AP BIO INSTA-REVIEW

TOPIC 7.1

Introduction to Natural Selection

EVO-1.C.1

Natural selection is a major mechanism of evolution.

EVO-1.C.2

According to Darwin's theory of natural selection, competition for limited resources results in differential survival. Individuals with more favorable phenotypes are more likely to survive and produce more offspring, thus passing traits to subsequent generations.

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TOPIC 7.1

Introduction to Natural Selection

EVO-1.D.1

Evolutionary fitness is measured by reproductive success.

EVO-1.D.2

Biotic and abiotic environments can be more or less stable/fluctuating, and this affects the rate and direction of evolution; different genetic variations can be selected in each generation.

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TOPIC 7.1

Who is the "father of evolution"

A. Aristotle
B. Darwin
C. Lamarck
D. Mendel

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TOPIC 7.1

Who is the "father of evolution"

B. Darwin

On the Origin of Species (or, more completely, On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life), published on 24 November 1859, is a work of scientific literature by Charles Darwin that is considered to be the foundation of evolutionary biology. Darwin's book introduced the scientific theory that populations evolve over the course of generations through a process of natural selection. The book presented a body of evidence that the diversity of life arose by common descent through a branching pattern of evolution. Darwin included evidence that he had collected on the Beagle expedition in the 1830s and his subsequent findings from research, correspondence, and experimentation. - Wikipedia

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TOPIC 7.1

What is Darwin’s theory of natural selection?

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TOPIC
7.1

What is Darwin's theory of natural selection?

Individuals with more favorable traits for their environment will be

> more likely to survive to reproduce
> leave more offspring for the next generation

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Which of the following evolves?

A. Individuals

B. Populations

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Which of the following evolves?

B. Populations

Individuals are selected for or against based on their phenotypic characters. That selection causes certain phenotypes to be more likely to survive and thus the frequency of the trait in the population will change. This means that the population has evolved not the individuals.

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What does it mean if an organism is "more fit"? (what does fitness mean?)

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TOPIC 7.1

What does it mean if an organism is "more fit"? (what does fitness mean?)

Fitness is reproductive success

So... how many individuals do you leave for the next generation (and, of those, how many can reproduce?)

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TOPIC 7.1

A mule is a hybrid between a horse and donkey. What is the reproductive fitness of a mule?

A. 0
B. 0.25
C. 0.5
D. 1.0

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TOPIC 7.1

A mule is a hybrid between a horse and donkey. What is the reproductive fitness of a mule?

A. 0

The mule is sterile. This means that the mule is unable to reproduce. Since it is unable to reproduce, it does not contribute to the next generation thus its reproductive fitness is zero.

What are the three types of selection?

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TOPIC 7.1

What are the three types of selection?

> Directional
> Disruptive
> Stabilizing

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TOPIC

7.1

Describe the three types of selection.

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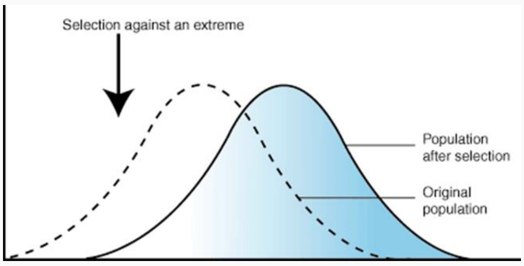
TOPIC

7.1

Describe the three types of selection

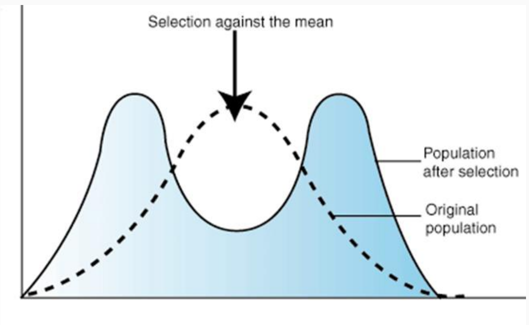
<u>**Directional Selection:**</u>

The phenotype at one extreme is selected leading to the population shifting in a direction



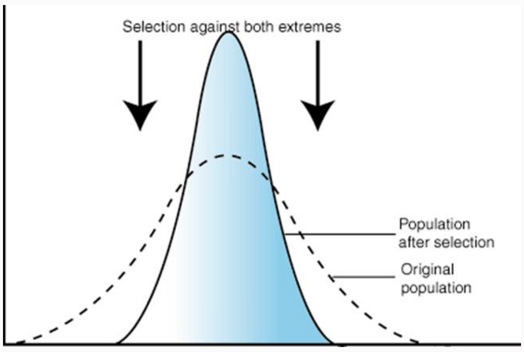
<u>**Disruptive Selection:**</u>

Phenotype at two extremes is selected for leading to a shift towards the two extremes



<u>**Stabilizing Selection:**</u>

The intermediate is selected for leading to an increase in the intermediate phenotype



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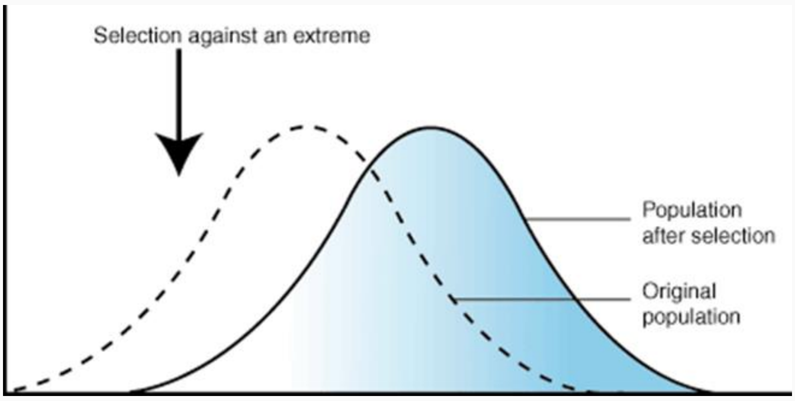
Describe the three types of selection

Directional Selection:



The phenotype at one extreme is selected leading to the population shifting in a direction

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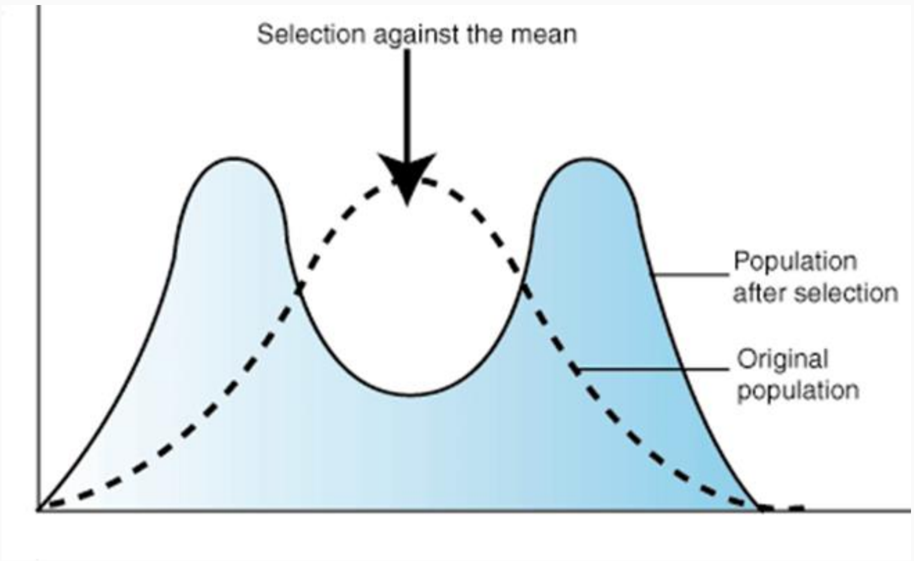
Describe the three types of selection

Disruptive Selection:



Phenotype at two extremes is selected for leading to a shift towards the two extremes

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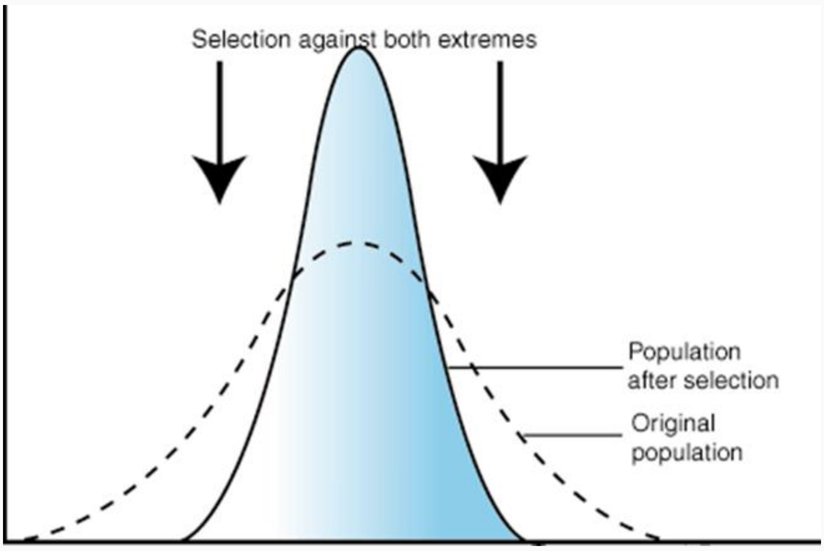
Describe the three types of selection

Stabilizing Selection:



The intermediate is selected for leading to an increase in the intermediate phenotype

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TOPIC 7.1

Peppered moths became darker during the industrial revolution due to the trees becoming darker. What type of selection describes the peppered moth population?

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

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TOPIC 7.1

Peppered moths became darker during the industrial revolution due to the trees becoming darker. What type of selection describes the peppered moth population?

A. Directional

Before the industrial revolution, the moths were light. After the industrial revolution, the moths were dark. The frequency of the dark phenotype has increased; thus, it is **DIRECTIONAL** selection as phenotype has shifted towards **ONE** phenotype.

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TOPIC 7.1

Birth weight averages between 6 to 8 pounds. Which type of selection describes birth weight of humans?

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

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TOPIC
7.1

Birth weight averages between 6 to 8 pounds. Which type of selection describes birth weight of humans?

D. Stabilizing

The frequency of birth weights have maintained between 6 to 8 pounds. Since the weight has stabilized to the intermediate phenotype, this is STABILIZING selection.

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TOPIC 7.1

Drought causes an absence of food for medium beaked birds. Which type of selection describes the bird population?

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

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TOPIC 7.1

Drought causes an absence of food for medium beaked birds. Which type of selection describes the bird population?

B. Disruptive

As the food for the medium (intermediate) beaked birds decreased, these birds are less likely to survive. There is a decrease in the intermediate phenotype and an increase in the TWO extreme phenotypes, so this is DISRUPTIVE selection.

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What is natural selection?

A. Organism with less favorable traits are more likely to live

B. Organism with more favorable traits are more likely to live

C. Nature selects for the less favorable traits

D. Nature selects against the most favorable traits.

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TOPIC 7.1

What is natural selection?

B. Organism with more favorable traits are more likely to live

Individuals with more favorable traits will be more likely to survive. Since they are more likely to survive, they are more likely to leave offspring (and those offspring are more likely to survive). So, nature selects for the more favorable traits and against less favorable traits.

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7.1

Describe Darwin's theory of natural selection

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TOPIC 7.1

Describe Darwin's theory of natural selection

Organism with more favorable traits are more likely to survive and leave more offspring to the next generation.

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TOPIC

7.1

Horse and donkey have unequal number of chromosomes, so the offspring has an odd number of chromosomes and is sterile. What is the fitness of the offspring?

A. 0
B. ½
C. 1
D. Cannot be determined

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TOPIC 7.1

Horse and donkey have unequal number of chromosomes, so the offspring has an odd number of chromosomes and is sterile. What is the fitness of the offspring?

A. 0

Fitness refers to the ability to survive to reproduce and that offspring surviving to reproduce. Since the offspring has an odd number of chromosomes, it is unable to pair homologous chromosomes and is sterile. The offspring is unable to reproduce and does not contribute to the gene pool thus its fitness is zero.

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Evolution produces perfect organisms

A. True
B. False

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TOPIC 7.1

Evolution produces perfect organisms

B. False

The environment is constantly changing thus the favorable traits are constantly changing. In addition, natural selection can only select from available phenotypes. If the mutation does not exist, it cannot be selected for.

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7.1

Note:

Evolution can only act on the current phenotypes available, so it select for the most favorable but as the environment changes the "favorable" traits can also change so a different trait is selected for

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TOPIC
7.2

Natural Selection

EVO-1.E.1

Natural selection acts on phenotypic variations in populations.

EVO-1.E.2

Environments change and apply selective pressures to populations.

EVO-1.E.3

Some phenotypic variations significantly increase or decrease fitness of the organism in particular environments.

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TOPIC 7.2

Which level does natural selection act on?

A. Individual Genotype
B. Individual Phenotype
C. Population Genotype
D. Population Phenotype

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TOPIC 7.2

Which level does natural selection act on?

D. Population Phenotype

Natural selection is acting on specific phenotypes in a population. The individuals able to blend into their environments are less likely to be consumed and more likely to survive. The genotype is not involved in the selection of individuals.

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TOPIC 7.2

What level does natural selection select?

A. Individual Genotype
B. Individual Phenotype
C. Population Genotype
D. Population Phenotype

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TOPIC 7.2

What level does natural selection select?

B. Individual Phenotype

Natural selection is selecting the individuals with the favorable phenotypes. The individuals able to blend into their environments are less likely to be consumed and more likely to survive.

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TOPIC 7.2

What level does natural selection cause change?

A. Individual Genotype
B. Individual Phenotype
C. Population Genotype
D. Population Phenotype

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TOPIC 7.2

What level does natural selection cause change?

C. Population Genotype

The individuals who are more likely to survive share alleles that led to the favorable phenotype. The allele frequency will increase in the population, thus natural selection causes changes in the population's genotype (allele frequency).

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TOPIC 7.2

An individual evolves to better match its environment.

A. True
B. False

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TOPIC 7.2

An individual evolves to better match its environment.

B. False

Individuals DO NOT evolve. Populations evolve.

The individuals are selected for or against, but the population will change due to those selections.

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TOPIC 7.2

NOTE:

Be super careful with all the evolution stuff. The population's phenotype is changing. Plus, the population isn't choosing to change. The environment selects certain phenotypes and that will adjust the gene pool.

What is a phenotype?

A. Genes
B. Physical Characteristics

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TOPIC 7.2

What is a phenotype?

B. Physical Characteristics

Phenotype is the physical (observable) characteristics from the proteins synthesized by the genes (genotype).

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7.2

What does natural selection MODIFY?

A. Genotype

B. Phenotype

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TOPIC 7.2

What does natural selection MODIFY?

A. Genotype

Due to specific traits being selected for or against, the alleles for those traits will either increase or decrease in the population. Natural selection modifies the allele frequency which is genotype.

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What does it mean by fitness?

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What does it mean by fitness?

Fitness is the ability for an organism to contribute to the gene pool. It's about being able to survive and reproduce and leave offspring that can survive and reproduce.

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TOPIC 7.2

How do you determine the fitness based on chromosomes

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TOPIC 7.2

How do you determine the fitness based on chromosomes

The mule is sterile since it has an odd number of chromosomes (the homologous pairs are unable to pair up) so the mule does not contribute to the gene pool.

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7.2

What does natural selection act on?

Act on means that is selected for or against.

A. Genotype
B. Phenotype

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TOPIC 7.2

What does natural selection act on?

Act on means that is selected for or against.

B. Phenotype

Natural selection will determine which individuals will survive. If a phenotype allows for an individual to be more likely to survive, it will be able to leave more offspring. If a phenotype allows for an individual to be less likely to survive, it will leave less offspring.

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7.3

Artificial Selection

EVO-1.F.1

Through artificial selection, humans affect variation in other species.

EVO-1.G.1

Convergent evolution occurs when similar selective pressures result in similar phenotypic adaptations in different populations or species.

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TOPIC
7.3

What is artificial selection?

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7.3

What is artificial selection?

Humans select a specific trait in an organism, and it accumulates or reduces in the population.

Due to this, humans will grow/breed organisms with the favorable trait. This increases that "favorable" trait in the population leading to a change in the population phenotype.

Convergent evolution is due to common ancestry.

A. True
B. False

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7.3

Convergent evolution is due to common ancestry.

B. False

Convergent evolution is a similar solution to a similar problem. It does NOT represent common ancestry.

For example:
sugar glider (marsupial) and flying squirrel (placental)

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TOPIC 7.3

What is convergent evolution?

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7.3

What is convergent evolution?

Similar solution to a similar problem...

This results from two populations that are under similar selective pressures. Due to this selective pressure, the same characteristic is selected for survival.

The two organisms look similar but DO NOT HAVE COMMON DESCENT.

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TOPIC 7.3

How is artificial selection different than natural selection?

A. Artificial picks best traits for past events
B. Artificial picks best traits for future events
C. Artificial picks traits based on human's interests
D. Artificial picks traits based on predator/prey interests

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7.3

How is artificial selection different than natural selection?

C. Artificial picks traits based on human's interests

Artificial selection is human selecting for traits they find favorable.

For example:
Corn has two varieties: thin/small seeds vs fat/plump seeds. Farmers have utilized artificial selection to produce majority plump kernels by constantly planting plump seeds so over time majority of the population has plump seeds.

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7.3

Peppered moths are an example of artificial selection.

A. True
B. False

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TOPIC
7.3

Peppered moths are an example of artificial selection.

B. False

Peppered moths are an example used in many classrooms. During the industrial revolution, humans caused the increase of smog and soot in the air which darkened the trees of the peppered moths' habitat. Over many generations, it was observed that the moths underwent directional selection to a darker moth phenotype.

Although humans caused the selective pressure which led to the directional selection, nature still determined reproductive fitness of the phenotypes.

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TOPIC 7.3

Antibiotic resistant bacteria are an example of artificial selection.

A. True

B. False

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TOPIC
7.3

Antibiotic resistant bacteria are an example of artificial selection.

B. False

If humans introduce antibiotics into their bodies, the bacteria that are resistant will be killed leaving resistant bacterial selected for.

Although humans caused the selective pressure which led to the directional selection, nature still determined reproductive fitness of the phenotypes.

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TOPIC 7.3

If a dog breeder only mates dalmatians with perfect spots, which type of selection?

A. Artificial selection
B. Natural selection

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TOPIC 7.3

If a dog breeder only mates dalmatians with perfect spots, which type of selection?

A. Artificial selection

Artificial selection involves humans selecting for specific traits by breeding organism with specific phenotypes.

