all living organisms and their physical abiotic environment _____

26. bees get the nectar they need to make honey by traveling between flowers and bring pollen from one plant to another, resulting in pollination _____

27. the entire range of conditions that supports any growth of a species _____

28. the base of a biomass pyramid _____

29. shark and remora relationship _____

30. a group of the same species _____

ECOLOGY MULTIPLE CHOICE QUESTIONS

Questions 1-6: Answer as either True or False

____ 31. 99% of the biosphere exists in the thermosphere

____ 32. The biosphere and ecosphere are synonymous terms.

____ 33. The highest concentration of beneficial ozone is located in the upper stratosphere.

____ 34. Primary consumers are heterotrophs.

____ 35. Energy can be recycled in the environment.

____ 36. Energy degradation in a food chain is best explained by the First Law of Thermodynamics

Questions 37-40: Choose the region that best fits the description provided.

(A) lithosphere
(B) hydrosphere
(C) atmosphere
(D) troposphere
(E) stratosphere

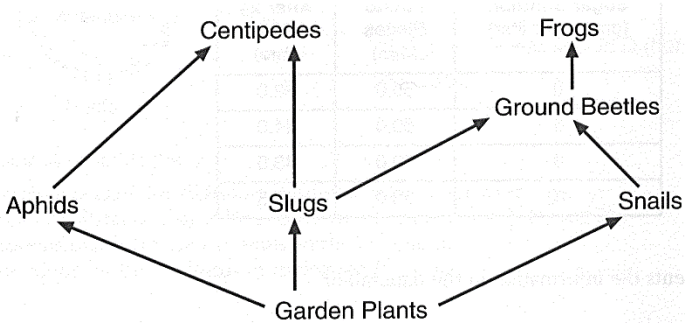
37. silicon and oxygen are most abundant elements in this region

38. lowest layer of the atmosphere

39. the region that is 480km in depth, but the bottom 12km consists of the highest concentration of oxygen

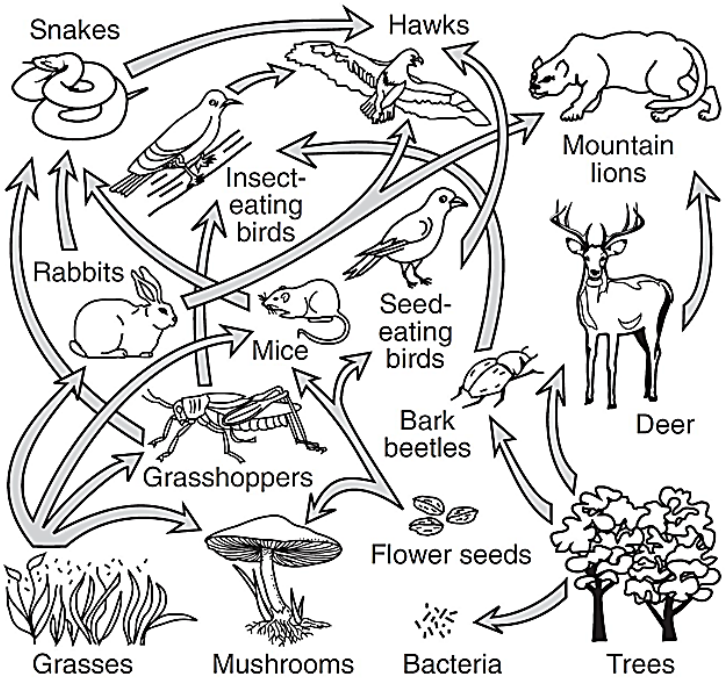
40. makes up 71% of Earth's surface

41. Which of the following is true of the food web shown to the right?
    (A) aphids eat centipedes
    (B) slugs are omnivores
    (C) snails prey on ground beetles
    (D) frogs are tertiary consumers
    (E) garden plants are herbivorous



42. Most of the energy put into the food chain
    (A) is in the form of heat
    (B) is converted to biomass by the end of the chain
    (C) is recycled by the end of the chain
    (D) exits in the form of low-quality waste heat
    (E) is used efficiently by the end of the chain

43. In the diagram below, 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
    (E) snake – omnivore; mushroom – detritivore



44. A fundamental concept of ecology is that living organisms
    (A) are independent and do not interact with each other or with the physical environment.
    (B) do not interact with other living organisms, but do interact with the physical environment
    (C) interact with each other, but do not interact with the physical environment
    (D) interact with other living organisms and interact with the physical environment

45. Which of the following statements is true of tertiary consumers in an ecosystem?
(A) There are more secondary consumers than tertiary consumers.
(B) They are eaten by secondary consumers.
(C) They contain the most biomass out of all of the trophic levels.
(D) They are the largest trophic level.
(E) This level of the food chain has the highest amount of diversity.

