

There is a single correct answer for each question - chose the **MOST** appropriate answer. All questions carry equal marks. Read the questions carefully.

- 1 All of the following statements about the logistic model of population growth are true **EXCEPT** :
- a) It fits an 's' shaped curve.
 - b) It incorporates the concept of a carrying capacity.
 - c) It describes changes in population density over time.
 - d) It predicts an equilibrium where birth rates will equal death rates.
 - e) **The carrying capacity is determined by the action of predators.**

*This is an example of a question where the right answer (i.e. the statement that is incorrect), e , might initially seem plausible because the carrying capacity might be determined by the action of predators. But the answer says 'is determined' implying that this is **always** the case, and this is clearly incorrect.*

- 2 A biologist reports that at Mount Meru he observed 21 Wildebeest per square kilometer. What is the biologist measuring?
- a) Dispersion
 - b) Carrying capacity
 - c) Range
 - d) **Density**
 - e) Competition

I think this one is just a bit too easy.

- 3 Species extinction rates are higher on small islands than larger islands because:
- a) Small islands are usually further from the mainland.
 - b) Small islands are harder for dispersers to find.
 - c) **Average population sizes are smaller on small islands.**
 - d) Small islands are more polluted.
 - e) Evolution occurs faster on small islands.

Answer a) may, or may not, be true but it isn't clear how this relates to extinction rates. Answer b) is certainly true but again this is unrelated to extinction rate. Answer c) is true and explains why extinction rates are higher. Answer d) probably isn't even true and answer e), even if true, would affect the rate of evolution of species and not extinction. You could perhaps make an argument for how d) and e) might lead to higher extinction rates but c) is clearly correct and simply explains the observed pattern. Occam says to go with c).

- 4 Fergus and Mel go to a restaurant and don't like the food they are served. They formulate the hypothesis that 'The chef sucks - we won't like any of the food in this restaurant'. If they continue to follow scientific method to investigate their hypothesis their next step should be:
- a) to become vegetarian
 - b) to try some alternative restaurants
 - c) **to return to the restaurant and order some alternative items from: the menu**
 - d) to call the city health inspectors
 - e) to get some friends to go to the restaurant

Remember the Citizen Dog comic strip with Fergus and Mel? I liked the fact that the dog did most of the driving. I think dogs would probably enjoy driving but would perhaps be too easily distracted. Anyway, I like this question too but it got retired after a couple of years. The next step in the scientific method is to test the hypothesis and the answer that fits best is c). By eating alternative items from the menu they are testing their hypothesis that they won't like any of the food at the restaurant. Answer e) was a popular wrong answer but the hypothesis specifically says 'we won't like any of the food' so getting friends to go to the restaurant does not test it.

- 5 Which of the following would be most likely to affect population growth of a species in a density dependent manner?
- a) Drought
 - b) Floods
 - c) **Disease**
 - d) Frost
 - e) Earthquakes

I didn't explicitly mention this feature this year, which would make this a fairly difficult conceptual question. On the other hand you can also take the short cut and notice that four of the answers are abiotic factors and one is a biotic factor. Generally we expect biotic factors to be more likely to be density dependent since biotic factors can increase in density themselves.

- 6 An introduced species is found to have a fundamental niche identical to that of a native species. A possible outcome is:
- a) one of the species will be driven to extinction as they compete.
 - b) evolutionary change will cause their niches to diverge.
 - c) they will exhibit distinct, and different, realized niches and coexist.
 - d) the introduced species may become extinct for reasons unrelated to competition.
 - e) **all of the above.**

Oops, this should be re-written as a I, II, III type question. That might make it a bit harder too since as it currently is, I think it is fairly obvious the answer has to be e) once you see that at least two of the statements are correct.

- 7 Which of the following is **NOT** an assumption of the logistic equation:
- a) The relationship between density and the per capita rate of increase is linear.
 - b) All individuals reproduce equally
 - c) There is no immigration or emigration
 - d) **The carrying capacity is proportional to the population density**
 - e) The effect of density on the rate increase is instantaneous

Read the answers carefully. d) may briefly sound plausible but when you think about it for a moment it is ridiculous.

- 8 All of the following statements about communities are correct **EXCEPT**:
- a) Closely related species may be able to coexist if there is at least one significant difference in their niches.
 - b) **Keystone predators reduce diversity in a community by holding down or wiping out prey populations.**
 - c) Mutualism is an important biotic interaction that occurs in communities.
 - d) Disturbances may increase the diversity in a community.

- e) Disturbances may decrease the diversity in a community

*It is hard to write wrong answers! One way around this, as you have seen, is to have 4 correct statements and one incorrect statement. To prevent the incorrect statement standing out too much it is usually dressed up in some plausible words. One common technique is to have the incorrect statement be the exact opposite of the truth. Here, for example, keystone predators usually **increase** diversity in a community by holding down prey populations.*

9 Highway 1 runs through the middle of Fanner Bob's Philosophical Chicken Farm. The chickens' roost on one side of the highway and their feeding trough is on the other side. Once per day each chicken crosses the road to feed and then returns back across the road to the roost. Chickens are occasionally struck by cars and killed and this is the main form of chicken mortality on the farm. Bob has just bought a new stock of 1000 chickens. What sort of survivorship curve would we expect to see?

- a) A type I curve
- b) A type II curve**
- c) A type III curve
- d) A combination of type I and type III with high juvenile mortality (like type III) followed by low mortality rates until almost all adults die in a short time period (like type III)

Okay, first the intent behind this question. 'Occasionally struck by cars' was meant to suggest each chicken had roughly constant probability of road death per day. Therefore a constant proportion of chickens would be killed each day. Thus translating to a type II curve. But when I got questions in the exam about chicken road crossing strategies (do they cross one at a time or all together?), truck wheel base dimensions (seriously) and the number of lanes of traffic on the highway I knew this question had taken on a life of its own.

10 As a habitat patch gets smaller which of the following statements is **INCORRECT**?

- a) The patch can support fewer species.
- b) The patch is influenced to an increasing degree by edge effects.
- c) Extinction rates increase.
- d) Immigration rates increase.**

Hmm, I'm becoming predictable. d) sounds plausible because it has the right words but is the exact opposite of what you would expect.

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