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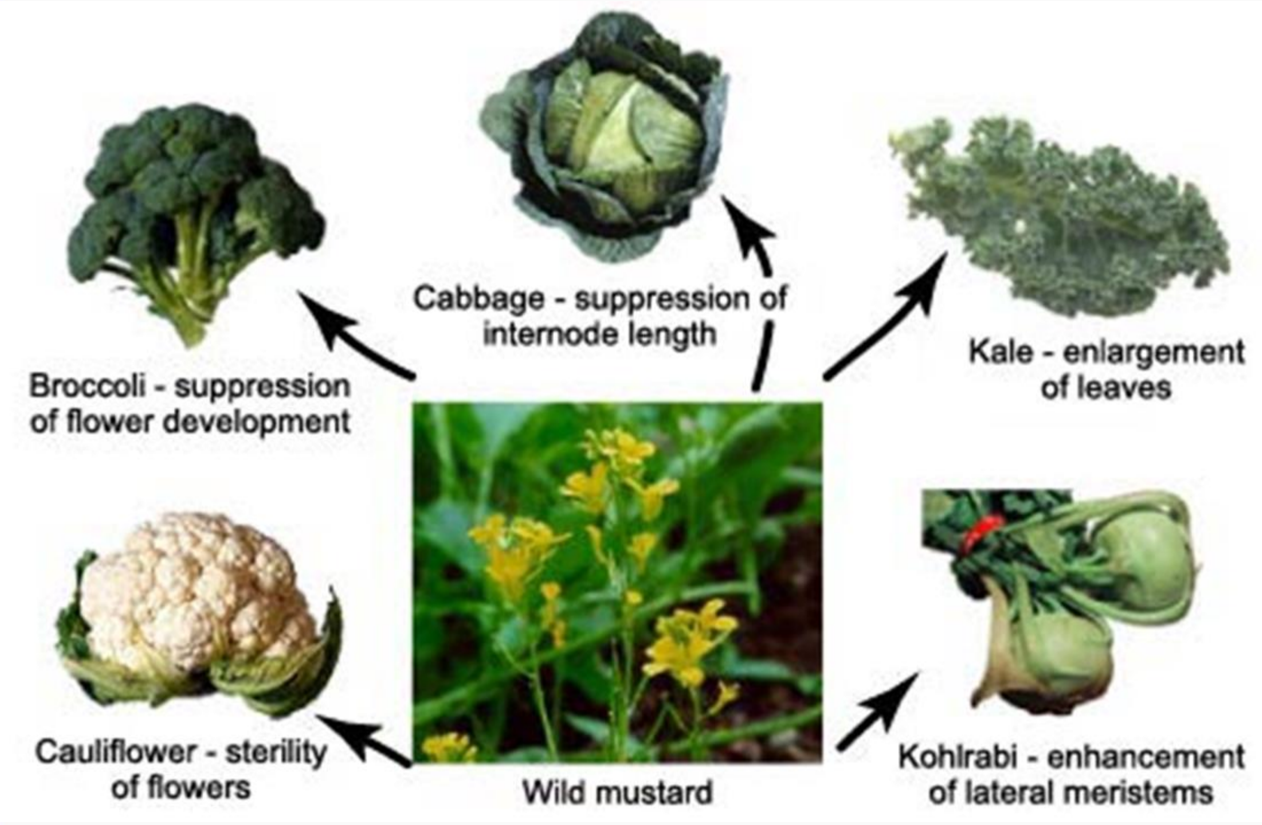
Example of artificial selection



Convergent evolution

A. Different structures, common ancestor

B. Different structures, different ancestor

C. Similar structure, common ancestor

D. Similar structure, different ancestor

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7.3

Convergent evolution

D. Similar structure, different ancestor

Convergent evolution involves two populations having a similar trait due to similar environmental constraints. The populations do not share a common ancestor.

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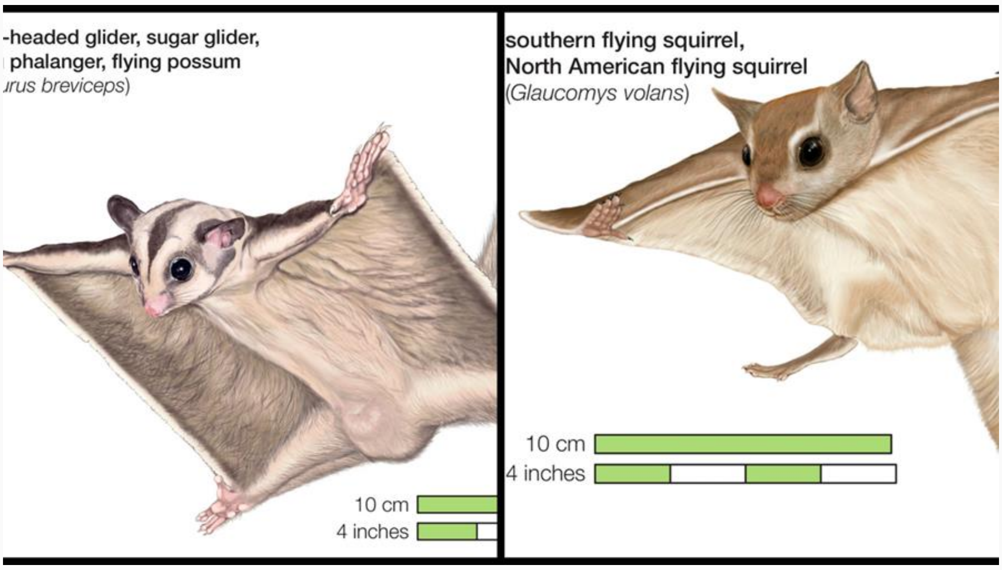
Note:

I like to think of convergent evolution as two organisms converge on the same trait. The are not related to one another but they are subjected to similar environmental conditions which leads to similar adaptations to be selected to survive.



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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.

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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.

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What are the two types of genetic drift?

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What are the two types of genetic drift?

> Bottleneck

> Founders Effect

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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

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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.

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What is the bottleneck effect?

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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.

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7.4

Bottleneck is an example of natural selection.

A. True
B. False

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.

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TOPIC 7.4

Why is bottleneck such a disadvantageous process?

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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)

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What is founder's effect?

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What is founder's effect?

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

The new population is representative of the original population?

* same allele frequency in both populations

A. True

B. False

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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.

What is gene flow?

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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.

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TOPIC 7.4

How does the increase in gene flow affect genetic diversity?

A. Decreases genetic diversity
B. Increase genetic diversity

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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)

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

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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.

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What are mutations?

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TOPIC
7.4

What are mutations?

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

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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

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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).

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TOPIC 7.4

Genetic drift affects ____ populations more drastically.

A. Large
B. Small

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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.

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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

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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.

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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

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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.

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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.

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.

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TOPIC 7.4

Why does a population need genetic variance?

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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.

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TOPIC 7.4

An increase in mutations...

A. Decreases genetic variance

B. No effect on genetic variance

C. Increases genetic variance

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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.

Identify and describe the three types of selection.

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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)

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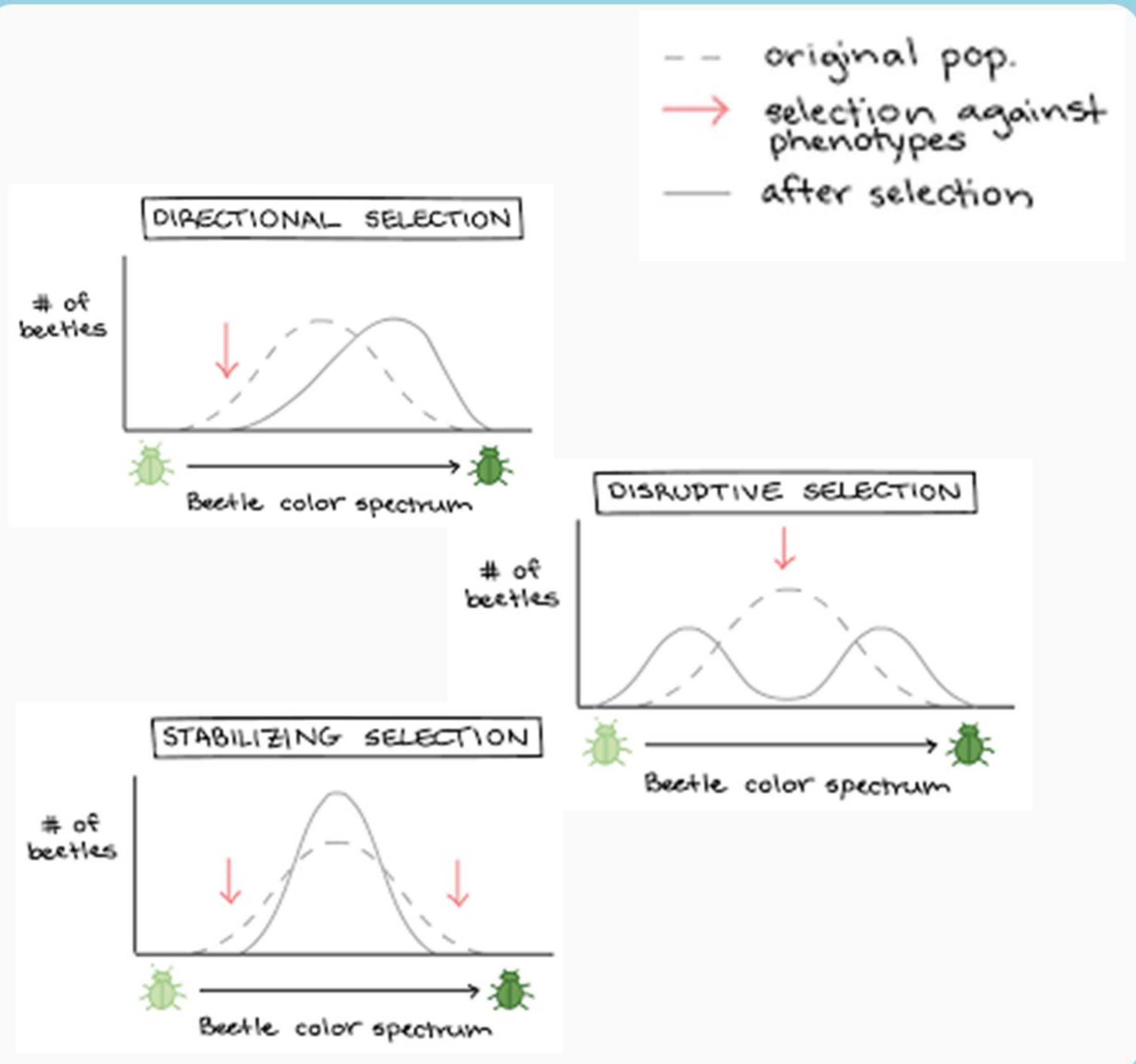
Identify and describe the three types of selection.



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TOPIC 7.4

Birth weight is approximately 6-8 lbs

A. Directional selection

B. Disruptive selection

C. Sexual selection

D. Stabilizing selection

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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.

AP BIO INSTA-REVIEW

TOPIC 7.5

Hardy-Weinberg Equilibrium

EVO-1.K.1

Hardy-Weinberg is a model for describing and predicting allele frequencies in a nonevolving population. Conditions for a population or an allele to be in Hardy-Weinberg equilibrium are—

(1) a large population size

(2) absence of migration

(3) no net mutations

(4) random mating

(5) absence of selection.

These conditions are seldom met, but they provide a valuable null hypothesis.

AP BIO INSTA-REVIEW

TOPIC 7.5

Hardy-Weinberg Equilibrium

EVO-1.K.2

Allele frequencies in a population can be calculated from genotype frequencies.

RELEVANT EQUATION

Hardy-Weinberg Equation—

$$p^2 + 2pq + q^2 = 1$$

$$p + q = 1$$

where:

p = frequency of allele 1 in the population

q = frequency of allele 2 in the population

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TOPIC 7.5

Hardy-Weinberg Equilibrium

EVO-1.L.1

Changes in allele frequencies provide evidence for the occurrence of evolution in a population.

EVO-1.L.2

Small populations are more susceptible to random environmental impact than large populations.

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TOPIC 7.5

NOTE:

The BEST video to watch to understand the conditions of Hardy-Weinberg is by Paul Anderson

TedEd:

[Five Fingers of Evolution]

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TOPIC

7.5

For Hardy-Weinberg, the population size should be...

A. Small

B. Large

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TOPIC 7.5

For Hardy-Weinberg, the population size should be...

B. Large

Hardy-Weinberg states that a population is not evolving if the allele frequencies stay the same. When the population is large, it allows for genetic drift to not affect the population to the same extreme. The five conditions for Hardy-Weinberg are LARGE population size, RANDOM mating, NO mutations, NO gene flow, and NO natural selection.

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TOPIC
7.5

Why do you want a large population size?

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TOPIC
7.5

Why do you want a large population size?

To inhibit genetic drift situations. Recall, we said yesterday that random situations could impact allele frequency.

If you had a population of 100 vs 100,000 and 50 individuals die from a random event. That decrease of 50 from the random event would be 50% of the first and 5% of the second population.

So, you see how the small population can have a large difference in the allele frequency

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TOPIC 7.5

For Hardy-Weinberg, condition for gene flow?

A. No gene flow
B. Yes gene flow

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TOPIC 7.5

For Hardy-Weinberg, condition for gene flow?

A. No gene flow

Hardy-Weinberg states that a population is not evolving if the allele frequencies stay the same. When the individuals immigrate or emigrate, alleles are added or removed from the population, which changes the allele frequency. The five conditions for Hardy-Weinberg are LARGE population size, RANDOM mating, NO mutations, NO gene flow, and NO natural selection.

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TOPIC
7.5

Why no gene flow for Hardy-Weinberg?

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TOPIC 7.5

Why no gene flow for Hardy-Weinberg?

Gene flow can modify the allele frequency due to the movement of alleles (not by evolution) and this can introduce new alleles from another population

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TOPIC
7.5

For Hardy-Weinberg, what about mutations?

A. No mutations
B. Yes mutations

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TOPIC

7.5

For Hardy-Weinberg, what about mutations?

A. No mutations

Hardy-Weinberg states that a population is not evolving if the allele frequencies stay the same. Mutations add new alleles to a population, which will change the allele frequencies. The five conditions for Hardy-Weinberg are LARGE population size, RANDOM mating, NO mutations, NO gene flow, and NO natural selection.

Why should there be no mutations for Hardy-Weinberg?

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TOPIC 7.5

Why should there be no mutations for Hardy-Weinberg?

Mutations add new alleles which is going to definitely change the allele frequency.

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TOPIC 7.5

For Hardy-Weinberg, what about mating?

A. Nonrandom mating
B. Random mating

For Hardy-Weinberg, what about mating?

B. Random mating

Hardy-Weinberg states that a population is not evolving if the allele frequencies stay the same. Random mating allows for no traits to be selected for or against which can affect the allele frequencies. The five conditions for Hardy-Weinberg are LARGE population size, RANDOM mating, NO mutations, NO gene flow, and NO natural selection.

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TOPIC 7.5

Why should mating be random for Hardy-Weinberg?

AP BIO INSTA-REVIEW

TOPIC 7.5

Why should mating be random for Hardy-Weinberg?

No one allele should be more "favorable" than another because it will modify the allele frequency

For Hardy-Weinberg, what about natural selection?

A. No natural selection
B. Yes natural selection

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TOPIC 7.5

For Hardy-Weinberg, what about natural selection?

A. No natural selection

Hardy-Weinberg states that a population is not evolving if the allele frequencies stay the same. Natural selection allows for traits to be selected for or against which can affect the allele frequencies. The five conditions for Hardy-Weinberg are LARGE population size, RANDOM mating, NO mutations, NO gene flow, and NO natural selection.

Why should there be no natural selection?

Why should there be no natural selection?

Natural selection involves one allele being more favorable and thus will lead to allele frequency differences

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TOPIC
7.5

So, I always tell my students, its...

LARGE
RANDOM
NO
NO
NO

(large population, random mating, no mutation, no gene flow, and no natural selection)

AP BIO INSTA-REVIEW

TOPIC 7.5

If allele frequency stays the same, but genotype frequencies change.

A. Population is still in Hardy-Weinberg

B. Population is NO LONGER in Hardy-Weinberg

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TOPIC 7.5

If allele frequency stays the same, but genotype frequencies change.

B. Population is NO LONGER in Hardy-Weinberg

Hardy-Weinberg equilibrium states that genetic variation (genotypic and allelic frequencies) will remain unchanged over multiple generations.

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TOPIC

7.5

Dominant allele frequency...

A. p

B. q

C. p^2

D. q^2

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TOPIC 7.5

Dominant allele frequency...

A. p

Hardy-Weinberg equilibrium involves
$p + q = 1$ AND $p^2 + 2pq + q^2 = 1$

where...

p = frequency of dominant allele

q = frequency of recessive allele

p^2 = frequency of homozygous dominant

$2pq$ = frequency of heterozygous

q^2 = frequency of homozygous recessive

AP BIO INSTA-REVIEW

TOPIC 7.5

Homozygous recessive...

A. p

B. q

C. p^2

D. q^2

AP BIO INSTA-REVIEW

TOPIC 7.5

Homozygous recessive...

D. q^2

Hardy-Weinberg equilibrium involves
$p + q = 1$ AND $p^2 + 2pq + q^2 = 1$

where...

p = frequency of dominant allele
q = frequency of recessive allele
p^2 = frequency of homozygous dominant
$2pq$ = frequency of heterozygous
q^2 = frequency of homozygous recessive

If the q value is 0.4, what is the p value?

AP BIO INSTA-REVIEW

TOPIC

7.5

If the q value is 0.4, what is the p value?

0.6

Recall:

$p + q = 1$

So, $p + 0.4 = 1$

$p = 1 - 0.4$

$p = 0.6$

AP BIO INSTA-REVIEW

TOPIC

7.5

If $p = 0.8$, what is q^2?

AP BIO INSTA-REVIEW

TOPIC

7.5

If $p = 0.8$, what is q^2?

$q^2 = 0.\ 04$

Recall:

$p + q = 1$

So, if $p = 0.8$

then $q = 0.2$

So, $q^2 = (0.\ 2)^2$

and $(0.\ 04)$

Don't forget your multiplication rules with decimals and forget to move your decimal.

Note:

The math for these problems could get a little tricky! It's important to remember and understand what all the variable stand for. Students sometimes get the singlets versus the squares/doublets confused.

If you are talking about an allele – you are talking about ONE allele (dominant allele, recessive allele) so it's p and q.

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TOPIC 7.5

Note:

If talking about a trait, you are talking about TWO alleles (diploid organisms). So, dominant phenotype or homozygous dominant, etc correspond with the p^2, q^2, and $2pq$.

Notice the ONE refers to a single variable while the TWO refers to the variables with a 2 for exponent of leading term.

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TOPIC 7.5

Which method do you use to calculate the allele frequency?

If you are given ALL of the phenotypes, solve for the alleles by COUNTING the alleles.

If you are only given SOME of the phenotypes, solve for the alleles by the EQUATION.

AP BIO INSTA-REVIEW

TOPIC 7.5

What does it mean if the population remains in Hardy Weinberg equilibrium?

A. Population is not evolving
B. Population is genetically diverse
C. Population is undergoing gradual equilibrium
D. Population is undergoing punctuated equilibrium

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TOPIC 7.5

What does it mean if the population remains in Hardy Weinberg equilibrium?

A. Population is not evolving

Hardy-Weinberg equilibrium states the conditions that must be met so the genetic frequencies remain the same and the population is not evolving.

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TOPIC 7.5

What is allele frequency?

A. The number of different alleles possible in a population
B. The number of individuals with each allele
C. The percent of individuals in the population with a trait
D. The percent of the allele in the population

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TOPIC 7.5

What is allele frequency?

D. The percent of the allele in the population

Frequencies refer to percents, so the allele frequency is the percent of the allele in the population. It is calculated as p or q in the Hardy-Weinberg equilibrium formula. It can be calculated as number of alleles divided by the total alleles.

