

Exercise walk-through

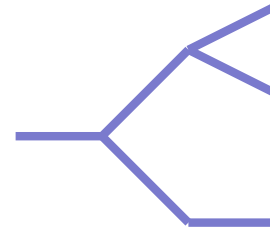
7.9

Phylogeny

AP Biology

What we will cover

- 1 Natural selection
- 2 Types of selection
- 3 Population genetics
- 4 Hardy–Weinberg equilibrium
- 5 Evidence and ancestry
- 6 Speciation and phylogeny



Hardy-Weinberg

$$p + q = 1$$

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

p frequency of allele A
 q frequency of allele a
 p^2 frequency of genotype AA
 $2pq$ frequency of genotype Aa
 q^2 frequency of genotype aa

H-W equilibrium: no selection, mutation, migration, drift, or non-random mating

Hardy-Weinberg: allele frequencies p and q give genotype frequencies p^2 , $2pq$, q^2

What all life shares

the claim

all life descends from a **common ancestor**

the same machinery

DNA and RNA, transcribed and translated the same way in every domain

the same genetic code

the same codons specify the same amino acids, nearly universally

ribosomes

present in every cell, and structurally conserved

shared metabolism

core pathways such as glycolysis appear everywhere

the inference

features this arbitrary and this universal are far better explained by **inheritance** than by repeated invention

The argument is not that the features are useful – it is that the **particular arbitrary choices** are shared. A different code would work just as well.

Exercises 2.1-2.3

2.1 What does a node (branch point) on a tree represent? [1]

2.2 How do you find the most recent common ancestor of two species? [1]

2.3 Are two species that branch off close together more or less related? [1]

Exercises 2.1-2.3

2.1 What does a node (branch point) on a tree represent? [1]

2.1

- A common ancestor
-

2.2 How do you find the most recent common ancestor of two species? [1]

2.2

- Trace both species' lines back until they meet at a shared node
-

2.3 Are two species that branch off close together more or less related? [1]

2.3

- More related

Exercise 3.1

3.1 On a phylogenetic tree, the tips represent

[1]

☐

A common ancestors

B species (or groups)

C mutations

D fossils only

Exercise 3.1

3.1 On a phylogenetic tree, the tips represent

[1]

☐

A common ancestors

B species (or groups)

C mutations

D fossils only

3.1 B

- species (or groups)

Exercise 3.2 (a)

3.2 On a tree, species A and B branch from one node; species C branches off earlier.

(a) Which two species are most closely related?

[1]

Exercise 3.2 (a)

3.2 On a tree, species A and B branch from one node; species C branches off earlier.

(a) Which two species are most closely related?

[1]

(a)

- A and B

Exercise 3.2 (b)

3.2 On a tree, species A and B branch from one node; species C branches off earlier.

(b) Explain your reasoning using the tree.

[2]

Exercise 3.2 (b)

3.2 On a tree, species A and B branch from one node; species C branches off earlier.

(b) Explain your reasoning using the tree.

[2]

(b)

- A and B share a more recent common ancestor (node) than either shares with C, which branched off earlier, so A and B are most closely related

Exercise 3.3

3.3 Explain how shared derived traits are used to group species on a tree.

[2]

Exercise 3.3

3.3 Explain how shared derived traits are used to group species on a tree. [2]

3.3

- A trait shared by all descendants of a node (but not by earlier-branching groups) marks that branch, grouping those species together as sharing that derived feature from their common ancestor