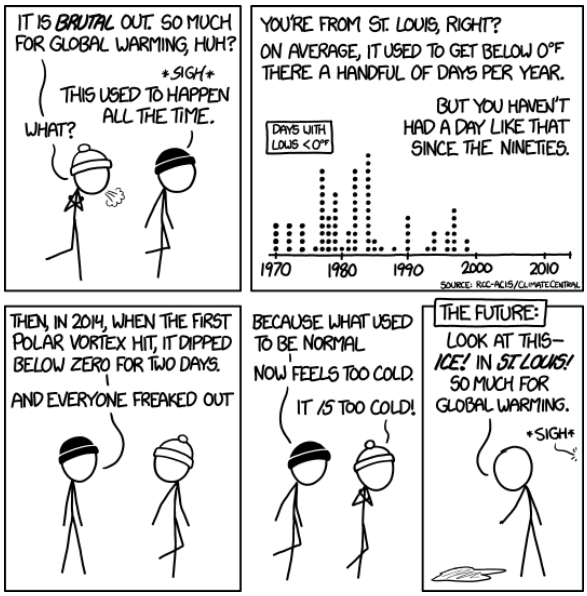
Science Olympiad
Green Generation Test
Sierra Vista Scrimmage



Name: _____

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Directions:

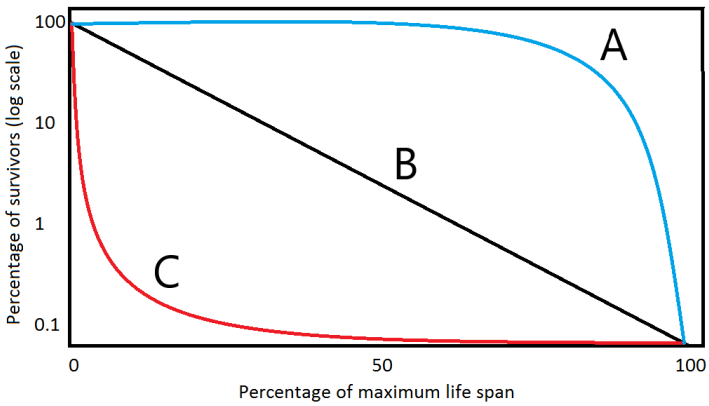
- This test is designed to be long and difficult to finish. You are not expected to complete every question.
- There are no penalties for incorrect or skipped questions. If you are unsure on a question, skip it or choose a random answer.
- All questions with multiple answers will be "all or nothing", so you need to select all correct answers, or you will not get any credit
- The use of external resources is not permitted.
- Good luck on the test!

For grading use only

Page:	2	3	4	5	6	7	8	9	10	Total
Points:	16	36	16	14	47	29	39	61	42	300
Score:										

Section A: General Ecology

Use the following diagram for the next six (6) questions.



1. (1 point) What type of survivorship curve is line A representing?
   A. Type I B. Type II C. Type III D. None of the above

2. (1 point) What type of survivorship curve is line C representing?
   A. Type I B. Type II **C. Type III** D. None of the above

3. (1 point) What type of survivorship curve is line B representing?
   A. Type I **B. Type II** C. Type III D. None of the above

4. (2 points) Which of the following organisms exhibit Type I survivorship curves? (select all that apply)
   A. Elephants B. Trees **C. Humans** D. Songbirds E. Rodents F. Fish

5. (2 points) Which of the following organisms exhibit Type II survivorship curves? (select all that apply)
   A. Elephants B. Trees C. Humans **D. Songbirds** **E. Rodents** F. Fish

6. (2 points) Which of the following organisms exhibit Type III survivorship curves? (select all that apply)
   A. Elephants **B. Trees** C. Humans D. Songbirds E. Rodents **F. Fish**

7. (1 point) How much energy (in percent) is lost, if any, between trophic levels?
   A. 0% B. 10% C. 20% D. 50% **E. 90%** F. None of the above

8. (1 point) What metric does a trophic pyramid measure?
   A. Biomass B. Population **C. Energy** D. None of the Above

9. (1 point) What does the bottom level of a trophic pyramid represent?
   A. Primary Consumers **B. Primary Producers** C. Second Order Consumers D. Decomposers

10. (1 point) What does the third layer of a trophic pyramid represent?
    A. First Order Consumers B. Primary Producers **C. Secondary Consumers** D. Decomposers

11. (1 point) What is an interaction where 2 different species both benefit known as?
    A. Amensalism B. Parasitism C. Commensalism **D. Mutualism**

12. (1 point) What is an interaction where 1 species benefits and the other is harmed known as? (select all that apply)
    A. Commensalism **B. Parasitism** C. Mutualism **D. Predation** E. Competition

