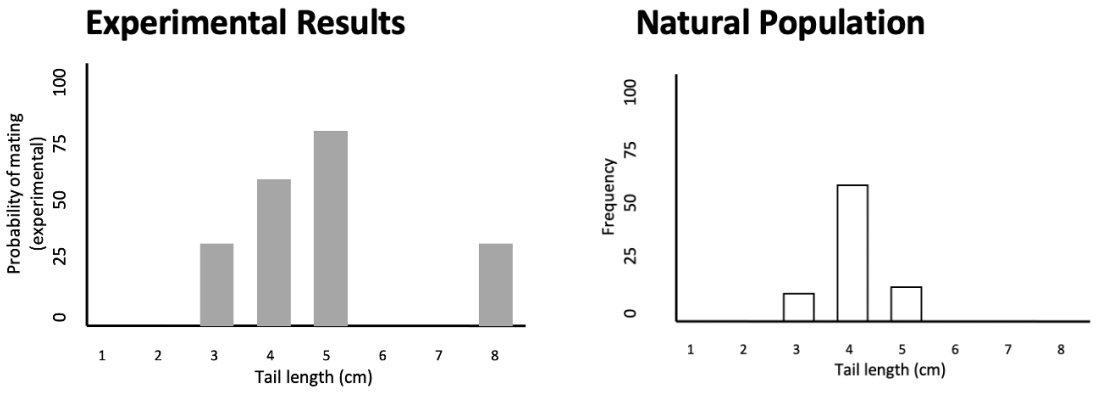
Started on	Tuesday, 24 November 2020, 1:18 PM PST
State	Finished
Completed on	Tuesday, 24 November 2020, 2:29 PM PST
Time taken	1 hour 11 mins
Grade	**96.00** out of 123.00 (**78**%)

Information

[Questions 1–3] The figures below show results from a series of observations on male tail length of the red bishop bird *(Euplectes orix)*. The figure on the left shows female preference for male tail length in experimental populations. The grey bars represent tail lengths manipulated by researchers (they artificially added long feathers to the tails of the experimental birds). Probability of mating is a proxy for estimating the ability of males to attract mates and have offspring. In the figure on the right, the white bars represent observed variation in male tail length in natural (*i.e.* wild) populations.



Question **1**

Incorrect

0.00 points out of 3.00

The male's fitness increases with tail length.

Select one:

- True ✖
- False

Explain why sexual selection typically does not result in adaptation to the environment

Define sexual selection

Compare and contrast the mechanisms of natural and sexual selection.

The correct answer is 'False'.

Question 2
Correct
3.00 points out of 3.00

Male tail length is subject to both natural and sexual selection in wild populations.

Select one:
- True ✔
- False

Explain why sexual selection typically does not result in adaptation to the environment

Define sexual selection

Compare and contrast the mechanisms of natural and sexual selection.

The correct answer is 'True'.

Question 3
Correct
3.00 points out of 3.00

Females exhibit a strong attraction to tails much longer than what they encounter in natural populations.

Select one:
- True
- False ✔

Explain why sexual selection typically does not result in adaptation to the environment

Define sexual selection

Compare and contrast the mechanisms of natural and sexual selection.

The correct answer is 'False'.

Information

[Questions 4–6] You're studying one genetic locus in a population of wombats and you sample 20 individuals with genotype *AA*, 100 individuals with genotype *Aa*, and 80 individuals with genotype *aa*.

Question 4
Correct
3.00 points out of 3.00

The genotype frequency of *AA* individuals is 0.2.

Select one:
- True
- False ✔

Calculate allele frequencies based on phenotypic or genotypic data for a population

Calculate genotype frequencies expected under HW equilibrium in a population given its allele frequencies

Lab Week 4

The correct answer is 'False'.

Question 5

Correct

3.00 points out of 3.00

The frequency of the *a* allele is 0.35

Select one:

- True
- False ✔

Calculate allele frequencies based on phenotypic or genotypic data for a population

Calculate genotype frequencies expected under HW equilibrium in a population given its allele frequencies

Lab Week 4

The correct answer is 'False'.

Question 6

Incorrect

0.00 points out of 3.00

This population has more homozygous recessive *(aa)* individuals than what is expected under Hardy-Weinberg equilibrium.

Select one:

- True ✖
- False

Calculate allele frequencies based on phenotypic or genotypic data for a population

Calculate genotype frequencies expected under HW equilibrium in a population given its allele frequencies

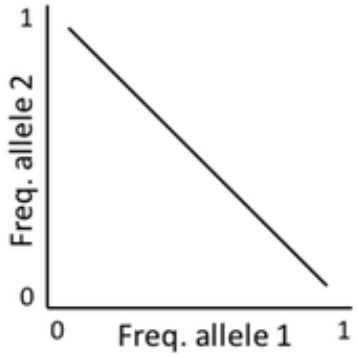
State whether a population is evolving based on deviations from HW equilibrium

Lab Week 4

The correct answer is 'False'.

Information

[Questions 7–9] The graph below shows the relationship between allele frequencies of two possible alleles for a gene in a population of a diploid organism.



Question 7

Incorrect

0.00 points out of 3.00

For any given point on the line above, there is only one possible set of genotype frequencies for a population that is in Hardy-Weinberg equilibrium.

Select one:

- True
- False ✖

Calculate allele frequencies based on phenotypic or genotypic data for a population

Calculate genotype frequencies expected under HW equilibrium in a population given its allele frequencies

State whether a population is evolving based on deviations from HW equilibrium

Lab Week 4

The correct answer is 'True'.

