BIO120 Sample Test Questions - Ecology

1. What is the sequence of events resulting in a change of temperature by 3 degrees Celsius under conditions of adiabatic cooling?

    i. Air descends 100 meters.
    ii. Air temperature decreases.
    iii. Air pressure increases.
    iv. Air rises 300 meters.
    v. Air pressure decreases.
    vi. Air temperature increases.

    a. i iii vi
    b. vi iii iv
    c. iv v vi
    d. v iv iii
    e. iv v ii

2. Which is a characteristic of desert biomes?

    a. Interspecific competition is important in structuring communities.
    b. Large seed banks have led to the evolution of animals which are specialized at exploiting these resources.
    c. Trees are not found here because of the frequent occurrence of fire.
    d. The biome is characterized by the extraordinary number of specialized plant-pollinator systems.
    e. High species diversity.

3. Which is the LEAST important factor in defining terrestrial biomes?

    a. Angle of incoming solar radiation
    b. The frequency of fire
    c. Temperature
    d. Precipitation
    e. Number of frost-free days

4. Which is NOT an example of adaptation to drought?

    a. Sclerophyllous vegetation
    b. Chamaephytes
    c. Thick leaves
    d. Xerophytes
    e. Deep plant roots

5. Which is NOT a demographic process?

    a. Immigration
    b. Emigration
    c. Birth
    d. Death
    e. Survivorship

6. In a life table, to what does the parameter s_x refer?
   a. Proportion of individuals of age x surviving to x + 1
   b. Proportion of individuals of age x dying by age x + 1
   c. Fecundity
   d. Survival of new-born individuals to age x
   e. Basic reproductive rate

7. What consequence of the imposition of the 200 mile limit off the Atlantic coast is implicated as part of the reason for the collapse of the Atlantic Cod fishery?
   a. Fishers in both the inshore and offshore fishery began to fish closer to shore.
   b. Inshore fishers began fishing in areas where the cod spawn (lay their eggs) causing disruption to the fish and reduced reproductive rates of the cod.
   c. This led to reduced fishing in the offshore fishery.
   d. Inshore fishers spent money on better equipment to fish further out to sea which acted as a disincentive to reduce fishing as the fish density declined.
   e. The number of inshore fishers increased.

8. Economic models of fish management suggest that fish stocks should be maintained at the point called the Maximum Sustainable Yield (MSY). What stock size is considered to be preferable from an ecological point of view?
   a. The stock size at K/2
   b. The stock size at K
   c. Stock sizes greater than the stock size at MSY
   d. Stock sizes less than the stock size at MSY
   e. The stock size at MSY

9. Which of the following has NOT been implicated as a reason for the dramatic decline of the Atlantic cod stocks?
   a. New technology made fishing more efficient.
   b. Catch per unit effort decreased.
   c. Proportionally more juveniles were discarded.
   d. The decline in older, fecund female fish reduced the overall reproductive rate of cod.
   e. Juvenile recruitment declined.

10. What is the SLOSS debate?
    a. A debate about whether sloths evolved in South or North America.
    b. A debate about whether the Sloss plant is a human-made hybrid or whether it also occurs in the wild.
    c. A debate about the best strategy for preserving biodiversity through the establishment of reserves.
    d. The minimum viable population needed to preserve large predators.
    e. 50 versus 500 as the minimum population size to prevent inbreeding depression.

11. What is the "rule of thumb" for the minimum viable population size?

a. 100
b. 1000
c. 50
d. 500
e. 10,000

12. What happens to the quality of incident radiation (sunlight) as it passes through the atmosphere and into the deep ocean?

a. The range of wavelengths present becomes smaller.
b. The light intensity increases.
c. More red light is transmitted.
d. Longer wavelengths are more common than shorter wavelengths.
e. Light does not penetrate deeper than 1m below the ocean surface.

13. At what population size is the growth increment the greatest?

a. N
b. r
c. K
d. 10% of K
e. 50% of K

14. What stage of photosynthesis has been modified by evolution to produce photosynthesis in C4 and CAM plants?

a. Calvin cycle
b. Absorption of light
c. Absorption of CO_2
d. Light reaction stage
e. The oxidization of NADPH

15. Which of the following is not necessary for the fixation of inorganic carbon to organic carbon?

a. ATP
b. NADPH
c. An electron donor
d. Inorganic carbon
e. Sunlight

Questions 18 and 19 pertain to information provided in the following table:

Fitness can be quantified on a scale where 1 is highest and 0 is lowest. This table reports the fitness (a measure of genetic contribution to the next generation) of species A, B and C in the presence of a second interacting species. Note that the fitness of A, B and C is 0.5 (along the diagonal) in the absence of a second species.

