

## BISC 100 FINAL EXAM

**READ ALL OF THE QUESTIONS CAREFULLY BEFORE ATTEMPTING TO ANSWER THEM. YOU WILL BE MARKED ON QUALITY, NOT QUANTITY.**

**PLEASE ANSWER EACH QUESTION IN THE SPACE PROVIDED. PROSE OUTSIDE OF THE ASSIGNED SPACE WILL NOT BE CONSIDERED.**

Answer **2 of the 3** questions provided below with essay answers (15 marks each).

1a) You study two populations of zebra skipper butterflies, one on the mainland and the other on a large island several hundred miles off the coast of Brazil. In the mainland population, males and females are nearly identical in size. By contrast, females are 1.2 times larger than males in the island population. How do you explain this fact? Pose a formal gender-specific hypothesis for this result. What sorts of information would you need to test your idea? Could you select for changes in the body size ratio between males and females at both locations? What experimental design would you need to pull this off?

1b) When faced with a predator, most but not all onion maggot flies fly away from their current foraging site where they assemble to lay eggs. Use Tinbergen's 4 questions to provide an explanation for this variable behavior. For each question, provide an experiment that would test these explanations.

1c) When people become sick with malaria they develop severe fever that causes them to be bed bound, weak and sweaty for several days. Provide an evolutionary explanation for this phenomenon along with an experimental design that would test your idea. Do you think that mosquitoes should evolve immunity to being malaria vectors? Why. Why not?  
To help you answer this question, here are some details regarding malaria in humans: malaria is caused by a protozoan parasite, the parasite moves among people by way of a mosquito vector. When a mosquito blood feeds on a malaria-ridden person it picks up the protozoan in the blood meal. The protozoan develops in the mosquito for several days then leaves the body cavity for the mosquito's salivary glands. The next time that infectious mosquito blood feeds the protozoan moves into the new human within the salivary secretions and starts a new infection.

Answer True or False (0.5) then justify your answer (1.5).

2a) The fundamental niche will always be larger than the realized niche in herbivores that are frequently attacked by predators.

2b) Rare individuals perform best under negative frequency dependent selection.

2c) Sex role reversals should be most common where sons are cheaper to produce and easier to rear than daughters.

2d) Honest signals should be most often associated with high costs of production.

2e) Competitive exclusion is an extreme form of niche reduction.

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STUDENT NUMBER \_\_\_\_\_

2

2f) Sexual selection is a special form of natural selection that deals sexual reproduction i.e. selection to produce sexually to increase genetic variance.

2g) The higher the variance in quality among egg-laying sites, the more pronounced the fighting characters in male salmon.

2h) In bamboo, plants that reproduce out of synch with the other members of the population will accrue high reproductive fitness.

2i) Ecosystems are defined by the unique biological communities that they harbor.

2j) Trait mediated effects can cause change in realized replacement rates.

2k) Replacement rate values of 1.0 are impossible to achieve when death rates exceed 0.5.

2l) Habitat fragmentation leads to decoupling of population dynamics among sub-populations.

2m) Inbreeding depression is most commonly observed in human females who suffer from morning sickness during their first trimester.