

BIO120H Mock Exam – 60 Multiple Choice Questions

2012 Fall

Created by students

Lectures 1-23 - Michael Liu

1. In lecture 1, Professor Thomson mentioned George Mallory's death on Mt. Everest. This best demonstrates what concept?

- a) Ranges of tolerance; lack of oxygen in the death zone of Mr. Everest
- b) Ubiquity of patchiness; there is less survivability on Mt. Everest because of the resources and conditions imposed by the environment
- c) Environmental gradients; temperatures decrease as you increase in elevation
- d) None of the above

2. Based on the Thomson's lectures, what is a proposed function of the sails on the *Dimetrodon* genus (the dinosaurs with sails on their backs)?

- a) Mate choice for sexual selection.
- b) Intra-sexual competition between males.
- c) Dumping heat to maintain thermal homeostasis.
- d) Defense against predators.

3. Which is not a tactic used by Kangaroo rats to adapt to its hot and dry climate?

- a) They are nocturnal.
- b) They are able to synthesize water biochemically from fat.
- c) They cache seeds underground.
- d) They enter torpor to slow down metabolism.

4. Which of the following is not an adaptation of cacti in their environment?

- a) Cacti pads, such as those of the prickly pear, are oriented east-west so their thin sides are facing the sun during the hottest time of the day.
- b) They have extensive but shallow roots to collect the most water possible during the rainy season.
- c) They have an accordion-pleated trunk that can expand to store up to 800L of water from episodic rains.
- d) All of the above are adaptations.

5. Identify the FALSE statement below. All of the statements are about population ecology.

- a) Individual fitness is maximized at the inflection point $K/2$.
- b) Difference equations are best for modeling populations that reproduce episodically.
- c) The population can grow over the carrying capacity, i.e. $N > K$.

d) Allee effects do not change the value of the carrying capacity.

6. Calculate λ from the given information in the table (you may use a calculator).

x (age)	L(x)	b(x)	L(x)b(x)	xL(x)b(x)
0	1	0	0	0
1	0.8	1	0.8	0.8
2	0.6	2	1.2	2.4
3	0.2	2	0.4	1.2

- a) 1
- b) 1.61
- c) 1.83
- d) 2.40

7. Which of the following statements is TRUE?

- a) Knowing the α values in the Lotka-Volterra equation allows us to determine if coexistence is possible between two species.
- b) It is more difficult for asexual reproducing species as opposed to sexual reproducing species to coexist.
- c) Stable coexistence from competition is nearly impossible to model in the lab.
- d) The niche differentiation theory currently involves studies of metapopulations, resource partitioning, and other factors that maintain biodiversity.

8. Which of the following is not a factor that can drive model populations to extinction?

- a) Unstable competition
- b) Unstable disease-host interaction
- c) Population overshoot
- d) Non-equilibrial conditions

9. The intermediate disturbance hypothesis states what?

- a) Species diversity is maximized when the disturbance is neither too great nor too little.
- b) A disturbance prevents a succession from reaching climax.
- c) Once primary succession reaches climax, a disturbance will cause it to undergo secondary succession.
- d) Two of the above.

10. Why is speciation more common in herbivores than carnivores?

- a) The arms race between specialist herbivores and plants give rise to new traits in both species.
- b) Herbivores need to develop new chemicals to better digest plant tissues.
- c) Herbivores need to develop new chemicals to be resistant to the microbial symbionts in its body.

d) Plants are more prone to genetic mutation and animals that eat plants are more likely to mutate and form new species.

11. Which of the following statements best describes the relationship between gophers, glacier lilies, and aspens?

- a) Gophers act as a keystone species, indirectly hurting both aspens and glacier lilies.
- b) Gophers act as a keystone species, indirectly helping glacier lilies by indirectly hurting aspens.
- c) Like forest fires, gophers act as a disturbance by directly harming aspens and glacier lilies and preventing climax.
- d) None of the above.

12. All of the following are accepted to be TRUE except:

- a) All organisms on earth have changed through time or gone extinct.
- b) All species have common ancestors.
- c) All evolutionary change results from natural selection.
- d) Biodiversity and adaptation are the products of evolution.

13. Evolution is science, whereas creationism is not. Extend and apply: what are some differences between psychological and philosophical approaches to answering questions?

- a) Psychology is a science because it answers questions using empirical observations.
- b) Psychology makes claims which are testable and falsifiable.
- c) Philosophy is not a science, rather, *philosophia est ars vitae* (philosophy is the art of life)
- d) All of the above.

