AP BIO INSTA-REVIEW

TOPIC 7.4

Population Genetics

EVO-1.H.1

Evolution is also driven by random occurrences—

a. Mutation is a random process that contributes to evolution.

b. Genetic drift is a nonselective process occurring in small populations—

i. Bottlenecks.

ii. Founder effect.

c. Migration/gene flow can drive evolution.

AP BIO INSTA-REVIEW

TOPIC 7.4

Population Genetics

EVO-1.I.1

Reduction of genetic variation within a given population can increase the differences between populations of the same species.

EVO-1.J.1

Mutation results in genetic variation, which provides phenotypes on which natural selection acts.

AP BIO INSTA-REVIEW

TOPIC 7.4

What are the two types of genetic drift?

AP BIO INSTA-REVIEW

TOPIC 7.4

What are the two types of genetic drift?

> Bottleneck

> Founders Effect

AP BIO INSTA-REVIEW

TOPIC 7.4

Which population is better to overcome genetic drift?

(as in for genetic drift to not have an affect on the allele frequency)

A. Small

B. Large

AP BIO INSTA-REVIEW

TOPIC 7.4

Which population is better to overcome genetic drift?

(as in for genetic drift to not have an affect on the allele frequency)

B. Large

Genetic drift involves random event changes in the allele frequency. If the population is larger, a random event like a flood will not change the allele frequency as much.

AP BIO INSTA-REVIEW

TOPIC 7.4

What is the bottleneck effect?

AP BIO INSTA-REVIEW

TOPIC 7.4

What is the bottleneck effect?

A random but drastic reduction in population size from natural causes.

This process leads to a random selection for alleles.

AP BIO INSTA-REVIEW

TOPIC 7.4

Bottleneck is an example of natural selection.

A. True

B. False

AP BIO INSTA-REVIEW

TOPIC 7.4

Bottleneck is an example of natural selection.

B. False

Bottleneck involves a drastic decrease in the population size. This decrease does not result from a trait being more favorable to less favorable thus it is not an example of natural selection.

AP BIO INSTA-REVIEW

TOPIC 7.4

Why is bottleneck such a disadvantageous process?

AP BIO INSTA-REVIEW

TOPIC 7.4

Why is bottleneck such a disadvantageous process?

> Reduction in population size

> Reduction in genetic diversity

> Potential to have a non favorable allele fixed (all of the alleles are the same – homozygous for that allele in ALL organisms)

AP BIO INSTA-REVIEW

TOPIC 7.4

What is founder's effect?

AP BIO INSTA-REVIEW

TOPIC 7.4

What is founder's effect?

A group of individuals are separated from the population and begin their own population.

AP BIO INSTA-REVIEW

TOPIC 7.4

The new population is representative of the original population?

* same allele frequency in both populations

A. True

B. False

AP BIO INSTA-REVIEW

TOPIC 7.4

The new population is representative of the original population?

* same allele frequency in both populations

B. False

The new population was randomly separated from the main population and was not based on traits. This leads to the new population having a different allele frequency.

AP BIO INSTA-REVIEW

TOPIC 7.4

What is gene flow?

AP BIO INSTA-REVIEW

TOPIC 7.4

What is gene flow?

The movement of alleles between populations.

This is a fancy way to say immigration and emigration.

The genes are flowing in or out of a population.

AP BIO INSTA-REVIEW

TOPIC 7.4

How does the increase in gene flow affect genetic diversity?

A. Decreases genetic diversity

B. Increase genetic diversity

AP BIO INSTA-REVIEW

TOPIC 7.4

How does the increase in gene flow affect genetic diversity?

A. Decreases genetic diversity

When the two are separate, there are some alleles in one population that are not in the other. Think about the human population before world travel. Would you agree there were large differences between populations? Now that we have world travel, individuals from different parts of the world can mate and have offspring. This makes the populations' characteristics more similar to each other (decrease in genetic diversity)

AP BIO INSTA-REVIEW

TOPIC 7.4

Mutations lead to differences of the genes in a population, but what allows for the mutations to remain in the population?
(aka what acts on the mutations)

A. Bottleneck effect

B. Founders effect

C. Sexual reproduction

AP BIO INSTA-REVIEW

TOPIC 7.4

Mutations lead to differences of the genes in a population, but what allows for the mutations to remain in the population?

C. Sexual reproduction

Sexual reproduction allows for alleles to be reshuffled with each reproductive event. These mutations can be recessive and remain in the population through multiple generations until the trait provides an evolutionary advantage. An example of this is the allele that allowed for an increased survival during the bubonic plague provides resistance to HIV infection.

AP BIO INSTA-REVIEW

TOPIC 7.4

What are mutations?

