

There should be 9 pages to this exam. Put your name on the first page of the exam, and on each of the last few pages (those with short answer or essay questions).

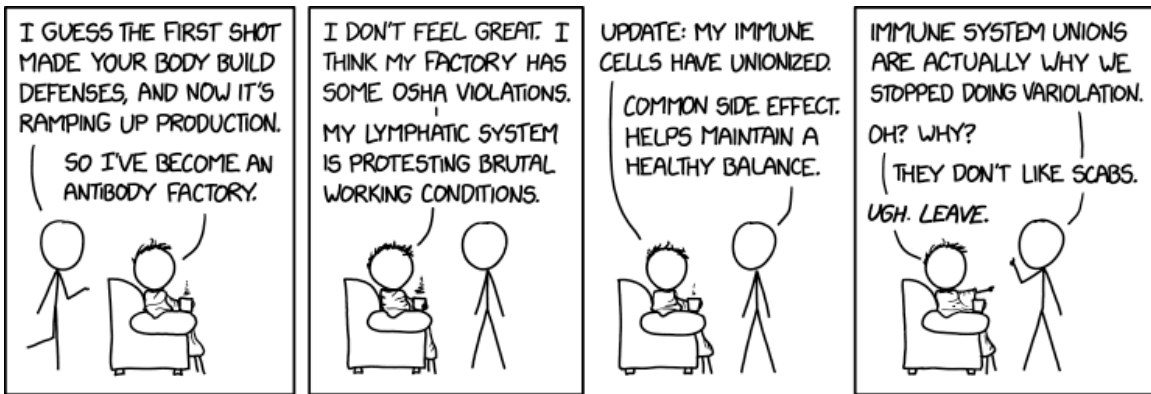
On the answer (bubble) sheet, **please fill in:**

- Student ID (All 9 spaces -use leading zeros as needed)
- Last Name and First Initial, Course info (3100-217-001) & Test Form (this is test form A).

READ THE ESSAY AND SHORT ANSWER QUESTIONS CAREFULLY!

Equations: M/N=R/C

	SCORE
Multiple choice: 23 questions (46 points total); 2 points each x _____ ==>	_____
Short answers: 23) 8 points	_____
24) 8 points	_____
25) 4 points	_____
26) 25 points	_____
Total (93 points)	_____ = _____ %



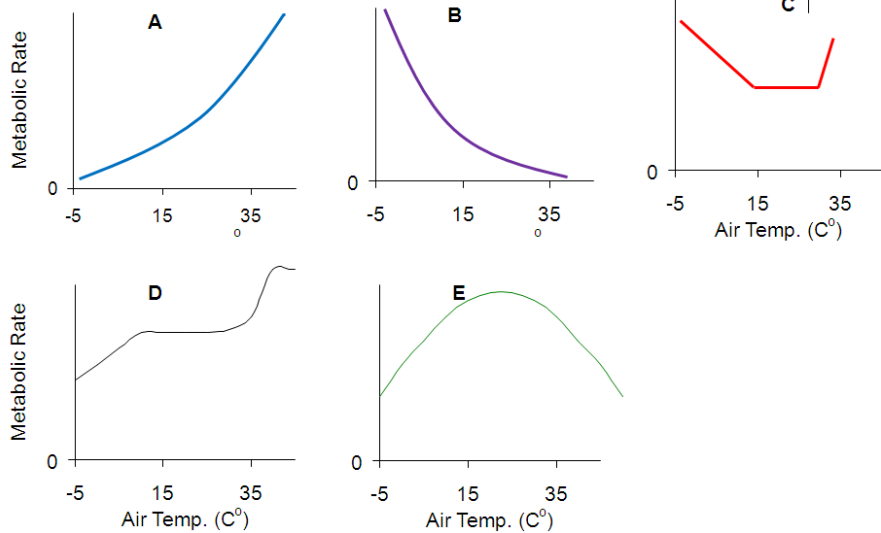
Xkcd.com

Multiple Choice questions: 2 points each. Please put your answers to this section on the Bubble Sheet. Feel free to use the question sheet for scratch work. Each question has only one correct answer. You will not be penalized for guessing on this section. Fill in your Answer Sheet carefully. Make sure that the number of the question matches the number whose bubble you're filling in!

1. Akron is in which of the following biomes?

- a. Savanna
- b. Tundra
- c. Mediterranean Woodland
- d. Temperate Forest
- e. Boreal Forest

2. In class we discussed Trevor, a toad that was found by Joel during a visit to the Rocky Mountains. Which of these graphs should best describe how Trevor's metabolic rate would change with air temperature in that situation?