46. Which trophic level does a lion belong to
(A) level 1 - producers
(B) level 2 - primary consumers
(C) level 2 – secondary consumers
(D) level 3 - secondary consumers
(E) level 3 – tertiary consumers

47. What percentage of energy is generally said to be passed upwards each successive level in the biomass-energy pyramid?
(A) 10% (B) 30% (C) 50% (D) 70% (E) 90%

48. Approximately what percentage of the solar energy that strikes the Earth is used for photosynthesis by plants?
(A) 1% (B) 10% (C) 21% (D) 71% (E) 78%

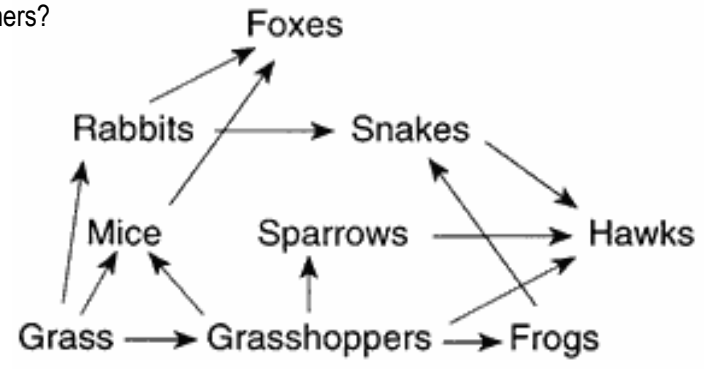
49. The second trophic level of a typical biomass pyramid consists of
(A) producers
(B) primary consumers
(C) secondary consumers
(D) carnivores
(E) detritivores

50. Which term (or terms) can be used to describe a city rat?
(A) omnivore
(B) saprophyte
(C) heterotroph
(D) A and C, only
(E) A, B, and C

51. Which of the following reasons account for the decrease in energy passed on to each successive trophic level?
(A) metabolic heat loss
(B) not all biomass is consumed at each level
(C) the increased number of organisms at high levels use up the excess energy
(D) A and B, only
(E) A, B, and C

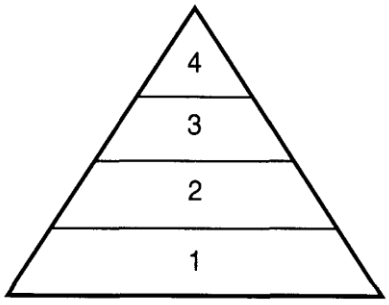
52. Which of the following organisms occupies the trophic level of greatest biomass?
(A) herbivores
(B) producers
(C) primary consumers
(D) secondary consumers
(E) tertiary consumers

53. In the food web above, which animals are tertiary consumers?
    (A) rabbits and sparrows
    (B) sparrows and hawks
    (C) snakes and hawks
    (D) frogs and foxes
    (E) mice and grasshoppers



54. Organisms that have the exact same source of nutrition within a food web can best be described as
    (A) providing links in the food chain
    (B) occupying the same trophic level
    (C) being omnivores
    (D) being herbivores
    (E) being tertiary consumers

Base your answers to **questions 55-56** on the drawing below of the pyramid of energy and numbers.



55. In which level would a monarch caterpillar that feeds on the milkweed plant belong to?
    (A) 1
    (B) 2
    (C) 3
    (D) 4

56. If the first trophic level represents an ecosystem with 100,000 kcal available to its producers, how much energy is available for the tertiary consumers in the ecosystem?
    (A) 100,000 kcal
    (B) 10,000 kcal
    (C) 1,000 kcal
    (D) 100 kcal

57. In a forest food chain, the least amount of energy would flow to which of the following organisms?
    (A) herbivores
    (B) producers
    (C) primary consumers
    (D) secondary consumers
    (E) tertiary consumers

