

Notes: Evolution

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CA State Standards we will cover:

7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:
 - a. Students know why natural selection acts on the phenotype rather than the genotype of an organism.
 - b. Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.
 - c. Students know new mutations are constantly being generated in a gene pool.
 - d. Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.
 - e. Students know the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature.
 - f. *Students know how to solve the Hardy-Weinberg equation to predict the frequency of genotypes in a population, given the frequency of phenotypes.

8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
 - a. Students know how natural selection determines the differential survival of groups of organisms.
 - b. Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment.
 - c. Students know the effects of genetic drift on the diversity of organisms in a population.
 - d. Students know reproductive or geographic isolation affects speciation.
 - e. Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.
 - f. *Students know how to use comparative embryology, DNA or protein sequence comparisons, and other independent sources of data to create a branching diagram (cladogram) that shows probable evolutionary relationships.
 - g. *Students know how several independent molecular clocks, calibrated against each other and combined with evidence from the fossil record, can help to estimate how long ago various groups of organisms diverged evolutionarily from one another.

10.2 Power Notes: Darwin's Observations

1) Darwin observed variation among island species.

(1) Variation is _____

(2) Examples

(a) Galápagos tortoises that live in areas with _____ have _____;
wet areas with _____ have _____

(b) Galápagos **finches** that live in areas w/ _____ have _____;
those that eat _____ have _____

2) Darwin realized species could adapt to their environment.

(1) An adaptation is _____

(a) Adaptations can lead to _____

3) Darwin observed fossil and geologic evidence of an ancient Earth.

(1) Fossil evidence included:

- Darwin found _____

(2) Geologic evidence included:

- He saw that _____

10.3 Power Notes: Theory of Natural Selection

Several key insights led to Darwin's idea for natural selection.

- **Artificial Selection** is a process where _____
 - Examples: _____
- **Heritability** is _____
- There is a **struggle for survival** due to _____
- Natural Selection is a process in which _____

The four main principles of **natural selection** are:

1) Variation: _____

2) Overproduction: _____

3) Adaptation: _____

4) Descent with Modification: _____

Fitness is the measure of _____ and _____

Natural selection can _____



Natural selection does not grant organisms what they "need".

10.4 Power Notes: Evidence of Evolution

Main Idea: Evidence of common ancestry among species comes from many sources

Fossils

- They are _____ of organisms that once lived
- They show evidence for evolution because _____
than those in the upper layers.

Geography

- _____
- _____
- Examples: The squirrels at the Grand Canyon (Abert vs. Kaibab)

Embryology

- _____
- _____

Anatomy

- Homologous structures are _____
- Are also _____
- Vestigial structures are _____ that had a function in an early ancestor.
- Examples of vestigial structures: _____

Analogous structures are not evidence of a recent common ancestor, but they show that the environment plays a role in putting pressure on organisms to adapt to the same conditions.

11.1 Power Notes: Genetic Variation within Populations

Genetic variation is beneficial.

- Genetic variation lead to _____.
- It _____ the chance that some individuals will _____.

How it's stored in a population

- Genetic variation is stored in a _____.
 - _____ in a population
 - Different allele combinations form when organisms have offspring

How it's measured

- _____ measure genetic variation.
 - _____

Two Main Sources

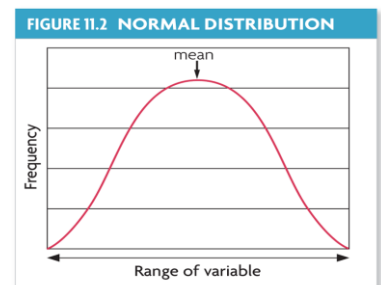
- Mutation is a _____
 - _____
 - Can be passed on to offspring in reproductive cells
- Recombination forms _____
 - usually occurs during _____
 - _____
- Hybridization is _____
 - Occurs when individuals can't find a mate.

11.2 Power Notes: Natural Selection in Populations

Natural selection acts on distribution of traits

- A **normal distribution** graphs as a _____
- A population follows a normal distribution when that population is _____

Natural selection can change the distribution of a trait in *3 ways*. This is called _____ . It is evolution within a population. There is an _____ .



Directional Selection

Range of variable

Stabilizing Selection

Range of variable

Disruptive Selection

Range of variable

11.3 Power Notes: Other Mechanisms of Evolution

Gene Flow

- Definition: _____
- How it works: When animals _____ and _____
- Lots of gene flow between populations _____
- Limited gene flow results in _____

Genetic Drift

- Definition: _____
- How it works: causes a loss of _____ and is most common in _____.
- Key Terms
 - **Bottleneck Effect:** _____
 - **Founder Effect:** _____
- Genetic drift has **negative effects** on a population.
 - _____
 - _____

Sexual Selection

- Definition: _____
- How it works:
 - Sexual selection occurs due to higher cost of reproduction for females
 - Females _____ with males that _____
- Types
 - Intrasexual: _____
 - Intersexual: _____

11.5 Power Notes: Speciation through Isolation

- Populations become isolated when there is no gene flow.
 - Isolated populations _____.
 - Genetic differences can add up over generations.
- **Reproductive isolation** can occur between isolated populations.
 - _____
 - It is the final stage of speciation
 - **Speciation:** _____
- Reproductive isolation can be caused by...
 1. **Behavioral behaviors:** includes differences in _____
 2. **Geographical barriers:** _____
 3. Temporal barriers: _____

11.6 Power Notes: Patterns in Evolution

Evolution through natural selection is **not random** and can be seen in patterns

- **Convergent evolution** describes evolution toward _____
- **Divergent evolution** describes evolution toward _____

Species can shape each other over time.

- When two or more species _____, this is called _____.
 - _____
- Coevolution can occur in **beneficial relationships**.
 - _____ from the other as a result of _____ that each species evolved over many generations
- Coevolution can occur in **competitive relationships**, sometimes called **evolutionary arms races**.
- **Both species respond to** _____ from the other through adaptations over many generations
- **Species can become extinct.**
 - Extinction is the _____.
 - Background extinctions _____.
 - Usually _____ in a small area
 - caused by _____
 - Mass extinctions are _____.
 - _____
 - Thought to be caused by _____ like earthquakes, volcanic eruptions, etc.
- A pattern of **punctuated equilibrium** exists in the fossil record.
 - theory proposed by Eldredge and Gould in 1972
 - _____
 - _____
 - revised Darwin's idea that species arose through *gradual transformations*
- **Many species evolve from one species during adaptive radiation.**
 - _____
 - descendent species usually _____