Question 8

Correct

3.00 points out of 3.00

Genetic drift could lead to fixation of one of the two alleles.

Select one:

- True ✔
- False

Explain how natural selection and genetic drift can affect the elimination, maintenance or increase in frequency of various types of alleles (e.g. dominant, recessive, deleterious, beneficial) in a population.

Evaluate each assumption of HW equilibrium and the effect violation of the assumptions may have on changing allele frequencies in a population

Calculate genotype frequencies expected under HW equilibrium in a population given its allele frequencies

Lab Week 5

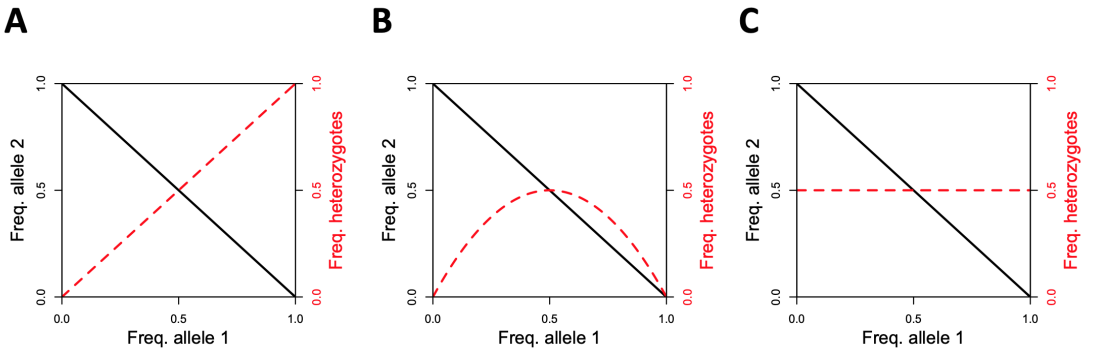
The correct answer is 'True'.

Question 9

Correct

3.00 points out of 3.00

In which of the figures does the dashed red line most closely reflect the frequency of heterozygotes if the population is in Hardy-Weinberg equilibrium?



- a. Graph A
- b. Graph B ✔
- c. Graph C

Your answer is correct.

Explain how natural selection and genetic drift can affect the elimination, maintenance or increase in frequency of various types of alleles (e.g. dominant, recessive, deleterious, beneficial) in a population.

Evaluate each assumption of HW equilibrium and the effect violation of the assumptions may have on changing allele frequencies in a population

Calculate genotype frequencies expected under HW equilibrium in a population given its allele frequencies

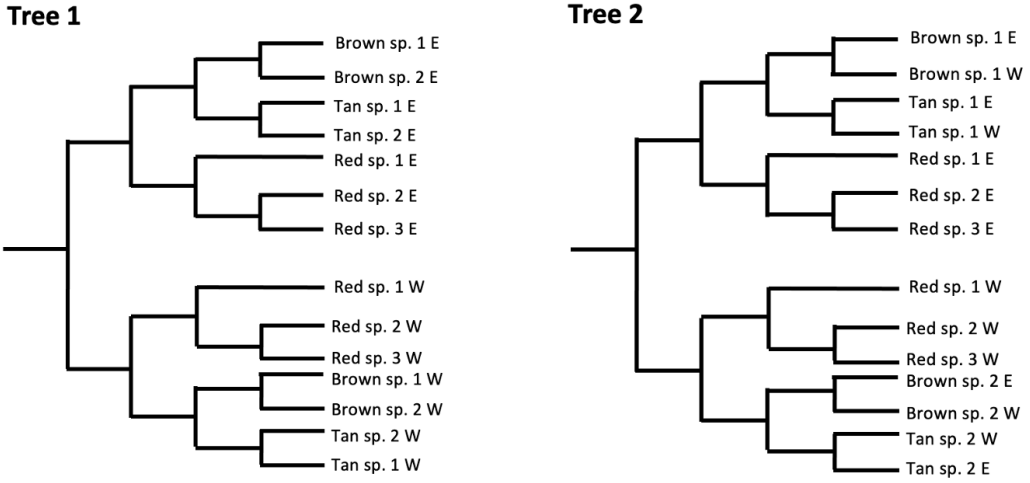
Lab Week 5

The correct answer is:
Graph B

Information

[Questions 10–12] Approximately 10,000 years ago the Grand Canyon was formed.

You are a field biologist studying 14 species of rodent that are found on both sides of the Grand Canyon. There are three species that are red in color, two species that are grey, and two species that are brown on each side of the Grand Canyon. You are interested in understanding how speciation occurred in these species of squirrels, and you have competing hypotheses about how speciation may have occurred in the group. The two phylogenies below represent two possible hypotheses for speciation patterns in this group.



Question 10
Correct
3.00 points out of 3.00

The development of the Grand Canyon would have forced individuals to disperse from one side of the Canyon to the other.

Select one:
- True
- False ✔

Recognize how phylogenies are hypotheses of evolutionary relationships
Interpret patterns of speciation and divergence based on the branching patterns represented on a phylogenetic tree
Interpret patterns of speciation and divergence based on the branching patterns represented on a phylogenetic tree
Predict phylogenetic tree topologies in the presence or absence of convergent evolution

The correct answer is 'False'.

Question 11
Correct
3.00 points out of 3.00

Your hypothesis is that there was a single species of squirrel that was separated by the Grand Canyon, and then there was subsequent diversification.

Tree 1 supports this hypothesis.