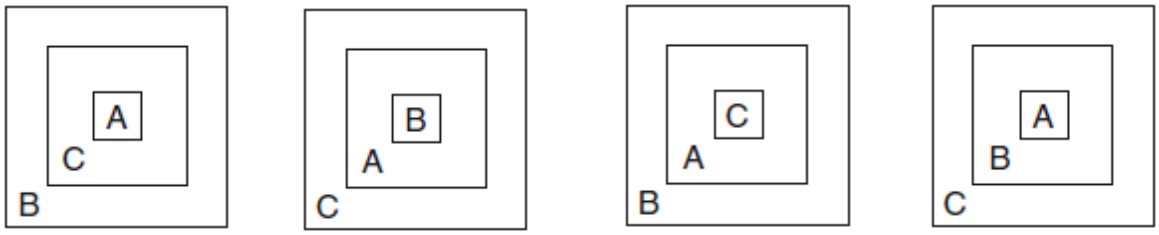
58. Which of the following organisms occupies the lowest trophic level?
    (A) lion
    (B) hawk
    (C) shark
    (D) cow
    (E) spider

59. A food chain represents
    (A) a list of what one organism eats
    (B) the flow of energy from one organism to another
    (C) links of what animals live together
    (D) the way that food is produced in an ecosystem

The chart below shows three ecological terms used to describe levels of organization on Earth.

A	ecosystem
B	population
C	biosphere

60. Which diagram best represents the relationship of these ecological terms?



(A) (B) (C) (D)

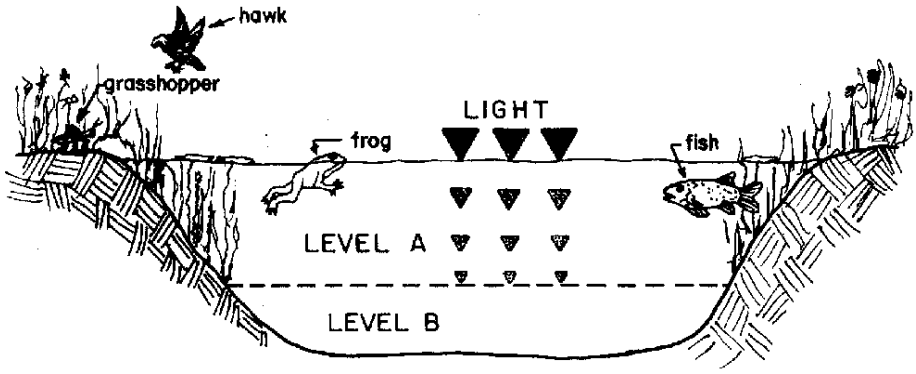
61. Which statement best describes an ecosystem maintaining a state of approximate equilibrium?
    (A) Nutrients from decayed organisms are recycled in a forest ecosystem by decomposers.
    (B) All the frog species in a South American rain forest become extinct.
    (C) A mutation spreads through a species of bacterium, making them unable to decompose wastes.
    (D) Mice are released into a field ecosystem as food for a declining predator population.

62. What is the term used to describe the transitional zone in which one ecosystem merges with an adjacent one?
    (A) ecoboundary
    (B) ecotone
    (C) biotransition zone
    (D) biosphere
    (E) ecotranzonation

63. "True" decomposers that secrete enzymes to absorb nutrition are known as
    (A) scavengers
    (B) detritus feeders
    (C) detritovores
    (D) saprophytes
    (E) specialists

64. In deep sea environments, by what process do bacteria convert sulfur compounds to organic sugars?
    (A) aphotosynthesis
    (B) modified photosynthesis
    (C) chemosynthesis
    (D) saprophytic nutrition
    (E) succession

Base your answers to **questions 65-67** on the diagram of a lake ecosystem below and on your knowledge of biology. The diagram shows a cross section of a deep lake. the dashed line which separates level A from level B indicates the depth beyond which light cannot penetrate.



