

# Biology 10 - Introduction to Biology

West Valley College - Norris

## How Populations Evolve

### I. Definitions

#### A. Evolution

### II. History

### III. Evidence of Evolution

#### A. Fossil Record

#### B. Biogeography

#### C. Comparative Anatomy

#### D. Comparative Embryology

#### E. Molecular Biology

### IV. Selection (the principle mechanism for evolution)

#### A. Natural Selection

“Survival of the Fittest” = “Survival of the Genes”

Darwin’s concept of natural selection is based on three simple observations:

1. organisms of a single species are not identical
2. some of these differences are heritable
3. more organisms are produced than survive. The basic premise is that inherited traits that are more adaptive increase the chance of survival and reproductive success - thus the more adaptive traits are more likely to be passed on

#### B. Artificial Selection

### V. Mechanisms for Evolution

#### A. Hardy-Weinberg Equilibrium

1. large population
2. isolated population
3. no mutation
4. random mating
5. equal reproductive success

#### B. Alterations in the Gene Pool

##### 1. Genetic Drift

- a. Bottle Necking
- b. Founder Effect

2. Gene Flow
3. Non-Random Mating
4. Natural Selection

B. Generation of New Alleles

1. Mutation

## VII. Speciation

A. What is a Species

B. Mechanisms of Speciation

1. Geographic Isolation (allopatric speciation)
2. Reproductive Isolation (sympatric speciation)

C. Tempo of Speciation

1. Gradualist Model
2. Punctuated Model

## VII. Additional Selected Key Terms

adaptive      analogous      cline      homologous      morph      polymorph

## Study Questions – Evolution

1. In general, what is “evolution”?
2. Briefly describe each of the different lines of evidence in support of evolution?
  - a. Fossil record
  - b. Biogeography
  - c. Comparative anatomy
  - d. Comparative embryology
  - e. Molecular biology
3. Darwin’s concept of “natural selection” is based on three simple observations. What are they?
4. What is “natural selection”?
5. The phrase “survival of the fittest” is frequently misunderstood and/or misused. What does this phrase mean?
6. What is “artificial selection”?
7. What is the “gene pool”?
8. What factors help to stabilize the “gene pool” (i.e. Hardy-Weinberg equilibrium)?
9. Describe the different factors that lead to alterations in the “gene pool”
  - a. Genetic drift
  - b. Gene flow
  - c. Non-random mating
  - d. Natural selection
10. How can new alleles be added to the gene pool?
11. Differentiate between microevolution and macroevolution.
12. What is “speciation”?
13. What is a “species”?
14. What factors can contribute to speciation?

*“What can be more curious than that the hand of a man, formed for grasping, that of a mole for digging, the leg of a horse, the paddle of a porpoise, and the wing of a bat should all be constructed on the same pattern and should include similar bones, and in the same relative positions?”*

Charles Darwin, 1859

*“Evolution is not a force but a process. Not a cause but a law.”*

John, Lord Morley