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TOPIC

7.5

What variable represents the frequency of the recessive allele?

A. p

B. p^2

C. q

D. q^2

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TOPIC 7.5

What variable represents the frequency of the recessive allele?

C. q

Hardy-Weinberg equilibrium involves
$p + q = 1$ AND $p^2 + 2pq + q^2 = 1$

where...

p = frequency of dominant allele
q = frequency of recessive allele
p^2 = frequency of homozygous dominant
$2pq$ = frequency of heterozygous
q^2 = frequency of homozygous recessive

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TOPIC 7.5

What is genotype frequency?

A. The number of individuals with each genotype in the population

B. The number of individuals with each phenotype in the population

C. The percent of individuals with each genotype

D. The percent of individuals with each phenotype

AP BIO INSTA-REVIEW

TOPIC 7.5

What is genotype frequency?

C. The percent of individuals with each genotype

Frequencies refer to percents, so the genotypic frequency is the percent of the genotype in the population. It is calculated as p^2, $2pq$, or q^2 in the Hardy-Weinberg equilibrium formula. It can be calculated as number of genotype divided by the total individuals.

AP BIO INSTA-REVIEW

TOPIC 7.5

What variable is used for frequency of homozygous dominant?

A. p
B. p^2
C. q
D. q^2

AP BIO INSTA-REVIEW

TOPIC 7.5

What variable is used for frequency of homozygous dominant?

B. p^2

Hardy-Weinberg equilibrium involves $p + q = 1$ AND $p^2 + 2pq + q^2 = 1$

where...

p = frequency of dominant allele

q = frequency of recessive allele

p^2 = frequency of homozygous dominant

$2pq$ = frequency of heterozygous

q^2 = frequency of homozygous recessive

AP BIO INSTA-REVIEW

TOPIC 7.5

What is the variable for frequency of the homozygous recessive?

A. p
B. p^2
C. q
D. q^2

AP BIO INSTA-REVIEW

TOPIC 7.5

What is the variable for frequency of the homozygous recessive?

D. q^2

Hardy-Weinberg equilibrium involves
$p + q = 1$ AND $p^2 + 2pq + q^2 = 1$

where...
p = frequency of dominant allele
q = frequency of recessive allele
p^2 = frequency of homozygous dominant
$2pq$ = frequency of heterozygous
q^2 = frequency of homozygous recessive

What variable is used for frequency of heterozygous?

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TOPIC 7.5

What variable is used for frequency of heterozygous?

2pq

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TOPIC 7.5

What is the equation used for Hardy-Weinberg?

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TOPIC 7.5

What is the equation used for Hardy-Weinberg?

$$p + q = 1$$

$$p^2 + 2pq + q^2 = 1$$

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TOPIC 7.5

Which variable should you always start with for solving these questions?

A. p
B. p^2
C. q
D. q^2

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TOPIC 7.5

Which variable should you always start with for solving these questions?

D. q^2

If you are NOT given all of the genotypes, solving for the q^2 is your first step. There's only one option for the recessive phenotype vs dominant phenotype can be either homozygous dominant or heterozygous.

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TOPIC 7.5

If 36% of the population has sickle cell disease. Solve for all values.

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TOPIC 7.5

If 36% of the population has sickle cell disease. Solve for all values.

$$q^2 = 0.36$$
$$q = 0.6$$
$$p = 0.4$$
$$p^2 = 0.16$$
$$2pq = 0.48$$

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TOPIC 7.5

If the population has 75 with DD, 50 with Dd, and 25 with dd. Solve all values.

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TOPIC 7.5

If the population has 75 with DD, 50 with Dd, and 25 with dd. Solve all values.

$$\#D = 2(75)+50 = 200$$
$$p = 200/300 = 0.67$$
$$\#d = 2(25) + 50 = 100$$
$$q = 100/300 = 0.33$$
$$p^2 = 75/150 = 0.5$$
$$2pq = 50/150 = 0.33$$
$$q^2 = 25/150 = 0.17$$

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TOPIC 7.5

How do you know the population is in equilibrium?

A. $p = q$

B. $p^2 = q^2$

C. $p + p^2 = q + q^2$

D. Frequencies remain the same between each generation

AP BIO INSTA-REVIEW

TOPIC 7.5

How do you know the population is in equilibrium?

D. Frequencies remain the same between each generation

As the population is in equilibrium, the allelic and genotypic frequencies remain the same. The conditions for Hardy-Weinberg keeps the frequencies constant.

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TOPIC 7.5

Extremely large population attempts to avoid

A. Gene flow
B. Genetic drift
C. Mutations

AP BIO INSTA-REVIEW

TOPIC 7.5

Extremely large population attempts to avoid

B. Genetic drift

Genetic drift involves the change of allele frequencies due to random chance.

AP BIO INSTA-REVIEW

TOPIC 7.6

Evidence of Evolution

EVO-1.M.1

Evolution is supported by scientific evidence from many disciplines (geographical, geological, physical, biochemical, and mathematical data).

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TOPIC 7.6

Evidence of Evolution

EVO-1.N.1

Molecular, morphological, and genetic evidence from extant and extinct organisms adds to our understanding of evolution—

a. Fossils can be dated by a variety of methods. These include:

i. The age of the rocks where a fossil is found

ii. The rate of decay of isotopes including carbon-14

iii. Geographical data

b. Morphological homologies, including vestigial structures, represent features shared by common ancestry.

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TOPIC
7.6

Evidence of Evolution

EVO-1.N.2

A comparison of DNA nucleotide sequences and/or protein amino acid sequences provides evidence for evolution and common ancestry.

EVO-2.B.1

Many fundamental molecular and cellular features and processes are conserved across organisms.

EVO-2.B.2

Structural and functional evidence supports the relatedness of organisms in all domains.

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TOPIC 7.6

Which of these structures demonstrate common ancestry?

A. Analogous structure
B. Convergent structure
C. Homologous structure
D. Nucleotide structure

Which of these structures demonstrate common ancestry?

C. Homologous structure

Homologous structures are structures that are structures due to common ancestry. These structures do not always look the same or function the same.

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TOPIC 7.6

What are homologous structures?

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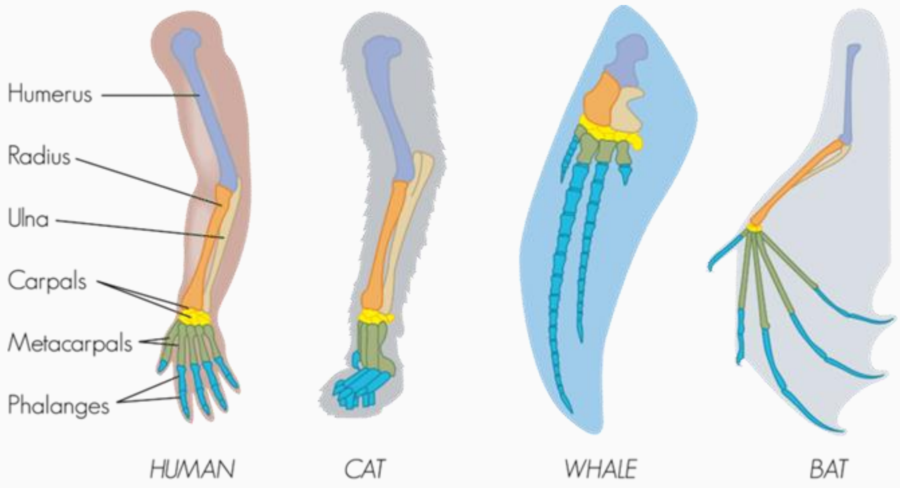
TOPIC 7.6

What are homologous structures?

Structures from common descent. As seen in the image, all these organisms have the same bones in their arm, fin, wing, etc. The bone structures are slightly different as changes occurred due to evolution, but they are similar enough to show common descent.



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TOPIC 7.6

Extant organisms are...

A. Ancestors
B. Current Living
C. Future Species

Extant organisms are...

B. Current Living

Extant organisms are organisms that are currently living versus extinct species have died out.

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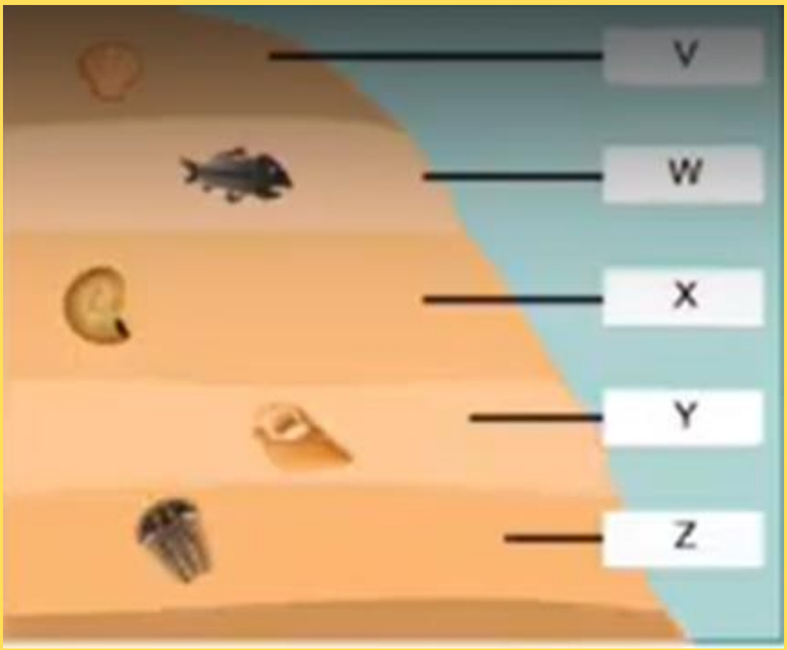
TOPIC 7.6



Which fossil is the oldest?

A. V
B. W
C. Y
D. Z

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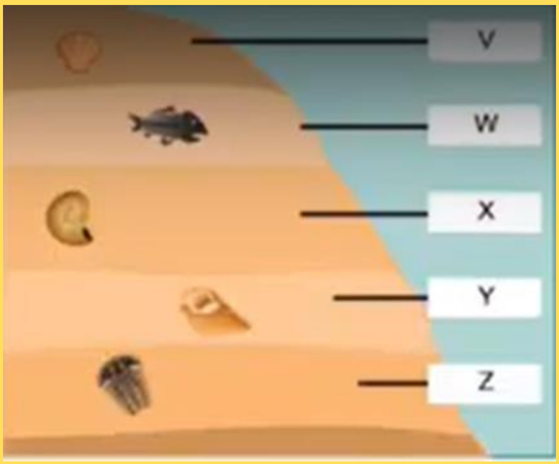
TOPIC 7.6

Which fossil is the oldest?



D. Z

As time progresses, soil is deposited on top. The oldest fossil would be the deepest fossil to show that it took place the longest time so has more soil on top of the fossil.

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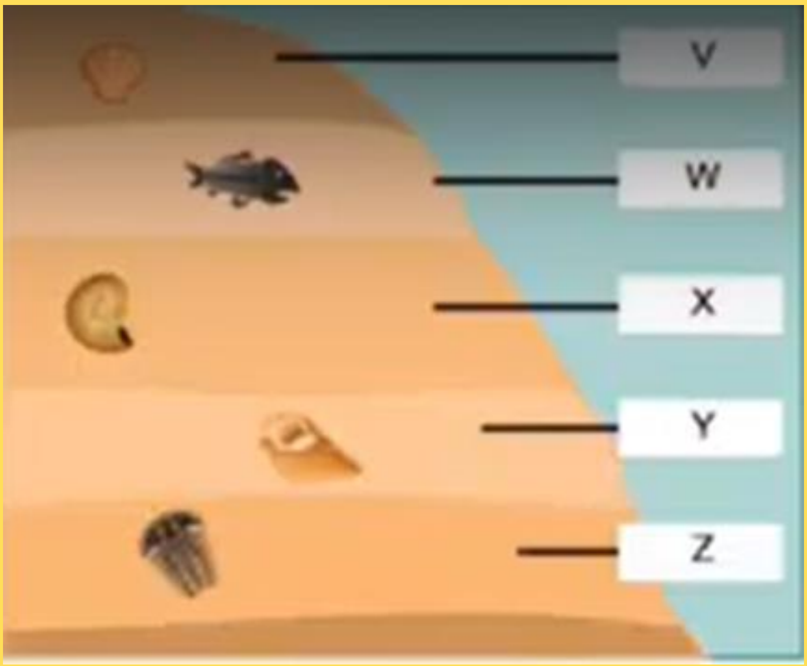
TOPIC 7.6



If looking for a recent ancestor of the fish, look at

A. V
B. X
C. Y
D. Z

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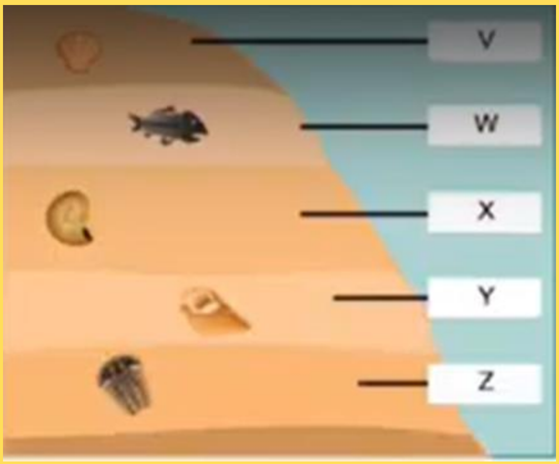
TOPIC 7.6

If looking for a recent ancestor of the fish, look at



B. X

The fish is in layer W. The V would be a descendant while the X, Y, & Z would be ancestors. The most recent would be the one right before layer W which is X.

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TOPIC 7.6

If the half life of carbon-14 is 5,000 years, how long does it take for 25% of the carbon to be remaining?

Note: I am rounding the half-life for easy math

A. 2500

B. 5000

C. 7500

D. 10000

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TOPIC 7.6

If the half life of carbon-14 is 5,000 years, how long does it take for 25% of the carbon to be remaining?

Note: I am rounding the half-life for easy math

D. 10000

After 1 half-life, the 100% is 50%.

After 2 half-lives, the 100% is 25%.

Since it is 2 half-lives, the half-life (5,000) is multiplied by 2.
The amount of time is 10,000.

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TOPIC 7.6

How many half-lives to get to 1/32 of the original amount?

A. 4
B. 5
C. 6
D. 7

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TOPIC
7.6

How many half-lives to get to 1/32 of the original amount?

B. 5

1 → 1/2 → 1/4 → 1/8 → 1/16 → 1/32

Count the number of arrows. There are 5 arrows so there were 5 half-lives.

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TOPIC
7.6

Vestigial structures show common ancestry...

A. True
B. False

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TOPIC 7.6

Vestigial structures show common ancestry...

A. True

Vestigial structures are traits inherited from ancestors that are no longer or less functional or less elaborate. These demonstrate common ancestry.

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TOPIC

7.6

Which is more accurate molecular data?

A. Amino acid sequence

B. Nucleotide sequence

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TOPIC
7.6

Which is more accurate molecular data?

B. Nucleotide sequence

Due to silent mutations, there can be changes in the nucleotide sequence without a change in the amino acid sequence.

Why is nucleotide sequence more accurate?

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TOPIC 7.6

Why is nucleotide sequence more accurate?

Nucleotides refer to the DNA sequence. There can be a change in the DNA that doesn't change the amino acid (silent mutation). There can be change in the DNA that is not coded (introns, noncoding DNA, etc).

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TOPIC 7.6

TABLE 1. AMINO ACID DIFFERENCES IN THE LYST PROTEIN AMONG BEAR SPECIES

	Panda	Black	Brown	Polar
Panda	–			
Black	33	–		
Brown	34	1	–	
Polar	40	7	8	–

Which two bears are most closely related?

A. Brown & Black
B. Brown & Polar
C. Black & Polar
D. Black & Panda

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TOPIC 7.6

Which two bears are most closely related?

TABLE 1. AMINO ACID DIFFERENCES IN THE LYST PROTEIN AMONG BEAR SPECIES

	Panda	Black	Brown	Polar
Panda	–			
Black	33	–		
Brown	34	1	–	
Polar	40	7	8	–

A. Brown & Black

Based on the amino acid differences in the chart, there is 1 difference between black and brown bears while there are more differences between the other bears.

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TOPIC
7.6

TABLE 1. AMINO ACID DIFFERENCES IN THE LYST PROTEIN AMONG BEAR SPECIES

	Panda	Black	Brown	Polar
Panda	–			
Black	33	–		
Brown	34	1	–	
Polar	40	7	8	–

Which bear is the outgroup?

A. Black
B. Brown
C. Panda
D. Polar

AP BIO INSTA-REVIEW

TOPIC 7.6

Which bear is the outgroup?

TABLE 1. AMINO ACID DIFFERENCES IN THE LYST PROTEIN AMONG BEAR SPECIES

	Panda	Black	Brown	Polar
Panda	–			
Black	33	–		
Brown	34	1	–	
Polar	40	7	8	–

C. Panda

The outgroup is the least related organism. Based on the largest number of differences between all of the bears and the panda bear, the panda bear is the outgroup.

What is biogeography?

AP BIO INSTA-REVIEW

TOPIC 7.6

What is biogeography?

Study of the distribution of species and ecosystems in geographic space and through geological time

Identify TWO evidences of evolution for organisms

AP BIO INSTA-REVIEW

TOPIC 7.6

Identify TWO evidences of evolution for organisms

Biogeography:
Two organisms are located in the same area

Geological:
Two organisms lived in a similar time period

Homologous structures:
Two organisms have the same structure due to a common ancestry

Embryology:
Two organisms have the same structures during embryonic development to demonstrate common ancestry

Biochemical:
Comparison of proteins or nucleic acids between two organisms to determine the number of differences

AP BIO INSTA-REVIEW

TOPIC
7.6

Identify TWO evidences of evolution for organisms

Biogeography:
Two organisms are located in the same area

Geological:
Two organisms lived in a similar time period

Homologous structures:
Two organisms have the same structure due to a common ancestry

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TOPIC
7.6

Identify TWO evidences of evolution for organisms

Embryology:
Two organisms have the same structures during embryonic development to demonstrate common ancestry

Biochemical:
Comparison of proteins or nucleic acids between two organisms to determine the number of differences

AP BIO INSTA-REVIEW

TOPIC 7.6

What is more accurate to determine relatedness?

A. DNA

B. Protein

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TOPIC 7.6

What is more accurate to determine relatedness?

A. DNA

DNA is more accurate to determine relatedness. The protein is synthesized under the direction of the DNA. Due to multiple codons coding for the same amino acid, there can be a change in the DNA but not in the protein.

AP BIO INSTA-REVIEW

TOPIC 7.6

Why is DNA more accurate than proteins?

A. 4 nucleotides make up DNA
B. 20 amino acids make up protein
C. Introns are removed from mRNA before making protein
D. Silent mutations change DNA without change in protein

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TOPIC 7.6

Why is DNA more accurate than proteins?

D. Silent mutations change DNA without change in protein

Silent mutations involves a change in the codon sequence but no change in the coded amino acid. This allows the DNA to change without a change in the protein.

AP BIO INSTA-REVIEW

TOPIC 7.6

What type of rock are fossils found in?

A. Flintstone
B. Granite
C. Igneous
D. Sedimentary

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TOPIC 7.6

What type of rock are fossils found in?

