

Ecology test.

You get 50 minutes to complete it, circle multiple choice answers and write short answers below.

[All multiple choice are 1 pt each]

32) $(\text{final population} - \text{initial population}) / \text{area}$ [1 pt, all or nothing]

33) Any four (two from each category) of the following -

Density-dependent: [1 pt each, 2 pts max]

predation, inter- and intraspecific competition, accumulation of waste, parasitic diseases, etc.

Density-independent: [1 pt each, 2 pts max]

temperature, floods, other natural disaster / extreme weather

34) Any comparison involving the following - [2 pts, all or nothing]

r (quantity over quality):

small size, energy per individual low, many offspring, early maturity, short life expectancy, only reproduce once, type III survivorship pattern

K (quality over quantity):

Large size, energy per individual high, few offspring, late maturity (often w/ parental care), long life expectancy, reproduce multiple times in lifetime, type I or II survivorship pattern

38) $70/r = 50$, $r = 1.4\%$ or $r = 0.0139$ [2 pts if correct answer, 1 pt if correct work and wrong answer]

39) $(5.4 \text{ billion})(1.014)^7 = 5.95 \text{ billion}$ [2 pts if correct answer, 1 pt if correct work and wrong answer]

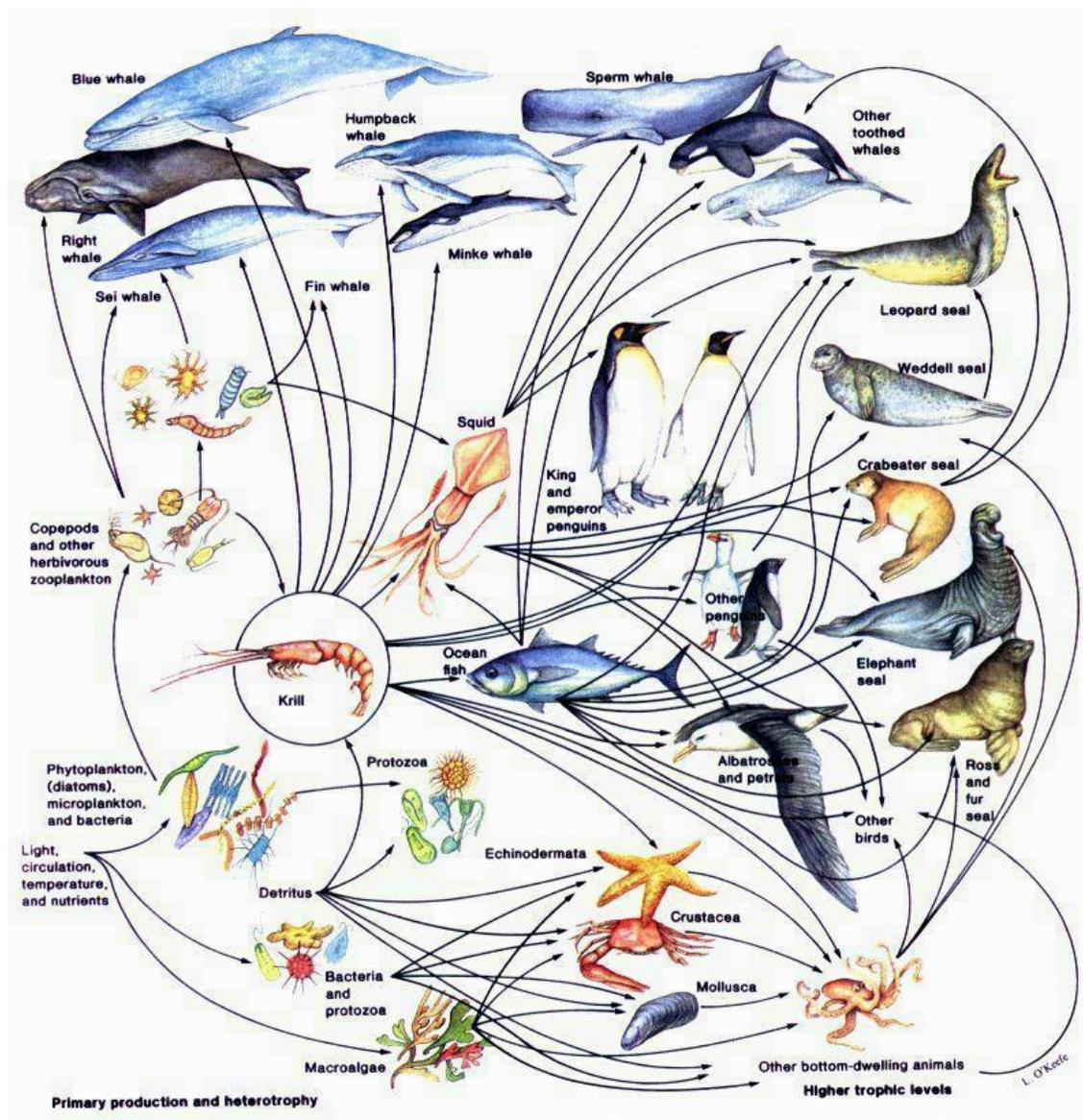
40) Exponential growth has no carrying capacity, [1 pt]

