

# AP BIOLOGY

# TOPIC REVIEW GUIDE: EVOLUTION #1

## NATURAL SELECTION & EVOLUTION OF POPULATIONS

### READ:

- Chapters 22 & 23

### QUESTIONS FOR YOUR BILL:

#### Chapter 22

1. Discuss how Darwin's ideas challenged the traditional view of a young Earth inhabited by unchanging species.
2. Contrast Lamarck view of the mechanism of evolution with Darwin's view.
3. Distinguish between artificial selection and natural selection.
4. Explain why an individual organism cannot evolve. Explain why populations are the smallest units of life that can evolve.
5. When an organism is said to have "fitness," what does that mean and how does this affect members of a population?
6. Using a diagram, illustrate the process of natural selection. Your diagram should include the following principles:

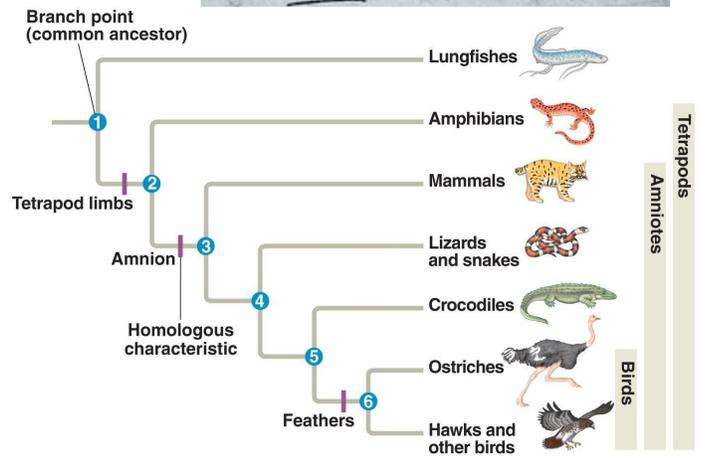
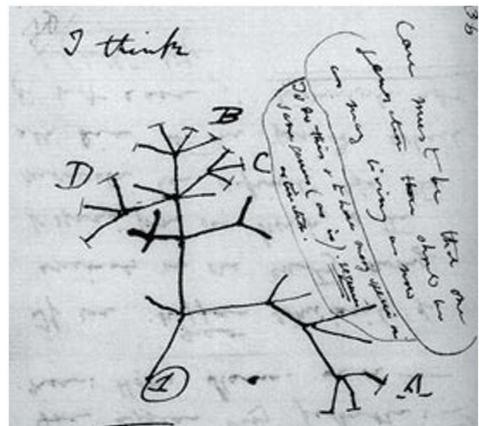
- a. Variation among organisms
- b. Overproduction of offspring
- c. Limited environmental resources
- d. Competition
- e. Adaptation
- f. "fitness"

7. Explain how mutations may actually benefit members of a population.
8. Distinguish between homologous, analogous, and vestigial structures.
9. Define **convergent evolution**.
10. Explain how each of the following may be used to support our current understanding of evolutionary patterns.

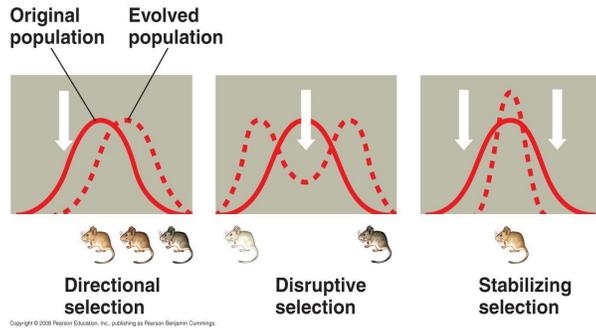
- a. *fossil record*
- b. *homologous anatomical structures*
- c. *analogous anatomical structures*
- d. *vestigial anatomical structures*
- e. *comparative embryology*
- f. *molecular homologies*
- g. *artificial selection*
- h. *biogeography*

#### Chapter 23

11. What is microevolution?
12. What are the three main mechanisms that can cause changes in allele frequency?
13. Explain why genetic variation within a population is a prerequisite for evolution.
14. Much of the genetic variation that makes evolution possible comes through sexual reproduction. What are the THREE mechanisms by which sexual reproduction shuffles existing alleles?
15. The Hardy-Weinberg principle is used to describe a population that is not evolving. What does this principle state?