14. In a symbiosis relationship between clownfish and sea anemone, the clownfish feed on small invertebrates harmful to the sea anemone and the sea anemone stings predators (clownfish are immune the sea anemone stings). In this mutual relationship, which of the following is FALSE?

- a) This interaction is follows with Gleason's organismal/holistic concept.
- b) This is a type of symbiotic relationship.
- c) The fitness of each species increases due to the presence of the other.
- d) None of the above.

15. Suppose one daisy in a patch of daisies has a mutation that turns all of its petals yellow instead of white. If no yellow daisies are found the next year, what can be ascertained?

- a) The mutation is lethal and kills the yellow daisy before it can reproduce.
- b) The mutation is deleterious is less fit.

- c) The mutation is neutral.
- d) None of the above.

16. Which of the following was not consistent with the classical school of genetic variation?

- a) They believed in a set of ideal characteristics: the wild type.
- b) They worked mostly with mutants.
- c) They predicted fixation and purifying selection in a heterozygous environment.
- d) They believed most species have high homozygosity and low polymorphism.

17. In which scenario is asexual reproduction most favoured?

- a) A tropical rainforest with gap-phase succession.
- b) A savannah frequently experiencing fires.
- c) A new oceanic island undergoing rapid development.
- d) All of the above are equally favourable/unfavourable.

18. Which one of the factors listed below does not increase the risk of transgenes flowing from a crop to a wild relative?

- a) Proximity of wild relatives
- b) Animal pollinator (as opposed to wind pollinated)
- c) Outcrosser (as opposed to selfer)
- d) All are factors.

19. Grant's 35 year study on Galapagos Finches found that these finches were subject to what type of selection?

- a) Stabilizing selection
- b) Directional selection
- c) Disruptive selection
- d) Artificial selection

20. Heavy metal tolerance in plants is an example of evolution by pollution. Why is there no gene flow between the metal tolerant plants and the normal plants?

- a) Premating isolation – different flowering times.
- b) Postmating isolation – hybrids have extremely low fitness and are extrinsically isolated.
- c) Allopatric speciation – geographic isolation between mine tailings and normal pastures.
- d) None of the above.

21. Homoplasies are similarities in different species resulting from:

- a) Convergent evolution.
- b) Character state reversals.

- c) Common ancestor.
- d) Two of the above.

22. The barnyard grass is an invasive species that has evolved to mimic cultivated rice. In countries where weeding is done manually, the mimics which most resemble rice are more likely not to be recognized and weeded off by farmers. The selection here is:

- a) Natural selection.
- b) Artificial selection.
- c) Both.
- d) Neither.

23. The experiment done on the Purple Loosestrife in the common garden experiment shows:

- a) Biological control of this invasive species would be difficult because it has high genetic variation due to multiple introductions and outbreeding.
- b) Purple Loosestrife is an R-strategist.
- c) There is rapid local adaptation in Purple Loosestrife.
- d) Purple Loosestrife is a polyploid.

24. Which of the following shows how organisms respond to climate change?

- a) More and more pika populations have gone extinct in recent years.
- b) Habitat fragmentation threatens the endemic golden lion tamarin.
- c) Drought has a directional selection on field mustards.
- d) Two of the above.
- e) All of the above.

Lectures 15-23 - Linlei Ye

25. Which of the following traits will not follow Mendelian genetics?

- a) The colour of Wild Gladiolus.
- b) The variation in height of the human population.
- c) The texture of peas.
- d) The morphs of Water Hyacinth.

26. An experiment was done to measure the mean number of chaetae on *Drosophila melanogaster*. When artificial selection was performed for many generations, the results showed a steady increase in the number of chaetae. What can this imply?

- a) The artificial selection was done only on the flies with low numbers of chaetae.
- b) A mutation evolved that caused the increase in number of chaetae.
- c) There was large variation in the initial population and only certain individuals were picked to mate with each other.

d) Artificial selection has the same results as random mating.

27. In a heterozygous environment, which of the following may be TRUE?

a) Asexual reproduction is favoured because all of the maternal genes will be passed on to the offspring.

b) Asexual reproduction is favoured because it is less energy costly and more reproduction occur, which increases fecundity.

c) Sexual reproduction is favoured because variation in genetics allows for a higher probability of survival in a patchy environment.

d) Both sexual and asexual reproduction are equally favoured because each has its own advantages.

28. In a study done by Professor Barrett, it was discovered that there are three different morphs of the annual Water Hyacinth. What is a conclusion for the evolution of the species as a result of genetic drift?

a) Genetic drift caused the disappearance of the S and m allele resulting in a monomorphic organism that evolved to inbreed.

b) There was an equal loss of all three morphs and the species continued to outbreed.

c) Genetic drift pushed the morph ratio away from 1:1:1 resulting in insufficient population size and potential extinction.

d) Genetic drift is rarely important for adaptation and was not significant in this study.

