Student Number: _____

UNIVERSITY OF TORONTO
Faculty of Arts and Science

26 APRIL 2011 EXAMINATION

EVOLUTION & ADAPTATION
EEB214H1S

Duration - 3 hours

No aids allowed

9 pages total (possible 66 points)

Answers should be written within the space provided under each question, and can be answered in **short essay** OR **point form**

Please **DO NOT** use back of pages to answer questions

1) Name **ONE** way humans vary when it comes to their ears. **(1 pt)**

2) Mendel said that the characteristics or traits of organisms are carried from one generation to the next by internal factors, which occur in pairs. What is the modern name for these factors? **(1 pt)**

3) Speciation is the process by which new species are formed from existing ones. Please contrast these two types of speciation: sympatric and allopatric. **(4 pts)**

4) This question will assess your understanding of "chance" in evolution and challenge you to integrate information from several different lectures.

Address the possible roles of chance in evolution during both **(a)** speciation **(4 pts)** and **(b)** adaptive radiation events **(4 pts)**. *Points are given for naming the type of speciation you describe, and for including an example of a species that has undergone an adaptive radiation.* ***(8 pts total)***

5) Individuals generally maximise their fitness by maximising the number of offspring they produce. However, not all individuals reproduce. **Briefly** describe **ONE** example where an individual foregoes its own reproduction to help others, and explain why it might be adaptive. **(6 pts)**

6) What is meant by parent-offspring conflict? Explain briefly using **ONE** example to illustrate your point. **(4 pts)**

7) Define and distinguish between aptation, adaptation, and exaptation. (***6 pts)***

8) Lionesses live in prides (prides are what groups of lions are called) and often nurse the young of other females. Please provide an explanation, other than kin selection, for how such behavior could have evolved. Be sure to define terms and explain how they operate**. (4 pts)**

9) a) What is convergent evolution? **(2 pts)**

b) How do you demonstrate that it has occurred? **(2 pts)**

c) Why does convergent evolution often indicate adaptation driven by natural selection? **(4 pts)**

10. *Homo floresiensis*—the "hobbit"—was a very short species of hominid that lived in the dense jungles on Flores Island in Indonesia. It also had very short legs relative to its body size. One anthropologist hypothesized that its short legs were an adaptation for moving easily through dense vegetation. From material that we covered in class can you suggest another plausible explanation? **(6 pts)**

11. In an article, David Buss, an evolutionary psychologist from University of Texas, suggests that human sexual jealousy is adaptive. Explain why natural selection may have favored the evolution of jealousy, particularly with regard to the fitness benefits to males and females (you should present explanations for each sex separately). ***(4 pts)***

12. The arctic Amish are a small group of people that have lived in an isolated part of northern Greenland for the last 300 years. They have had little contact with the outside world and have had few people join their community since it was founded centuries ago. *Bluetongueitis* is a genetic disease caused by a single mutant allele; the disease is recessive and is usually fatal by age 10. The *Bluetongueitis* allele is very rare in most populations, but quite common in the arctic Amish population. What is an explanation for the unusually high allele frequency of the *Bluetongueitis* allele in this population? **(4 pts)**

13. One major problem that hospitals are now facing is that certain diseases caused by bacteria have evolved that are immune to common antibiotics like penicillin or amoxicillin. Moreover, these drug resistant strains can get passed among patients in the hospital. This is a problem that only started occurring in the past 20-30 years. (We have been treating bacteria with antibiotics for about 120 years now). What is it about these bacteria that allow them to evolve so quickly—especially since we usually consider evolution occurs over hundreds of thousands of years? **(4 pts)**

14. Mutualisms are sometimes maintained by punishment. Give an example of a mutualistic relationship between species, and explain how both sides of the interactions are kept in line. **(6 pts)**

The END