Select one:
- True ✔
- False

Recognize how phylogenies are hypotheses of evolutionary relationships
Interpret patterns of speciation and divergence based on the branching patterns represented on a phylogenetic tree
Interpret patterns of speciation and divergence based on the branching patterns represented on a phylogenetic tree
Predict phylogenetic tree topologies in the presence or absence of convergent evolution

The correct answer is 'True'.

Question 12
Correct
3.00 points out of 3.00

Your hypothesis is that there was a single species of squirrel that was separated by the Grand Canyon, and then there was subsequent diversification.

Tree 2 supports this hypothesis.

Select one:
- True
- False ✔

Recognize how phylogenies are hypotheses of evolutionary relationships
Interpret patterns of speciation and divergence based on the branching patterns represented on a phylogenetic tree
Interpret patterns of speciation and divergence based on the branching patterns represented on a phylogenetic tree
Predict phylogenetic tree topologies in the presence or absence of convergent evolution

Information

[Questions 13-15] You are studying a gene locus with three distinct alleles found in *Daphnia magna*, a species of water fleas. Your sample reveals the following genotype proportions:

AA = 10

AB = 25

BB = 30

BC = 15

CC = 20

Question **13**

Correct

3.00 points out of 3.00

The frequency of allele *A* is equal to the frequency of the *C* allele.

Select one:

- True
- False ✔

Calculate allele frequencies based on phenotypic or genotypic data for a population

Calculate genotype frequencies expected under HW equilibrium in a population given its allele frequencies

Lab Week 4

The correct answer is 'False'.

Question **14**

Correct

3.00 points out of 3.00

The frequency of allele *B* is 0.5.

Select one:

- True ✔
- False

Calculate allele frequencies based on phenotypic or genotypic data for a population

Calculate genotype frequencies expected under HW equilibrium in a population given its allele frequencies

Lab Week 4

The correct answer is 'True'.

Question 15

Incorrect

0.00 points out of 3.00

This population is **not** in Hardy Weinberg Equilibrium.

Select one:

- True
- False ✖

Calculate allele frequencies based on phenotypic or genotypic data for a population

Calculate genotype frequencies expected under HW equilibrium in a population given its allele frequencies

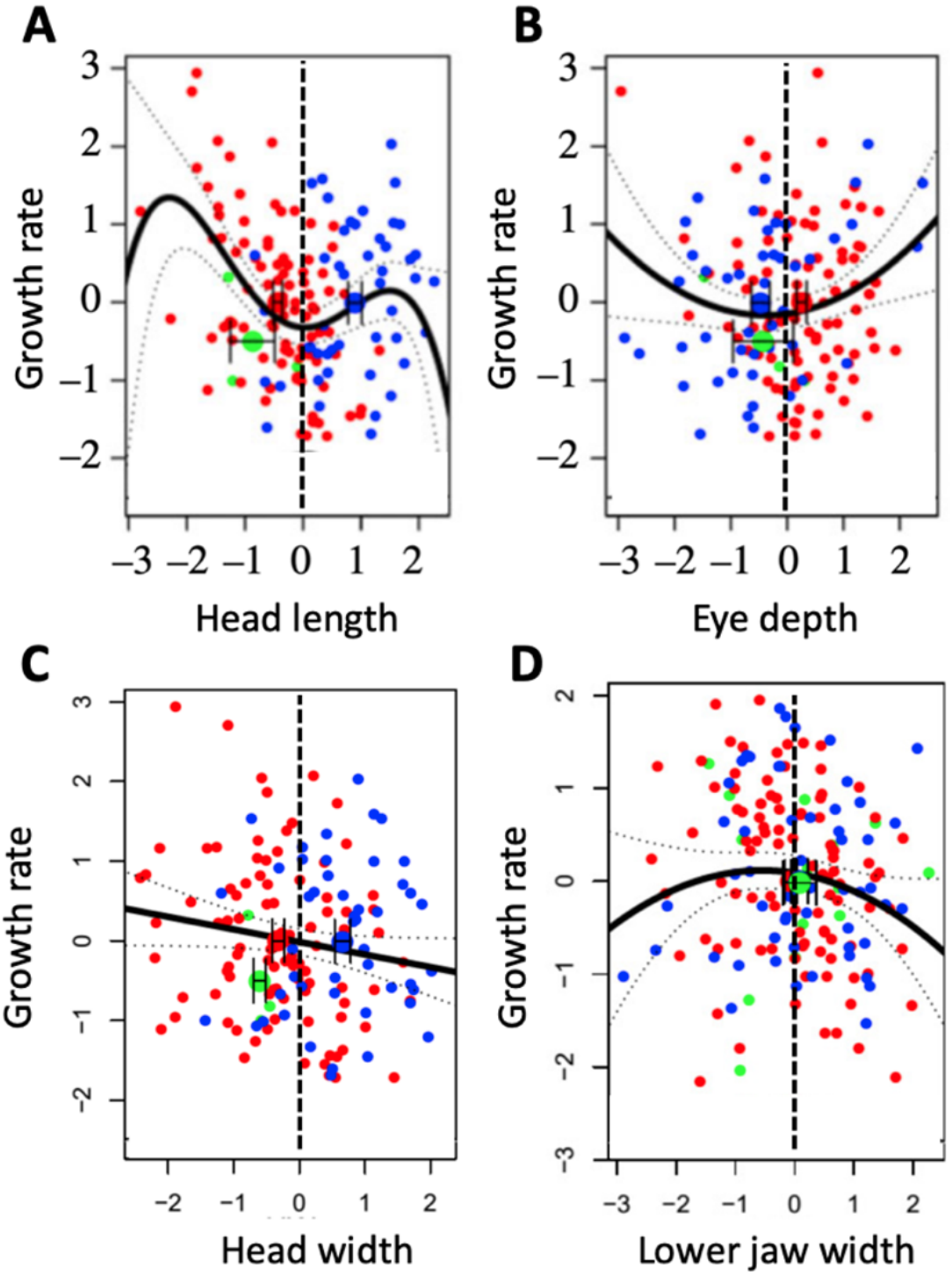
State whether a population is evolving based on deviations from HW equilibrium

Lab Week 4

The correct answer is 'True'.