13. (1 point) What is an interaction where 2 different species are harmed known as?
    A. Mutualism B. Amensalism C. Predation **D. Competition**

14. (2 points) In the Amazon Rainforest, special groves of trees known as devil's gardens can be found. In these, ants and trees live together. The trees provide shelter for the ants, and the ants kill other trees nearby. What type of interaction is occurring between the ants and the trees?
A. Comensalism **B. Mutualism** C. Parasitism D. Competition

15. (2 points) Is the above example an example of symbiosis?
A. Yes B. No

16. (2 points) In coral reefs, some species of shrimp can be found eating parasites off of larger fish. What type of interaction is occurring between the shrimp and the fish?
A. Predation B. Parasitism **C. Mutualism** D. Comensalism

17. (2 points) Is the above example an example of symbiosis?
A. Yes **B. No**

18. (4 points) In the 1970s, wolves were hunted to near 0 populations in Yellowstone National Park. This caused a drastic increase in moose populations, and destroyed local grass populations. The collapse of these parts of the ecosystem caused some types of trees to stop being found. This is an example of:
A trophic cascade

19. (3 points) What are the 3 types of distribution patterns.
Uniform, Clumped, Random (1 point each)

20. (3 points) Which of the following organisms have a uniform distribution pattern? (select all that apply)
A. Penguins B. Wolves C. Flowers D. Fish **E. Walnut trees** F. Dandelions

21. (3 points) Which of the following organisms have a clumped distribution pattern? (select all that apply)
A. Penguins **B. Wolves** **C. Elephants** **D. Fish** E. Walnut trees F. Dandelions

22. (3 points) Which of the following organisms have a random distribution pattern? (select all that apply)
A. Penguins B. Wolves C. Elephants D. Fish E. Walnut trees **F. Dandelions**

23. (4 points) What is allelopathy, and what kind of distribution pattern does it form?

> **Solution:** Allelopathy is the chemical inhibition of other plants nearby a plant. (2 points) It forms uniform distributions (2 points)

24. (1 point) Which of the following nutrient cycles does not have a significant atmospheric component
A. Phosphorus Cycle B. Hydrological Cycle C. Sulfur Cycle D. Carbon Cycle

25. (1 point) What is the process of carbon dioxide being converted into sugar known as?
A. Respiration **B. Photosynthesis** C. Deposition D. Evaporation

26. (1 point) What is the largest reservoir of carbon on Earth?
A. Soil B. The Atmosphere C. Organic Matter **D. Oceans**

27. (1 point) Define carbon sink
Anything that absorbs more carbon than it releases

28. (1 point) What is the process of surface water entering soil known as?
Infiltration

29. (1 point) What powers the hydrological cycle?
The Sun

30. (2 points) Which of the following organisms can fix nitrogen? (select all that apply)
A. Legumes B. Grains **C. Cyanobacteria** D. Flowers

31. (2 points) What is the process in which nitrogen is artificially converted to ammonia known as?
Haber-Bosch Process

32. (1 point) In what form is sulfur mainly stored in the ocean?
A. Hydrogen Sulfide **B. Sulfur Dioxide** C. Sulfate D. None of the above

33. (1 point) Which aquatic biome is located at the mixing site of salt water and freshwater?
A. Mangrove B. Kelp Forest **C. Estuary** D. Coral Reef

34. (1 point) Which aquatic biome is known for its extremely high biodiversity?
A. Coral reef B. Salt Marsh C. Mangrove D. Hydrothermal vent

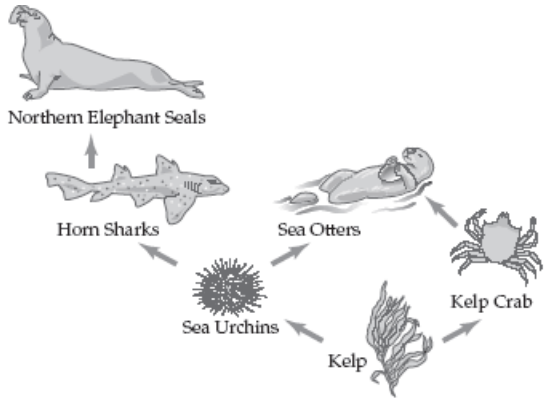
35. (1 point) What type of lake is contains low nutrient levels and high oxygen?
A. Oligotrophic B. Mesotrophic C. Eutrophic D. Anoxic

36. (2 points) Which aquatic biome has a high density of kelp that is anchored to the seabed?
A. Coral reef B. Mangrove C. Kelp forest **D. Kelp Bed**

37. (3 points) What is the name of the zone that extends from the high water mark to the shore that is permanently submerged?
Littoral

38. (3 points) What is the name of the zone that occurs on the banks of bodies of water?
Riparian

Use the below image for the next five (5) questions.