AP BIO INSTA-REVIEW

TOPIC 7.4

What are mutations?

Changes in the genetic material (DNA/RNA) depending on the genome

AP BIO INSTA-REVIEW

TOPIC 7.4

Genetic drift...

A. Frequency changes due to natural selection

B. Immigration into/emigration occur of a population

C. Random events cause the change in the gene frequency

D. Slight movement of alleles from transposition

AP BIO INSTA-REVIEW

TOPIC 7.4

Genetic drift...

C. Random events cause the change in the gene frequency

Genetic drift involves a random change in allele frequency. There are two types: bottleneck (random decrease in population size due to a natural event) or founders effect (small group is separated from main population).

AP BIO INSTA-REVIEW

TOPIC 7.4

Genetic drift affects ____ populations more drastically.

A. Large

B. Small

AP BIO INSTA-REVIEW

TOPIC 7.4

Genetic drift affects ____ populations more drastically.

B. Small

The small population will not have as many individuals to allow for the random occurrences to not affect the allele frequency as drastically.

AP BIO INSTA-REVIEW

TOPIC 7.4

What is the bottleneck effect?

A. Decrease in population size due to natural disaster

B. Increase in desirable alleles and decrease in undesirable

C. Natural selection decreases population size to fix alleles.

D. Small group of individuals separated from rest of population

AP BIO INSTA-REVIEW

TOPIC 7.4

What is the bottleneck effect?

A. Decrease in population size due to natural disaster

A natural event drastically decreases the population size so only a small group of individuals survive. The selection is random and not based on traits. As the population size decreases drastically, it can cause specific alleles to become fixed.

AP BIO INSTA-REVIEW

TOPIC 7.4

In founder's effect, the new population is...

A. Is not representative of the original population

B. Is representative of the original population

AP BIO INSTA-REVIEW

TOPIC 7.4

In founder's effect, the new population is...

A. Is not representative of the original population

In founder's effect, a small population is separated from the original population. The new group was not separated by a specific phenotype, but it was random so the allele frequency is not representative of the original population.

AP BIO INSTA-REVIEW

TOPIC 7.4

What is gene flow?

A. Alleles found in a population

B. Immigration/emigration

C. Natural frequency changes in a population

D. Random changes in allele frequencies due to nature.

AP BIO INSTA-REVIEW

TOPIC 7.4

What is gene flow?

B. Immigration/emigration

As individuals move into a population (immigration), they bring alleles into the gene pool.

As individuals move out of a population (emigration), they remove alleles from the gene pool.

AP BIO INSTA-REVIEW

TOPIC 7.4

Why does a population need genetic variance?

AP BIO INSTA-REVIEW

TOPIC 7.4

Why does a population need genetic variance?

The higher the genetic variance, the higher the chances of survival in a changing environment.

The more alleles (alternations of a gene), the more possible alleles to allow for an individual to survive if there's a change in the environment leading to a decrease in populations of certain alleles.

AP BIO INSTA-REVIEW

TOPIC 7.4

An increase in mutations...

A. Decreases genetic variance

B. No effect on genetic variance

C. Increases genetic variance

AP BIO INSTA-REVIEW

TOPIC 7.4

An increase in mutations...

C. Increases genetic variance

As a new mutation occurs, a new allele results and a new phenotype is possible. The more alleles, the more genetic variance.

AP BIO INSTA-REVIEW

TOPIC 7.4

Identify and describe the three types of selection.

AP BIO INSTA-REVIEW

TOPIC 7.4

Identify and describe the three types of selection.

Directional selection:
One extreme is selected for so the population shifts towards the extreme