D. Sedimentary

Sedimentary rocks are types of rock that are formed by the accumulation or deposition of mineral or organic particles at Earth's surface, followed by cementation. After an organism dies, it will be surrounded by this type of rock to form a fossil.

AP BIO INSTA-REVIEW

TOPIC 7.6

How much of a 200 g sample is remaining after 5 half-lives?

A. 3.125
B. 6.25
C. 25
D. 40

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TOPIC 7.6

How much of a 200 g sample is remaining after 5 half-lives?

B. 6.25

200 → 100 → 50 → 25 → 12.5 → 6.25

A half-life involves the amount of time for half of the substance to break down.

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TOPIC 7.6

How much time passed if 12.5 g of 100 g sample has decayed if the half-life is 3 years?

A. 3
B. 6
C. 9
D. 12

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TOPIC 7.6

How much time passed if 12.5 g of 100 g sample has decayed if the half-life is 3 years?

c. 9

100 → 50 → 25 → 12.5

There are 3 arrows, so there have been 3 half-lives.
If a half-life is 3 years, then 3 x 3 = 9

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TOPIC

7.6

What fossil layer is the oldest?

A. Deepest

B. Middle Rock

C. Surface Layer

D. Unable to determine due to natural turn over each season

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TOPIC 7.6

What fossil layer is the oldest?

A. Deepest

As sedimentary rock surrounds the organism after it dies, the oldest fossils will be the deepest as more and more sedimentary rock is placed on top of the organism over time.

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TOPIC

7.6

When comparing protein sequences...

A. Two organisms with the greatest differences are more closely related

B. Two organisms with the least differences are more closely related

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TOPIC 7.6

When comparing protein sequences...

B. Two organisms with the least differences are more closely related

As time increases, the number of nucleotide differences increases. The two organisms with the least differences would be the most closely related due to less time passed.

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TOPIC

7.6

Homologous structures

A. Show common descent
B. Show a convergent event
C. Are structures that are similar due to similar environments
D. Are structures that are different due to similar environments

Homologous structures

A. Show common descent

Homologous structures are similar structures due to common ancestry. They may differ in form or function but are from common ancestry.

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TOPIC 7.6

Analogous structures

A. Show common descent
B. Show convergent evolution
C. Shares an ancestral trait
D. Shares the same body structure

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TOPIC 7.6

Analogous structures

B. Show convergent evolution

Analogous structures are similar structures but do not represent common ancestry.

Convergent evolution is due to similar solution to a similar problem. The structures are similar because the selective pressure was similar which led to a similar structure.

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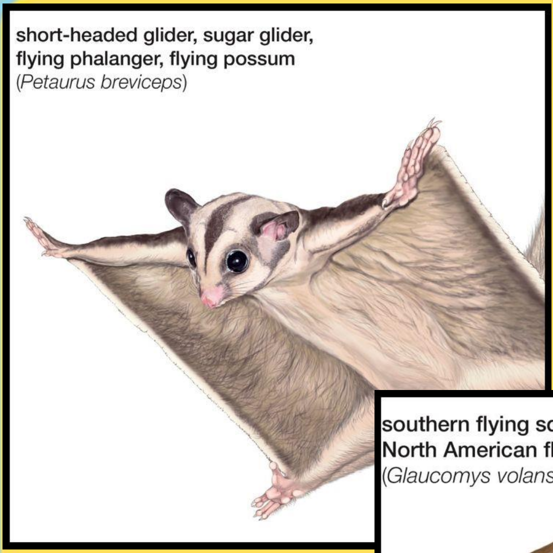
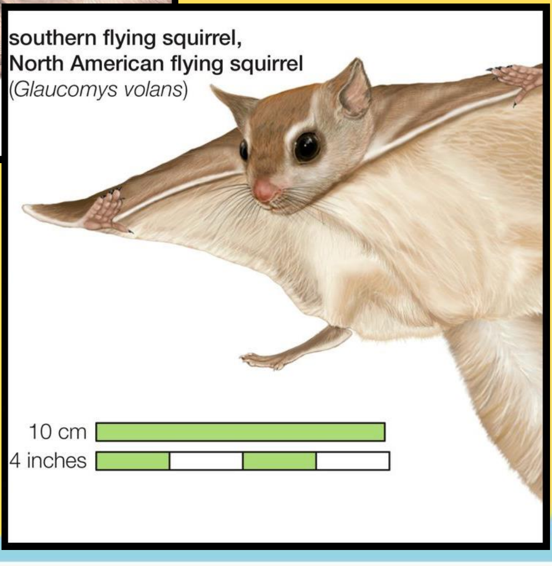
TOPIC 7.6





Sugar Glider vs Flying Squirrel

A. Analogous structure
B. Embryological structure
C. Homologous structure
D. Vestigial structure

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TOPIC 7.6

Sugar Glider vs Flying Squirrel

A. Analogous structure

Although the sugar glider and the flying squirrel look similar, they have different lineages. The sugar glider is a marsupial while the flying squirrel is a placental.

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TOPIC

7.6

Convergent evolution shows common ancestry

A. True

B. False

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TOPIC 7.6

Convergent evolution shows common ancestry

B. False

Convergent evolution is due to a similar solution to a similar problem. It does not represent common ancestry.

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TOPIC 7.7

Common Ancestry

EVO-2.C.1

Structural evidence indicates common ancestry of all eukaryotes—

a. Membrane-bound organelles

b. Linear chromosomes

c. Genes that contain introns

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TOPIC

7.7

Eukaryotic DNA is...

A. Circular & multiple DNA strands
B. Linear & multiple DNA strands
C. Circular & a single DNA strand
D. Linear & a single DNA strand

Note: single means that it's one DOUBLE stranded DNA molecule

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TOPIC 7.7

Eukaryotic DNA is...

B. Linear & multiple DNA strands

Note: single means that it's one DOUBLE stranded DNA molecule

Eukaryotes have multiple linear strands of DNA while prokaryotes have a single circular piece of DNA.

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TOPIC 7.7

All eukaryotic cells have...

A. Mitochondria
B. Chloroplast

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TOPIC

7.7

All eukaryotic cells have...

A. Mitochondria

Eukaryotic cells have membrane bound organelles. Both mitochondria and chloroplasts are membrane bound organelles. Based on the endosymbiotic theory, the chemosynthetic bacteria was engulfed prior to the photosynthetic bacteria.

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TOPIC 7.7

Eukaryotic cells have...

A. Nucleoid
B. Nucleus

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TOPIC 7.7

Eukaryotic cells have...

B. Nucleus

Eukaryotic cells have membrane bound organelles. The nucleus is a membrane bound organelle that surrounds the DNA while the nucleoid is the region of the cytosol in prokaryotes where the DNA is located.

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TOPIC

7.7

Why are eukaryotic cells able to be bigger than prokaryotic cells?

A. Compartmentalization due to membrane bound organelles
B. Eukaryotes are more robust to scare the prokaryote away
C. Endosymbiotic theory required a larger cell
D. My teacher said so

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TOPIC 7.7

Why are eukaryotic cells able to be bigger than prokaryotic cells?

A. Compartmentalization due to membrane bound organelles

Due to the membrane bound organelles, there are compartments that allow for specific reactions to take place in specific locations. This allows for the eukaryotes to be larger than prokaryotes without membrane bound organelles.

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TOPIC 7.7

Why can eukaryotic DNA store more information in same DNA amount?

A. Eukaryotes have introns and no mRNA processing
B. Eukaryotes have introns and mRNA processing
C. Prokaryotes have introns and no mRNA processing
D. Prokaryotes have introns and mRNA processing

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TOPIC 7.7

Why can eukaryotic DNA store more information in same DNA amount?

B. Eukaryotes have introns and mRNA processing

Eukaryotic DNA is linear and located in a nucleus, which is an organelle surrounded by membrane. The process of transcription takes place in the nucleus while the process of translation takes place in the cytosol. Due to this difference in location, the mRNA can undergo processing which cuts out introns and allows for multiple mRNA strands from same pre-mRNA.

All eukaryotes came from a common ancestor.

A. True
B. False

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TOPIC 7.7

All eukaryotes came from a common ancestor.

A. True

Eukaryotes all diverged from a common ancestor. This explains why all eukaryotes have mitochondria.

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TOPIC 7.7

Which organelle is not membrane bound?

A. Golgi Bodies
B. Lysosome
C. Ribosome
D. Rough ER

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TOPIC 7.7

Which organelle is not membrane bound?

C. Ribosome

The ribosome is made up of rRNA and protein. There are two parts: large subunit and the small subunit which work together to allow for protein synthesis.

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TOPIC 7.7

Membrane bound organelles are found in...

A. Eukaryotes
B. Prokaryotes

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TOPIC 7.7

Membrane bound organelles are found in...

A. Eukaryotes

Eukaryotes have membrane bound organelles while prokaryotes do not. This is one of the reasons why the eukaryotic cells is larger than the prokaryotic cell. In addition, the nucleus is found in a eukaryote and not in a prokaryote.

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TOPIC 7.7

Which organelle would you find in a prokaryote?

A. Golgi bodies
B. Lysosome
C. Ribosome
D. Rough ER

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Which organelle would you find in a prokaryote?

C. Ribosome

Prokaryotes do not have membrane bound organelles. The Golgi, lysosome, and rough ER are all membrane bound organelles. The ribosome is composed of mRNA and proteins.

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TOPIC 7.7

How does the DNA between prokaryotes and eukaryotes differ?

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TOPIC 7.7

How does the DNA between prokaryotes and eukaryotes differ?

Prokaryotes:
Single circular DNA houses in the nucleoid, does not contain introns

Eukaryotes:
Multiple linear DNA strands housed in a nucleus, contains introns

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TOPIC 7.7

What is an intron?

A. Coding segment of DNA
B. Coding segment of mRNA
C. Noncoding segment of DNA
D. Noncoding segment of mRNA

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TOPIC 7.7

What is an intron?

D. Noncoding segment of mRNA

Introns are noncoding segments of mRNA that are cut out during mRNA processing/splicing.

The expressed information is in the exons.

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TOPIC
7.7

Which are removed during mRNA splicing?

A. Exons
B. Introns

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TOPIC 7.7

Which are removed during mRNA splicing?

B. Introns

Exons are expressed information while the introns are noncoding information. Due to the introns having noncoding information, they are removed during mRNA processing called mRNA splicing.

Where in the cell are the introns removed?

A. Cytosol
B. Lysosome
C. Nucleus
D. Peroxisome

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TOPIC 7.7

Where in the cell are the introns removed?

C. Nucleus

The mRNA is synthesized in the nucleus. After it is synthesized before it leaves the nucleus, the post-transcriptional modification takes place which include mRNA splicing.

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TOPIC 7.7

Which cells have introns?

A. Eukaryotes
B. Prokaryotes
C. Both Eukaryotes and Prokaryotes

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TOPIC 7.7

Which cells have introns?

A. Eukaryotes

Eukaryotes have introns. They are removed prior to the mRNA leaving the nucleus to be translated in the ribosome.

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TOPIC 7.8

Continuing Evolution

EVO-3.A.1

Populations of organisms continue to evolve.

EVO-3.A.2

All species have evolved and continue to evolve—

a. Genomic changes over time.

b. Continuous change in the fossil record.

c. Evolution of resistance to antibiotics, pesticides, herbicides, or chemotherapy drugs.

d. Pathogens evolve and cause emergent diseases.

Antibiotics make bacteria resistant.

A. True
B. False

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TOPIC
7.8

Antibiotics make bacteria resistant.

B. False

As we have mentioned before, the antibiotic selects for the resistance. This phrase "antibiotic makes the bacteria resistant" means that the antibiotic created the mutations that allowed for the bacteria to survive, but it selects for those that are ALREADY resistant. The resistance allele comes from random mutations.

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TOPIC 7.8

What evolves?

A. Individuals
B. Populations

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TOPIC

7.8

What evolves?

B. Populations

Populations undergo evolution. Although natural selection will select certain phenotypes/individuals, the change in allele frequencies will take place in the next generation. Hence, the population evolves not the individual.

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TOPIC

7.8

Once a population is "perfect", evolution will stop occurring.

A. True

B. False

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TOPIC 7.8

Once a population is "perfect", evolution will stop occurring.

B. False

The environment is always changing, so the organisms are never "perfect".

As we saw with Hardy-Weinberg, it is rare for evolution to not occur. It might be slow, but is still happening.

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TOPIC 7.8

What is evolution?

A. Allele/Genotypic frequencies
B. Environmental conditions causing mutations
C. Process where unfavorable traits are selected
D. Use and disuse leading to traits passed down

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TOPIC 7.8

What is evolution?

A. Allele/Genotypic frequencies

Evolution is demonstrated by the change in allele or genotypic frequencies.

As certain individuals are selected (and more likely to survive and pass on their alleles to the next generation), those alleles will increase in frequency.

Once a population matches their environment, evolution stops

A. True

B. False

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TOPIC 7.8

Once a population matches their environment, evolution stops

B. False

The environment is always changing which means that the population is **ALWAYS** evolving.

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TOPIC 7.8

Antibiotic resistance is...

A. Artificial selection
B. Natural selection

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TOPIC 7.8

Antibiotic resistance is...

B. Natural selection

When the antibiotic is present, the bacteria with the gene that provides resistance will be able to survive. Since they are more likely to survive, they are more likely to pass on their traits to the next generation which leads to an increase in antibiotic resistance in the population of bacteria.

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TOPIC 7.8

Antibiotics made the bacteria resistant

A. True
B. False

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TOPIC 7.8

Antibiotics made the bacteria resistant

B. False

Antibiotics select for the bacteria that have the resistance. Since the resistant bacteria survived, they passed on their traits to the next generation.

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TOPIC 7.8

Why get a flu shot every year?

A. Influenza is an DNA virus which leads to increase mutations
B. Influenza is an RNA virus so it mutates often
C. Influenza is a DNA virus so it replicates quickly
D. Influenza is a RNA virus so it often mutates

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TOPIC

7.8

Why get a flu shot every year?

D. Influenza is a RNA virus so it often mutates

RNA is single stranded which leads to an increase in mutations. As the mutations increase in the virus, your immune system will not recognize the new virus as it's immune response was based on the previous year's virus.

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TOPIC 7.9

Phylogeny

EVO-3.B.1

Phylogenetic trees and cladograms show evolutionary relationships among lineages—

a. Phylogenetic trees and cladograms both show relationships between lineages, but phylogenetic trees show the amount of change over time calibrated by fossils or a molecular clock.

c. Molecular data typically provide more accurate and reliable evidence than morphological traits in the construction of phylogenetic trees or cladograms.

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TOPIC 7.9

Phylogeny

EVO-3.B.1

Phylogenetic trees and cladograms show evolutionary relationships among lineages—

b. Traits that are either gained or lost during evolution can be used to construct phylogenetic trees and cladograms—

i. Shared characters are present in more than one lineage.

ii. Shared, derived characters indicate common ancestry and are informative for the construction of phylogenetic trees and cladograms.

iii. The out-group represents the lineage that is least closely related to the remainder of the organisms in the phylogenetic tree or cladogram.

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TOPIC 7.9

Phylogeny

EVO-3.C.1

Phylogenetic trees and cladograms can be used to illustrate speciation that has occurred. The nodes on a tree represent the most recent common ancestor of any two groups or lineages.

EVO-3.C.2

Phylogenetic trees and cladograms can be constructed from morphological similarities of living or fossil species and from DNA and protein sequence similarities.

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TOPIC 7.9

Phylogeny

EVO-3.C.3

Phylogenetic trees and cladograms represent hypotheses and are constantly being revised, based on evidence.

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TOPIC

7.9

Phylogenetic trees & cladograms both show lineage.

A. True

B. False

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TOPIC

7.9

Phylogenetic trees & cladograms both show lineage.

A. True

A phylogenetic tree (also phylogeny or evolutionary tree) is a branching diagram or a tree showing the evolutionary relationships among various biological species or other entities based upon similarities and differences in their physical or genetic characteristics.
- Wikipedia

A cladogram is a diagram used to represent a hypothetical relationship between groups of animals, called a phylogeny.
- Biology Dictionary

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TOPIC 7.9

What does a phylogenetic tree show?

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What does a phylogenetic tree show?

Amount of change as determined by molecular clock or calibrated by fossils.

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TOPIC 7.9

Don't worry!

Since the 2013 redesign, the FRQs have always included the blank template cladogram or tree for you to fill in.

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TOPIC 7.9

What is the outgroup?

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TOPIC 7.9

What is the outgroup?

The lineage that is least closely related to the remainder of the organisms in the phylogenetic tree or cladogram.

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TOPIC 7.9

What does a node represent?

A. A divergent event leading to two related lineages
B. A convergent event leading to two unrelated lineages
C. A divergent event leading to two unrelated lineages
D. A convergent event leading to two related lineages

What does a node represent?

A. A divergent event leading to two related lineages

A node is a branch point on a cladogram or phylogenetic tree. This shows the common ancestor of organisms.

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TOPIC 7.9

Which two are most closely related?

TABLE 1. DIVERGENCE (IN PERCENT) OF MITOCHONDRIAL DNA SEQUENCES AMONG FIVE PRIMATE SPECIES

	Human	Gorilla	Orangutan	Gibbon	Chimpanzee
Human	-	10.3	16.1	18.1	8.8
Gorilla		-	16.7	18.9	10.6
Orangutan			-	18.9	17.2
Gibbon				-	18.9
Chimpanzee					-

A. Human & Gorilla

B. Human & Orangutan

C. Human & Gibbon

D. Human & Chimpanzee

AP BIO INSTA-REVIEW

TOPIC 7.9

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Gibbon				-	18.9
Chimpanzee					-

D. Human & Chimpanzee

The two organisms with the least differences in their DNA sequences are most closely related. The human and the chimp have 8.8% difference, which is the smallest number in the chart.

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TOPIC
7.9

Justify the claim that the human & chimpanzee are most closely related.

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TOPIC 7.9

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Orangutan			-	18.9	17.2
Gibbon				-	18.9
Chimpanzee					-

Human and chimpanzee have **8.8%** difference in their mitochondrial sequences.

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TOPIC 7.9

If human/chimp diverged 7 million years ago, calculate the rate of divergence per million years.

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TOPIC 7.9

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Orangutan			-	18.9	17.2
Gibbon				-	18.9
Chimpanzee					-

8.8 divided by 7 million years

8.8/7 = 1.257

so... let's just say

1.26/million years

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TOPIC
7.9

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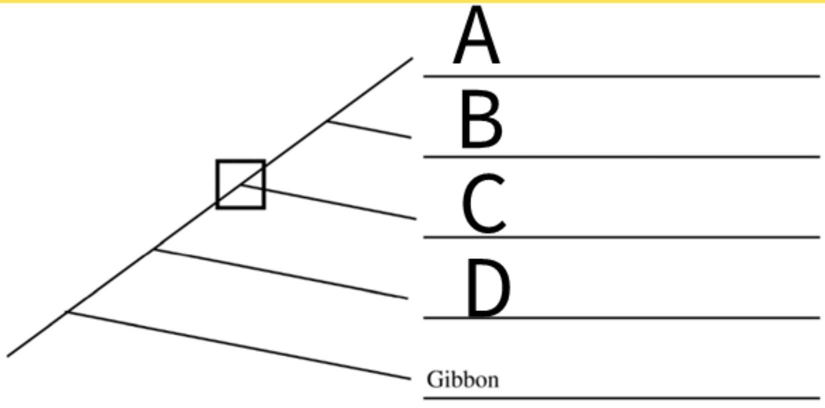
Chimpanzee					-



Which organism would be at position D on the cladogram?