65. Which type of organism that ordinarily inhabits a lake ecosystem would not be found in level B because of the lack of light penetration?
    (A) decomposers
    (B) scavengers
    (C) carnivores
    (D) producers
    (E) omnivores

66. A possible food chain represented by the diagram could be
    (A) plant → grasshopper →frog → fish
    (B) hawk → plant → grasshopper → frog
    (C) grasshopper → fish → frog → plant
    (D) plant → hawk → frog → fish

67. The amount of light received by the pond would be considered a(n)
    (A) biotic limiting factor
    (B) abiotic limiting factor
    (C) trophic level
    (D) ecotone

68. Which of the following are necessary to sustain life on Earth?
    I. gravity
    II. biogeochemical cycles
    III. the Sun

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

69. Almost all of the Earth's weather occurs in the:
    (A) exosphere
    (B) stratosphere
    (C) mesosphere
    (D) thermosphere
    (E) troposphere

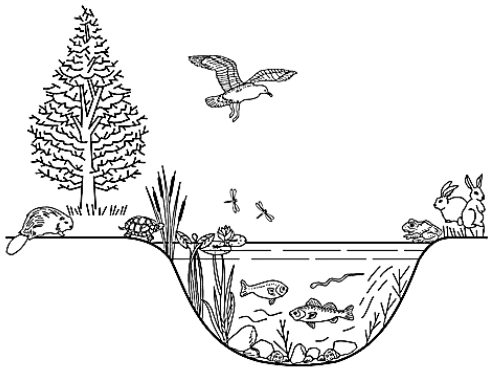
70. The ozone layer helps life on Earth because ozone
(A) modifies the normal El Niño weather pattern
(B) reflects insolation from the Sun
(C) absorbs damaging ultraviolet radiation from the Sun
(D) deflects winds from a straight line to a curved path

71. Which formula correctly illustrates the process of photosynthesis?
(A) $C_6H_{12}O_6 + H_2O \rightarrow CO_2 + O_2 + \text{energy}$
(B) $O_2 + H_2O \rightarrow \text{energy} + CO_2 + C_6H_{12}O_6$
(C) $CO_2 + H_2O + \text{energy} \rightarrow O_2 + C_6H_{12}O_6$
(D) $CO_2 + C_6H_{12}O_6 + \text{energy} \rightarrow H_2O + O_2$

72. Which level of biological organization includes the greatest total number of species?
(A) community
(B) ecosystem
(C) population
(D) biosphere

73. What does the diagram best represent?

(A) community
(B) ecosystem
(C) population
(D) biosphere



74. The abiotic factors of a given area include the
(A) animals
(B) climatic conditions
(C) plants
(D) decomposers

75. Which term refers to the behavior of two species attempting to use the same living space, food source, and water source?
(A) saprophytic
(B) competitive
(C) predatory
(D) symbiotic

76. During its annual migration, the red knot, a medium-size shorebird, flies the entire length of North and South America. During one critical stop to feed on the eggs of horseshoe crabs, the birds nearly double their body mass. The relationship between the red knot and the horseshoe crab is that of
(A) parasite–host
(B) consumer–producer
(C) scavenger–producer
(D) predator–prey

77. Which relationship best describes the interactions between lettuce and a rabbit?
(A) predator — prey
(B) producer — consumer
(C) parasite — host
(D) decomposer — scavenger

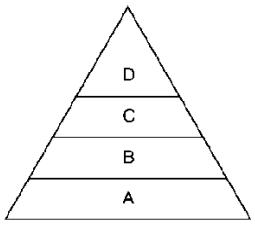
78. Which of the following would be considered a specialist species?
    (A) pandas
    (B) rats
    (C) cockroaches
    (D) raccoons

79. Two interactions between organisms are shown in the table below. X and Y do *not* represent the same organisms in the two interactions

	Organism X	Organism Y
Interaction 1	predator	prey
Interaction 2	parasite	host

Which statement best describes the relationship between organism X and organism Y in each interaction?
(A) Organism X is positively affected by the relationship and organism Y is negatively affected.
(B) Organism X is negatively affected by the relationship and organism Y is positively affected.
(C) Both organisms are positively affected by the relationship.
(D) Both organisms are negatively affected by the relationship

The diagram to the right represents an energy pyramid.