while logistic growth takes carrying capacity into account. [1 pt]

Equations:

exponential $\rightarrow P_f = P_i e^{rt}$ or $dP/dt = rP$ [1 pt]

logistic $\rightarrow dP/dt = rP(1 - P/K)$ [1 pt]



- Which of these is not, by definition, a producer in this diagram?
 - Protozoa
 - Microalgae
 - Zooplankton
 - Detritus**
 - Phytoplankton
- Which organism is not considered a tertiary consumer in this diagram?
 - Octopus
 - Minke whale
 - Squid
 - Sei whale
 - All can be considered tertiary consumers**

3. What is the most likely result of removing all microalgae from the web?
 - a. Whales would likely remain unaffected
 - b. Bacteria and protozoa would flourish
 - c. Seals would be greatly affected
 - d. Octopuses would go extinct
 - e. All would result from the removal of microalgae
4. What is a difference between food chains and food webs?
 - a. One shows energy flow, the other does not
 - b. One depicts trophic levels, the other does not
 - c. One gives insight to the energy transfer within an ecosystem, the other does not
 - d. One is just the interconnections of the other
 - e. If you don't know the relationship between food chains and food webs get out
5. How many true primary consumers does the food web depict?
 - a. 1
 - b. 16
 - c. 5
 - d. 3
 - e. 8
6. What do trophic pyramids not depict?
 - a. Biomass
 - b. Bio productivity
 - c. Food chain
 - d. Trophic levels
 - e. All of the above
7. How much energy is transferred between levels of an energy pyramid?
 - a. 10%
 - b. 30%
 - c. 3%
 - d. 1%
 - e. 13%
8. What is not a shape a numbers pyramid can take?
 - a. Upright
 - b. Inverted
 - c. Dumbbell
 - d. Diamond
 - e. All are shapes
9. What is NPP
 - a. $GPP - R_d$
 - b. $GPP - NEP$
 - c. $GPP - R_h$
 - d. $GPP - R_p$
 - e. $GPP - (R_d + R_h + R_p)$

10. Which value of measure is best suited for determining the CO₂ balance between various ecosystems, or the entire earth, and the atmosphere?
- NPP
 - GPP
 - NEP
 - GEP
 - None of the above
11. Which of the following ecosystems has the most NPP per unit area?
- Open ocean
 - Savanna
 - Taiga
 - Tundra
 - Agricultural land
12. Which of the following ecosystems has the least NPP per unit area?
- Open ocean
 - Savanna
 - Taiga
 - Tundra
 - Agricultural land
13. Which of the following is the most productive, that is, highest total NPP?
- Open ocean
 - Savanna
 - Taiga
 - Tundra
 - Agricultural land
14. Which of the following is the least productive, that is, lowest total NPP?
- Open ocean
 - Savanna
 - Taiga
 - Tundra
 - Agricultural land
15. What is the estimate of total global NPP?
- 105 kilograms of carbon
 - 105 megagrams of carbon
 - 105 gigagrams of carbon
 - 105 teragrams of carbon
 - 105 petagrams of carbon
16. NPP in different areas are limited by different nutrients. NPP in equatorial Pacific Ocean is limited by
- Phosphorous
 - Nitrogen
 - Oxygen
 - Iron
 - Carbon