A. Human
B. Gorilla
C. Orangutan
D. Chimpanzee

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TOPIC 7.9

Which organism would be at position D on the cladogram?

C. Orangutan

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Orangutan			-	18.9	17.2
Gibbon				-	18.9
Chimpanzee					-

If you look at the human, the gibbon (already on the diagram as the outgroup) has 18.1. The next number is 16.1, which belongs to the orangutan at position D. Position C is the gorilla with 10.3. Positions A/B is human/chimpanzee with 8.8.

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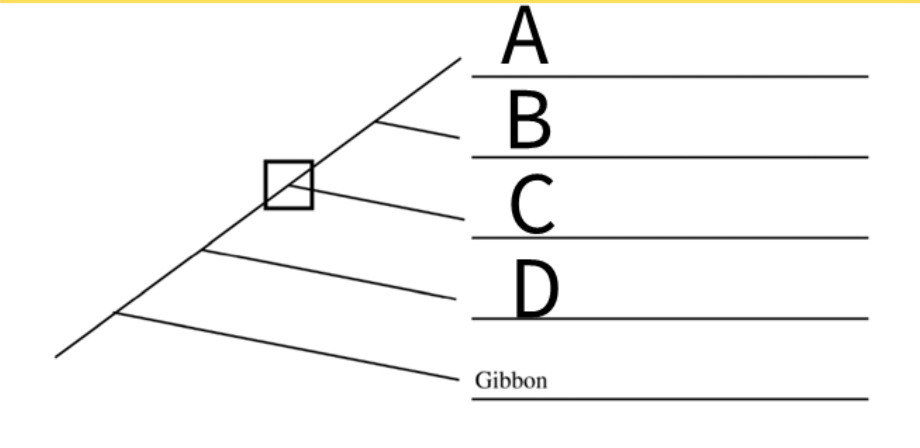
TOPIC 7.9



Which two organisms would be at positions A and B?

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TOPIC
7.9

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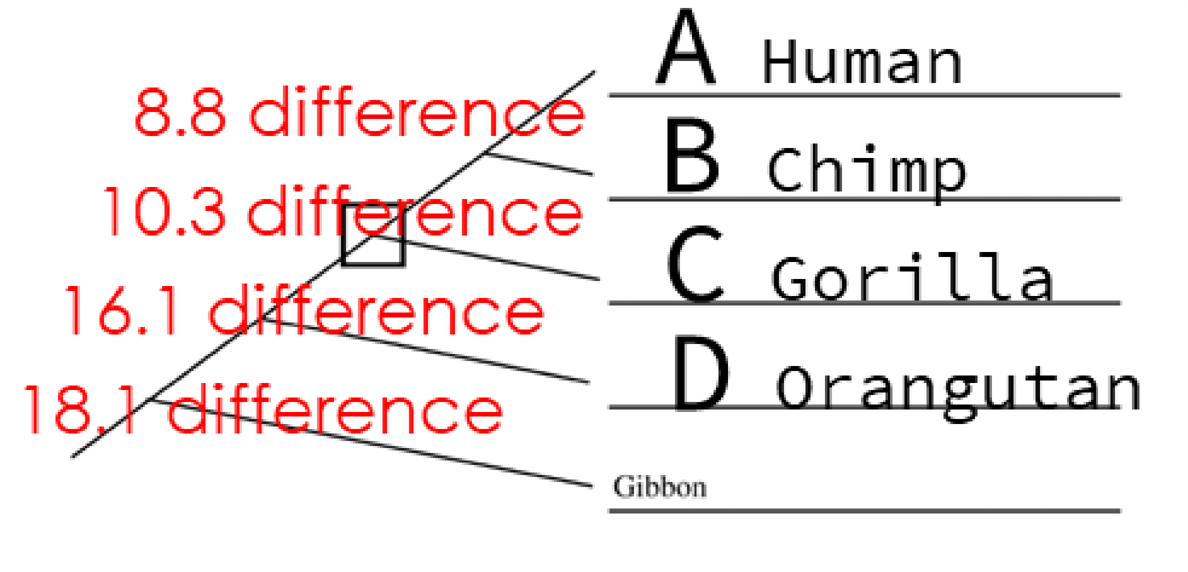
Gibbon				-	18.9
Chimpanzee					-

Human & Chimpanzee



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TOPIC 7.9

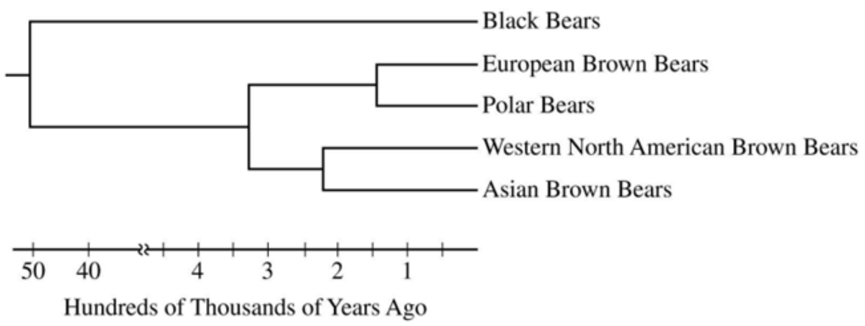

Figure 1. Phylogenetic tree representing the evolutionary relatedness among bear populations based on mitochondrial DNA sequence comparisons

How many hundreds of thousands of years ago was the common ancestor of Brown Bears?

A. 2
B. 3
C. 4
D. 5

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TOPIC 7.9

How many hundreds of thousands of years ago was the common ancestor of Brown Bears?

B. 3

That's where all of the brown bears diverged from so it's the most recent common ancestor of all brown bears.

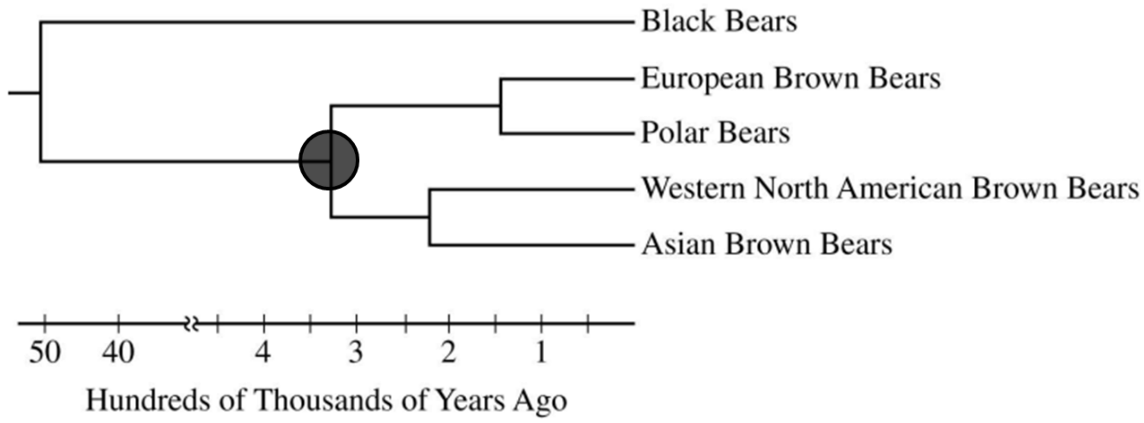

Figure 1. Phylogenetic tree representing the evolutionary relatedness among bear populations based on mitochondrial DNA sequence comparisons

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TOPIC 7.9

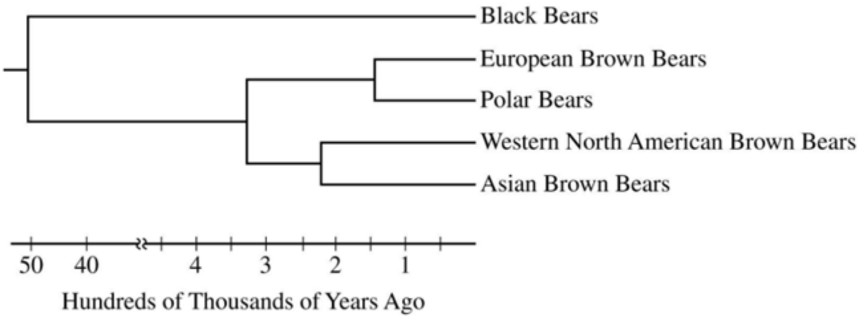

Figure 1. Phylogenetic tree representing the evolutionary relatedness among bear populations based on mitochondrial DNA sequence comparisons

Which two bears can be rotated at ONE point?

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TOPIC 7.9

Which two bears can be rotated at ONE point?

European Bear & Polar

OR

Western North American Brown & Asian Brown

The branch point (node) is able to be rotated. Since the bears come from the same branch point, they can be rotated.

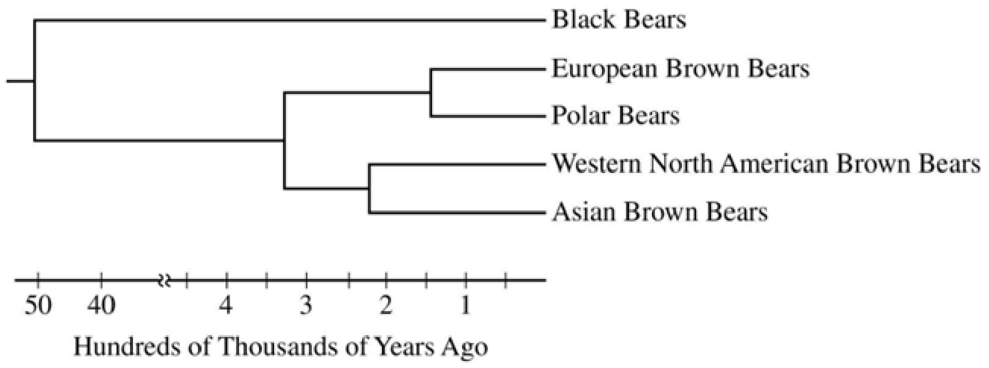

Figure 1. Phylogenetic tree representing the evolutionary relatedness among bear populations based on mitochondrial DNA sequence comparisons

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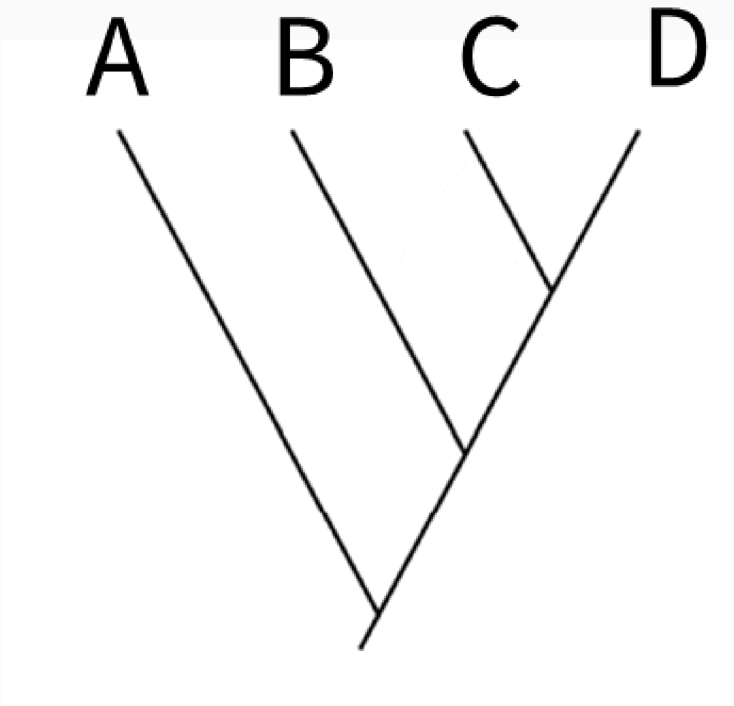
TOPIC 7.9

TABLE 1. AMINO ACID DIFFERENCES IN THE LYST PROTEIN AMONG BEAR SPECIES

	Panda	Black	Brown	Polar
Panda	–			
Black	33	–		
Brown	34	1	–	
Polar	40	7	8	–

Which position would you find the outgroup?



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TOPIC 7.9

Which position would you find the outgroup?

A

The outgroup is the organism that is the least related to the other organisms. Traditionally, it does not share any of the traits with the other organisms. The organism on branch A is the first to diverge and does not share traits with the others.

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TOPIC 7.9

TABLE 1. AMINO ACID DIFFERENCES IN THE LYST PROTEIN AMONG BEAR SPECIES

	Panda	Black	Brown	Polar
Panda	–			
Black	33	–		
Brown	34	1	–	
Polar	40	7	8	–

Which organism would be the outgroup?

A. Black
B. Brown
C. Panda
D. Polar

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TOPIC

7.9

Which organism would be the outgroup?

C. Panda

When looking at the amino acid differences, the panda bear has the largest number of differences with each of the other bears.

Panda/Black – 33
Panda/Brown – 34
Panda/Polar - 40

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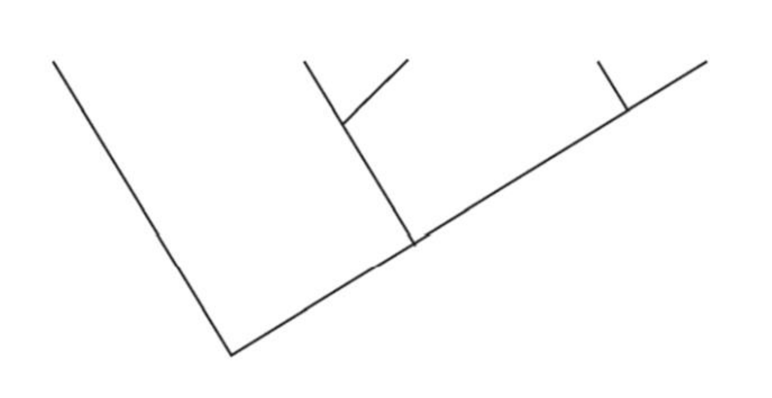
TOPIC 7.9

THE NUMBER OF AMINO ACID DIFFERENCES IN CYTOCHROME *c* AMONG FIVE SPECIES

	E. ferus	*D. polylepis*	*G. gallus*	*A. forsteri*	*E. africanus*
E. ferus	0	21	11	13	1
D. polylepis		0	18	17	20
G. gallus			0	3	10
A. forsteri				0	12
E. africanus					0

Starting from the left, identify the placement of organisms.



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TOPIC 7.9

Starting from the left, identify the placement of organisms.

There are multiple possible answers due to the ability to rotate upon a node.

DAGEE
DGAEE
DEEGA
DEEAG

(Note: I am just writing the first letter of the organism)

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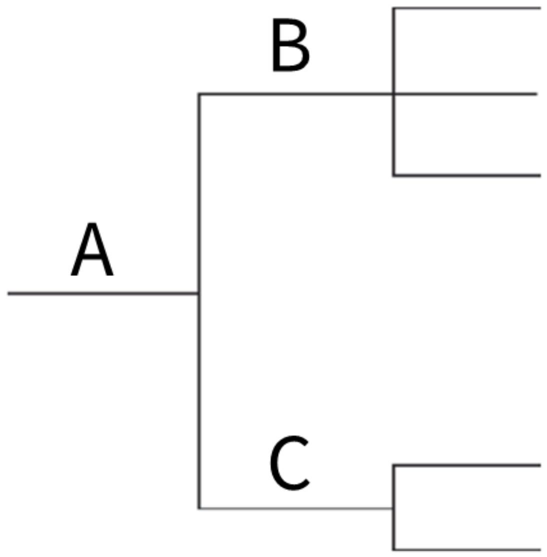
TOPIC 7.9

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+
+ indicates the presence of the character, and – indicates the absence of the character					

What position was the lactose and protein A traits gained?



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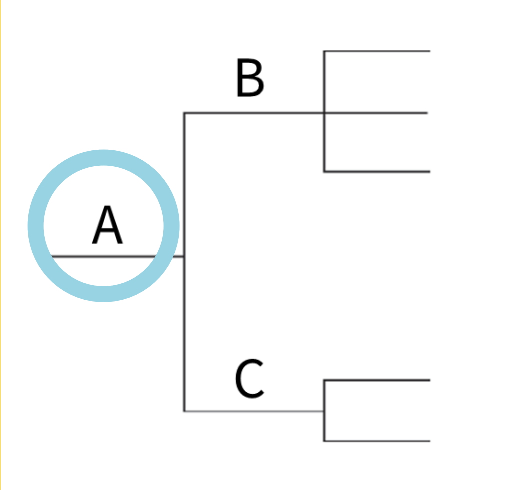
TOPIC 7.9

What position was the lactose & protein A traits gained?



Notice that all of the organisms have both of these traits. This trait must have emerged BEFORE the branch point.

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+

+ indicates the presence of the character, and – indicates the absence of the character

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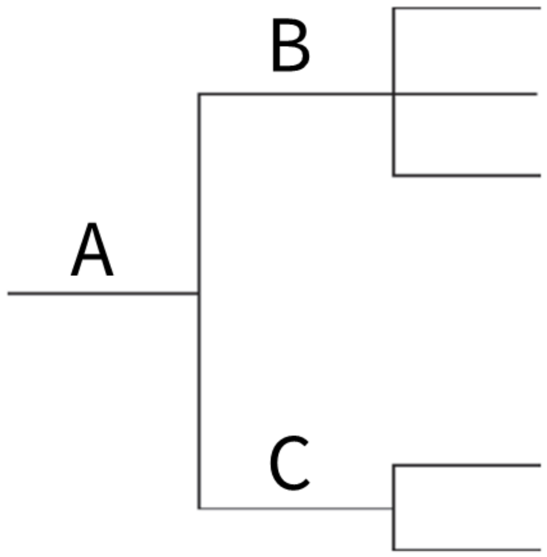
TOPIC 7.9

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+
+ indicates the presence of the character, and – indicates the absence of the character					

What position might the protein B trait been gained?



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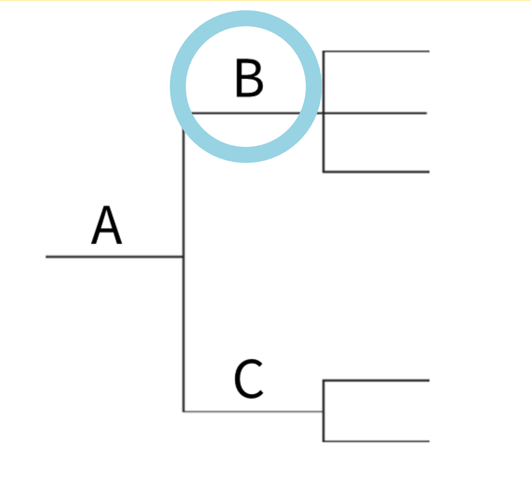
TOPIC 7.9

What position might the protein B trait been gained?



Notice that the cow, horse, and pig all have the trait for protein B, so the trait might have emerged on the branch with the three organisms that have the trait.