3. Spadefoot toad tadpoles come in two different forms (morphs): carnivores and omnivores. A single genotype can produce either form, and the form that an individual grows into depends on the environment in which it develops. This is an example of:

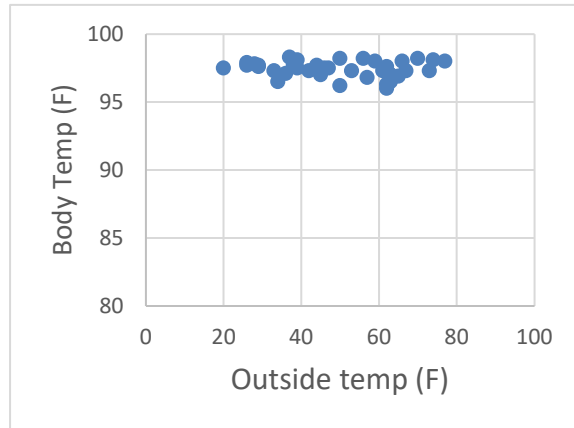
- a. phenotypic plasticity
- b. countercurrent exchange
- c. senescence
- d. C4 photosynthesis
- e. euryhaline

4. For one assignment in this class you read an article by Harvey Lilywhite about osmotic stress in 'sea kraits.' What kind of organism is a 'sea krait'?

- a. Coral
- b. Fish
- c. Algae
- d. Snake
- e. Seagull

5. During the COVID outbreak, Dr. Mitchell recorded his body temperature along with the ambient (outside) temperature. Which of the following statements about Dr. Mitchell best describes these data?

- He is acting as a homeotherm
- He is acting as a heterotherm
- He is acting as a poikilotherm
- He is undergoing torpor
- He is warm-blooded

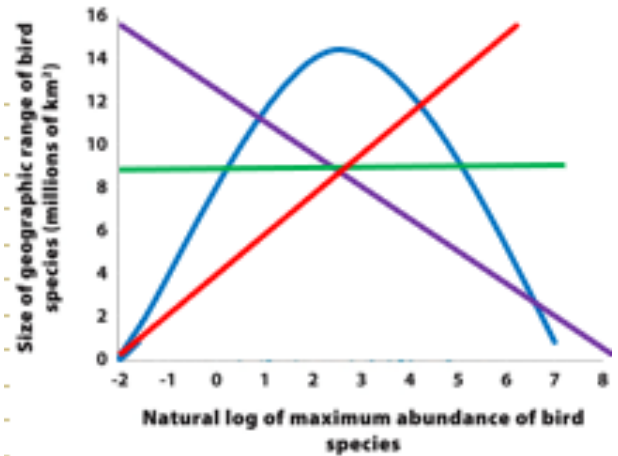


6. Plants grown in soils that are not well fertilized will most likely allocate more energy into which of the following categories?
- Seed
 - Flower
 - Leaf
 - Stem
 - Root
7. Which of the following is an advantage that plants with C4 photosynthesis have over plants that rely only on C3 photosynthesis?
- C4 plants show a saturating response to light abundance
 - C4 plants can close their stomata more often, which reduces water loss
 - C4 plants can open their stomata more often, which allows them to increase the amount of sunlight they receive
 - C4 plants have higher transpiration rates than do C3 plants
 - C4 plants can reduce leaf temperature better than can C3 plants
8. Shorebirds often nest in large colonies on sandy beaches and sand pits. These birds maintain small territories surrounding their nests. The nests are packed fairly densely on the sand, each nesting pair maintaining a uniform minimum distance between its nest and those belonging to other pairs. What kind of dispersion might you expect in these nests?
- clumped
 - evenly spaced
 - random
 - irregular
9. The transfer of heat between two touching solid bodies with different temperatures is
- radiation.
 - conduction.
 - convection.
 - evaporation.
 - insulation.