Information

[Questions 16–19] Researchers measured the growth rate (a proxy for fitness) of Cichlid fish living in Lake Victoria, and several of their physical traits, including their head length (**A**), eye depth (**B**), head width (**C**), and lower jaw width (**D**). Each point shows data for a single fish. To facilitate comparisons, the trait values were standardized in these plots, so that the mean trait value equals zero (shown by the vertical dashed line). Growth rates were standardized similarly, so that the mean growth rate equals zero. Thick black lines show the statistically significant relationships the researchers estimated between growth rate and a trait.



Question 16
Correct
3.00 points out of 3.00

The trait "head length" is experiencing directional selection.

Select one:
- True
- False ✔

Learning Objectives

Differentiate between disruptive, directional, and stabilizing selection

Evaluate data to determine the direction and mode of selection on a specific trait in a population

The correct answer is 'False'.

Question 17
Correct
3.00 points out of 3.00

The trait "eye depth" is experiencing disruptive selection.

Select one:
- True ✔
- False

Learning Objectives

Differentiate between disruptive, directional, and stabilizing selection

Evaluate data to determine the direction and mode of selection on a specific trait in a population

The correct answer is 'True'.

Question 18
Incorrect
0.00 points out of 3.00

Consider the trait of Head width. Assuming it is heritable, over one generation of natural selection the most likely outcome is:

a. The mean trait value would decrease, and variability would change very little

b. The mean trait value will stay the same, and variability would increase

c. The mean trait value would increase, and variability would change very little ✖

d. The mean trait value will stay the same, and variability would decrease

Your answer is incorrect.

Learning Objective

Predict how different modes of selection affect the distribution of phenotypes in a population

The correct answer is:

The mean trait value would decrease, and variability would change very little

Question 19
Correct
3.00 points out of 3.00

In reality, these fish actually come from two different populations (red and blue; ignore green). The mean trait values of each population for each trait are shown with the large red dot (= -0.3) and large blue dot (= 0.9) in each graph. Assume that these populations cannot interbreed, that new variation can arise through mutation, and that the fitness curve does not change.

After many generations of selection, the mean "Head length" of the blue population will converge on a value of -2.1

Select one:

- True
- False ✔

Learning Objective

Interpret fitness curves to make predictions about the outcome of natural selection over many generations

The correct answer is 'False'.

Information

[Questions 20–21] You are working with a population of snails. During the mating season, you observe that individuals in the population will only mate with others of the same genotype (for example, *Mm* individuals will only mate with *Mm* individuals). There are only two alleles at this locus (*M* is dominant; *m* is recessive); you have determined that the frequency of the *M* allele = 0.4 and that selection acts against heterozygous individuals. Consider what will occur in this population over the course of many generations.

Question 20
Incorrect
0.00 points out of 3.00

Both the allele frequencies and the genotype frequencies in the population would be expected to change over time.

Select one:

- True
- False ✖

Explain how inbreeding increases the number of homozygotes (and possibly disease) in comparison to HWE.

Evaluate each assumption of HW equilibrium and the effect violation of the assumptions may have on changing allele frequencies in a population

Lab Week 5

The correct answer is 'True'.

Question 21
Correct
3.00 points out of 3.00

Assortative mating will cause both allele frequencies to reach 0.5.

Select one:

- True
- False ✔

Explain how inbreeding increases the number of homozygotes (and possibly disease) in comparison to HWE.

