

Exercise walk-through

7.7

Common Ancestry

AP Biology

Evidence and common ancestry

Many independent lines all point to **evolution** :

- **Fossils** : change over time
- **Homologous structures** : same bones
- **Molecular** : shared DNA sequences
- **Biogeography** : where species live

One near-universal genetic code + ATP
+ ribosomes $\Rightarrow$ common ancestry.



Fossils record change and shared ancestry

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.

Speciation, and reading a phylogenetic tree

speciation

the origin of new species, when populations become **reproductively isolated** and diverge

allopatric

a **geographic** barrier separates the populations

sympatric

divergence **without** physical separation – polyploidy, or a shift in habitat or mating time

a phylogenetic tree

a cladogram diagramming evolutionary relationships

branch points

mark **common ancestors**; the shared derived characters define each clade

reading it

relatedness is read from **how recently two lines share a node**, never from proximity across the page

Two tips drawn next to each other can be distantly related. Trace back to the shared node – that is the only thing a tree asserts.

Exercises 2.1-2.3

2.1 Name two features shared by all living things. [2]

2.2 What does sharing the same genetic code suggest? [1]

2.3 Do more closely related species share more or fewer features? [1]

Exercises 2.1-2.3

2.1 Name two features shared by all living things. [2]

2.1

- Any two: DNA/RNA, the same genetic code, ribosomes, ATP
-

2.2 What does sharing the same genetic code suggest? [1]

2.2

- That all organisms share a common ancestor
-

2.3 Do more closely related species share more or fewer features? [1]

2.3

- More features

Exercise 3.1

3.1 The universal genetic code is evidence that all organisms

[1]

☐

A evolved separately

B share a common ancestor

C are identical

D cannot be related

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3.1 The universal genetic code is evidence that all organisms

[1]

☐

A evolved separately

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3.1 B

- share a common ancestor

Exercise 3.2 (a)

3.2 A student notes that bacteria and humans both use ATP and ribosomes.

(a) Explain how this supports common ancestry.

[2]

Exercise 3.2 (a)

3.2 A student notes that bacteria and humans both use ATP and ribosomes.

(a) Explain how this supports common ancestry. [2]

(a)

- Both features are complex and identical in function; the simplest explanation is that both inherited them from a shared ancestor rather than evolving them independently

Exercise 3.2 (b)

3.2 A student notes that bacteria and humans both use ATP and ribosomes.

(b) State one other shared feature.

[1]

Exercise 3.2 (b)

3.2 A student notes that bacteria and humans both use ATP and ribosomes.

(b) State one other shared feature.

[1]

(b)

- The same genetic code (or DNA as genetic material)

Exercise 3.3

3.3 Explain why the pattern of “more related organisms share more features” fits descent from common ancestors. [2]

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3.3

- Closely related species diverged more recently, so they have had less time to accumulate differences and retain more shared inherited features – exactly what a branching tree of descent predicts