Interacting Species	Fitness of A	Fitness of B	Fitness of C
A	0.5	0.7	0.7
B	0.6	0.5	0.5
C	0.3	0.5	0.5

16. What is the nature of the relationship between A and B?

a. Mutualism
b. Neutral
c. A is a predator, herbivore or parasite of B
d. B is a predator, herbivore or parasite of A
e. Competition

17. What is the nature of the relationship between A and C?

a. Mutualism
b. Neutral
c. A is a predator, herbivore or parasite of C
d. C is a predator, herbivore or parasite of A
e. Competition

18. Which of the following would NOT characterize plants living in the understory of a tropical rainforest?

a. Increased pigment concentration to capture more sunlight.
b. Adapted to high light conditions.
c. Possess pigments active in the blue range of PAR.
d. Tolerant of shade.
e. Adapted to high humidity.

19. What term(s) in the equation for basal metabolic rate, $m=cM^{0.75}$ is a variable?

a. m
b. M
c. c
d. all of the above
e. a and b

20. In the logistic equation of population growth, what does the expression (K-N)/K represent?

a. The effect of population crowding.
b. The effect of loss to predation.
c. Exponential growth.
d. Type II survival curve.
e. Increases from more births.

21. Compared to the largest mammal in a community, which of the following is NOT true about the smallest mammal in the same community?

a. It has a shorter lifespan.
b. It has a higher rate of physical activity.
c. It is better able to survive a long period of food shortage.
d. It has a lower metabolic rate.
e. It is more specialized in resource use.

22. What is the usual rate of energy transfer between trophic levels?

a. 5% - 20%
b. 20% - 30%
c. 30% - 40%
d. 40% - 50%
e. 50% - 60%

23. Which of the following is NOT a characteristic of photosynthesis?

a. Can occur in the absence of oxygen.
b. Can involve a C4 pathway.
c. Energy from oxidation reaction can be a raw material.
d. Inorganic carbon is a raw material.
e. Includes a phase called Calvin Cycle.

24. What is a common characteristic of compounds that are likely to biomagnify in ecosystems?

a. High number of chlorine atoms.
b. High solubility in water.
c. Highly biodegradable.
d. Low lipophilicity.
e. Concentration declines at higher trophic levels.

25. In general, in which trophic level will the total biomass be greatest in a terrestrial ecosystem?

a. Herbivores
b. Primary consumers
c. Secondary consumers
d. Tertiary consumers
e. Producers

26. Populations of predators and their prey often cycle between population increases and decreases over time. Which of the following is NOT characteristic of these systems?

a. The prey population is larger at the peaks than the predator population.
b. The duration of these cycles is relatively constant over long periods of time
c. A classic ecological example is the lynx and snowshoe hare population cycles.
d. The prey population is often driven to extinction (the population disappears entirely).
e. The population decline of the predator species typically lags behind that of the prey.

27. Which statement about plant-insect interactions is FALSE?
    a. Some plants defend themselves from herbivores by providing resources to predators.
    b. Plants typically respond with a greater defensive reaction to real herbivory than to damage by scissors.
    c. The interactions between plants and parasitoids is often positive.
    d. Batesian mimicry is thought to be a consequence of coevolution.
    e. In the experiment we considered in class, the presence of domatia had a positive effect on herbivore fitness. (2013 students: we did not look at this experiment)

28. Compared to an interior forest habitat, which of the following is NOT characteristic of habitat at the forest edge?
    a. Soil temperature is warmer.
    b. The air is more humid.
    c. The air is warmer.
    d. Bird nests are more likely to be predated.
    e. It is sunnier.

29. Which of the following is NOT a mechanism by which lipophilic chemical contaminants can move through ecological systems?
    a. The "Grasshopper effect"
    b. Animal transport
    c. Biomagnification
    d. Calvin cycle
    e. Transport by moving air masses

30. If you wanted to minimize the possibility of ingesting organochlorides from products of Lake Ontario (one of the Great Lakes) what food would be most appropriate?
    a. Salmon (a top predator fish)
    b. Perch (a medium-sized predator fish)
    c. Mallard duck (eats aquatic vegetation)
    d. Catfish (mollusc and insect-eating fish)
    e. Smelts (fish that eats zooplankton and insects)

31. Which method has been well used to count Lake Trout in Lake Opeongo, Algonquin Park?
    a. Medium quadrat method
    b. Territory mapping
    c. Aerial surveys
    d. Creel survey
    e. Pellet counts

32. Which method is most reliable for counting moose in Algonquin Park?
    a. Medium quadrat method
    b. Aerial surveys
    c. Territory mapping
    d. Creel survey
    e. Pellet counts

33. What is NOT a prediction of the Green World Hypothesis?

a. Plants and predators compete.
b. Herbivores do not compete with each other.
c. Herbivore populations are limited by top-down forces.
d. Herbivores are food limited.
e. The number of predators has a limiting effect on the number of herbivores.

