Second Midterm Exam (200 points)

BIO 115 **November 17, 2000**

Name_____ I.D. Number_____

A. Multiple Choice Questions (24 points). Each question has one correct answer and is worth 4 points.

1. Which taxonomic grouping is between genus and order?
   a. Kingdom
   b. Phylum
   c. Family
   d. Class

2. Which of the following was NOT one of Fleeming Jenkin's criticisms of Darwin's theory?
   a. Variability could not be maintained in a population.
   b. The Earth could not possibly be old enough.
   c. Selection could not occur quickly enough.
   d. Darwin used the hypothetico-deductive method which was not good scientific practice.

3. If you crossed two parents, one of which was Aa and the other AA, what would be the expected distribution of genotypes in the offspring?
   a. ½ AA, ½ aa
   b. ¼ AA, ½ Aa, ¼ aa
   c. ½ AA, ½ Aa
   d. ½ AA, ¼ Aa, ¼ aa

4. Organisms adapt
   a. to avoid extinction
   b. to their local environment
   c. for the good of the species
   d. for the good of man

5. Natural selection can occur when
   a. population size is increasing
   b. population size is decreasing
   c. population size is constant
   d. all the above

6. The Malthusian parameter m from the equation NT = N0emt determines how populations will change in number through time. If m = 0, then

a. natural selection can not occur
b. there is no reproduction in the population
c. the population will go extinct
d. the population number will stay constant

Section B. Matching: write the letter of the person next to their contribution. (4 points per correct match, 32 points total)

1. Charles Lyell 2. Plotinus 3. Sewall Wright 4. Rev. Adam Sedgwick

5. G.F. Gause 6. Thomas Huxley 7. Gregor Johann Mendel

8. Sir Richard Owen

_____Neo-Platonic thinker who developed the idea of plentitude, which was used by Lamarck in theory of evolution.

_____Friend of Darwin, proponent of the theory of uniformitarianism in geology.

_____Prominent zoologist; Darwin's "bulldog", debated with Wilberforce.

_____His work demonstrated the law of segregation and the law of independent assortment of genetic material (genes)

_____American population geneticist; worked in agriculture, and emphasized drift as an important force changing gene frequencies.

_____Last important idealist in Britain; showed vertebrate body plants were homologous.

_____Criticized Darwin for using the hypothetico-deductive method.

_____Principle of competitive exclusion; potential vs. actual niche.

Section C. Definitions (64 points). Define the following terms. (8 points each)

1. Batesian vs. Mullerian mimicry

2. scramble vs. interference competition

3. allometry

4. continental drift

5. mutation (definition used by biologist today)

6. natural selection

7. secondary sexual characteristics

Section D. Short Answer (4 points each, 20 points total)

1. Name the four forces that change gene frequency:
    1.
    2.
    3.
    4.

2. Mendelian genetics is a _____ theory of heredity, not a blending theory.

3. Two causes of mutation are
    a.
    b.

4. Fleeming Jenkin had four major criticisms of Darwin's theory. Three of them have been answered by major developments in science. Describe one of them and name the field of science that arose which provided the answer.

5. According to Ernst Mayr, Charles Darwin made three great contributions in *the Origin of Species*. One of these contributions was that he replaced _____ thinking by _____ thinking.

Section E. Short Essay. Please answer in the space provided. (15 points each, 60 points total)

1. Define sexual selection, and give an example of each of the major types (several were given in class).

2. Describe and differentiate stabilizing, directional and diversifying selection?

3. The allele A codes for a yellow colored snail shell and the allele a codes for a blue color. The heterozygotes are green, which means they blend better with the vegetation and suffer less predation. The fitnesses are

Genotype	AA	Aa	aa
Fitness	0.25	1.0	0.25

a. What is the equilibrium frequency of allele A? **Hint:** The equilibrium frequency of the A allele (p) is p=t/(t+s) where t is the selection against aa homozygotes and s is the selection against the AA homozygote.

b. What is the frequency of green snails in the population? (Assume Hardy-Weinberg proportions). **Hint:** the frequencies of all the alleles according to Hardy-Weinberg must add up to 1).

4. Francois Jacob suggests that the metaphor of evolution as a tinkerer is a better one than evolution as an engineer. What are the reasons he suggests this? Can you think of any ways that the engineer metaphor may better describe evolution than the tinkerer?

5. **Bonus Question** (10 points): "When you have a recessive allele, it can take a long time to get rid of it." Explain this statement and, if possible, illustrate it with equations presented in class.