39. (1 point) Which of the following species are first order consumers? (select all that apply)
A. Sea Urchins B. Elephant Seals C. Horn Sharks D. Sea Otters **E. Kelp Crabs**

40. (1 point) Which of the following organisms would be harmed if all sea urchins were removed?
A. Sea Urchins **B. Elephant Seals** **C. Horn Sharks** **D. Sea Otters** E. Kelp Crabs

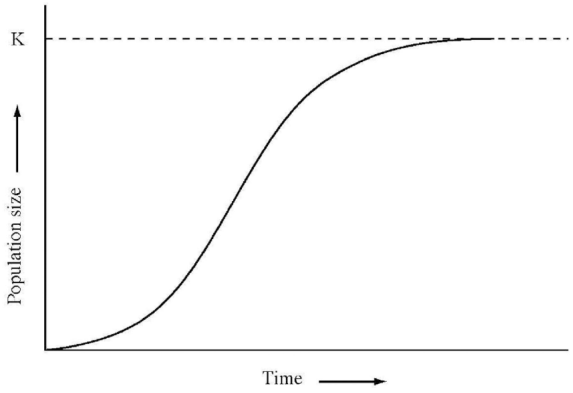
41. (3 points) Why are there so few levels in this and other food webs?

> **Solution:** Too much energy is lost between levels or carnivores generally need to be larger in each successive layer, so they require more energy.

42. (2 points) A dangerous chemical is spilled into the water of the ecosystem. This chemical is mistakenly absorbed by kelp and is harmless at the low concentrations in the kelp. Which of the following organisms will most likely contain the highest concentration of this chemical? (select all that apply)
A. Sea Urchins **B. Elephant Seals** C. Horn Sharks D. Sea Otters E. Kelp Crabs

43. (2 points) What is the above example an example of?
A. Biomagnification B. Bioaccumulation C. Trophic Cascade D. None of the above

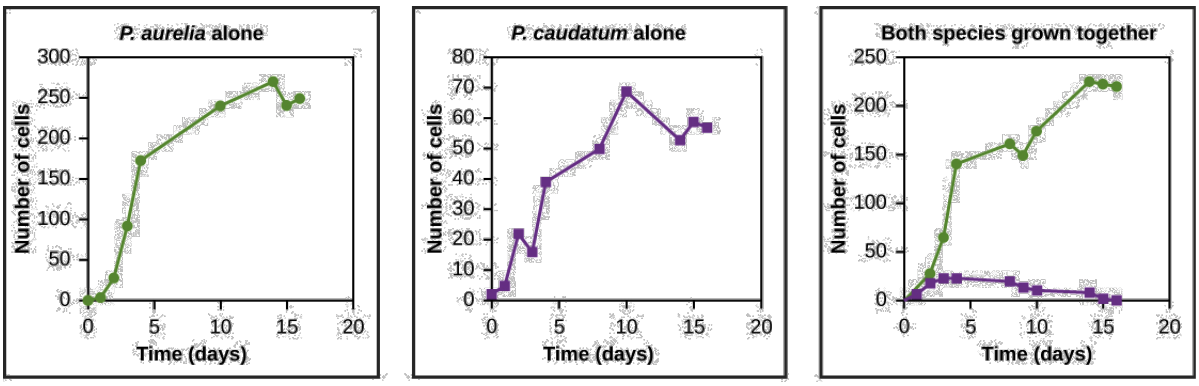
Use the below image for the next two (2) question.



44. (2 points) What does this graph model?
Population Growth

45. (2 points) What variable does k stand for?
Carrying Capacity

Use the below image for the next one (1) question.



46. (3 points) What is the above picture an example of?
Principle of Competitive Exclusion or Gause's Law

47. (3 points) How can two (2) organisms with the same niche coexist? (2 words)

Resource Partitioning

48. (5 points) List the levels of biological organization from smallest to largest starting at cells:

Solution: cells, tissues, organs, organ systems, organisms, populations, communities, ecosystems, the Biosphere (all or nothing)

49. (1 point) What is a close, long term interaction between 2 species known as?

Symbiosis

50. (1 point) What is the process where organisms with better adaptations survive and reproduce more known as?

Natural selection

51. (2 points) What are bacteria and archaea that can fix nitrogen known as?

Diazotroph

52. (3 points) What is a mutual symbiotic relationship between a plant and fungus known as?