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+

+ indicates the presence of the character, and – indicates the absence of the character

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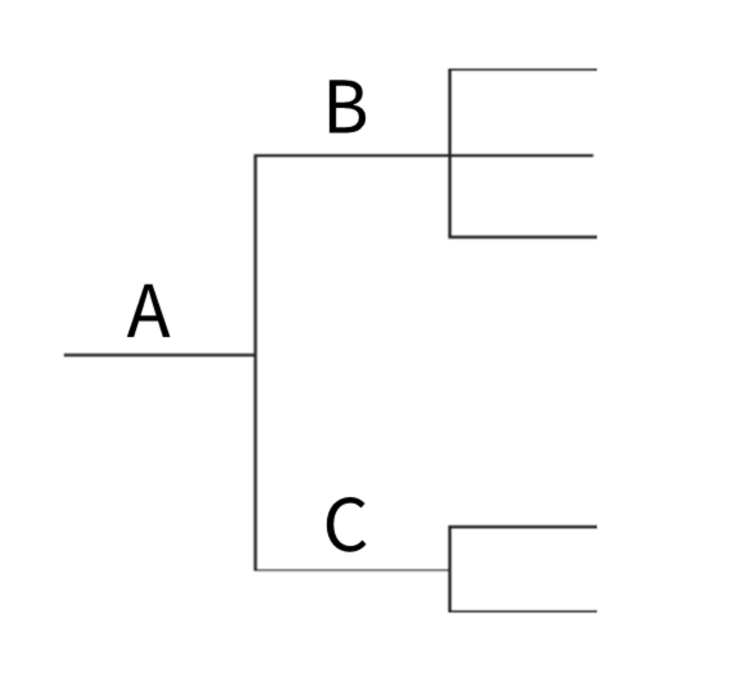
TOPIC 7.9

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+

+ indicates the presence of the character, and – indicates the absence of the character

If casein was gained at position A, when was it lost?



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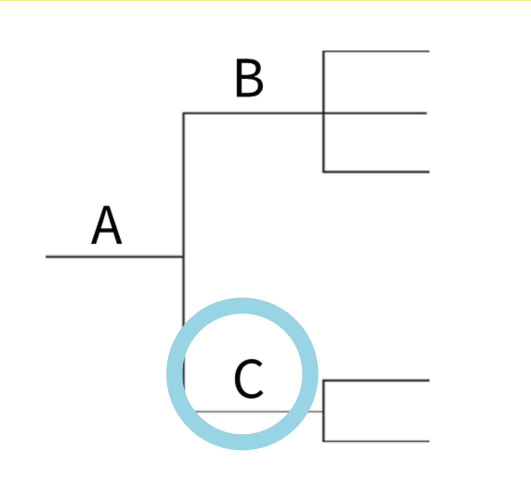
If casein was gained at position A, when was it lost?



Notice that cat and human do NOT have the trait for casein, so the trait might be lost on the branch with the two organisms that DO NOT have the trait.

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+

+ indicates the presence of the character, and – indicates the absence of the character

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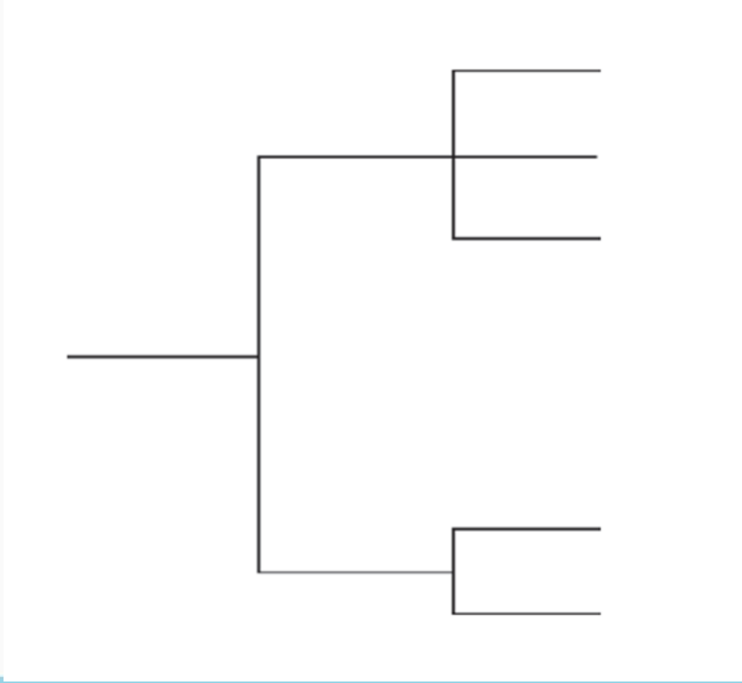
TOPIC 7.9

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+
+ indicates the presence of the character, and – indicates the absence of the character					

Which three organisms are placed together on the top branch?



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TOPIC
7.9

Which three organisms are placed together on the top branch?

Cow, Horse, & Pig

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+

+ indicates the presence of the character, and – indicates the absence of the character

These three organisms share the same traits.

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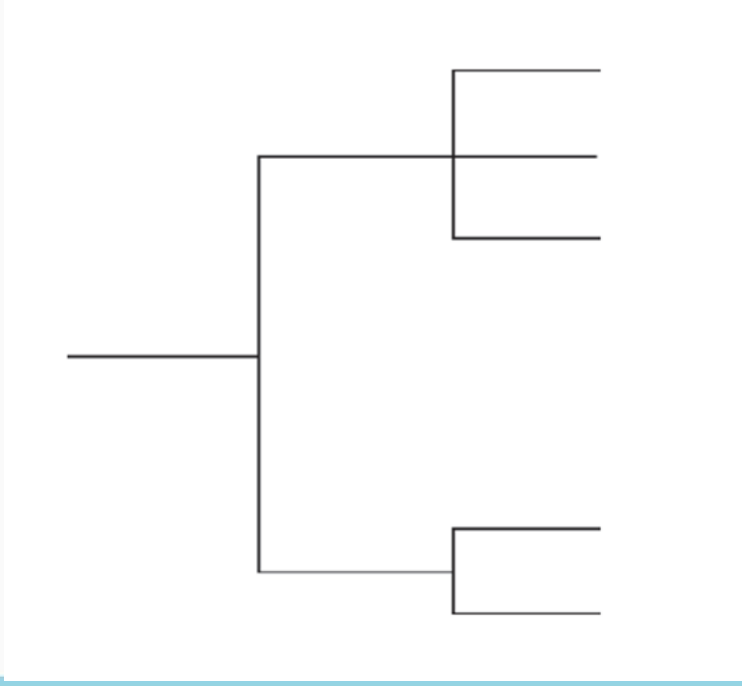
TOPIC 7.9

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+
+ indicates the presence of the character, and – indicates the absence of the character					

Which two organisms are placed together on the bottom branch?



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TOPIC
7.9

Which two organisms are placed together on the bottom branch?

Cat & Human

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+

+ indicates the presence of the character, and – indicates the absence of the character

These two organisms share the same traits.

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TOPIC 7.9

What type of data is most effective to develop a tree?

A. Biogeography evidence
B. Ecological evidence
C. Fossil evidence
D. Molecular evidence

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TOPIC
7.9

What type of data is most effective to develop a tree?

D. Molecular evidence

Molecular evidence shows the differences in nucleotide sequence or protein sequences. It is the most effective to determine a tree.

Biogeography shows organisms living the same area. Ecological shows organisms living in the same environment. Fossil evidence shows organisms that lived in the same area. These do not show relatedness between organisms.

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TOPIC

7.9

Which molecular data is more accurate for relatedness?

A. DNA

B. Proteins

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TOPIC 7.9

Which molecular data is more accurate for relatedness?

A. DNA

DNA is able to have changes that are not observed in the amino acid sequence. Recall, a silent mutation involves different codon sequences that code for the same amino acid. So, if you are comparing DNA sequences, you are able to see the organisms with the least nucleotide differences and the most closely related.

What change can occur in the DNA that would not be observed in the protein?

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TOPIC 7.9

What change can occur in the DNA that would not be observed in the protein?

Silent mutations will change the nucleotide pair without changing the amino acid

Any mutations in an intron will be removed/are not expressed

If the mutation takes place in a noncoding region of the genome, it is not expressed.

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TOPIC 7.9

Which is the outgroup?

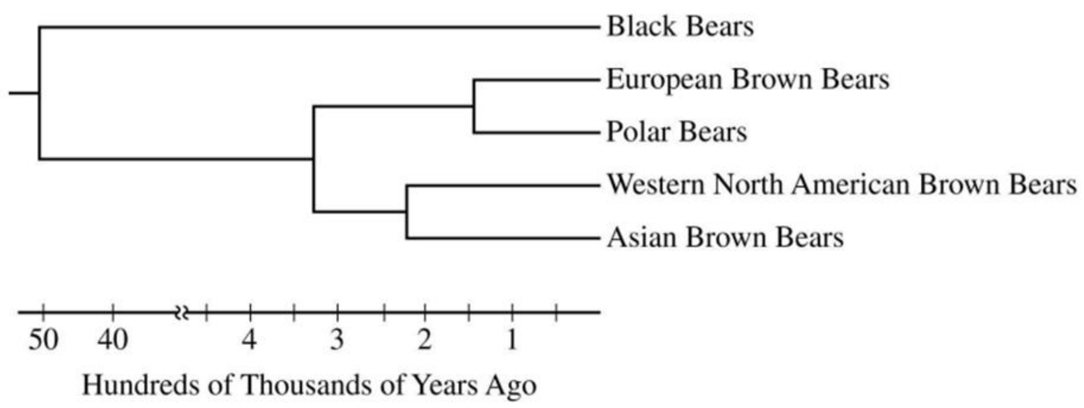

Figure 1. Phylogenetic tree representing the evolutionary relatedness among bear populations based on mitochondrial DNA sequence comparisons

A. Asian Brown Bear

B. Black Bear

C. European Brown Bear

D. Polar Bear

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TOPIC 7.9

Which is the outgroup?

B. Black Bear

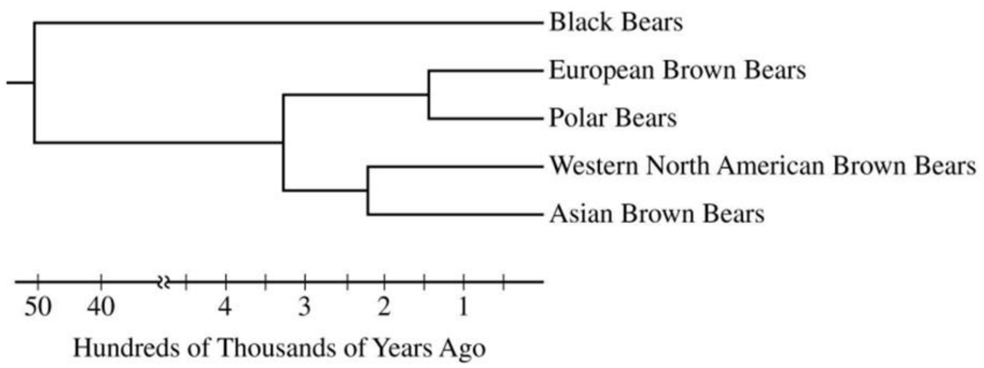

Figure 1. Phylogenetic tree representing the evolutionary relatedness among bear populations based on mitochondrial DNA sequence comparisons

As seen in the phylogenetic tree, the black bear diverges from the other bears. The E. Brown and Polar Bears are closely related to each other AND Western North American Brown and Asian Brown Bears are closely related.

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TOPIC 7.9

What is closely related to the polar bear?

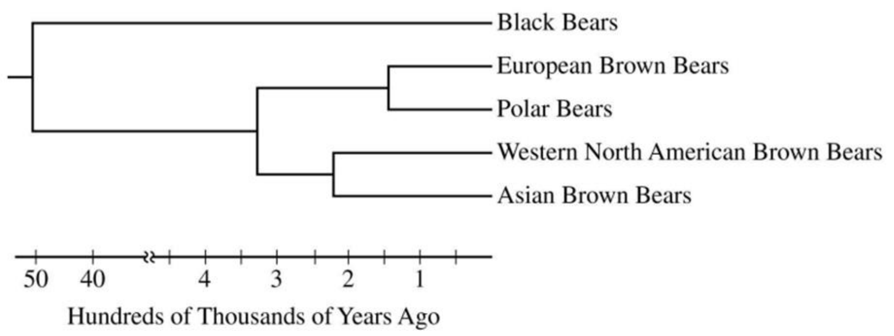

Figure 1. Phylogenetic tree representing the evolutionary relatedness among bear populations based on mitochondrial DNA sequence comparisons

A. Asian Brown Bear

B. Black Bear

C. European Brown Bear

D. Western North American Brown Bear

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TOPIC
7.9

What is closely related to the polar bear?

C. European Brown Bear

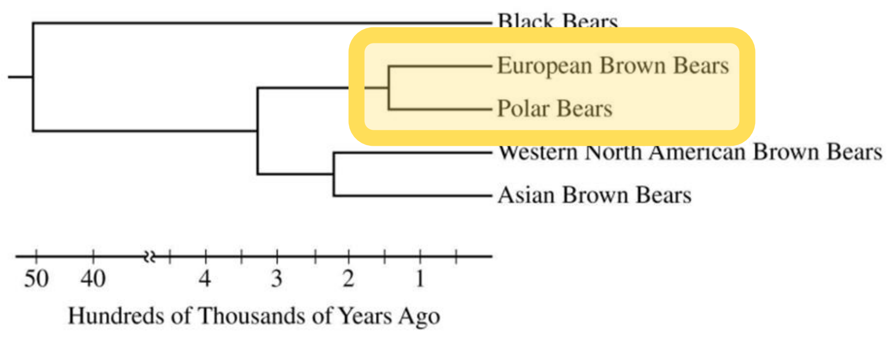

Figure 1. Phylogenetic tree representing the evolutionary relatedness among bear populations based on mitochondrial DNA sequence comparisons

The two organisms that are most closely related share the most recent common ancestor (or branch point). If you look at Polar Bears, you will see that European Brown Bears share a recent branch point.

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The Western North American and Asian Brown Bears can rotate positions.

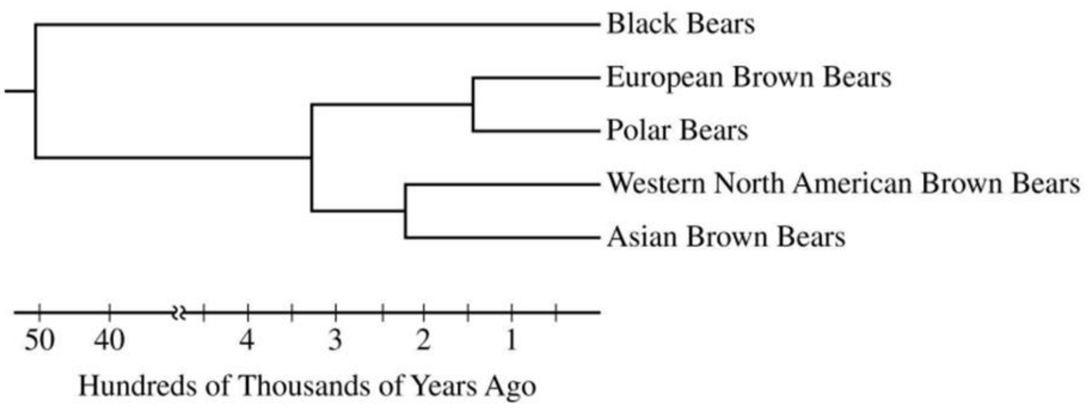

Figure 1. Phylogenetic tree representing the evolutionary relatedness among bear populations based on mitochondrial DNA sequence comparisons

A. True

B. False

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TOPIC 7.9

The Western North American and Asian Brown Bears can rotate positions.

A. True

The organisms can rotate on the node at the branch point.

So, the European Brown Bear & Polar Bear can also rotate.

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TOPIC
7.9

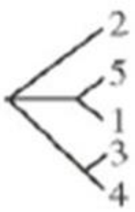
Note:
This was found on Google Images when I searched "phylogeny practice"

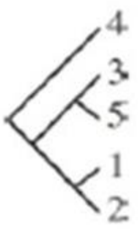
18. Five new species of bacteria were discovered in Antarctic ice core samples. The nucleotide (base) sequences of rRNA subunits were determined for the new species. The table below shows the number of nucleotide differences between the species.

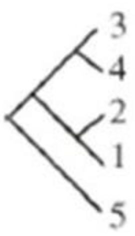
NUCLEOTIDE DIFFERENCES

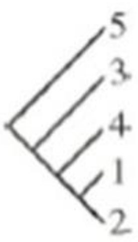
Species	1	2	3	4	5
1	--	3	19	18	27
2		--	19	18	26
3			--	1	27
4				--	27
5					--

Which of the following phylogenetic trees is most consistent with the data?

(A)


(B)


(C)


(D)


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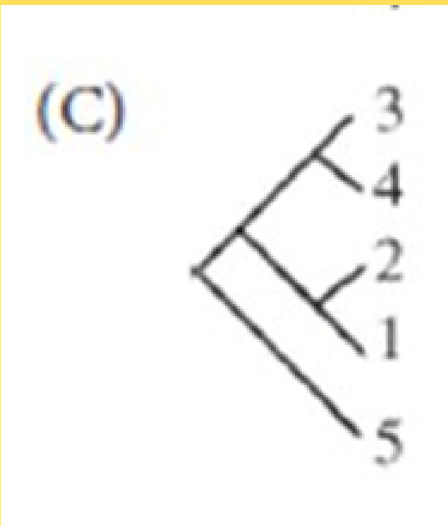
TOPIC 7.9

NUCLEOTIDE DIFFERENCES

Species	1	2	3	4	5
1	--	3	19	18	27
2		--	19	18	26
3			--	1	27
4				--	27
5					--



Since 1 & 2 only have 3 differences, we know they are closely related. Since 3 & 4 only have 1 difference, we know they are closely related. Since 5 has a large number of differences with everything, it is considered the "outgroup"

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TOPIC 7.9

Which two are closely related?

TABLE 1. AMINO ACID DIFFERENCES IN THE LYST PROTEIN AMONG BEAR SPECIES

	Panda	Black	Brown	Polar
Panda	–			
Black	33	–		
Brown	34	1	–	
Polar	40	7	8	–

A. Panda & Black

B. Black & Brown

C. Brown & Polar

D. Polar & Panda

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TOPIC 7.9

Which two are closely related?

B. Black & Brown

The Black & Brown bears only have 1 amino acid difference in their LYST protein. The two organisms with the least amino acids differences are most closely related.

TABLE 1. AMINO ACID DIFFERENCES IN THE LYST PROTEIN AMONG BEAR SPECIES

	Panda	Black	Brown	Polar
Panda	–			
Black	33	–		
Brown	34	1	–	
Polar	40	7	8	–

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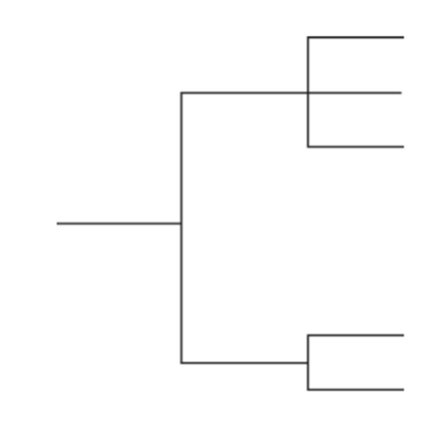
TOPIC 7.9

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+

+ indicates the presence of the character, and – indicates the absence of the character



Which two organisms would be grouped together on the branch with two placements?