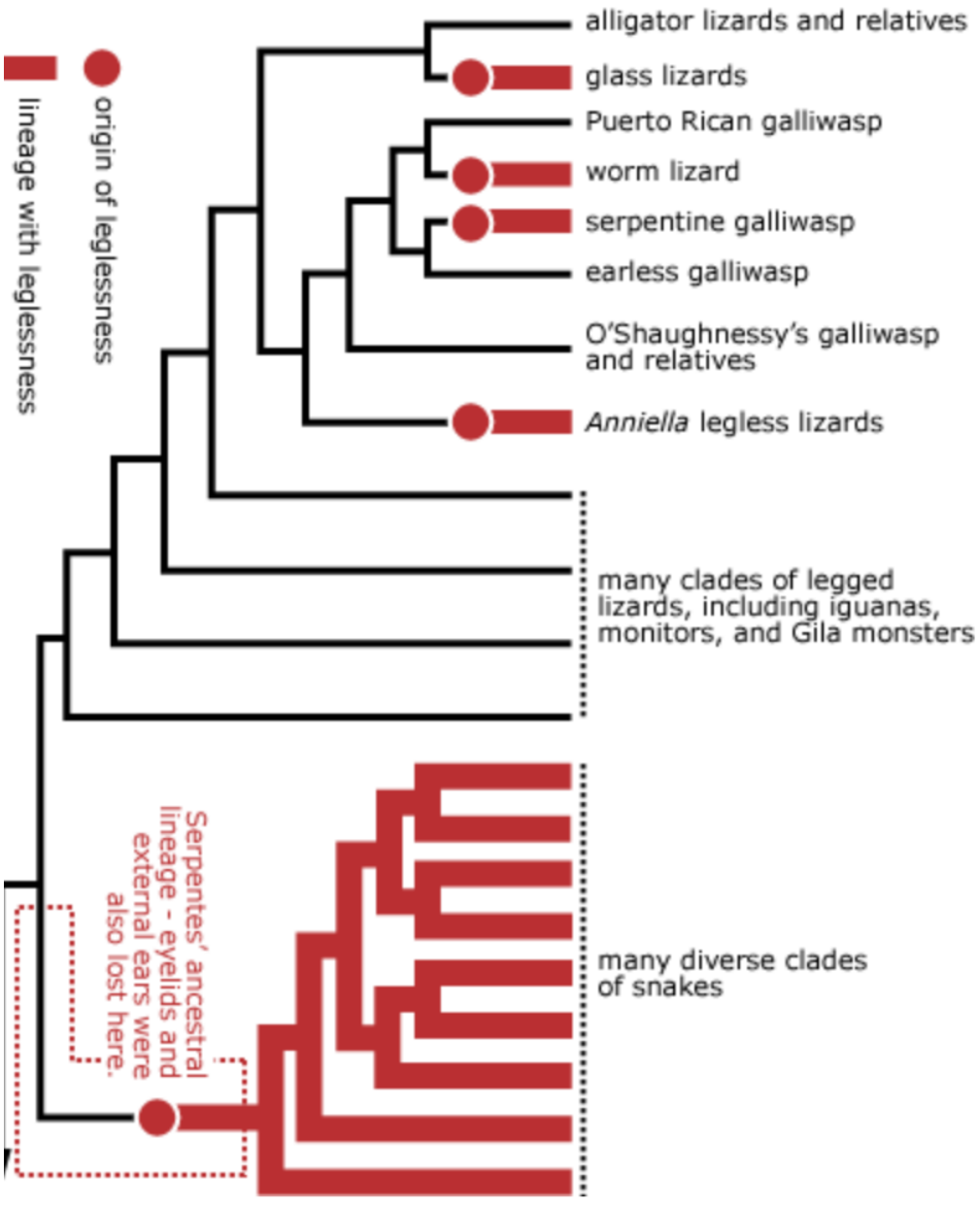
Evaluate each assumption of HW equilibrium and the effect violation of the assumptions may have on changing allele frequencies in a population

Lab Week 5

The correct answer is 'False'.

Information

[Questions 22–27] Examine the cladogram below.



Question **22**

Correct

3.00 points out of 3.00

For some species of lizards the absence of legs was inherited from the common ancestor with snakes.

Select one:

- True
- False ✔

Evaluate the relationships between various groups of organisms based on a phylogeny.

Predict phylogenetic tree topologies in the presence or absence of convergent evolution

The correct answer is 'False'.

Question 23
Correct
3.00 points out of 3.00

In this phylogeny, the clades of Iguanas, Monitors, or Gila monsters could all serve as outgroups for the clades of lizards that include legless species.

Select one:
- True ✔
- False

Evaluate the relationships between various groups of organisms based on a phylogeny.
Predict phylogenetic tree topologies in the presence or absence of convergent evolution

The correct answer is 'True'.

Question 24
Incorrect
0.00 points out of 3.00

If you only considered species that had galliwasp in their name, the galliwasps would be a paraphyletic group.

Select one:
- True
- False ✖

Evaluate the relationships between various groups of organisms based on a phylogeny.
Predict phylogenetic tree topologies in the presence or absence of convergent evolution

The correct answer is 'True'.

Question 25
Incorrect
0.00 points out of 3.00

The presence of legs would be a considered a synapomorphy for the lizard species on the tree.

Select one:
- True ✖
- False

Evaluate the relationships between various groups of organisms based on a phylogeny.
Predict phylogenetic tree topologies in the presence or absence of convergent evolution

The correct answer is 'False'.

Question 26
Correct
3.00 points out of 3.00

Based on the phylogeny, the earless galliwasp is equally related to the PuertoRican galliwasp and the worm lizard.

Select one:
- True ✔
- False

Evaluate the relationships between various groups of organisms based on a phylogeny.
Predict phylogenetic tree topologies in the presence or absence of convergent evolution

Question 27

Correct

3.00 points out of 3.00

Excluding the outgroup (branches labeled as "many clades of legged lizards...") for the group of lizards, eight (8) distinct monophyletic groups (of two or more species) can be found within the lizard species listed on the phylogeny.

Select one:

- True
- False ✔

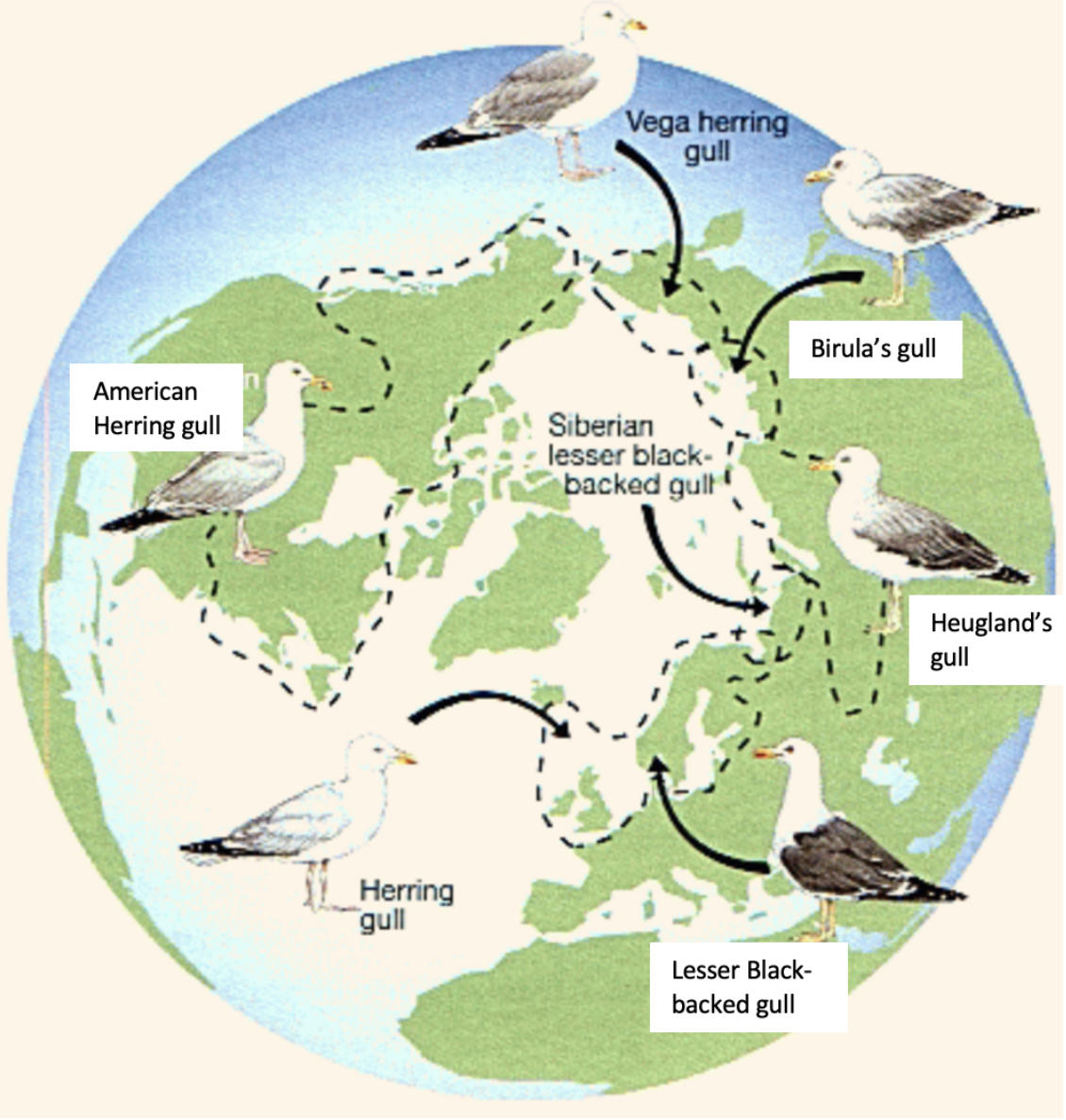
Evaluate the relationships between various groups of organisms based on a phylogeny.

Predict phylogenetic tree topologies in the presence or absence of convergent evolution

The correct answer is 'False'.

Information

[Questions 28-31] The range of *Larus* gulls forms a ring around the North Pole. Within the ring, neighboring species (species with adjacent distributions, e.g. the Vega herring gull and the Birula's gull) can mate with each other, even though they look slightly different. The birds at the two "ends" of the ring, the Herring Gull and the Lesser Black-backed Gull, cannot mate.



Question 28
Correct
3.00 points out of 3.00

Absence of mating between the Herring gull and the Lesser Black-backed gull is an example of a post-zygotic isolating mechanism.

Select one:
- True
- False ✔

Differentiate between pre- and post-zygotic isolating mechanisms.

Relate the pre- and post-zygotic isolating mechanisms to the process of speciation

The correct answer is 'False'.

Question 29
Correct
3.00 points out of 3.00

Mating between Vega herring gull and Birula's gull could preclude speciation.

Select one:
- True ✔
- False

Differentiate between pre- and post-zygotic isolating mechanisms.

Relate the pre- and post-zygotic isolating mechanisms to the process of speciation

The correct answer is 'True'.

Question 30
Correct
3.00 points out of 3.00

We would expect Birula's gull to show equal amounts of genetic divergence from the Herring gull and the Lesser Black-backed gull.

Select one:
- True
- False ✔

Differentiate between pre- and post-zygotic isolating mechanisms.

Relate the pre- and post-zygotic isolating mechanisms to the process of speciation

The correct answer is 'False'.

Question 31
Correct
3.00 points out of 3.00

According to the biological species concept, Herring gull and Lesser Black-backed gull are different species.

Select one:
- True ✔
- False

Define the biological species concept.

Recognize the limitations of the biological species concept.

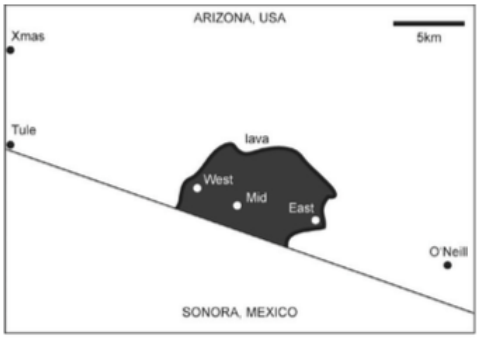
Differentiate between pre- and post-zygotic isolating mechanisms.

Relate the pre- and post-zygotic isolating mechanisms to the process of speciation

The correct answer is 'True'.