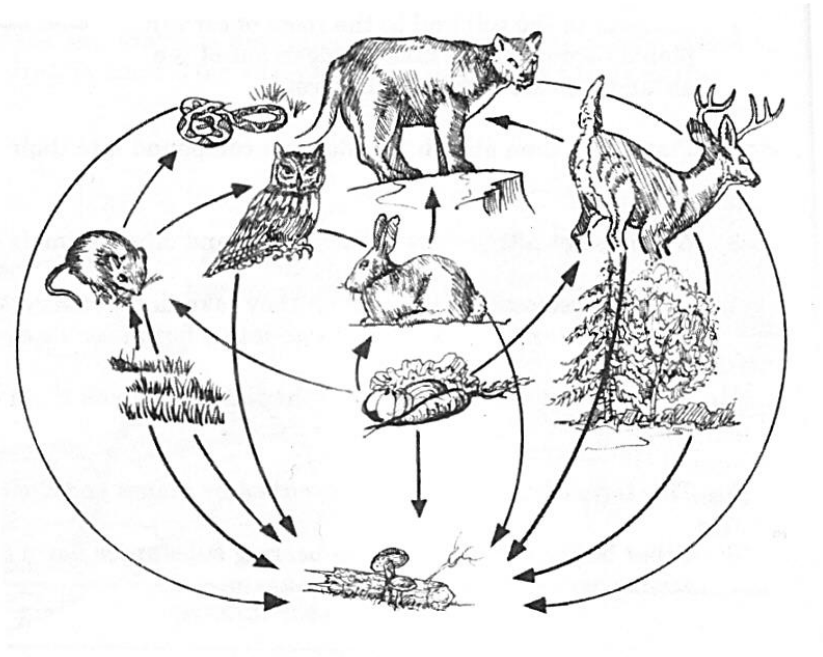
80. Which organisms would *most likely* be found at level A?
    (A) birds (C) algae
    (B) worms (D) mammals

81. Which represents the correct flow of energy through an ecosystem?
    (A) consumer, decomposer, producer, Sun
    (B) producer, consumer, decomposer, Sun
    (C) Sun, decomposer, consumer, producer
    (D) Sun, producer, consumer, decomposer

82. The reason that producers are at the base of almost all energy pyramids and food chains is
    (A) most organisms build their homes on or near producers
    (B) plants are the least abundant organisms on Earth
    (C) producers are strong and form a good base for the food chain or pyramid
    (D) most organisms use food, directly or indirectly, made by the producers

83. The net primary production of a pine forest on a lava flow on Mount Fuji is about 180,000kcal/m^2/yr, and the plant respiration is estimated to be 110,000kcal/m^2/yr . Using the primary productivity formula (NPP = GPP – R) formula, what is the total amount of energy transferred during photosynthesis for this ecosystem?
    (A) 70,000 kcal/m^2/yr (C) 190,000 kcal/m^2/yr
    (B) 100,000 kcal/m^2/yr (D) 290,000 kcal/m^2/yr

Use the diagram to the right to answer **questions 84-86.**

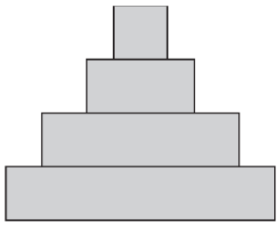


84. Which of the following combinations are all consumers?
    (A) deer, rabbit, owl
    (B) grass, snake, mouse
    (C) vegetables, rabbit, owl
    (D) tree, vegetables, grass

85. Which organisms are in competition for the vegetables?
    (A) snakes and mice
    (B) rabbits and owls
    (C) deer and rabbits
    (D) mountain lions and deer

86. If the number of owls was to increase, the number of mice would
    (A) increase
    (B) decrease
    (C) remain the same

87. A diagram frequently used in ecological studies is shown to the right. This diagram can be used to represent the



    (A) dependency of animal survival on physical conditions in an ecosystem
    (B) loss of energy from various groups of organisms in an ecosystem
    (C) competition among species in an ecosystem
    (D) mechanisms that maintain homeostasis in the plants in an ecosystem

88. According to the Second Law of Thermodynamics,
    (A) energy can neither be created nor destroyed, only changed in form
    (B) energy can be destroyed but not created
    (C) the entropy of the universe is continually fluctuating between zero and infinity
    (D) the entropy of the universe tends to increase

89. Burmese pythons are large snakes that have been introduced into the Florida Everglades ecosystem. Burmese pythons and alligators hunt the same prey. One likely effect of the introduction of the pythons is that
    (A) alligators will have more prey available
    (B) pythons will become native to the Everglades
    (C) alligator populations will decline
    (D) pythons will become an endangered species
    (E) alligators will outcompete the pythons because they are more accustomed to their native ecosystem

90. "Nature's early warning system" of the changing health of an ecosystem rests in observations of changing populations of environmentally sensitive organisms such as frogs and lichens. The aforementioned sentence makes reference to the importance of
    (A) invasive species
    (B) generalist species
    (C) indigenous species
    (D) keystone species
    (E) indicator species