17. NPP in different areas are limited by different nutrients. NPP in lake ecosystems is limited by
- Phosphorous
 - Nitrogen
 - Oxygen
 - Iron
 - Carbon
18. NPP in different areas are limited by different nutrients. NPP in the open ocean is limited by
- Phosphorous
 - Nitrogen
 - Oxygen
 - Iron
 - Carbon
19. Which of the following nutrients are not present in the atmosphere
- Carbon
 - Sulfur
 - Nitrogen
 - Water
 - Phosphorus
20. What acts as the biggest carbon sink on Earth?
- Atmosphere
 - Soil
 - Fossil pool
 - Sediment
 - Ocean
21. Which human activity is largely responsible for the human impact on the carbon cycle
- Deforestation
 - Burning fossil fuels
 - Calcination of limestone
 - Human caused land use and land cover change
 - Agriculture
22. Carbon in the atmosphere is most likely found as
- Carbon dioxide
 - CFCs
 - Hydrocarbons
 - Methane
 - Ozone
23. Which step of the nitrogen cycle uses both lightning and bacteria to aid the process
- Nitrogen fixation
 - Assimilation
 - Ammonification
 - Nitrification
 - Denitrification

24. Which process converts N_2 to NH_3
- Nitrogen fixation
 - Assimilation
 - Ammonification
 - Nitrification
 - Denitrification
25. Which process is replicated by humans by the Haber process
- Nitrogen fixation
 - Assimilation
 - Ammonification
 - Nitrification
 - Denitrification
26. Which process involves microorganisms called diazotrophs
- Nitrogen fixation
 - Assimilation
 - Ammonification
 - Nitrification
 - Denitrification
27. Which process frees nitrogen atoms from their triple-diatomic bond
- Nitrogen fixation
 - Assimilation
 - Ammonification
 - Nitrification
 - Denitrification
28. Which is not a step of the sulfur cycle
- Mineralization of organic sulfur into inorganic sulfur
 - Oxidation of elemental sulfur into sulfate
 - Reduction of sulfide into sulfate
 - Incorporation of sulfur into organic compounds
 - All of the above are steps of the sulfur cycle
29. Where is the largest reservoir of the Earth's oxygen
- Lithosphere
 - Biosphere
 - Atmosphere
 - Stratosphere
 - Hydrosphere
30. Which of the following species interactions does not involve a negative affect
- Competition
 - Amensalism
 - Antagonism
 - Neutralism
 - None of the above

31. Which of the following species interactions is not considered an antagonistic interaction
- Carnivory
 - Parasitism
 - Predation
 - Batesian mimicry
 - Competition
32. (1) What is the formula for change in population density?
33. (4) List two examples of both density-independent factors and density-dependent factors
34. (2) Explain the difference between r-selected and K-selected populations
35. The maximum number of organisms that can be sustained by the available resources over a given period of time is
- Ecological load
 - Carrying capacity
 - Pop_{max}
 - Environmental overload
 - None of the above
36. A population pyramid showing rapid growth
- Has a narrow base and bulges upward
 - Shows an even age distribution
 - Narrows steadily from its base upward
 - Has a broad base and curves upward
 - Has a narrow base and widens
37. According to Thompson's Transition Model, a country in the post-industrial stage will
- Slow population growth due to high births and deaths
 - Rapid population growth
 - Little population growth due to declining birth rates
 - Zero population growth
 - Decline
38. (2) As of 1995, the human population was expected to double within 50 years. Calculate r .
- $r=0.0139$
39. (2) If the human population size in 1993 was 5.4 billion, what was the projected population size in the year 2000 (use info from previous question) 5.95 billion

40. (4) Explain difference between exponential and logistic growth, give equations for both

41. Of all the species that have ever lived on Earth, about what percent is extinct?

- a. 50%
- b. 75%
- c. 85%
- d. 93%
- e. 99%

42. The IUCN Red List is

- a. A list of all earth's extinct species
- b. An inventory of conservation status of biological species
- c. An inventory of critically-endangered biological species
- d. An annual account of the species that have gone extinct over the year
- e. None of the above

Determine which biome the following statements apply to the most:

a. Tundra (TU), b. Taiga (TG), c. Deciduous Forest (DF)

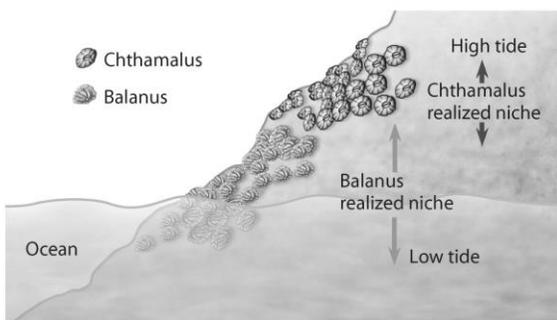
- 43. Hot summers, cold winters **C**
- 44. Susceptible to wildfire **B**
- 45. 750-1500mm of precipitation **C**
- 46. Largest terrestrial biome **B**
- 47. Permafrost **A**
- 48. Relies on detritus for nutrient pool **A**
- 49. Pine forests **B**
- 50. Most plants are asexual **A**
- 51. Podzolization **B**
- 52. Acidic soil **B**
- 53. Lynx **B**
- 54. No soil **A**
- 55. Alfisols **C**

56. Which type of energy transfer occurs between two substances in direct physical contact

- a. Radiation
- b. Circulation
- c. **Conduction**
- d. Convection
- e. Negative feedback

57. Which two gases make up 99 percent of Earth's atmosphere?
- Argon and nitrogen
 - Nitrogen and oxygen**
 - Oxygen and carbon dioxide
 - Carbon dioxide and nitrogen
 - Methane and carbon dioxide
58. Which is the most abundant greenhouse gas in Earth's atmosphere?
- Ozone
 - Nitrogen
 - Methane
 - Water vapour**
 - Carbon dioxide
59. Which greenhouse gas is produced only through human activity and no natural sources?
- Ozone
 - Nitrogen
 - Methane
 - Halocarbons**
 - Nitrous oxide
60. Which factor causes the concentration of water vapour in the atmosphere to increase?
- Condensation
 - Rising temperatures**
 - Anthropogenic activities
 - Decrease in the atmospheric concentration of halocarbons
 - Decrease in the atmospheric concentration of carbon dioxide
61. Which is not an example of electromagnetic radiation?
- X-rays
 - Albedo**
 - Visible light
 - Radio waves
 - Infrared radiation
62. Which type of energy transfer occurs as energy travels from the Sun to Earth?
- Radiation**
 - Circulation
 - Conduction
 - Convection
 - Negative feedback

63. Which process cycles air through the atmosphere, moving warm air upward and cool air downward?
- Radiation
 - Circulation
 - Conduction
 - Convection**
 - Negative feedback
64. Most of the solar radiation that enters Earth's atmosphere is absorbed by
- Clouds
 - Earth's surface
 - Zones of permanent ice
 - Gases in the atmosphere**
 - Aerosols in the atmosphere
65. Which is the largest single indicator of climate change?
- Extinction
 - Deforestation
 - Desertification
 - Global warming**
 - The greenhouse effect
66. Which activity in developing countries may be a major contributor to global climate change?
- Tourism
 - Agriculture
 - The use of electricity
 - The use of automobiles**
 - The use of small cooking stoves



67. Which of the following is the most logical conclusion about the distribution of the two species of barnacle, *Chthamalus* and *Balanus*?
- Chthamalus* and *Balanus* compete for the same types of food.
 - Balanus* is less able to resist desiccation than *Chthamalus*.**
 - Chthamalus* prefers higher temperatures than *Balanus*.
 - Balanus* is a better osmoregulator than *Chthamalus*.
 - Chthamalus* is preyed upon more than *Balanus* by birds because of its size.

68. Which of the following is a good description of an ecological niche?

- a. the "address" of an organism
- b. synonymous with an organism's specific trophic level
- c. how an organism uses the biotic and abiotic resources in the community
- d. the organism's role in recycling nutrients in its habitat
- e. the interactions of the organism with other members of the community

69. A species of fish is found to require a certain water temperature, a particular oxygen content of the water, a particular depth, a rocky substrate on the bottom, and a variety of nutrients in the form of microscopic plants and animals to thrive. These requirements describe its

- a. dimensional profile.
- b. ecological niche.
- c. prime habitat.
- d. resource partition.
- e. home base.

70. Resource partitioning would be most likely to occur between

- a. sympatric populations of a predator and its prey.
- b. sympatric populations of species with similar ecological niches.
- c. sympatric populations of a flowering plant and its specialized insect pollinator.
- d. allopatric populations of the same animal species.
- e. allopatric populations of species with similar ecological niches.

71. Which of the following interactions can correctly be labeled coevolution?

- a. the tendency of coyotes to respond to human habitat encroachment by including pet dogs and cats in their diets
- b. a genetic change in a virus that allows it to exploit a new host, which responds to virus-imposed selection by changing its genetically controlled habitat preferences
- c. a genetic change in foxes that allows them to tolerate human presence (and food)
- d. the adaptation of cockroaches to human habitation
- e. the ability of rats to survive in a variety of novel environments

72. White-breasted nuthatches and Downy woodpeckers both eat insects that hide in the furrows of bark in hardwood trees. The Downy woodpecker searches for insects by hunting from the bottom of the tree trunk to the top, while the White-breasted nuthatch searches from the top of the trunk down.

These hunting behaviors best illustrate which of the following ecological concepts?

- a. competitive exclusion
- b. resource partitioning
- c. character displacement
- d. keystone species
- e. individualistic hypothesis

73. Monarch butterflies are protected from birds and other predators but the cardiac glycosides they incorporate into their tissues are from eating milkweed when they were in their caterpillar stage of development. The wings of a different species of butterfly, the Viceroy, look nearly identical to the Monarch so predators that have learned not to eat the bad-tasting Monarch avoid Viceroys as well. This example best describes

- a. aposmatic coloration.
- b. cryptic coloration.
- c. Batesian mimicry.
- d. Müllerian mimicry.
- e. mutualism.

74. All of the following have been used by plants to avoid being eaten except

- a. possessing spines and thorns on stems and leaves.
- b. synthesis of chemical toxins, such as strychnine, nicotine, and tannins.
- c. producing chemicals that are distasteful to herbivores, such as cinnamon, cloves, and peppermint.
- d. producing tissues that have unappealing colors.
- e. synthesizing chemicals that can cause abnormal development in some insects that eat them.

75. The energetic hypothesis and dynamic stability hypothesis are explanations to account for

- a. plant defenses against herbivores.
- b. the length of food chains.
- c. the evolution of mutualism.
- d. resource partitioning.
- e. the competitive exclusion principle.

76. a tide pool, 15 species of invertebrates were reduced to eight after one species was removed. The species removed was likely a(n)

- a. community facilitator.
- b. keystone species.
- c. herbivore.
- d. resource partitioner.
- e. mutualistic organism.

77. When lichens grow on bare rock, they may eventually accumulate enough organic material around them to supply the foothold for later rooted vegetation. These early pioneering lichens can be said to do what to the later arrivals?

- a. tolerate
- b. inhibit
- c. facilitate
- d. exclude
- e. concentrate

78. Which of the following treatments would most likely create a healthy, biodiverse community out of an impoverished community?

- a. Decrease the number of top level predators.
- b. Eliminate some of the pest species of trees and shrubs.
- c. Add plenty of nutrients to the soil.
- d. Add more predators.
- e. Reduce the number of primary producers.

Use the following diagram of a hypothetical food web to answer the following questions. The arrows represent the transfer of food energy between the various trophic levels.

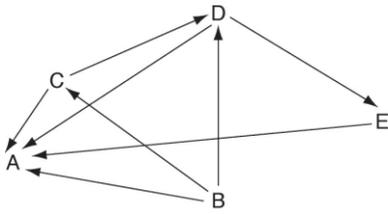


Figure 54.2

79. Which letter represents an organism that could be a producer?

- a. A
- b. B
- c. C
- d. D
- e. E

80. Which letter represents an organism that could be a primary consumer?

- a. A
- b. B
- c. C
- d. D
- e. E

81. Which of the following is the most accepted hypothesis as to why invasive species take over communities into which they have been introduced?

- a. Invasive species are more aggressive than natives in competing for the limited resources of the environment.
- b. Invasive species are not held in check by the predators and agents of disease that have always been in place for the natives.
- c. Humans always select which species will outcompete the nuisance native species.
- d. Invasive species have a higher reproductive potential than native species.
- e. Invasive species come from geographically isolated regions, so when they are introduced to regions where there is more competition, they thrive.

82. Which of the following is considered by ecologists a measure of the ability of a community either to resist change or to recover to its original state after change?

- a. stability
- b. succession
- c. partitioning
- d. productivity
- e. competitive exclusion

83. You are most likely to observe primary succession in a terrestrial community when you visit a(n)

- a. tropical rain forest.
- b. abandoned field.
- c. recently burned forest.
- d. recently created volcanic island.
- e. recently plowed field.

84. Which of the following describes the relationship between ants and acacia trees?

- a. parasitism
- b. mutualism
- c. inhibition
- d. facilitation
- e. commensalism

85. Which of the following describes the relationship between legumes and nitrogen-fixing bacteria?

- a. parasitism
- b. mutualism
- c. inhibition
- d. facilitation
- e. commensalism

86. Ecologists are particularly concerned about pathogens because

- a. human activities are transporting pathogens around the world at alarming rates.
- b. pathogens are evolving faster than ever before.
- c. host organisms are not coming up with defenses against pathogens.
- d. new technologies have allowed microbiologists to classify more new pathogens.
- e. pathogens that infect organisms at the community level will eventually infect human beings.

87. Zoonotic disease

- a. describes sub-organismal pathogens such as viruses, viroids, and prions.
- b. is caused by pathogens that are transferred from other animals to humans by direct contact or by means of a vector.
- c. can only be spread from animals to humans through direct contact.
- d. can only be transferred from animals to humans by means of an intermediate host.
- e. is too specific to study at the community level, and studies of zoonotic pathogens are relegated to organismal biology.

88. Of the following zoonotic diseases, which is most applicable to study by a community ecologist?

- a. mad cow disease
- b. hantavirus
- c. AIDS
- d. avian flu
- e. trichinosis

89. The principle of competitive exclusion states that

- a. two species cannot coexist in the same habitat.
- b. competition between two species always causes extinction or emigration of one species.
- c. competition in a population promotes survival of the best-adapted individuals.
- d. two species that have exactly the same niche cannot coexist in a community.
- e. two species will stop reproducing until one species leaves the habitat.

90. Based on the intermediate disturbance hypothesis, a community's species diversity is

- a. increased by frequent massive disturbance.
- b. increased by stable conditions with no disturbance.
- c. increased by moderate levels of disturbance.
- d. increased when humans intervene to eliminate disturbance.
- e. increased by intensive disturbance by humans.

91. According to the equilibrium model of island biogeography, species richness would be greatest on an island that is

- a. small and remote.
- b. large and remote.
- c. large and close to a mainland.
- d. small and close to a mainland.
- e. environmentally homogeneous.