Information

[Questions 32–35] Some populations of Arizona pocket mice live on light-colored granite substrate, and others live on dark volcanic rock substrate. Their coat color also varies and is determined by the Melanocortin-1 receptor (*Mc1r*) alleles, *D* and *d*, which differ by four amino acids. Mice with *DD* genotypes have dark coats, *dd* give the mice light-colored coats, and heterozygotes develop an intermediate coat color. The figure below shows the geographic distribution of pocket mouse populations and substrate color. (Hoekstra et al. 2004 *Evolution* 58:1329–1341)



Question 32
Correct
3.00 points out of 3.00

Pocket mice are subject to predation throughout their Arizona habitat. Assuming their predators detect them visually, what mode of selection is acting on coat color when considering the entire species as a whole?

Select one:
- a. directional selection
- b. stabilizing selection
- c. disruptive selection ✔
- d. sexual selection

Your answer is correct.

Recognize that selection acts upon individuals, while populations evolve

Differentiate three components of organismal fitness, in the context of natural selection

Evaluate data to determine the direction and mode of selection on a specific trait in a population

Predict how different modes of selection affect the distribution of phenotypes in a population

The correct answer is: disruptive selection

Question 33

Correct

3.00 points out of 3.00

In their investigation of natural selection on *Mc1r* alleles in Arizona pocket mice, Hoekstra et al. determined the frequency of the *D* and *d* alleles in each population. They also determined the frequency of alleles for two neutral mitochondrial DNA genes (genes that do not affect and are not linked to coat color). Why did the researchers include the mitochondrial DNA genes as part of their experimental design?

Select one:

a. Allele frequencies for the neutral mitochondrial genes serves as an experimental group and gives information on general background genetic differences among these populations.

b. Allele frequencies for the neutral mitochondrial genes serves as an experimental group and gives information on coat-color differences among these populations.

c. Allele frequencies for the neutral mitochondrial genes serves as a control and determines coat-color differences among these populations.

d. Allele frequencies for the neutral mitochondrial genes serves as a control and gives information on general background genetic difference among these populations. ✔

Your answer is correct.

Recognize that selection acts upon individuals, while populations evolve

Differentiate three components of organismal fitness, in the context of natural selection

Evaluate data to determine the direction and mode of selection on a specific trait in a population

Predict how different modes of selection affect the distribution of phenotypes in a population

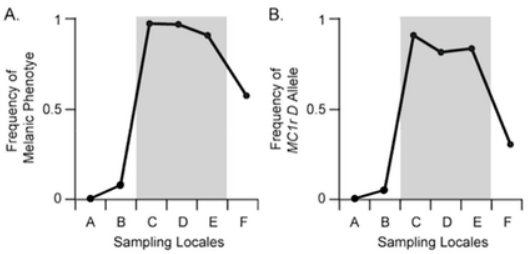
The correct answer is: Allele frequencies for the neutral mitochondrial genes serves as a control and gives information on general background genetic difference among these populations.

Question **34**

Correct

3.00 points out of 3.00

In the figure, chart A shows the frequency of the melanic (dark) coat phenotype across six populations. Populations C, D, and E live on dark volcanic rock; populations A, B, and F live on light-colored granite. Chart B shows the frequency of the *D* allele of the Melanocortin-1 receptor (*Mc1r*) gene across these populations. Which of the following statements best interprets the results shown in charts A and B?



Select one:

- a. Frequency of the *D* allele is closely associated with both the melanic phenotype and the presence of dark substrate color. ✔
- b. Frequency of the *D* allele does not vary across populations.
- c. Frequency of the *D* allele is associated neither with the melanic phenotype nor with the presence of dark substrate color.
- d. Frequency of the *D* allele is closely associated with the melanic phenotype, but is unrelated to the presence of dark substrate color.
- e. Frequency of the *D* allele is not associated with the melanic phenotype, but is associated with the presence of dark substrate color.

Your answer is correct.

Recognize that selection acts upon individuals, while populations evolve

Differentiate three components of organismal fitness, in the context of natural selection

Evaluate data to determine the direction and mode of selection on a specific trait in a population

Predict how different modes of selection affect the distribution of phenotypes in a population

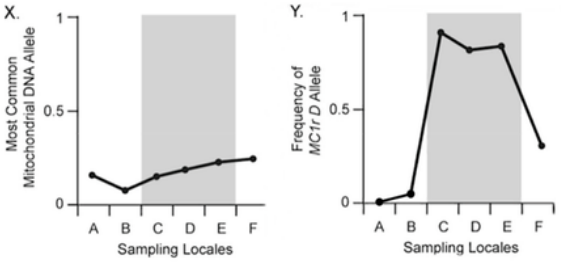
The correct answer is: Frequency of the *D* allele is closely associated with both the melanic phenotype and the presence of dark substrate color.

Question **35**

Correct

3.00 points out of 3.00

In the figure, chart X shows the frequency of the most common neutral mitochondrial DNA allele across six pocket mouse populations. Populations C, D, and E live on dark volcanic rock; populations A, B, and F live on light-colored granite. Compare chart X with chart Y. What should you conclude after comparing these two figures?



Select one:

a. The most common neutral mitochondrial DNA allele is strongly associated with the frequency of the *Mc1r D* allele.

b. The most common neutral mitochondrial DNA allele is strongly associated with substrate color.

c. Little to no correlation exists between neutral mitochondrial DNA alleles and habitat color. ✔

d. The most common neutral mitochondrial DNA allele varies more among populations than does the *Mc1r D* allele.

Your answer is correct.