Mycorrhiza

53. (4 points) What is a parasitic plant that derives nutrition partly or fully from a fungus known as?

Myco-heterotroph

54. (3 points) What is an indicator species?

A species used to judge a quality of an ecosystem

55. (3 points) What are keystone species?

Species that have a disproportionate impact on their ecosystem

56. (2 points) What is an indigenous species?

A species native to a certain area

57. (2 points) What are invasive species?

Introduced species that negatively effect the new ecosystem

58. (8 points) What is the difference between species richness and biodiversity?

Solution: Species richness refers to the number of species in an area (3 points) Biodiversity combines richness (2 points) and the relative amount of each species (3 points)

59. (10 points) Write five (5) of the properties that contribute to invasive species' success in their new environments.

Solution: (2 points each, max 10 points) Generalist diets, few predators, fast growth, rapid reproduction rates, tolerance of many conditions, high dispersal, plasticity

60. (5 points) Is it possible for a biomass pyramids lowest layer to not be the largest layer? If yes, where might this occur? If no, why not?

Solution: Yes (2 points) and it can be found in many marine ecosystems (3 points).

Use the below chart for the next question

Species	Grassland	Chaparral	Forest
A	√		
B	√		√
B	√		√
D	√	√	√
E	√	√	√
F	√		√
G	√	√	
H	√	√	
I	√		
J	√	√	
K	√	√	√
L		√	
M		√	
N		√	
O		√	√
P			√
Q			√
R			√
S			
T			√

61. **Solve for each of the below values**
    (a) (3 points) α Diversity of the Grassland: **11**
    (b) (3 points) α Diversity of the Chaparral: **10**
    (c) (3 points) α Diversity of the Forest: **11**
    (d) (4 points) β Diversity of the Grassland and Chaparral: **9**
    (e) (4 points) β Diversity of the Grassland and Forest: **6**
    (f) (4 points) β Diversity of the Chaparral and Forest: **13**
    (g) (3 points) γ Diversity: **19**

Section B: Human Impacts to the environment

62. (1 point) What are the two (2) most common limiting nutrients in aquatic ecosystems?
A. Iron B. Oxygen **C. Nitrogen** **D. Phosphorus**

63. (1 point) What is an excess of nutrients in an ecosystem known as?
Eutrophication

64. (3 points) What are HABs, and why are they bad?

> **Solution:** HAB stands for harmful algal blooms (1 point), and they grow uncontrollably and use up most of the oxygen in water (2 points)

65. (1 point) How many ocean garbage patches are there? **5**

66. (3 points) Unsurprisingly, plastics are the main component of the ocean garbage patches. What type of plastic is the main component of the garbage patches?
Microplastics

67. (2 points) What are dead zones in ecology?
Hypoxic (low oxygen) areas in large oceans and lakes

68. (3 points) What is the term for unwanted organisms (wrong gender, wrong size, wrong species, etc.) caught in fishing? About how much of the organisms caught is unwanted (to the nearest 10 percent)?
Bycatch, 90%

69. (2 points) The primary cause for ocean defaunation is:
A. Overfishing B. Oil spills C. Microplastics D. Hypoxic waters

70. (6 points) What is the difference between point source and nonpoint source pollution?

> **Solution:** Point source is from a single, easily identifiable source (3 points), nonpoint source is from many sources and harder to identify (3 points).

71. (1 point) Can a coral survive from being bleached?
A. Yes B. No

72. (2 points) Where have mangrove forest losses been most extensive?
A. Southeast Asia B. South America C. North America D. West Africa

73. (2 points) Which of the following gases commonly cause acid rain? (select all that apply)
A. Carbon Dioxide **B. Sulfur Dioxide** **C. Nitrogen Oxides** D. Nitrogen gas

74. (2 points) Under what pH is precipitation considered acid rain? **5.7**

75. (4 points) What is the principle natural source of the gases that cause acid rain?
Volcanoes

76. (6 points) What are three (3) effects of acid rain on the natural environment?

> **Solution:** (2 points each, 6 point maximum) Denatures enzymes, leaches cations, kills organisms, prevents fish eggs' hatching,

77. (2 points) Which of the following are sources of atmospheric particulate matter? (select all that apply)
A. Volcanoes **B. Vehicles** C. Air Conditioning **D. Ocean Spray**

78. (2 points) What human body system does particulate matter affect the most?
A. Cardiovascular **B. Respiratory** C. Immune D. Integumentary

79. (2 points) What is the largest carbon sink on Earth?
A. Soil B. Organic Matter C. The Atmosphere **D. Oceans**

80. (2 points) In one sentence, briefly describe what the Greenhouse effect is.
The trapping of solar radiation by the atmosphere. (anything similar works)

81. (8 points) Which of the following gases are greenhouse gases: (select all that apply)
A. Argon B. Ammonia **C. Carbon Dioxide** D. Sulfur Dioxide **E. Water Vapor**
F. Nitrous Oxide **G. Ozone** H. Oxygen **I. Hydrofluorocarbons**

82. (2 points) The increased temperatures of the planet has caused snow and ice to melt. This decreases the **albedo** of the planet.