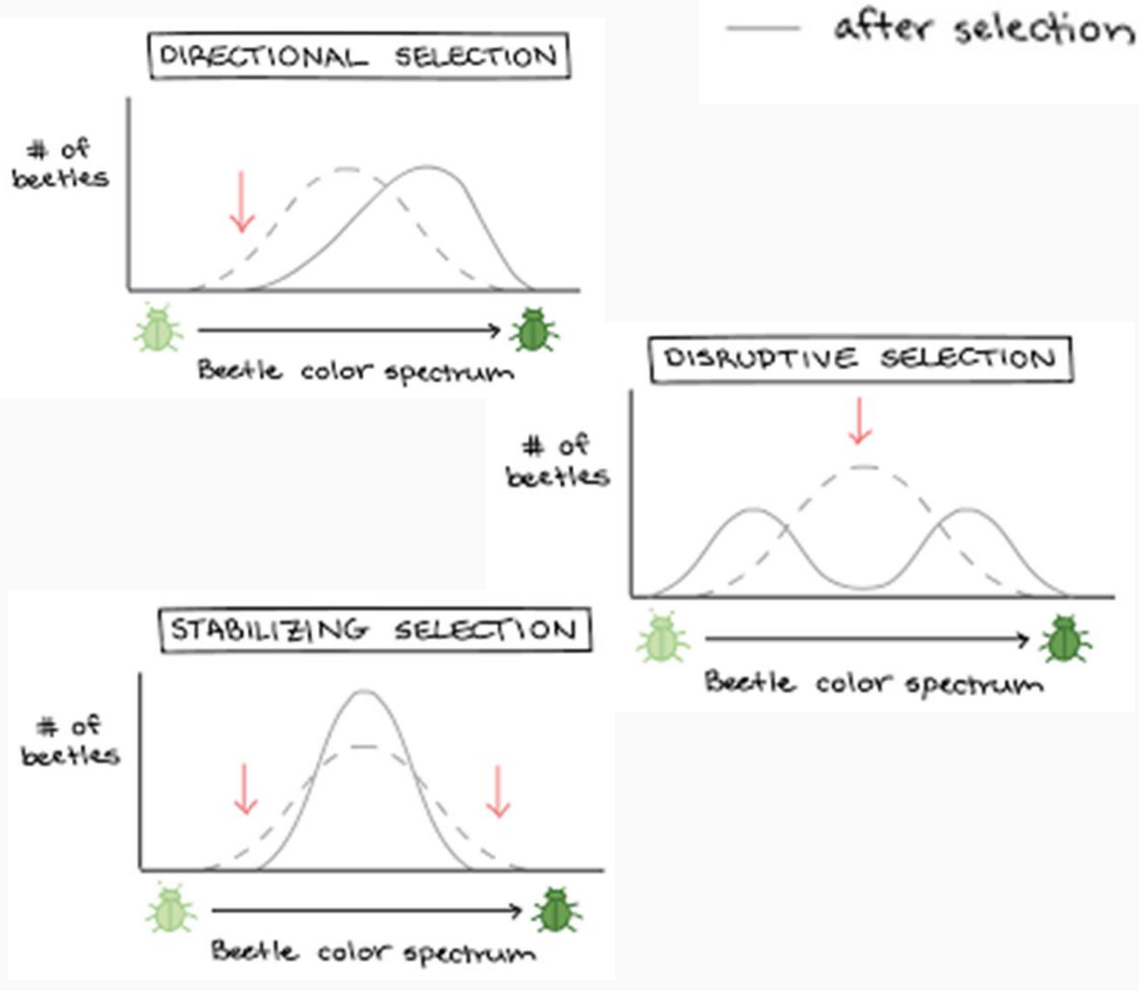
Stabilizing selection:
The intermediate is selected for so there's an increase in the intermediate phenotype

Disruptive selection:
One of the two extremes are selected for which shifts the population towards the two extremes (and decreases the intermediate)

AP BIO INSTA-REVIEW

TOPIC 7.4

Identify and describe the three types of selection.



AP BIO INSTA-REVIEW

TOPIC 7.4

Birth weight is approximately **6-8 lbs**

A. Directional selection

B. Disruptive selection

C. Sexual selection

D. Stabilizing selection

AP BIO INSTA-REVIEW

TOPIC 7.4

Birth weight is approximately 6-8 lbs

D. Stabilizing selection

The birth weight has stabilized to an intermediate birth weight. This has increased the frequency of the intermediate and decreased the frequency of the extremes. This is an example of STABILIZING selection.

AP BIO INSTA-REVIEW

TOPIC 7.4

Peppered moths got darker during industrial revolution

A. Directional selection
B. Disruptive selection
C. Sexual selection
D. Stabilizing selection

AP BIO INSTA-REVIEW

TOPIC 7.4

Peppered moths got darker during industrial revolution

A. Directional selection

Peppered moths had a DIRECTIONAL selection during the industrial revolution. As the increase in soot into the air darkened the trees, the moths with darker phenotypes were more favorable. The frequency of dark phenotypes increased while frequency of light phenotypes decreased showing a directional movement of phenotypes.

AP BIO INSTA-REVIEW

TOPIC 7.4

Finches due to a drought have large or small beaks

A. Directional selection

B. Disruptive selection

C. Sexual selection

D. Stabilizing selection

AP BIO INSTA-REVIEW

TOPIC 7.4

Finches due to a drought have large or small beaks

B. Disruptive selection

Due to the drought, the intermediate beak was selected against (no food) while the small and large beaks were selected for (access to food). This decreased the intermediate phenotype and increased the extreme phenotypes leading to DISRUPTIVE selection.