A. Cat & Cow
B. Cow & Horse
C. Horse & Human
D. Human & Cat

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TOPIC 7.9

Which two organisms would be grouped together on the branch with two placements?

D. Human & Cat

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+

+ indicates the presence of the character, and – indicates the absence of the character

The human and the cat share the same characteristics.

+ : Lactose & Protein A

– : Protein B & Casein

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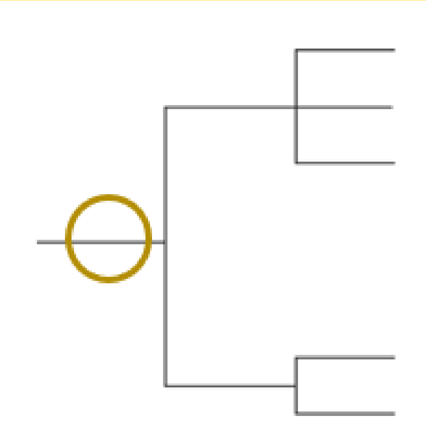
TOPIC 7.9

MILK COMPONENTS IN DIFFERENT MAMMALS

Character	Cat	Cow	Horse	Human	Pig
Lactose	+	+	+	+	+
Protein A	+	+	+	+	+
Protein B	–	+	+	–	+
Casein	–	+	+	–	+

+ indicates the presence of the character, and – indicates the absence of the character



Which traits would be at the circled part of the phylogenetic tree?

A. Lactose & Protein A
B. Protein A & Protein B
C. Protein B & Casein
D. Casein & Lactose

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TOPIC 7.9

Which traits would be at the circled part of the phylogenetic tree?

A. Lactose & Protein A

The circle shows that the traits emerged in the common ancestor, so all of the descendants have the traits.

All four of the organisms have Lactose & Protein A, which means these two traits emerged before the branch point.

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TOPIC 7.10

Speciation

EVO-3.D.1

Speciation may occur when two populations become reproductively isolated from each other.

EVO-3.D.2

The biological species concept provides a commonly used definition of species for sexually reproducing organisms. It states that species can be defined as a group capable of interbreeding and exchanging genetic information to produce viable, fertile offspring.

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TOPIC 7.10

Speciation

EVO-3.E.1

Punctuated equilibrium is when evolution occurs rapidly after a long period of stasis. Gradualism is when evolution occurs slowly over hundreds of thousands or millions of years.

EVO-3.E.2

Divergent evolution occurs when adaptation to new habitats results in phenotypic diversification. Speciation rates can be especially rapid during times of adaptive radiation as new habitats become available.

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TOPIC
7.10

Speciation

EVO-3.F.1

Speciation results in diversity of life forms.

EVO-3.F.2

Speciation may be sympatric or allopatric.

EVO-3.F.3

Various prezygotic and postzygotic mechanisms can maintain reproductive isolation and prevent gene flow between populations.

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TOPIC
7.10

What is the biological species concept?

What is the biological species concept?

Two organisms are from the same species if

they can interbreed AND produce fertile, viable offspring

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TOPIC

7.10

Speciation occurs due to an absence of gene flow

A. True

B. False

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TOPIC 7.10

Speciation occurs due to an absence of gene flow

A. True

Due to the absence of gene flow, two organisms could diverge and become two different species.

Recall, the biological species concept states that two organisms are the same species if they are able to interbreed and produce fertile, viable offspring.

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TOPIC

7.10

What is speciation?

What is speciation?

An evolutionary process resulting in the production of a new species.

Traditionally, we are looking at one species diverging.

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TOPIC

7.10

What are the two types of speciation?

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TOPIC 7.10

What are the two types of speciation?

> Allopatric
> Sympatric

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TOPIC 7.10

Speciation resulting from a geographical barrier

A. Allopatric
B. Sympatric

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TOPIC 7.10

Speciation resulting from a geographical barrier

A. Allopatric

Allopatric speciation occurs when two organisms have a geographical barrier that separates the two organisms.
Allopatric = Apart

Sympatric speciation occurs without a geographical barrier that separates the two organisms.
Sympatric = Same

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TOPIC
7.10

Speciation resulting from polyploidy in the same area

A. Allopatric
B. Sympatric

Speciation resulting from polyploidy in the same area

B. Sympatric

Allopatric speciation occurs when two organisms have a geographical barrier that separates the two organisms.
Allopatric = Apart

Sympatric speciation occurs without a geographical barrier that separates the two organisms.
Sympatric = Same

What is the difference between punctuated equilibrium and gradualism?

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TOPIC 7.10

What is the difference between punctuated equilibrium and gradualism?

Punctuated – evolution takes place in a short geologic time period followed by long period of stasis (unchanging)

Gradualism – evolution occurs slowly over MANY years

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TOPIC 7.10

Mechanism to inhibit hybrid formation after zygote forms

A. Prezygotic barrier
B. Postzygotic barrier

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TOPIC
7.10

Mechanism to inhibit hybrid formation after zygote forms

B. Postzygotic barrier

Break down the words
Post – after
Zygotic – zygote
(result from fertilization)

This is a barrier that inhibits and takes place AFTER the zygote forms

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TOPIC

7.10

Hybrid forms but it is sterile

A. Hybrid breakdown

B. Reduced hybrid fertility

C. Reduced hybrid viability

Hybrid forms but it is sterile

B. Reduced hybrid fertility

Fertility is the ability for an organism to reproduce. If an organism is fertile, it is able to reproduce, so reduced fertility would be an individual less able or unable to reproduce (sterile).

Hybrid breakdown refers to the first generation being viable but the second generation is feeble or sterile.

Reduced hybrid viability refers to the hybrid not being viable.

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TOPIC
7.10

Hybrid from the first generation is healthy but the second generation has reduced fitness

A. Hybrid breakdown
B. Reduced hybrid fertility
C. Reduced hybrid viability

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TOPIC 7.10

Hybrid from the first generation is healthy but the second generation has reduced fitness

A. Hybrid breakdown

In hybrid breakdown, the first generation is viable but through subsequent generations the hybrid becomes less viable or less fertile.

Reduced hybrid viability refers to the hybrid not being healthy.

Reduced hybrid fertility refers to the hybrid not being fertile.

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TOPIC
7.10

Hybrid forms but is not healthy

A. Hybrid breakdown
B. Reduced hybrid fertility
C. Reduced hybrid viability

AP BIO INSTA-REVIEW

TOPIC 7.10

Hybrid forms but is not healthy

C. Reduced hybrid viability

Viability refers to the healthiness of the organism. If there's a reduced viability, then the hybrid is less viable.

Reduced hybrid fertility refers to the hybrid not being fertile.

Hybrid breakdown refers to the first generation being viable but the second generation is feeble or sterile.

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TOPIC

7.10

What does the biological species concept state?

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TOPIC 7.10

What does the biological species concept state?

Two organisms are from the same species if they can interbreed and produce viable, fertile offspring

AP BIO INSTA-REVIEW

TOPIC 7.10

Mechanism to inhibit two species from mating

A. Postzygotic barrier
B. Prezygotic barrier

AP BIO INSTA-REVIEW

TOPIC

7.10

Mechanism to inhibit two species from mating

B. Prezygotic barrier

Pre- means before and -zygotic refers to the zygote that is form from fertilization.

A prezygotic barrier inhibits the formation of the zygote possibly through inhibiting two species from mating.

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TOPIC

7.10

Mating song or dance or other ritual inhibits two organisms from mating.

A. Behavioral Isolation
B. Gametic Isolation
C. Habitat Isolation
D. Temporal Isolation

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TOPIC 7.10

Mating song or dance or other ritual inhibits two organisms from mating.

A. Behavioral Isolation

Behavioral isolation is two organisms with different mating behaviors (calls, dances, etc.) that inhibits two organisms from mating.

Gametic isolation is two gametes not being compatible to fuse. Habitat isolation is two organisms living in different habitats, so they do not mate. Temporal isolation is two organisms mating at different times (day, month, year).

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TOPIC 7.10

Mating occurs at different times of day, month, year, etc.

A. Behavioral Isolation
B. Gametic Isolation
C. Habitat Isolation
D. Temporal Isolation

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TOPIC 7.10

Mating occurs at different times of day, month, year, etc.

D. Temporal Isolation

Temporal isolation is two organisms mating at different times (day, month, year).

Behavioral isolation is two organisms with different mating behaviors (calls, dances, etc.) that inhibits two organisms from mating. Gametic isolation is two gametes not being compatible to fuse. Habitat isolation is two organisms living in different habitats, so they do not mate.

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TOPIC

7.10

Sperm & egg are unable to fuse due to incompatibility of proteins

A. Behavioral Isolation
B. Gametic Isolation
C. Habitat Isolation
D. Temporal Isolation

AP BIO INSTA-REVIEW

TOPIC
7.10

Sperm & egg are unable to fuse due to incompatibility of proteins

B. Gametic Isolation

Gametic isolation is two gametes (sperm & egg) not being compatible to fuse.

Behavioral isolation is two organisms with different mating behaviors (calls, dances, etc.) that inhibits two organisms from mating. Habitat isolation is two organisms living in different habitats, so they do not mate. Temporal isolation is two organisms mating at different times (day, month, year).

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TOPIC 7.10

Two species live in different areas and do not interact

A. Behavioral Isolation
B. Gametic Isolation
C. Habitat Isolation
D. Temporal Isolation

AP BIO INSTA-REVIEW

TOPIC
7.10

Two species live in different areas and do not interact

C. Habitat Isolation

Habitat isolation is two organisms living in different habitats, so they do not mate.

Behavioral isolation is two organisms with different mating behaviors (calls, dances, etc.) that inhibits two organisms from mating. Gametic isolation is two gametes (sperm & egg) not being compatible to fuse. Temporal isolation is two organisms mating at different times (day, month, year).

Prezygotic barrier that involves inability to mate due to anatomical structure

Prezygotic barrier that involves inability to mate due to anatomical structure

Mechanical Isolation

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TOPIC
7.10

When new niches open up, speciation...

A. Decreases
B. Increases

AP BIO INSTA-REVIEW

TOPIC 7.10

When new niches open up, speciation...

B. Increases

New niches open up allows for organisms to take up different ecological environments. This leads to ecological isolation. As these organisms no longer mate, there is an absence of gene flow which leads to speciation.

What is polyploidy?

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TOPIC 7.10

What is polyploidy?

Polyploidy is an organism with more than two sets of chromosomes.

We are diploid. We have two sets (maternal & paternal).

But sometimes, there are errors in which a cell doesn't divide results in a fusion of two diploid cells leads to a tetraploid. This organisms's cell has four sets of chromosomes. It happens more frequently on plants (wheat, bananas, etc.)

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TOPIC
7.10

What is speciation?

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TOPIC

7.10

What is speciation?

Creation of a new species

This comes back to the biological species concept when two individuals are from different species they are unable to interbreed/produce fertile and viable offspring

AP BIO INSTA-REVIEW

TOPIC 7.10

What is the difference between punctuated and gradual equilibrium?

A. Gradual occurs after punctuated
B. Gradual is abrupt while punctuated is slow
C. Punctuated occurs after gradual
D. Punctuated is abrupt while gradual is slow

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TOPIC

7.10

What is the difference between punctuated and gradual equilibrium?

D. Punctuated is abrupt while gradual is slow

Punctuated:

the hypothesis that evolutionary development is marked by isolated episodes of rapid speciation between long periods of little or no change

Gradual:

the concept that large changes in species are actually the culmination of very small changes that build up over time

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TOPIC 7.10

What is the difference between sympatric and allosteric speciation?

A. Allopatric is due to divergent events and sympatric is due to convergent evolution

B. Allopatric takes place with organisms apart due to a geographical barrier and sympatric takes place without geographical barriers

C. Sympatric is due to divergent events and allopatric is due to convergent evolution

D. Sympatric takes place with organisms apart due to a geographical barrier and allopatric takes place without geographical barriers

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TOPIC 7.10

What is the difference between sympatric and allosteric speciation?

B. Allopatric takes place with organisms apart due to a geographical barrier and sympatric takes place without geographical barriers

Sympatric speciation refers to speciation that takes place in the SAME area while allopatric speciation refers to speciation that takes place due to a geographical barrier so the organisms are APART.

AP BIO INSTA-REVIEW

TOPIC
7.10

Barrier due to different ecological conditions

A. Behavioral
B. Habitat
C. Mechanical
D. Temporal

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TOPIC 7.10

Barrier due to different ecological conditions

B. Habitat

Habitat isolation refers to individuals that live in a different habitat or ecological environment. Due to this separation, the two organisms have an absence of gene flow which leads to speciation.

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TOPIC
7.10

Barrier due to different anatomical components

A. Behavioral
B. Habitat
C. Mechanical
D. Temporal

AP BIO INSTA-REVIEW

TOPIC 7.10

Barrier due to different anatomical components

C. Mechanical

Mechanical isolation refers to two organisms unable to mate due to anatomical differences that inhibit mating.

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TOPIC 7.10

Barrier occurring in mules that are unable to reproduce

A. Hybrid breakdown
B. Reduced hybrid fertility
C. Reduced hybrid viability

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TOPIC 7.10

Barrier occurring in mules that are unable to reproduce

B. Reduced hybrid fertility

The mule is sterile due to an odd number of chromosomes. Since the hybrid between a horse and a donkey is sterile, this is an example of reduced hybrid fertility.

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TOPIC
7.10

Barriers due to health problems of the hybrid

A. Hybrid breakdown
B. Reduced hybrid fertility
C. Reduced hybrid viability

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Barriers due to health problems of the hybrid

C. Reduced hybrid viability

The hybrid has health problems, so this is an example of reduced hybrid viability. The hybrid is not healthy or less viable.

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TOPIC

7.10

Barrier due to the second generation hybrid has issues

A. Hybrid breakdown
B. Reduced hybrid fertility
C. Reduced hybrid viability

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TOPIC 7.10

Barrier due to the second generation hybrid has issues

A. Hybrid breakdown

The first generation is viable and fertile, but the subsequent generations have reduced viability or reduced fertility. Overall, the hybrid is breaking down with each generation.

Which has more reproductive barriers?

A. Allopatric
B. Sympatric

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TOPIC 7.10

Which has more reproductive barriers?

B. Sympatric

Sympatric speciation takes place in the same area without a geographical barrier. Since the two populations are coming into contact more frequently, there should be more reproductive barriers to inhibit reproduction.

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TOPIC

7.10

Which does not occur in the hybrid zone?

A. Balance

B. Fusion

C. Reinforcement

D. Stability

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TOPIC
7.10

Which does not occur in the hybrid zone?

A. Balance

Fusion refers to the increase of gene flow between Population A, Population B, and Hybrid Population that it fuses into ONE population.

Reinforcement refers to the decrease in gene flow between Population A and B which reinforces the TWO populations.

Stability refers to the decrease in gene flow between the hybrid population and population A or B which stabilizes the hybrid population so there's THREE populations.

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TOPIC 7.11

Extinction

EVO-3.G.1

Extinctions have occurred throughout Earth's history.

EVO-3.G.2

Extinction rates can be rapid during times of ecological stress.

EVO-3.H.1

Human activity can drive changes in ecosystems that cause extinctions.

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TOPIC 7.11

Extinction

EVO-3.I.1

The amount of diversity in an ecosystem can be determined by the rate of speciation and the rate of extinction.

EVO-3.J.1

Extinction provides newly available niches that can then be exploited by different species.

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TOPIC
7.11

Why does mass speciation occur after a mass extinction event?

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TOPIC 7.11

Why does mass speciation occur after a mass extinction event?

There are more available niches.

As the extinction event takes place, organisms that would normally take up a niche are no longer living making the niche available. Organisms undergo speciation as they take up that niche.

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TOPIC 7.11

What is the process after an extinction event that allows population to evolve?

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TOPIC

7.11

What is the process after an extinction event that allows population to evolve?

Adaptive Radiation

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TOPIC 7.11

Which scientist believe catastrophism?

A. Aristotle
B. Cuvier
C. Darwin
D. Lamarck

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TOPIC 7.11

Which scientist believe catastrophism?

B. Cuvier

Cuvier believed in catastrophism

Aristotle developed the scala naturae

Darwin developed theory of Natural Selection and believed in descent with modification

Lamarck believed in use and disuse.

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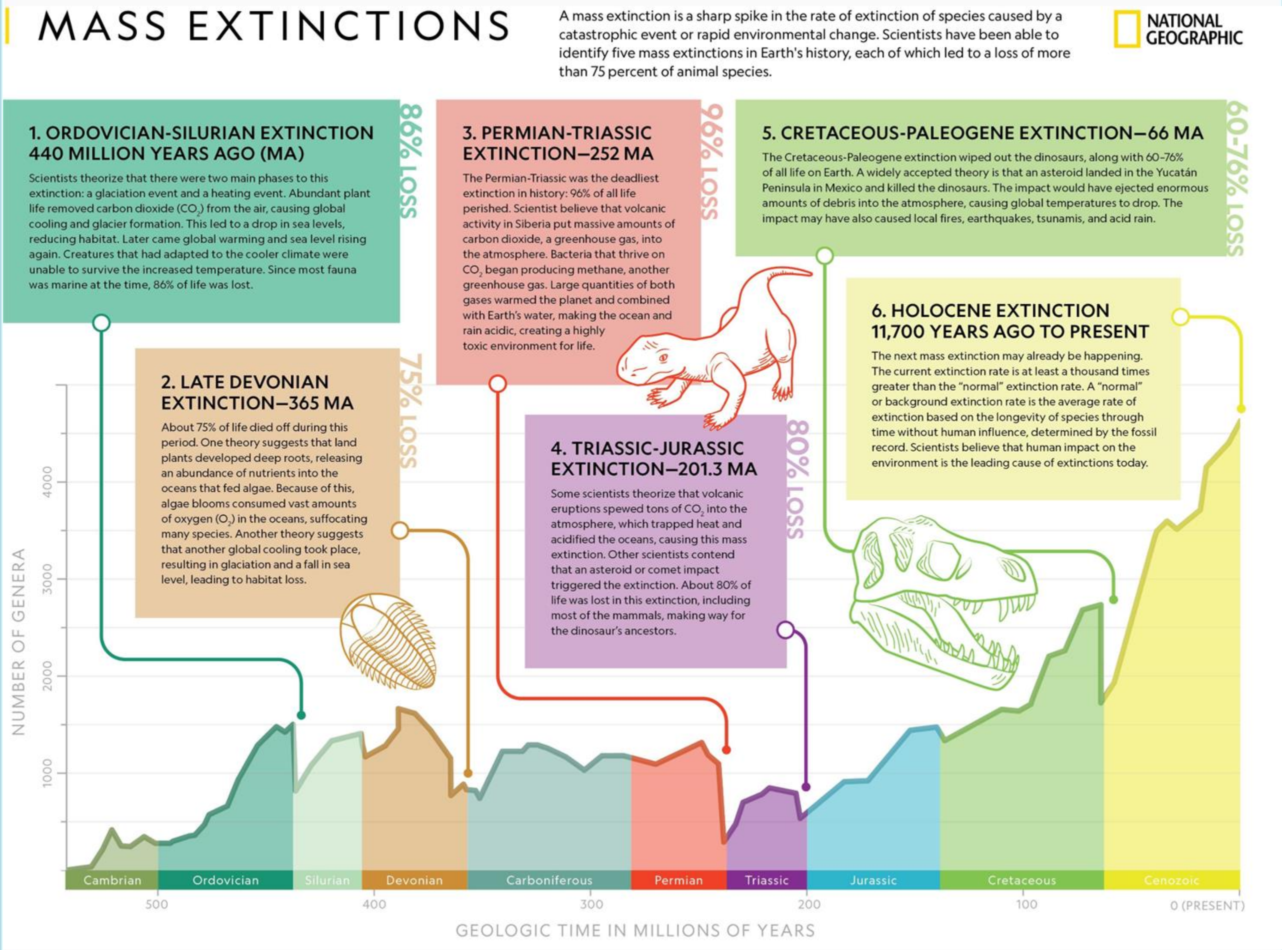
TOPIC

7.11

Mass Extinctions



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TOPIC

7.11

What is species diversity?