29. From the birth of the Industrial Revolution in England onwards, heavy pollution from factories left black soot on trees in the cities. This instigated an evolution in the melanism of peppered moths. What is the agent of selection?

a) The pollution from factories.

b) Bird predation.

c) Humans collecting moths for a hobby.

d) Environmental changes as a result of increased industries.

30. Dolph Schluter from UBC investigated the physiology of stickleback fish in marine and freshwater and discovered that the organisms that live in seawater developed lateral plates for defense against predation. Why might this be detrimental to stickleback living in freshwater?

a) There is much less predation in freshwater so the extra bones are unnecessary.

b) Growing lateral plates are energy costly so the fish don't mature fast enough to sexual maturity before winter.

c) This is an example of allopatric speciation and the fish naturally developed in different ways according the environment.

d) Freshwater stickleback has other mechanisms for defense.

31. The sexual conflict and arms race in water striders is an example of Bateman's principle. What is the main concept of this principle?

- a) Males must evolve structures to overcome female resistance to mating.
- b) Females are uninterested in mating because they can store sperm.
- c) Mating has more costs for females because they expend and invest large amounts of energy in producing offspring.
- d) Both sexes want to optimize their own fitness and this may be at the cost of the other sex.

32. Invasive species have many common traits. Which of the following is NOT a trait in successful invasive species?

- a) High phenotypic plasticity.
- b) Well-developed dispersal mechanisms.
- c) High reproductive output.
- d) Narrow ecological tolerance.

33. Which of the following combinations is the best goal in conservation biology?

- a) Increasing homozygosity, reducing the effect of stochastic processes.
- b) Increasing homozygosity, increasing the effect of stochastic processes.
- c) Reducing homozygosity, reducing the effect of stochastic processes.
- d) Reducing homozygosity, increasing the effect of stochastic processes.

Online Articles – Josh Campbell

If information from the articles contradicts information given in lecture, follow the information in the Nature Education Knowledge Articles.

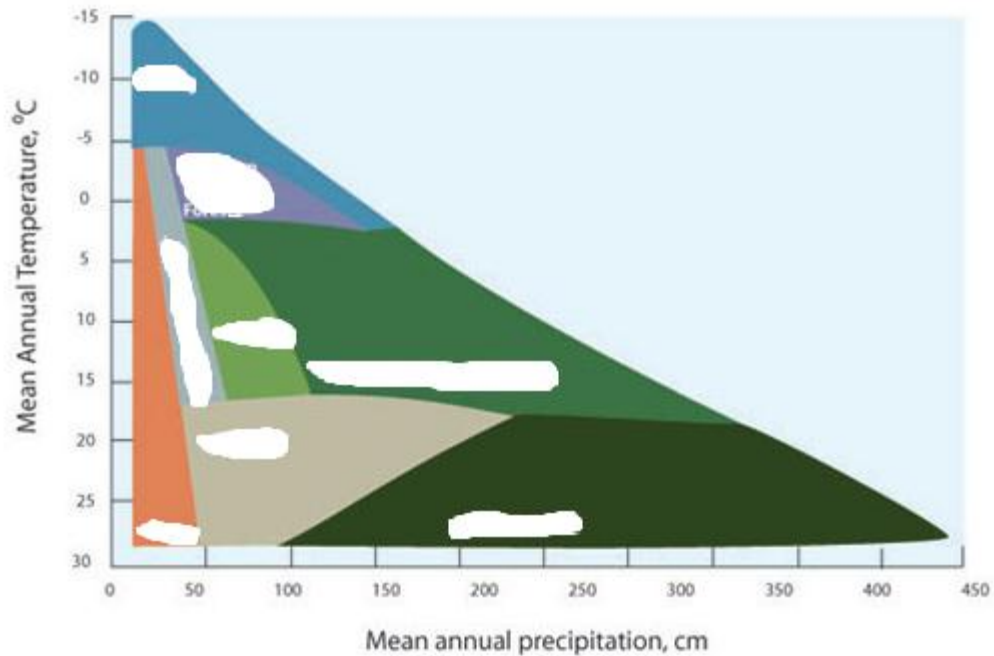
34. You are sitting on top of a mountain that straddles an ocean and notice that one side of the mountain is covered extensively by forest whereas the leeward side is much like a desert. This is likely caused by?

