

STUDY GUIDE: Evolution

KEY TERMS

Biological evolution	gene pool	phylogeny
Jean Baptist de Lamarck	allelic frequency	prezygotic isolating mechanisms
inheritance of acquired characteristics	genetic equilibrium	geographic isolation
James Hutton	genotype frequencies	ecological(habitat) isolation
catastrophism	Hardy-Weinberg Law	temporal(seasonal) isolation
uniformitarianism	genetic drift	behavioral isolation
Charles Lyell	neutral selection	mechanical isolation
Alfred Russell Wallace	mutation pressure	gametic isolation
Charles Darwin	gene flow	postzygotic isolating mechanisms
natural selection	bottleneck effect	developmental isolation
survival of the fittest	founder effect	hybrid inviability
Thomas Malthus	selection pressure	hybrid sterility
variation	polymorphism	allopatric speciation
excessive reproduction	heterozygote advantage	sympatric speciation
evidence for evolution	directional selection	polyploidy
Geologic	disruptive selection	evolutionary bottleneck
Radioactive decay	stabilizing selection	punctuated equilibrium
Fossils	balanced polymorphism	gradualism
Paleontology	adaptation	Geologic time chart
Biogeography	fitness	index fossils
Comparative anatomy	sexual selection	radioactive dating
homologous	species	phylogeny
analogous	subspecies	systematics
vestigial	anagenesis	convergent evolution
Domestication	cladogenesis	molecular clocks
Embryology	cline	
Biochemistry	subspecies	
Molecular Genetics	races	
Modern Synthesis	speciation	
species	microevolution	
	macroevolution	

QUESTIONS

1. Explain Charles Darwin's contributions to evolutionary ideas. Give the basic assumptions upon which Darwin's theory rests. Indicate the types of evidence that Darwin used in formulating his theory.
2. List the processes that can lead to genetic variation.
3. Explain why changes in somatic cells cannot bring about evolution.
4. Contrast Lamarck's theory of inheritance of acquired characteristics with Darwin's theory of natural selection.
5. Explain the concept of the gene pool. Given the frequencies of two alleles, calculate the ratios of the genotypes produced by them, using a Punnett square or algebraic method.

6. State the Hardy-Weinberg Law, and discuss its four conditions for maintenance of genetic equilibrium. Why are these conditions rarely met in nature?
7. Explain how natural selection in one generation can affect the genotype of the next generation.
8. Using diagrams contrast directional selection, stabilizing selection and disruptive selection.
9. Contrast the roles of selection and mutation in directing evolutionary change.
10. Explain how a characteristic can have both positive and negative effects and indicate what determines whether or not a trait will increase or decrease in a population.
11. Describe heterozygote advantage, explain how this process helps maintain deleterious recessive genes. (Note sickle cell anemia as an example.)
12. Give a biological definition of species.
13. Explain the geographic isolation model of speciation, in doing so take into account the roles of mutation, natural selection, and the gene pool. Distinguish between extrinsic and intrinsic isolating mechanisms.
14. Describe speciation by polyploidy.
15. Explain what is meant by adaptive radiation, and discuss the evidence for this phenomenon.
16. Explain why the modern concept of the species is difficult to apply to asexual organisms, fossil organisms, populations at an intermediate stage of divergence and allopatric populations.
17. Darwin and Wallace both came up with a theory of evolution at approximately the same time. Explain how the time was right for these two men to come up with the same theory at the same time.
18. Describe the Darwin-Wallace theory of natural selection. What is meant by "survival of the fittest"?
19. Why is it that only inherited changes are important in evolution?
20. Discuss allopatric speciation.
21. Name three vestigial structures found in *Homo sapiens* and suggest the functional structure from which they descended.
22. Give two definitions of biological evolution.
23. Compare the hypotheses of gradualism and punctuated equilibrium, and give evidence supporting each hypothesis.
24. Does evolution produce "perfect" organisms? See page 449 in Campbell.
25. What happened in September 1859 that upset Bishop Wilberforce?
26. Define, discuss and give an example of how each of the following isolating mechanisms contributes to speciation in organisms.
 - a. Geographical barriers
 - b. Ecological (including seasonal) isolation
 - c. Behavioral isolation
 - d. Polyploidy