16. Discuss how **genetic drift** affects allele frequency.
17. Distinguish between the **bottleneck effect** and the **founder effect**. Provide an example to illustrate both types of genetic drift.
18. Discuss how **gene flow** affects allele frequency.
19. Distinguish among **directional**, **disruptive**, and **stabilizing** selection. Give an example of each mode of



selection.

20. Discuss how sexual selection affects the allele frequency of a population.
21. Distinguish between **intrasexual selection** and **intersexual selection**. Give an example of each.
22. Discuss what is meant by **heterozygote advantage**, and use sickle-cell anemia as an example.
23. Write the Hardy-Weinberg equation. Identify what each of the parts of the equation represents. ( $p=?$ ,  $q=?$ ,  $p^2=?$ ,  $2pq=?$ ,  $q^2=?$ )
24. List the 5 conditions that must be met for a population to remain in H-W equilibrium.
25. Create a drawing that explains how each of the following mechanisms can affect frequencies in a population.
  - a. mutation
  - b. gene flow
  - c. genetic drift
  - d. nonrandom mating
  - e. natural selection

**KEY TERMS:** Here is a list of key terms and concepts you will hear about and see during the chapter readings. Get to know them!

|                             |                            |                              |                                   |
|-----------------------------|----------------------------|------------------------------|-----------------------------------|
| <i>Evolution</i>            | <i>Gene pool</i>           | <i>Fitness</i>               | <i>Natural selection</i>          |
| <i>Adaptations</i>          | <i>Selection</i>           | <i>Artificial selection</i>  | <i>Allele</i>                     |
| <i>Analogous structures</i> | <i>Vestigial Structure</i> | <i>Homologous structures</i> | <i>Convergent evolution</i>       |
| <i>Biogeography</i>         | <i>Continental Drift</i>   | <i>Allele Frequencies</i>    | <i>Hardy Weinberg Equilibrium</i> |
| <i>Population</i>           | <i>Genetic Drift</i>       | <i>Sexual Dimorphism</i>     | <i>biogeography</i>               |

## SUPPLEMENTARY RESOURCES:

### Interactives

- Kimball's Biology Pages: [Evolution and Adaptation](#)
- UC Berkeley's Understanding Evolution: [Mechanisms of Evolution](#) (until you get to "Microevolution")
- PBS' Evolution site: [An Origin of Species](#)
- Kimball's Biology Pages: [Mutation and Evolution](#), [Examples of Evidence of Evolution](#)
- University of Utah Learn Genetics site: [Sources of Variation](#)
- UC Berkeley's Understanding Evolution: [Homologies and Analogies](#)
- Learn Genetics: [All Living Things are Related](#) (also use the HHMI Lectures linked below the main page)
- [Early Theories of Evolution: Evidence of Evolution](#) (Palomar College)
- BBC's GCSE Bitesize Biology: [Evidence for Evolution](#)
- Nature: [15 Evolutionary Gems](#)
- [Genetic Drift Simulation](#) at the University of Arizona
- [Brief video tutorial about genetic drift \(Lego people!\)](#)
- UC Berkeley's Understanding Evolution: [Genetic Drift](#)
- PBS' Evolution site: [The Founder Effect and Polydactyly](#)
- [Genetic drift simulator at UConn](#)
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### Lectures

- [Bozeman Biology's "Natural Selection" video.](#)
- [Crash Course's "Natural Selection" video.](#)
- Bozeman Biology's ["Evidence for Evolution" video.](#)
- Crash Course's ["Evolution: It's a Thing" video.](#)
- Crash Course's ["Evolutionary Development: Chicken Teeth" video.](#)
- Bozeman Biology's ["Genetic Drift" video.](#)
- Bozeman Biology's ["Evolution Continues" video.](#)
- 



(a) Cactus-eater



(b) Insect-eater



(c) Seed-eater

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HYPERLINK

"[http://www.youtube.com/watch?v=aTftyFboC\\_M](http://www.youtube.com/watch?v=aTftyFboC_M)"