**Name _____** **Period _____**

**AP Biology** **Date _____**

# REVIEW UNIT 6: EVOLUTION — "TOP TEN"

## A. Top "10" — If you learned anything from this unit, you should have learned:

1. Darwin's Principle of Natural Selection
   a. Variation
      individuals within a population possess heritable variation within traits
      - sexual recombination
      - mutation
   b. Overproduction
      organisms produce more offspring than can survive
   c. Competition
      those individuals with advantageous adaptations will out-compete others
   d. Differential Survival
      individuals with favorable characteristics tend to survive more
   e. Differential Reproduction
      individuals with favorable characteristics tend to have more offspring & pass on these traits to their offspring
      - alleles for favorable traits increase in the population
      - individuals are selected, but populations evolve

2. Selection
   a. directional vs. stabilizing vs. disruptive
   b. sexual selection
   c. genetic drift = effect of chance events
      - bottleneck effect (cheetahs)
      - founder's effect (European settlers in Americas)
   d. gene flow

3. Evidence
   a. fossil record
   b. biogeography
      - convergent evolution (analogous structures)
   c. comparative anatomy
      - homologous structures
      - vestigial structures
   d. comparative embryology

e. comparative genomics (molecular biology)
   - universal genetic code
   - conserved proteins (hemoglobin, cytochrome C)

f. artificial selection
   - agriculture, dog breeding, pesticide resistance, antibiotic resistance

4. Hardy Weinberg equilibrium
   a. $p + q = 1$ (allele frequency)
   b. $p^2 + 2pq + q^2 = 1$ (phenotype frequency)
   c. H-W conditions:
      - infinitely large population
      - random mating
      - no mutation
      - no gene flow (migration in or out)
      - no selection

5. Speciation
   a. biological species concept (Ernst Mayr)
      - population able to interbreed & produce viable, fertile offspring
   b. allopatric = geographically isolated populations
   c. sympatric = populations in same environment adapt to fill different niches
      - adaptive radiation (Galapagos finches)
      - mechanisms:
        pre-zygotic: habitat factors, temporal factors, behavioral factors, mechanical factors, gamete factors
        post-zygotic: reduced hybrid viability, reduced hybrid fertility
   d. rate of speciation
      - gradualism (Darwin)
      - punctuated equilibrium (Stephen Jay Gould & Niles Eldridge)

6. Origin of Life
   a. Earth is 4.5 billion years old
   b. abiotic origin
      - atmosphere of $CO_2$, methane ($CH_3$) & ammonia ($NH_3$) energized by lightning & UV rays
      - formation of organic compounds in seas (Miller – Urey experiment)
      - formation of protobionts & then bacteria (3.5 bya)

## B. Labs

1. Hardy-Weinberg Population Genetics Lab

   Be sure to review the procedures and the conclusions, and understand:

   a. Factors that affect evolution (changes in allele frequency) in populations
   b. How & when to use both H-W formulas
   c. Compare expected frequencies to actual to test for evolution