A. Number of individuals in an area
B. Number of phenotypes in a population
C. Number of species in a community
D. Number of species in a community plus abundance

What is species diversity?

D. Number of species in a community plus abundance

Species diversity refers to how diverse the community is. So, how many different types of species are in an area and the abundance of each of those species.

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TOPIC

7.11

If the species diversity decreases...

A. Rate of extinction decreases
B. Rate of extinction increases

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TOPIC 7.11

If the species diversity decreases...

B. Rate of extinction increases

The less diverse in the community, the more extinction occurs. A higher species diversity leads to higher ecological stabilization and resilience. More ecological relationships lead to more ability to resist stress.

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TOPIC

7.11

An increase of species diversity,

A. Results in a decrease in rate of speciation
B. Results in an increase in rate of speciation

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TOPIC 7.11

An increase of species diversity,

A. Results in a decrease in rate of speciation

An increase in species diversity leads to less available niches which decreases speciation within the community.

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TOPIC 7.11

Extinctions

A. Decrease available niches
B. Increase available niches

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TOPIC

7.11

Extinctions

B. Increase available niches

As individuals die, there are more available niches. So, extinctions increase available niches.

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TOPIC 7.12

Variations in Populations

SYI-3.D.1

The level of variation in a population affects population dynamics—

a. Population ability to respond to changes in the environment is influenced by genetic diversity. Species and populations with little genetic diversity are at risk of decline or extinction.

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TOPIC 7.12

Variations in Populations

SYI-3.D.1

The level of variation in a population affects population dynamics—

b. Genetically diverse populations are more resilient to environmental perturbation because they are more likely to contain individuals who can withstand the environmental pressure.

c. Alleles that are adaptive in one environmental condition may be deleterious in another because of different selective pressures.

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TOPIC 7.12

To withstand selective pressures, populations need

A. To have low genetic diversity
B. To have high genetic diversity

AP BIO INSTA-REVIEW

TOPIC 7.12

To withstand selective pressures, populations need

B. To have high genetic diversity

As the environment changes, the population must have a trait that allows for the population to survive. The more genetic diversity in the population, the more resilient to changes in the environment (withstand selective pressure)

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TOPIC 7.12

Cavendish bananas are triploids and undergo asexual reproduction. Why are the Cavendish bananas at risk?

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TOPIC 7.12

Cavendish bananas are triploids and undergo asexual reproduction. Why are the Cavendish bananas at risk?

Due to asexual reproduction, the bananas are genetically identical. Due to the absence of genetic diversity, they are unable to survive some selective pressures.

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TOPIC 7.12

Which could cause harmful alleles to be fixed?

A. Bottleneck effect
B. Founder effect
C. Gene flow
D. Natural selection

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TOPIC

7.12

Which could cause harmful alleles to be fixed?

A. Bottleneck effect

As the population undergoes a rapid decrease in population size due to random chance, this could cause harmful alleles to be the only allele remaining (fixed).

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TOPIC

7.12

An advantageous trait will always be advantageous.

A. True
B. False

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TOPIC 7.12

An advantageous trait will always be advantageous.

B. False

Different environments have different selective pressures, so a trait that is advantageous in one area might now be in another area.

Dark mice blend into dark substrate in areas of past volcanic activity, but dark mice will not survive on the light substrate in other areas.

What is genetic diversity?

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TOPIC 7.12

What is genetic diversity?

Range of different inherited traits within species

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TOPIC

7.12

A population with little genetic diversity

A. At risk of decline or extinction

B. Favorable in a changing environment

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TOPIC 7.12

A population with little genetic diversity

A. At risk of decline or extinction

Due to the little genetic diversity, the population does not have alleles available as the environment changes. Natural selection can only select among available alleles, so less genetic diversity can lead to a decline in population or extinction.

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TOPIC

7.12

Why would a population with little genetic diversity be at risk to decline?

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TOPIC
7.12

Why would a population with little genetic diversity be at risk to decline?

There's a lack of genetic diversity to allow for a trait that would provide resistance to potential diseases or changes to the environment.

Recall: Natural selection can only select from the traits that are available in the population. If the trait isn't in the population, they will be unable to survive the infection.

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TOPIC 7.12

A favorable trait is always favorable (in any environment)

A. True
B. False

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TOPIC

7.12

A favorable trait is always favorable
(in any environment)

B. False

As the environment changes, the "favorable" alleles change. Just because an allele was favorable in one environment does not mean it will be favorable in all environments.

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TOPIC
7.12

What increases genetic variation?

A. Crossing over
B. Independent Assortment
C. Mutations
D. Random Fertilization

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TOPIC 7.12

What increases genetic variation?

C. Mutations

Mutations are changes in the DNA sequence, which leads to changes in the amino acid sequence. These changes lead to an increase in genetic variation as there are new alleles available.

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TOPIC

7.12

A variable environment causes mutations

A. True

B. False

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TOPIC
7.12

A variable environment causes mutations

B. False

The environment changing is not causing the alleles, it is selecting for alleles that allow the population to be more favorable in the environment.

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TOPIC 7.13

Origins of Life on Earth

SYI-3.E.1

Several hypotheses about the origin of life on Earth are supported with scientific evidence—

a. Geological evidence provides support for models of the origin of life on Earth.

i. Earth formed approximately 4.6 billion years ago (bya). The environment was too hostile for life until 3.9 bya, and the earliest fossil evidence for life dates to 3.5 bya. Taken together, this evidence provides a plausible range of dates when the origin of life could have occurred.

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TOPIC
7.13

Origins of Life on Earth

SYI-3.E.1

Several hypotheses about the origin of life on Earth are supported with scientific evidence—

b. There are several models about the origin of life on Earth—

i. Primitive Earth provided inorganic precursors from which organic molecules could have been synthesized because of the presence of available free energy and the absence of a significant quantity of atmospheric oxygen (O_2).

ii. Organic molecules could have been transported to Earth by a meteorite or other celestial event.

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TOPIC 7.13

Origins of Life on Earth

SYI-3.E.1

Several hypotheses about the origin of life on Earth are supported with scientific evidence–

c. Chemical experiments have shown that it is possible to form complex organic molecules from inorganic molecules in the absence of life–

i. Organic molecules/monomers served as building blocks for the formation of more complex molecules, including amino acids and nucleotides.

ii. The joining of these monomers produced polymers with the ability to replicate, store, and transfer information.

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TOPIC 7.13

Origins of Life on Earth

SYI-3.E.2

The RNA World Hypothesis proposes that RNA could have been the earliest genetic material.

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TOPIC
7.13

Based on evidence, earth formed...

A. 3.5 billion years ago
B. 3.9 billion years ago
C. 4.3 billion years ago
D. 4.6 billion years ago

AP BIO INSTA-REVIEW

TOPIC

7.13

Based on evidence, earth formed...

D. 4.6 billion years ago

Directly from the CED:

Earth formed approximately 4.6 billion years ago (bya). The environment was too hostile for life until 3.9 bya, and the earliest fossil evidence for life dates to 3.5 bya. Taken together, this evidence provides a plausible range of dates when the origin of life could have occurred.

AP BIO INSTA-REVIEW

TOPIC
7.13

Based on evidence, the earliest fossil evidence...

A. 3.5 billion years ago
B. 3.9 billion years ago
C. 4.3 billion years ago
D. 4.6 billion years ago

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TOPIC 7.13

Based on evidence, the earliest fossil evidence...

A. 3.5 billion years ago

Directly from the CED:

Earth formed approximately 4.6 billion years ago (bya). The environment was too hostile for life until 3.9 bya, and the earliest fossil evidence for life dates to 3.5 bya. Taken together, this evidence provides a plausible range of dates when the origin of life could have occurred.

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TOPIC 7.13

Based on evidence, the Earth was too hostile for life until...

A. 3.5 billion years ago
B. 3.9 billion years ago
C. 4.3 billion years ago
D. 4.6 billion years ago

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TOPIC 7.13

Based on evidence, the Earth was too hostile for life until...

B. 3.9 billion years ago

Directly from the CED:

Earth formed approximately 4.6 billion years ago (bya). The environment was too hostile for life until 3.9 bya, and the earliest fossil evidence for life dates to 3.5 bya. Taken together, this evidence provides a plausible range of dates when the origin of life could have occurred.

AP BIO INSTA-REVIEW

TOPIC 7.13

Describe Miller's experiment regarding abiotic synthesis of organic compounds.

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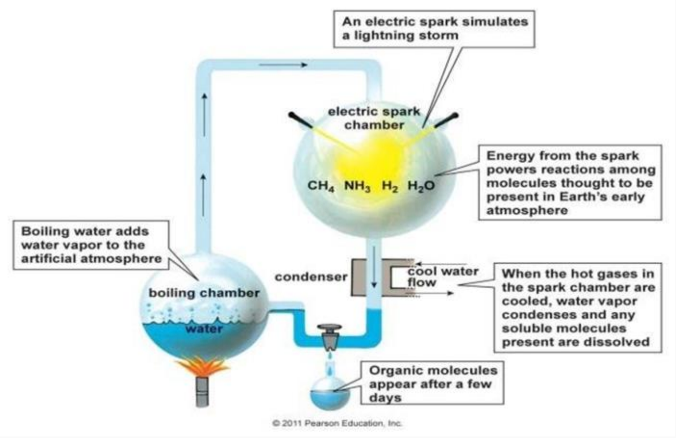
TOPIC 7.13

Describe Miller's experiment regarding abiotic synthesis of organic compounds.

Miller created an environment with similar gases of primitive Earth. He heated up the water similar to how the sun heats the ocean. He used electric sparks to recreate lightning. Then condensed the vapor (made rain) and collected the sample. In the sample, he found monomers (amino acids, etc).



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TOPIC

7.13

Describe Miller’s experiment regarding abiotic synthesis of organic compounds.

Miller created an environment with similar gases of primitive Earth. He heated up the water similar to how the sun heats the ocean. He used electric sparks to recreate lightning. Then condensed the vapor (made rain) and collected the sample. In the sample, he found monomers (amino acids, etc).

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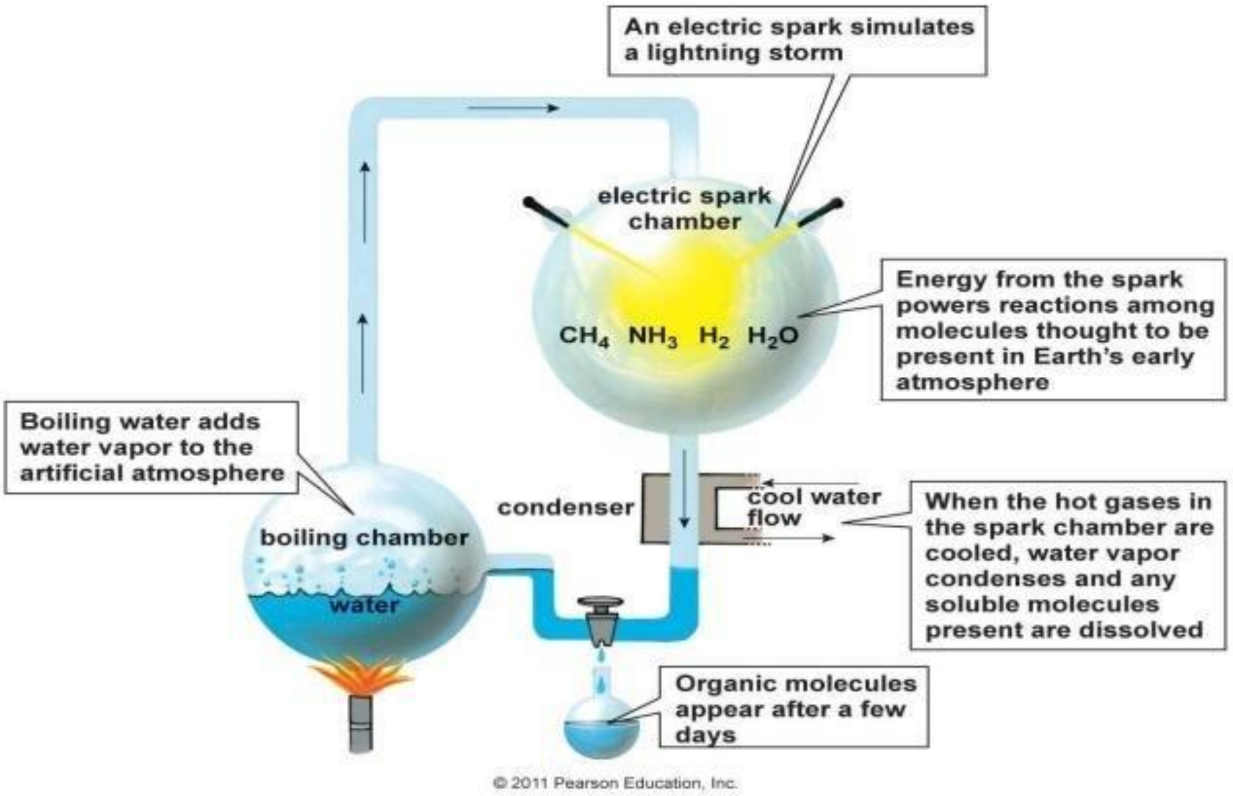
TOPIC 7.13

Describe Miller's experiment regarding abiotic synthesis of organic compounds.



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TOPIC 7.13

Which gas was not present in earth Earth’s atmosphere?

A. Ammonia
B. Hydrogen
C. Methane
D. Oxygen

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TOPIC 7.13

Which gas was not present in earth Earth's atmosphere?

D. Oxygen

Oxygen (O_2) gas was not available in early Earth's atmosphere.

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TOPIC 7.13

Organic compounds could have come to Earth on meteorites.

A. True
B. False

Organic compounds could have come to Earth on meteorites.

A. True

Directly from the CED:

There are several models about the origin of life on Earth—
Organic molecules could have been transported to Earth by a meteorite or other celestial event.

AP BIO INSTA-REVIEW

TOPIC 7.13

The first genetic material was...

A. Carbohydrate

B. DNA

C. Protein

D. RNA

AP BIO INSTA-REVIEW

TOPIC 7.13

The first genetic material was...

D. RNA

Ribozymes (ribonucleic acid enzymes) are RNA molecules that have the ability to catalyze specific biochemical reactions, including RNA splicing in gene expression, similar to the action of protein enzymes. The 1982 discovery of ribozymes demonstrated that RNA can be both genetic material (like DNA) and a biological catalyst (like protein enzymes), and contributed to the RNA world hypothesis, which suggests that RNA may have been important in the evolution of prebiotic self-replicating systems.
-Wikipedia

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TOPIC
7.13

Why was RNA thought to be the first genetic material?

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TOPIC

7.13

Why was RNA thought to be the first genetic material?

It has the capability to self replicate.

It can be used as a template to make proteins.

It has enzymatic capabilities (ribozymes).

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TOPIC 7.13

The environment was too hostile for life until...

A. 4.6 billion years ago
B. 3.9 billion years ago
C. 3.5 billion years ago

AP BIO INSTA-REVIEW

TOPIC 7.13

The environment was too hostile for life until...

B. 3.9 billion years ago

Directly from the CED:

Earth formed approximately 4.6 billion years ago (bya). The environment was too hostile for life until 3.9 bya, and the earliest fossil evidence for life dates to 3.5 bya. Taken together, this evidence provides a plausible range of dates when the origin of life could have occurred.

AP BIO INSTA-REVIEW

TOPIC

7.13

How old were the earliest fossils?

A. 4.6 billion years ago
B. 3.9 billion years ago
C. 3.5 billion years ago

AP BIO INSTA-REVIEW

TOPIC
7.13

How old were the earliest fossils?

c. 3.5 billion years ago

Directly from the CED:

Earth formed approximately 4.6 billion years ago (bya). The environment was too hostile for life until 3.9 bya, and the earliest fossil evidence for life dates to 3.5 bya. Taken together, this evidence provides a plausible range of dates when the origin of life could have occurred.

AP BIO INSTA-REVIEW

TOPIC

7.13

When was the earth first formed?

A. 4.6 billion years ago
B. 3.9 billion years ago
C. 3.5 billion years ago

AP BIO INSTA-REVIEW

TOPIC
7.13

When was the earth first formed?

A. 4.6 billion years ago

Directly from the CED:

Earth formed approximately 4.6 billion years ago (bya). The environment was too hostile for life until 3.9 bya, and the earliest fossil evidence for life dates to 3.5 bya. Taken together, this evidence provides a plausible range of dates when the origin of life could have occurred.

AP BIO INSTA-REVIEW

TOPIC 7.13

Oxygen was found on primitive earth.

A. True
B. False

AP BIO INSTA-REVIEW

TOPIC 7.13

Oxygen was found on primitive earth.

B. False

Oxygen (O_2) was not found in early Earth's atmosphere.

AP BIO INSTA-REVIEW

TOPIC 7.13

Which macromolecule is not made of monomers?

A. Carbohydrates
B. Lipids
C. Nucleic Acids
D. Proteins

AP BIO INSTA-REVIEW

TOPIC 7.13

Which macromolecule is not made of monomers?

B. Lipids

Lipids do not have a repeating structure.

Carbohydrates are made up of monosaccharides. Nucleic acids are made up of nucleotides. Proteins are made up of amino acids.

AP BIO INSTA-REVIEW

TOPIC
7.13

What is the monomer for nucleic acids?

A. Amino acids
B. Fatty acids
C. Monosaccharides
D. Nucleotides

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TOPIC 7.13

What is the monomer for nucleic acids?

D. Nucleotides

Nucleic Acids are made up of nucleotides. Nucleotides are composed of a phosphate group, pentose sugar, and a nitrogenous base.

AP BIO INSTA-REVIEW

TOPIC

7.13

What is the monomer for proteins?

A. Amino acids
B. Fatty acids
C. Monosaccharides
D. Nucleotides

AP BIO INSTA-REVIEW

TOPIC

7.13

What is the monomer for proteins?

A. Amino acids

Proteins are made up of amino acids. Amino acids are composed of an amino group, carboxyl group, a variable R group, and a hydrogen around a central carbon.

AP BIO INSTA-REVIEW

TOPIC 7.13

What was the first genetic material?

A. DNA
B. Proteins
C. RNA

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TOPIC 7.13

What was the first genetic material?

C. RNA

The first genetic material is believed to be RNA as it was able to be a ribozyme to self-catalyze and a template.