34. Based on the computer model *Saving the Whooping Crane*, what type of management is most cost-effective for the 1941 Whooping Crane population?

a. Removing wolves on the breeding grounds.
b. Replacing infertile eggs with fertile eggs.
c. Reducing death rates of migrating birds.
d. Providing food on the wintering grounds.
e. Providing food on the breeding grounds.

35. Why did the plant Prickly Pear Cactus increase so dramatically when it was introduced into Australia?

a. It had no competitors in Australia.
b. Australian soils were unusually high in nutrients which favored growth.
c. The species was protected by laws which prohibited collection of the plant in the wild.
d. It had no natural predators.
e. The plants were protected from predators by symbiotic ants.

36. What is the nature of the relationship between ants and aphids?

a. Competition
b. Mutualism
c. Predation
d. Herbivory
e. Tolerance

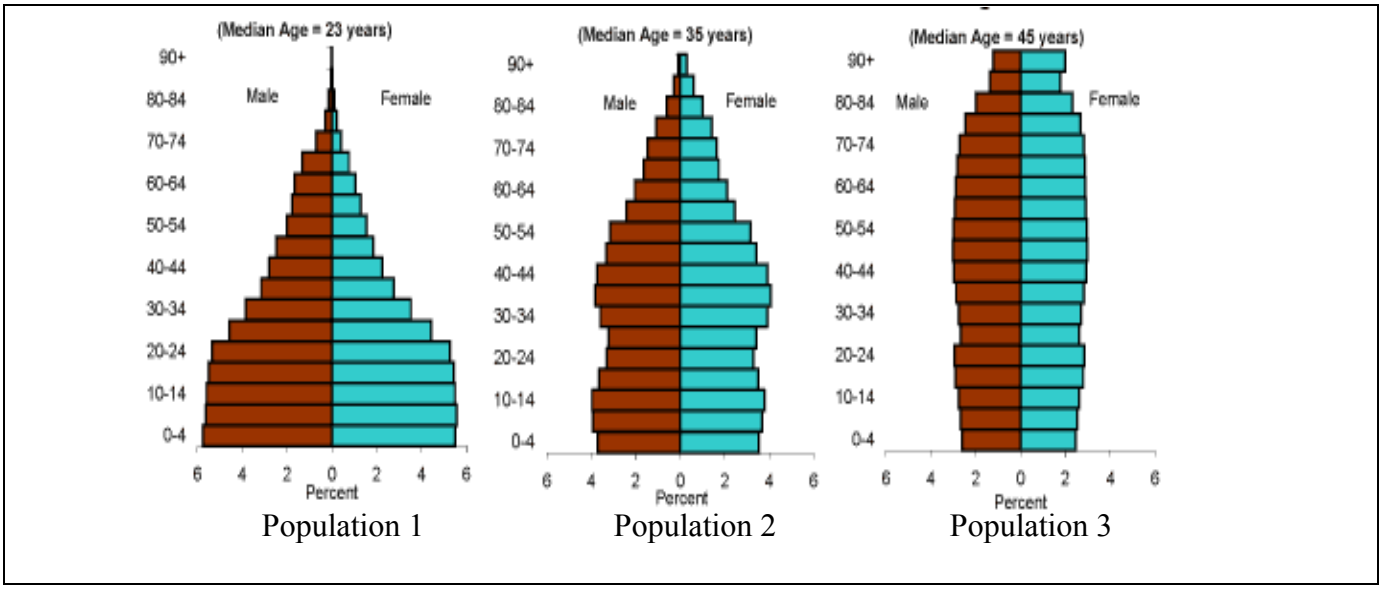
37. If plant defense is a phenotypically plastic trait, the amount of plant defense should:

a. remain high at all times.
b. be greatest in the juvenile life stages.
c. increase with increased herbivory.
d. decrease in poor quality soils.
e. be very low.

38. A famous quote is “the enemy of my enemy is my friend”. What biological phenomenon that we considered could be described in this way?

a. The relationship between prickly pear cactus and the caterpiller *Cactoblastus cactorum*.
b. The relationship between ants and aphids.
c. The relationship between maize (corn) and the parasitic insect of the plant’s herbivore, the beet army worm.
d. The relationship between termites and their wood hosts.
e. The relationship between the introduced ladybug *Harmonia* and the native ladybug *Coccinella*.

Questions 39 and 40 pertains to the following figure.



