

Bios 101, Problem Set 4

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1. (1 point) A population of *Melanopus* grasshoppers reaches very high densities, and is subjected to aerial spraying by malathion pesticide. The following year, the grasshoppers are not observed at all. An outbreak occurs two years later, however, and this time, the aerial spraying is much less effective. Laboratory tests indicate that malathion kills these grasshoppers, but that the majority of grasshoppers are very sensitive to the smell of it and avoid contacting the chemical.

What type of evolutionary event has occurred here? How could you test your idea?

2. (1 point) Go online and look up two cases of allopatric speciation, and at least one probable case of sympatric speciation. What types of geographic barriers were involved in your cases of allopatric speciation? What was the mechanism of sympatric speciation?
3. (1 point) List and explain at least four lines of evidence Darwin used to document the evidence for evolution by natural selection.
4. (1 point) A species of wren arrives on a chain of volcanic islands off the coast of New Zealand that previously had no wrens. After several thousand years, wrens from these islands are able to interbreed with occasional migrants from the mainland, but the resulting offspring are poorly adapted to compete with the local wrens and produce no offspring. This is an example of what type of speciation and what type of isolation mechanism?
5. (1 point) In terms of sexual selection, under what conditions would you expect female choice to be the strongest? Under what conditions would you expect males to be choosy in selecting a mating partner? Can you find an example of the latter phenomenon? Research online.
6. (1 point) The mutation rate to a lethal, recessive genetic illness is 10^{-10} . Individuals die before they get a chance to reproduce. Under mutation-selection balance, what is the equilibrium frequency of the heterozygous genotype? Imagine it was discovered that, in a population of Icelanders, the frequency of this allele was .01. Come up with a likely explanation for the high frequency of the allele. List some actual recessive, deleterious alleles that are probably in mutation-selection balance.

7. (1 point) Two species of tree crickets live in a Costa Rican dry forest. Their habitats and ranges overlap. The two species never interbreed because the calls of the males are different and do not attract females of the other species. This is an example of what type of isolation mechanism? Compare this fictional example to a real example of the same evolutionary mechanism.

8. (1 point) An series of isolated population of salamanders lives on a ring of mountaintops in the Ozarks. Individuals occasionally migrate to other populations, but this is rare. On the average, one migrant reaches a new mountaintop every five generations, and only half of these reproduce. Is the rate of migration sufficient to stop the affects of genetic drift? Over time, would separate species of salamanders develop? Why or why not?

9. (1 point) A population of several hundred humans living on an isolated oceanic island was founded by sixteen men and four women. Population geneticists have studied this group and found that it is homozygous at many of the blood group loci that are normally polymorphic in humans, for instance, all the people on the island are blood type A. What is the likely evolutionary mechanism for this situation? Compare this fictional example to a real human population that has underwent a similar phenomenon.

10. (1 point) Go online or use whatever resources you have available to you and look up five species that have gone extinct in the last two centuries or so. List the causes, and for each one, list what measures could have been done to prevent the extinction.