83. (2 points) What unit is ozone concentration measured in?
A. Hooke Units B. Parts per Million **C. Dobson units** D. Parts per Billion

84. (2 points) What was the first tool that could measure ozone concentration from the ground called?
Dobsonmeter

85. (3 points) Under what concentration is an area considered a hole in the ozone layer?
220 DU

86. (4 points) Which group of molecules containing only fluorine, chlorine, oxygen, and hydrogen, are known to damage the ozone layer.
Chlorofluorocarbons (CFCs)

87. (1 point) What is the main function of the ozone layer?
A. Temperature regulation **B. Blocking UV radiation** C. Regulating water concentration

88. (12 points) Increased carbon dioxide levels in the atmosphere causes what to happen in the oceans? What are 3 reasons this process is harmful to wildlife?

Solution: Ocean Acidification (3 points). (3 points each, 9 points max) Increases dissolution of calcium carbonate, impairs fish development and senses, reduces metabolic rates, increases algal blooms, increases noise in the ocean.

89. (9 points) What is the Claus Process used for? How does it reduce emissions of a air pollutant?

Solution: It is a desulfurization process (3 points), and it reduces emissions of sulfur dioxide (3 points) by removing sulfur from natural gas (3 points)

90. (10 points) What are five (5) causes of the loss of mangrove forests?

Solution: (2 points each, max 10 points) Logging, Agriculture, Aquaculture, Coastal Development, Climate Change, Pollution

Section C: Solutions to Environmental Problems

91. (1 point) The fire at Cuyahoga River caused the revision of this influential piece of legislation.
A. Clean Air Act B. Safe Drinking Water Act **C. Federal Water Pollution Control Act**

92. (1 point) What was the first piece of legislature controlling air pollution passed in the US?
A. Clean Air Act **B. Air Pollution Control Act** C. Air Quality Act

93. (2 points) The Clean Air Act specifies 2 sources of air pollution. What 2 are these? (select all that apply)
A. Mobile B. Fixed C. Modern D. Pre-Industrial revolution **E. Stationary**

94. (4 points) What is the main function of the Marine Protection, Research, and Sanctuaries Act?
Prevents dumping of material in the ocean

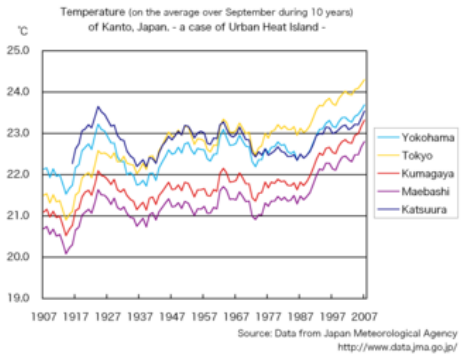
95. (7 points) This piece of legislature was designed to help clean up contaminated or hazardous waste sites. Ironically, despite of its name, it is unable to do this. What act is being referred to, and why can't it do what it was made to do?
Superfund or CERCLA (3 points); lack of money (4 points)

96. (3 points) The addition of iron into the oceans to increase biological productivity is known as:
Iron fertilization/seeding

97. (6 points) (3 points each blank) Willow has the ability to absorb large amounts of cadmium from soil. Willow is a **hyperaccumulator** for cadmium and a plant used for the process of **phytoextraction** (be specific).

98. (3 points) The *Mega Borg* oil spill was a oil spill in 1990 off the coast of the Gulf of Mexico. To clean up the spill, officials used about one hundred pounds of bacteria to break down the oil. This is an example of: **Bioremediation**

99. (3 points) The filtration of contamination liquid through plant roots is known as:
Rhizofiltration



100. (12 points) The above graph shows data from five (5) Japanese cities. What effect causes this upward trend of temperatures, why, and how can it be prevented? List two (2) reasons why it is caused.

Solution: This is caused by the Urban Heat Island effect (4 points) which is caused due to: (2 points each, max 4 points) dark surfaces absorbing more light, lack of evapotranspiration in cities, high amounts of reflection (urban canyon effect), waste heat from technology, high pollution. It can be mitigated (4 points for anything similar to the following) by the addition of more plant life in urban areas (green roofs) or painting of roofs white.