10. For which of the following would Ecological Niche Modeling be most useful?
- Predicting the range of a potentially invasive animal
 - Determining whether an animal has an Eltonian Niche or a Hutchinsonian Niche
 - Predicting population size
 - Designing an experiment about niche axes
 - Measuring the extent of competition between two species
11. In your study of squirrel ecology, you decide to manipulate both the availability of nuts, and the availability of nestsites in the area around The University of Akron campus. After a year you census the squirrel population in dozens of experimental plots, and find the following results (average number of squirrels per plot), which is highly statistically significant:
- | | |
|------------------------------------|---------------------|
| <i>Plots with nuts added:</i> | <i>11 squirrels</i> |
| <i>Plots with nestsites added:</i> | <i>20 squirrels</i> |
| <i>Plots with both added :</i> | <i>40 squirrels</i> |
| <i>Plots with neither added:</i> | <i>10 squirrels</i> |
- Which of the following statements best describes the results of this experiment?**
- Squirrel populations are not limited by nuts or nestsites
 - Squirrel niche requirements are met throughout eastern North America
 - Squirrel habitats are not well supplied with nuts
 - The niche of squirrels does not involve nuts or nestsites
 - Squirrels show an interaction between their requirements for nuts and nestsites
12. Some birds save energy by allowing their body temperature to drop by a large amount over night. This is called:
- Endothermy
 - Homeothermy
 - Torpor
 - Hypothermy
 - Elastothermy
13. Which of these statements is most correct about the essential difference between ecology and environmentalism?
- Ecology concerns study of organisms, while environmentalism concerns study of organisms and their environment
 - Ecology is a branch of science, while environmentalism is a branch of politics
 - They are really the same things
 - One is a philosophy and the other is a thought process
 - Ecology focuses on policy while environmentalism focuses on basic principles

14. In class we saw a video about a frog that was able to freeze solid during the winter, and emerge healthy again in the spring. What explanation for this remarkable ability was offered?
- Hibernation in a warm burrow
 - Eating particular plants and insects just before the winter
 - Periodic bouts of warming
 - Counter current circulation
 - Sugars and other antifreeze chemicals in the blood
15. Your book explains that you would use a mark-recapture study to quantify which of the following?
- population size
 - growth rate
 - thermodynamic equilibrium
 - homeostasis
 - foraging rate

16. The figure to the right compares attributes of different species. We saw this graph in class: what relationship is usually found between total abundance and range size?

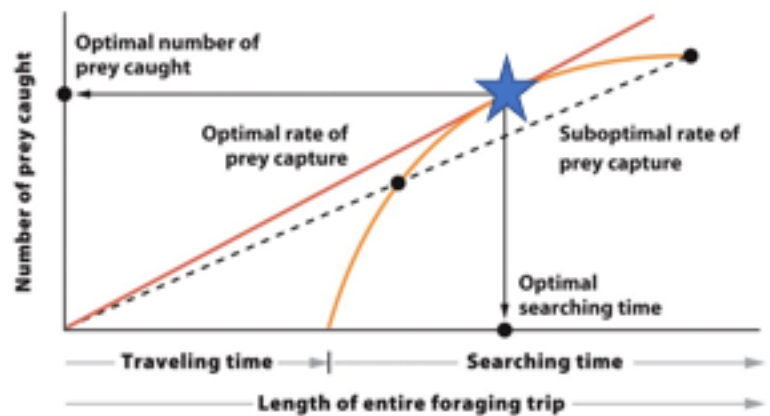


- Increase
- Decrease
- No relationship
- Hump
- None of the above

17. Which of the following increases as one moves from the tropics to the poles?
- length of the growing season
 - mean annual temperature
 - seasonal range in temperatures
 - rainfall
 - all of the above
18. An ecologist who studies populations would most likely be interested in
- plastic responses of individual organisms to a particular environment.
 - births and deaths of individuals of a population of a particular species in a particular place.
 - the number and relative abundances of species living in a particular place.
 - physical and chemical transformations of energy and materials in the soil, atmosphere, and water.
 - transport of energy and materials at the global scale.

19. Your book suggests that the star in this figure represents the optimal rate of prey capture. Which of the following is the best explanation for that statement?

- This point maximizes the number of prey caught
- This point minimizes search time
- This point minimizes foraging time
- This point reduces exposure to predation
- This point maximizes energy / unit time



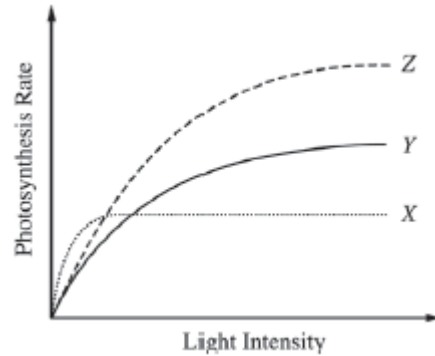
20. Which of the following is used to increase the ability of fish gills to extract oxygen extraction from water?