Population 1 Population 2 Population 3

39. Assuming that RO (and r) is the same for all three populations, which statement is CORRECT?

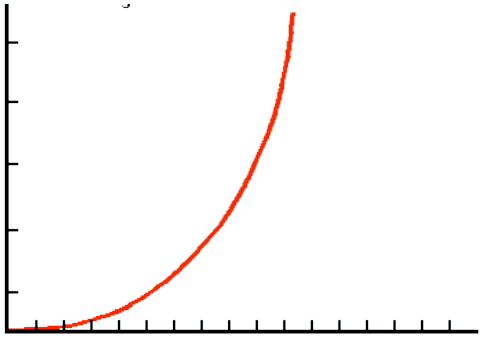
a. The three populations are growing at the same rate.
b. Population 3 is the fastest growing population.
c. Population 2 is the slowest growing population.
d. Population 1 is the fastest growing population.
e. The sex ratio is strongly female-biased in population 3.

40. What do these figures show?

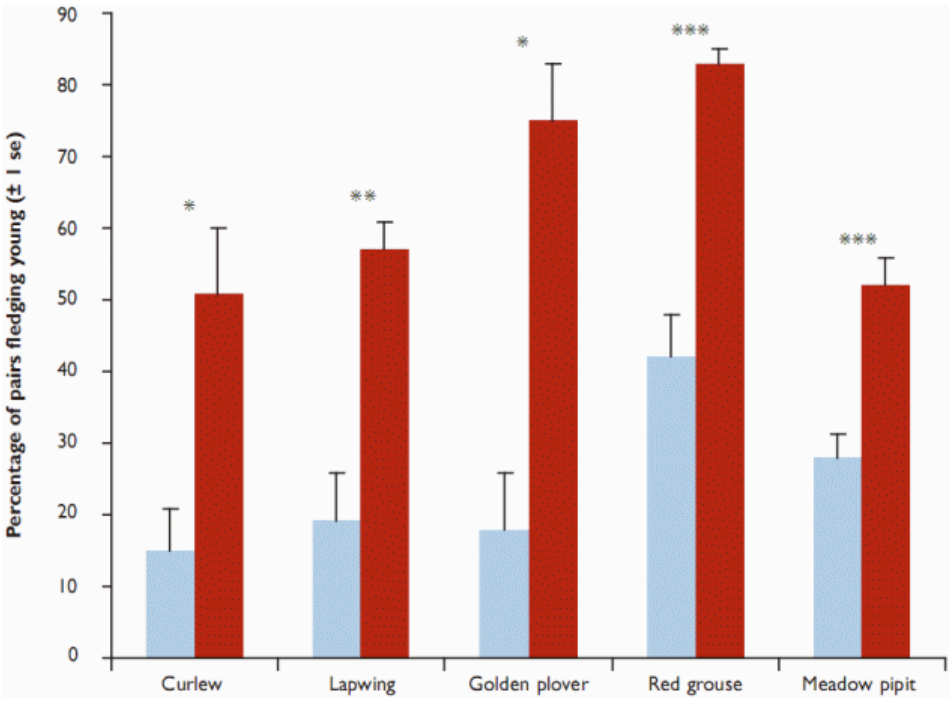
a. The mortality rates of people in a population in various age categories.
b. The percent of people in a population in various age categories.
c. The average age of people in a population.
d. The fertility rates of people in a population in various age categories.
e. Emigration rates of a population.

41. The following graph can be described by the ecological equation rN. What best describes the labels for the Y and X axes?

a. Y is time and X is number of offspring
b. Y is growth rate and X is time
c. Y is time and X is number of individuals
d. Y is growth increment and X is population size
e. Y is number of individuals and X is time



Questions 42 and 43 pertain to the figure below which shows the results of a study of the nest success of several bird species which make their nests on the ground in marsh habitat. Scientists measured nest success in several places. Success of nests surrounded by fences to exclude ground predators was compared to nests which were not fenced and therefore accessible to predators.



Breeding success of ground-nesting birds in plots with predator excluded (dark bars) and in plots where predators were not excluded (light coloured bars). Levels of significance: P<0.05=, P<0.01=, P<0.001=.

42. Which of the following statements is TRUE given the information provided?

a. The study of lapwing birds was the control treatment and the study of curlew birds was the experimental treatment.
b. Predator exclusion was the experimental treatment and not excluding predators was the control treatment.
c. Studying nest success at many sites was the control treatment.
d. Predator exclusion was the control treatment and not excluding predators was the experimental treatment.
e. Measuring nest success was the experimental treatment.

43. Which species appears to have benefited most from the experimental treatment?

a. Red grouse and Meadow pipits (note: these are the two with the smallest P values)
b. Curlews and Golden plovers.
c. Lapwings.
d. Red grouse and Golden plovers.
e. None of the species benefited from the experimental treatment.