91. Parasitism is best represented by the relationship between
    (A) crocodiles and plovers
    (B) fleas and dogs
    (C) monarch butterflies and milkweed
    (D) sea anemones and clownfish
    (E) bears and foxes

92. Which of the following is a characteristic of a keystone species?
    (A) their presence dictates the survival of the entire community
    (B) they evoke a strong emotional response in people
    (C) they have a very large population
    (D) they provide an early warning of environmental degradation
    (E) they are always generalist species

93. When environmental change occurs, which type of species is most prone to extinction because they do not adapt well to such change?
    (A) generalist species
    (B) r-selected species
    (C) specialist species
    (D) invasive species

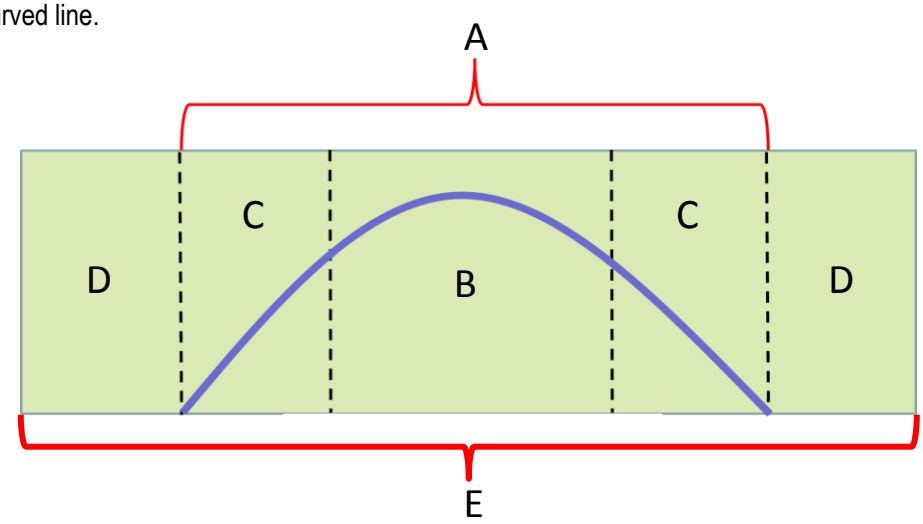
94. An earthworm lives and reproduces in the soil. It aerates the soil and adds organic material to it. The earthworm provides a source of food for other organisms. All of these statements together best describe
    (A) a habitat
    (B) autotrophic nutrition
    (C) an ecological niche
    (D) intraspecific competition
    (E) specialist species behavior

95. An ecological relationship in which one species benefits, but another remains unaffected is known as
    (A) mutualism
    (B) commensalism
    (C) competitive
    (D) parasitism
    (E) predator-prey

96. Resource partitioning helps organisms avoid
    (A) mutualism
    (B) commensalism
    (C) competition
    (D) parasitism

97. Which pair of organisms would most likely compete for the same ecological niche?
    (A) bacteria and fungi
    (B) deer and wolf
    (C) tree and fungi
    (D) deer and bacteria
    (E) grasses and birds

Use the diagram below to answer **questions 98-100**.
The diagram shows an unknown environmental factor and its effect on the population density of a species as illustrated by the curved line.



98. Which lettered zone indicates the range of conditions necessary for the ideal growth of this species?
    (A) A (B) B (C) C (D) D (E) E

99. Which lettered zone indicates the zone in which organisms survive, but do not thrive?
    (A) A (B) B (C) C (D) D (E) E

100. Which lettered zone indicates the zone in which conditions are outside the range of tolerance?
    (A) A (B) B (C) C (D) D (E) E

SUMMER ASSIGNMENT PART 2:
FREE RESPONSE AND REVIEW MATH

To be submitted as per teacher instructions provided upon return to school.
20-point assignment based on completion as per instructions.
Appropriate points will be deducted for any incomplete part of the assignment or for disregarding instructions.

1. Fill in the chart below with the information about each invasive species based on the case studies you read in the notes packet.

Name of Organism	Geographic Location Introduced To	Resulting Environmental Problems	Methods Attempted to Remediate Problem
a.			
b.			
c.			
d.			
e.			
f.			

2. When you read over the notes provided, you learned about a few examples of indicator species, keystone species, generalists and specialists.

Do some research to find one more example for each type of species and give a brief explanation as to why it is classified as such.

Indicator Species:

Keystone Species:

Specialist Species:

Generalist Species: