1) A chemical produced by an animal that serves as a communication to another animal of the same species is called
A) a marker.
B) an inducer.
C) a pheromone.
D) an imprinter.
E) an agonistic chemical.

2) A cage containing male mosquitoes has a small earphone placed on top, through which the sound of a female mosquito is played. All the males immediately fly to the earphone and thrust their abdomens through the fabric of the cage. What is the best explanation for this behavior?
A) The males learn to associate the sound with females.
B) Copulation is a fixed action pattern, and the female flight sound is a sign stimulus that initiates it.
C) The sound from the earphone irritates the male mosquitoes, causing them to attempt to sting it.
D) The reproductive drive is so strong that when males are deprived of females, they will attempt to mate with anything that has even the slightest female characteristic.
E) Through classical conditioning, the male mosquitoes have associated the inappropriate stimulus from the earphone with the normal response of copulation.

3) A type of learning that can occur only during a brief period of early life and results in a behavior that is difficult to modify through later experiences is called
A) insight.
B) imprinting.
C) habituation.
D) operant conditioning.
E) trial-and-error learning.

4) Sow bugs become more active in dry areas and less active in humid areas. This is an example of
A) taxis.
B) tropism.
C) net reflex.
D) cognition.
E) kinesis.
5) You turn on a light and observe cockroaches scurrying to dark hiding places. What have you observed?
A) taxis
B) learned behavior
C) migration
D) visual communication
E) operant conditioning

6) Loss of responsiveness to stimuli that convey little or no new information is called
A) adapting.
B) spacing.
C) conditioning.
D) imprinting.
E) habituation.

7) Every morning at the same time, John went into the den to feed his new tropical fish. After a few weeks, he noticed that the fish swam to the top of the tank when he entered the room. This is an example of
A) habituation.
B) imprinting.
C) operant conditioning.
D) classical conditioning.
E) maturation.

8) Animals tend to maximize their energy intake-to-expenditure ratio. What is this behavior called?
A) agonistic behavior
B) optimal foraging
C) dominance hierarchies
D) animal cognition
E) territoriality

9) Which of the following levels of organization is arranged in the correct sequence from most to least inclusive?
A) community, ecosystem, individual, population
B) ecosystem, community, population, individual
C) population, ecosystem, individual, community
D) individual, population, community, ecosystem
E) individual, community, population, ecosystem

10) Which of the following are important biotic factors that can affect the structure and organization of biological communities?
A) precipitation, wind
B) nutrient availability, soil pH
C) predation, competition
D) temperature, water
E) light intensity, seasonality
11) In temperate lakes, the surface water is replenished with nutrients during turnovers that occur in the
A) autumn and spring.
B) autumn and winter.
C) spring and summer.
D) summer and winter.
E) summer and autumn.

12) Which of the following causes Earth's seasons?
A) global air circulation
B) global wind patterns
C) ocean currents
D) changes in Earth's distance from the sun
E) the tilt of Earth's axis

13) Which marine zone would have the lowest rates of primary productivity (photosynthesis)?
A) pelagic
B) abyssal
C) neritic
D) continental shelf
E) intertidal

14) Phytoplankton is most frequently found in which of the following zones?
A) oligotrophic
B) photic
C) benthic
D) abyssal
E) aphotic

15) Tropical grasslands with scattered trees are also known as
A) taigas.
B) tundras.
C) savannas.
D) chaparrals.
E) temperate plains.

16) The growing season would generally be shortest in which of the following biomes?
A) savanna
B) temperate broadleaf forest
C) temperate grassland
D) tropical rain forest
E) coniferous forest
17) Trees are not usually found in the tundra biome because of
A) insufficient annual precipitation.
B) acidic soils.
C) extreme winter temperatures.
D) overbrowsing by musk ox and caribou.
E) permafrost.

18) The most common kind of dispersion in nature is
A) clumped.
B) random.
C) uniform.
D) indeterminate.
E) dispersive.

Use the survivorship curves in Figure 53.1 to answer the following questions #19-20.

![Survivorship Curves](image)

19) Which curve best describes survivorship in marine mollusks?

20) Which curve best describes survivorship in elephants?

21) Pacific salmon or annual plants illustrate which of the following?
A) cohort
B) dispersion
C) Allee effect
D) iteroparous
E) semelparous

22) Which of the following characterizes relatively K-selected populations?
A) offspring with good chances of survival
B) many offspring per reproductive episode
C) small offspring
D) a high intrinsic rate of increase
E) early parental reproduction
23) Carrying capacity is
A) seldom reached by marine producers and consumers because of the vast resources of the ocean.
B) the maximum population size that a particular environment can support.
C) fixed for most species over most of their range most of the time.
D) determined by density and dispersion data.
E) the term used to describe the stress a population undergoes due to limited resources.

Use the graphs below to correctly answer questions #24-25.

24) Which of the following graphs illustrates the population growth curve of single bacterium growing in a flask of ideal medium at optimum temperature over a 24-hour period?

25) Which of the following is a likely graphic outcome of a population of deer introduced to an island with an adequate herbivory and without natural predators, parasites, or disease?
The following question #26 refer to Figure 53.3, which depicts the age structure of three populations.

![Figure 53.3](image)

26) Which population is in the process of decreasing?
A) I
B) II
C) III
D) I and II
E) II and III

27) An ecological footprint is a construct that is useful
A) for a person living in a developed nation to consider to make better choices when using global food and energy resources.
B) for a person living in a developing country to see how much of the world's resources are left for him/her.
C) in converting human foods' meat biomass to plant biomass.
D) in making predictions about the global carrying capacity of humans.
E) in determining which nations produce the least amount of carbon dioxide from the burning of fossil fuels.

28) Which of the following is the most logical conclusion about the distribution of the two species of barnacle, *Chthamalus* and *Balanus*?
A) *Chthamalus* and *Balanus* compete for the same types of food.
B) *Balanus* is less able to resist desiccation than *Chthamalus*.
C) *Chthamalus* prefers higher temperatures than *Balanus*.
D) *Balanus* is a better osmoregulator than *Chthamalus*.
E) *Chthamalus* is preyed upon more than *Balanus* by birds because of its size.
Infant mortality and life expectancy at birth in developed and developing countries. 
(Data as of 2005.)

Figure 53.4

29) What is a logical conclusion that can be drawn from the graphs above?
A) Developed countries have lower infant mortality rates and lower life expectancy than developing countries.
B) Developed countries have higher infant mortality rates and lower life expectancy than developing countries.
C) Developed countries have lower infant mortality rates and higher life expectancy than developing countries.
D) Developed countries have higher infant mortality rates and higher life expectancy than developing countries.

30) Which of the following statements is consistent with the principle of competitive exclusion?
A) Bird species generally do not compete for nesting sites.
B) The density of one competing species will have a positive impact on the population growth of the other competing species.
C) Two species with the same fundamental niche will exclude other competing species.
D) Even a slight reproductive advantage will eventually lead to the elimination of the less well adapted of two competing species.
E) Evolution tends to increase competition between related species.

31) The sum total of an organism's interaction with the biotic and abiotic resources of its environment is called its
A) habitat.
B) logistic growth.
C) biotic potential.
D) carrying capacity.
E) ecological niche.
32) Which of the following best describes resource partitioning?
A) Competitive exclusion results in the success of the superior species.
B) Slight variations in niche allow similar species to coexist.
C) Two species can coevolve to share the same niche.
D) Differential resource utilization results in the decrease in species diversity
E) A climax community is reached when no new niches are available.

33) Which of the following is an example of cryptic coloration?
A) bands on a coral snake
B) brown color of tree bark
C) markings of a viceroy butterfly
D) colors of an insect-pollinated flower
E) a "walking stick" insect that resembles a twig

34) 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.

35) Which of the following terms best describes the interaction between termites and the protozoans that feed in their gut?
A) commensalism
B) mutualism
C) competitive exclusion
D) ectoparasitism
E) endoparasitism

36) Approximately how many kg of carnivore production can be supported by a field plot containing 2000 kg of plant material?
A) 20,000
B) 2,000
C) 200
D) 20
E) 2
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

37) Which letter represents an organism that could be a primary consumer?
   A) A
   B) B
   C) C
   D) D
   E) E

38) 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.

39) 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.

40) Subtraction of which of the following will convert gross primary productivity into net primary productivity?
   A) the energy contained in the standing crop
   B) the energy used by heterotrophs in respiration
   C) the energy used by autotrophs in respiration
   D) the energy fixed by photosynthesis
   E) all solar energy
Use the following diagram of five islands formed at around the same time near a particular mainland and MacArthur and Wilson's island biogeography principles to answer the following questions.

![Diagram of five islands](image)

Figure 54.4

41) Which island would likely have the greatest species diversity?

42) What is the most important role of photosynthetic organisms in an ecosystem?
   A) converting inorganic compounds into organic compounds
   B) absorbing solar radiation
   C) producing organic detritus for decomposers
   D) dissipating heat
   E) recycling energy from other trophic levels

43) If you wanted to convert excess grain into the greatest amount of animal biomass, to which animal would you feed the grain?
   A) chickens
   B) mice
   C) cattle
   D) carp (a type of fish)
   E) mealworms (larval insects)

44) Nitrogen is available to plants only in the form of
   A) N2 in the atmosphere.
   B) nitrite ions in the soil.
   C) uric acid from animal excretions.
   D) amino acids from decomposing plant and animal proteins.
   E) nitrate ions in the soil.

45) The high levels of pesticides found in birds of prey is an example of
   A) eutrophication.
   B) predation.
   C) biological magnification.
   D) the green world hypothesis.
   E) chemical cycling through an ecosystem.
46) Which of the following is caused by excessive nutrient runoff into lakes?
A) depletion of atmospheric ozone
B) turnover
C) biological magnification
D) greenhouse effect
E) eutrophication

47) Which of the following is primarily responsible for limiting the number of trophic levels in most ecosystems?
A) Many primary and higher-order consumers are opportunistic feeders.
B) Decomposers compete with higher-order consumers for nutrients and energy.
C) Nutrient cycles involve both abiotic and biotic components of ecosystems.
D) Nutrient cycling rates tend to be limited by decomposition.
E) Energy transfer between tropic levels is in almost all cases less than 20% efficient.

48) Trophic efficiency is
A) the ratio of net secondary production to assimilation of primary production.
B) the percentage of production transferred from one trophic level to the next.
C) a measure of how nutrients are cycled from one trophic level to the next.
D) usually greater than production efficiencies.
E) about 90% in most ecosystems

49) How does phosphorus normally enter ecosystems?
A) cellular respiration
B) photosynthesis
C) rock weathering
D) geological uplifting (subduction and vulcanism)
E) atmospheric phosphorus dust

50) Which of the following lists of organisms is ranked in correct order from lowest to highest percent in production efficiency?
A) mammals, fish, insects
B) insects, fish, mammals
C) fish, insects, mammals
D) insects, mammals, fish
E) mammals, insects, fish