- boundary layers
- countercurrent circulation
- concurrent circulation
- circular circulation
- hydrogen ion circulation

21. A hundred years ago Asian Carp (e.g., bighead carp) were only found in lakes and streams of China and nearby countries. However, Asian Carp were introduced to the US for fish farming in the 20th century, and have now spread through rivers and lakes of the central Midwest. They are likely to invade the Great Lakes of North America in the next few years. Based on this information, which of the following conclusions is justified?

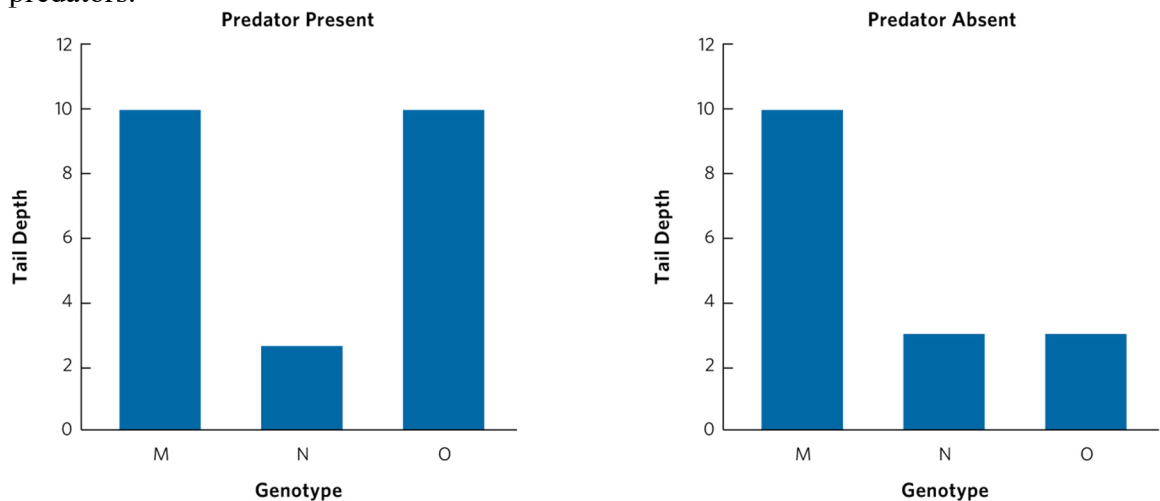
- The fundamental niche of Asian Carp did not include the conditions found in the Great Lakes
- The Asian Carp have expanded their niche
- The distribution of the Asian Carp is decreasing.
- The distribution of Asian Carp was limited by dispersal.
- B and C

22. The graph above shows the photosynthetic response of three coexisting plant species (x, y, and z) to a gradient of light intensity. Based on these response curves, which of the following is most likely true?



- Species Y should outcompete species Z in all light environments
- Species Y is the tallest of the three
- Species X is the superior competitor in deep shade
- Species X has been artificially selected for high yield
- Removal of species X should allow the population of species Z to increase greatly

23. This figure shows the tail shape developed by three tadpole genotypes (M, N, and O) when raised in an environment with predators and an environment without predators.



In the presence of predators, tadpoles with large tails have high fitness and tadpoles with small tails have low fitness. When predators are not present, tadpoles with large tails have low fitness and tadpoles with small tails have high fitness. Which genotype(s) exhibit(s) phenotypic plasticity in response to predators?

- M only
- N only
- O only
- Both M and N
- Both N and O

Short answer

- f) 8 points. Explain the differences between the Hutchinsonian niche and the Eltonian niche
- g) 8 points. Draw a fully labeled graph representing how an organism's performance typically varies with abundance of an important resource. Explain in words how and why this would differ from the response to a 'condition' of the environment.
- h) 4 points. In class we discussed the factors used to decide whether a species is 'rare'. List **two** of those attributes, and for each, provide a few words of explanation.

i) 25 pts. Pre-prepared review sheet question: Remember: your answer should be well-reasoned & well-written - outline format is not acceptable. Your answer should fit on this page
The map below shows the 2020 distribution of the Spotted LanternFly (Lycorma delicatula). This species originated in Asia and has in recent years expanded its range as shown in the map.

- Describe the major features of this distribution that are of importance for an understanding of its ecology.*
- Suggest two testable ecological hypotheses to explain this pattern of distribution*
- For one of your hypotheses, describe in general terms how you could test this hypothesis, with a brief explanation of what sorts of outcomes would support or refute your hypothesis.*