- a) Warm air rising on the forest side and cool air descending on the leeward side.
- b) Cool air descending on the forest side and warm air rising on the leeward side.
- c) A lack of nutrients on the leeward side.
- d) None of the above.

35. On the following graph, which is a graph of mean annual precipitation and mean annual temperature for various biomes around the world, the pieces have been removed. Which of the following biomes is found in the bottom right region of this graph?

- a) Tundra
- b) Mediterranean

- c) Desert
- d) Grassland
- e) Tropical rainforest



36. Which is NOT a physiological mechanism that organisms use to survive in changing environments?

- a) High metabolic rates
- b) Efficient circulatory systems
- c) Hibernation
- d) The ability to swim
- e) All of the above

37. According to the 8th Nature Education Knowledge Article, “Population Limiting Factors”, which of the following is/are not density-independent factor(s) influencing a population?

- a) Catastrophes
- b) Disease
- c) Predation
- d) More than one of the above.

38. Developing countries most likely demonstrate which of the following survivorship curves

- a) Type III
- b) Type II

- c) Type I
- d) Depends on the country
- e) Not enough information to make a clear decision.

39. Which is NOT a benefit of dispersal in plants and animals?

- a) It reduces inbreeding and inbreeding depression.
- b) It allows the species to exploit areas of better climate or resource availability.
- c) Males can potentially increase their access to females through male-based dispersal.
- d) The new habitat is unfamiliar.

40. Which of the following are adaptations that increase the fitness of a prey species? (Not all of the following adaptations have to apply to every single species to be true, it could only be a few)

- i) Camouflage
 - ii) Discharging slime
 - iii) Bright coloration
 - iv) Slow movement
- a) None of the above
 - b) Two of the above
 - c) Three of the above
 - d) All of the above

41. A wolf exhibits which of the following processes(s):

- a) Top down control
- b) Bottom up control
- c) The wolves are neutral
- d) Positive indirect effects
- e) Both a and d are correct

42. Which of the following does not affect habitat patchiness?

- a) Fires
- b) Floods
- c) Disease
- d) None of the above.

43. Which is a member of the Diamond's "Evil Quartet" when talking about conservation biology (factors of the Diamond Quartet damage natural ecosystems)?

- a) Introduced predators and competitors
- b) Wildlife conservation
- c) Overabundance of inhospitable areas

d) Habitat patchiness

44. Which is not an ecosystem service to humans or nature?

- a) Decomposition of waste
- b) Pollination
- c) Economy
- d) Water purification

45. What is likely the main reason why conservation of biodiversity is so important?

- a) Biodiversity is central to humans' selfish needs.
- b) Biodiversity is what drives every single process, as each species does its part to maintain the world's ecosystem.
- c) Biological resources are plentiful when biodiversity is high.
- d) It provides social and spiritual benefits.

46. What key factor is important to plants in the final stages of primary and secondary succession?

- a) Nutrients in the soil
- b) Temperature
- c) Shade
- d) Rainfall

Lab Questions – Xuanli Monica Wang

47. Which of the following statements about phenotypic plasticity is FALSE?

- a) Costs and limitations may result in a selective pressure against a trait evolving phenotypic plasticity.
- b) Individuals with low plasticity in melanin production can have high plasticity in other traits.
- c) Not all phenotypically plastic traits are reversible.
- d) During the time difference between sensing environmental change and alteration of the phenotype, the organism's fitness is not changed.

48. In a population that is in Hardy-Weinberg equilibrium, where there are two alleles (one dominant and one recessive) for gene X, what is the frequency of the homozygous recessive genotype when the frequency of the dominant allele equals 0.6?

- a) 0.4
- b) 0.24
- c) 0.16
- d) 0.64

49. Which of the following statements about adaptation is FALSE?
- a. Adaptation is a fitness-enhancing trait that has spread through the population by natural selection.
 - b. The large bumps on the thorax of the male hissing cockroaches are an adaptation for foraging and for defence from predators.
 - c. Natural selection can't produce perfect adaptations.
 - d. New combinations of traits are created in the population by mutations only.

50. Which of the following is a qualitative attribute?
- a) Hair colour
 - b) The number of trees in a forest
 - c) Height
 - d) The number of white blood cells in a given volume of blood.

51. The bar graph can be used to depict which of the following data?
- a) Mean annual temperature over a range of latitudes.
 - b) The daily ocean surface temperature recorded off Vancouver Island from 1980 to 1998.
 - c) The frequency of different types of behaviours shown by a rat exploring a new maze.
 - d) The frequency distribution of 122 student heights.