Recognize that selection acts upon individuals, while populations evolve

Differentiate three components of organismal fitness, in the context of natural selection

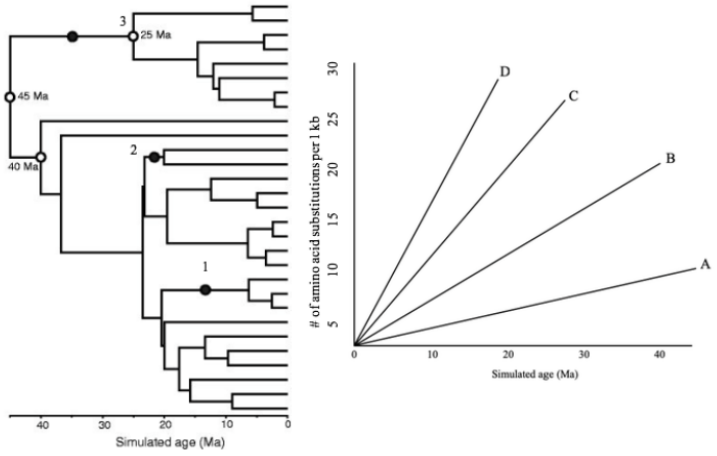
Evaluate data to determine the direction and mode of selection on a specific trait in a population

Predict how different modes of selection affect the distribution of phenotypes in a population

The correct answer is:
Little to no correlation exists between neutral mitochondrial DNA alleles and habitat color.

Information

[Questions 36-37] You are given the phylogeny shown below and its corresponding time scale. In addition you have the molecular clock data shown for genes A-D.



Question 36

Correct

3.00 points out of 3.00

Gene D would be the best to use as a molecular clock to estimate the divergence of the point labeled 2.

Select one:

- True
- False ✔

Evaluate data and phylogenetic patterns, and indicate how they are used to test hypotheses about historic and current patterns of biodiversity.

Relate data from molecular clocks to evolutionary patterns in organismal lineages

The correct answer is 'False'.

Question 37

Incorrect

0.00 points out of 3.00

Using the divergence event labeled 3, shown with an open circle, you would expect ~13 amino acid changes/kb between descendent lineages if using gene B as the molecular clock.

Select one:

- True
- False ✖

Evaluate data and phylogenetic patterns, and indicate how they are used to test hypotheses about historic and current patterns of biodiversity.

Relate data from molecular clocks to evolutionary patterns in organismal lineages

The correct answer is 'True'.

Information

[Questions 38–40] You have a large population (10,000 individuals) of a species of bird that is found along the mainland coastal region of a continent. There is a single gene that is responsible for wing color in these birds, and there are three alleles at this locus. The alleles are for yellow, blue, and red. The allele frequencies in the coastal region are 0.095, 0.46, and 0.445 respectively. There are three islands of similar size and habitat that are located an equal distance from the aforementioned mainland coastal region. At exactly the same time, three separate groups of 40 individuals leave the mainland coastal region and colonize each of the islands. Immediately after the colonization event, you determine the allele frequencies for each island population and find the following:

Island number	Yellow allele frequency	Blue allele frequency	Red allele frequency
1	0.09	0.46	0.45
2	0.106	0.446	0.448
3	0	0.524	0.476

Question 38

Correct

3.00 points out of 3.00

After some time, individuals begin to migrate between islands 2 and 3, but the overall population size remains at 40 individuals on each island. On island 3, you would expect that the red allele frequency will stay the same, but the yellow and blue allele frequencies will increase over time.

Select one:

- True
- False ✔

Evaluate each assumption of HW equilibrium and the effect violation of the assumptions may have on changing allele frequencies in a population

Explain how natural selection and genetic drift can affect the elimination, maintenance or increase in frequency of various types of alleles (e.g. dominant, recessive, deleterious, beneficial) in a population.

Lab Week 5

The correct answer is 'False'.

Question 39

Correct

3.00 points out of 3.00

After many generations, you return and sample individuals from the mainland coastal region and island 2, and you discover that the same mutation, a green allele, has appeared in both populations. It is present in five individuals in the mainland population and in five individuals in the population from island 2.

True or False? Mutation is a stronger evolutionary mechanism in the large mainland population than in the small island population.

Select one:

- True
- False ✔

Evaluate each assumption of HW equilibrium and the effect violation of the assumptions may have on changing allele frequencies in a population

Explain how natural selection and genetic drift can affect the elimination, maintenance or increase in frequency of various types of alleles (e.g. dominant, recessive, deleterious, beneficial) in a population.

Lab Week 5

The correct answer is 'False'.

Question 40

Correct

3.00 points out of 3.00

A subordinate male wild turkey may help his dominant brother to perform an elaborate mating dance, which increases the likelihood that the dominant brother will attract a female and reproduce. If the subordinate male helps, he has zero offspring and his brother has 6 offspring. If he doesn't help, he has 2 offspring, but his brother only has 1.

True or False: The subordinate male will have greater inclusive fitness if he helps his brother.

Select one:

- True ✔
- False

Define kin selection

Calculate the relatedness between individuals and how that may influence kin selection and the evolution of certain species' specific behaviors

The correct answer is 'True'.

Question 41

Correct

3.00 points out of 3.00

Natural selection is the mechanism of evolution that most likely explains these results.

Select one:

- True
- False ✔

Evaluate each assumption of HW equilibrium and the effect violation of the assumptions may have on changing allele frequencies in a population

Explain how natural selection and genetic drift can affect the elimination, maintenance or increase in frequency of various types of alleles (e.g. dominant, recessive, deleterious, beneficial) in a population.

Lab Week 5

The correct answer is 'False'.

◄ Midterm 1

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