52. Why is complete metamorphosis in insects advantageous?
- a) Decreases competition between life stages.
 - b) Provides a "rest period" between growth and sexual maturity.
 - c) Protects the developing organism from predators and parasites.
 - d) Allows females more time to lay eggs.

53. Which of the following statements concerning the origin of HIV is FALSE?
- a) The Hunter Hypothesis states that humans came into contact with SIV around chimpanzees and become infected with a mutant strain of SIV, otherwise known as HIV.
 - b) Keele et al. 2006 collected primate stool samples in Cameroon and found that HIV evolved more than once from SIV.
 - c) The genus Hominidae is most related to Pan, which include chimpanzees and gorillas.
 - d) The Hunter Hypothesis lacks evidence of SIV occurring in wild chimpanzee populations.

Why Evolution is True - Victor Lee

54. Which of the following is FALSE?
- a) Over 99% of species that ever lived have gone extinct.
 - b) The fact that there are imperfections implies that there was no divine creator.
 - c) Reptiles evolved from birds.

d) In older rocks, we find fossils of more primitive species.

55. What best describes the relationship between euphorbs and cacti?

- a) Divergent evolution
- b) Convergent evolution
- c) Sister species
- d) Hybrids

56. What is most true about oceanic islands?

- a) They are made up of land just like much of earth so they must contain the same species.
- b) They are islands just like continental islands so that they must have similar species.
- c) Oceanic islands only have plants, birds, and insects because those species can easily colonize over long distances; land mammals, reptiles, amphibians, and freshwater fish cannot do that.
- d) Oceanic islands are like continental islands but they went further from the land by drifting.

57. Why are European honeybees prime targets for the Asian Giant Hornet?

- a) The European honeybees are an introduced species so they never got to adapt.
- b) The European honeybees are much smaller than the Asian giant hornets so they stand no chance.
- c) The European honeybees cannot fly as fast so they cannot escape the Asian Giant hornets.
- d) The European honeybees are outnumbered by the hornets.

58. Which is NOT a condition for adaptations to form by natural selection?

- a) The starting population has to be variable.
- b) Some proportion of that variation has to come from changes in the form of genes.
- c) The genetic variation must affect an individual's probability of leaving offspring.
- d) Upper generations had to challenge themselves in order to improve for their children to have those improvements.

59. Which of the following is not true?

- a) Monogamous species show less sexual dimorphism since males don't need to compete with other males.
- b) Some species may be socially monogamous but not actually monogamous.
- c) Males are always the promiscuous gender.
- d) If a female chooses a mate wisely, she can benefit directly from the male helping her during the act of child care or she can benefit indirectly by choosing the male with better genes.

60. Which of the following CANNOT differ in sexual dimorphism?

- a) Songs
- b) Tail decoration
- c) Body colour
- d) Skeletal structure

End of Mock Test

Answers

1. a	16. c	31. c	46. c
2. c	17. d	32. d	47. d
3. d	18. d	33. c	48. c
4. a	19. b	34. a	49. d
5. d	20. a	35. e	50. a
6. b	21. d	36. d	51. c
7. b	22. a	37. d	52. a
8. d	23. c	38. a	53. c
9. a	24. e	39. d	54. c
10. a	25. b	40. d	55. b
11. d	26. c	41. e	56. c
12. c	27. c	42. d	57. a
13. d	28. a	43. a	58. d
14. a	29. b	44. none of the above	59. c
15. d	30. b	45. b	60. a

Notes

- For #6

x (age)	L(x)	b(x)	L(x)b(x)	xL(x)b(x)
0	1	0	0	0
1	0.8	1	0.8	0.8
2	0.6	2	1.2	2.4
3	0.2	2	0.4	1.2

$R_0 = \sum L_x b_x$	<u>2.40</u>
$\sum x L_x b_x$	<u>4.40</u>
$T = \sum x^2 L_x b_x$	<u>1.83</u>
$\lambda = R_0^{1/T} =$	<u>1.61</u>

Even though you are not allowed a calculator for the actual exam, the purpose of this question was to apply all of the equations that you had to memorize.

- For #7

- (a) The alpha values alone do not tell us enough.
- (b) Asexual reproduction is favoured in homogeneous environments. However, it is environment complexity that allows coexistent competition.
- (c) Gause (1930) was able to achieve coexistence between difference Parameciums.
- (d) Niche studies faded in the late 1970s.

- For #15, we cannot know for sure. Even if the mutation is beneficial, it can still be lost by genetic drift (low numbers) because only one individual that carries it.
- For #37, disease spreads quicker among denser populations and denser populations of prey are more noticeable to predators.
- For #44, the correct answer was purposely not included in the options; my friend wanted to trick you.