

APOLLO

# Classification and cladistics

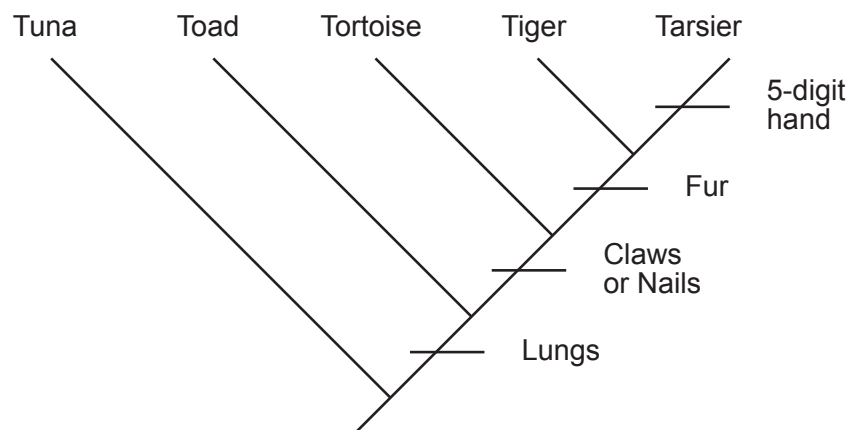
## HL

Biology

First assessment 2025

10 questions | questions

21. What can be deduced from the cladogram?



- A. Tortoises do not have lungs.
- B. A tortoise and a tarsier are more closely related than a tiger and a tarsier.
- C. A toad and a tuna are more closely related than a tiger and a tuna.
- D. Tigers have fur and 5-digit hands.

**Turn over**

- 22.** Classification systems can change based on new evidence. What evidence was used to produce the domains of organisms we now recognize?
- A. mRNA sequence
  - B. rRNA sequence
  - C. Amino acid sequence
  - D. DNA sequence

**Turn over**

**22.** What is one application of DNA barcoding?

- A. Selective breeding
- B. Preserving an endangered species
- C. Analysing environmental DNA
- D. Sequencing a genome

## Section B

Answer **two** questions. One additional mark is available for the construction of your answers for each question. Answers must be written within the answer boxes provided.

9. Evolution is the change in the heritable characteristics of a population.
- (a) Describe the evidence for evolution from homologous structures. [4]
  - (b) Outline the conditions needed and the use of the Hardy–Weinberg equation to calculate allele frequencies in a population. [3]
  - (c) Explain how evolutionary relationships and cladograms can be used for classification. [8]

Section A

Answer **all** questions. Answers must be written within the answer boxes provided.

7. (a) Outline what is meant by the “root” and “node” with reference to a cladogram. [2]

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(b) Discuss the use of amino acid sequences of proteins as the basis for constructing cladograms. [3]

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(c) Identify a type of information, other than amino acid sequence, that could be used to construct a cladogram. [1]

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(d) Outline the use of parsimony analysis when choosing between different possible cladograms. [1]

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Turn over

21. The table shows the binomial naming of four species.

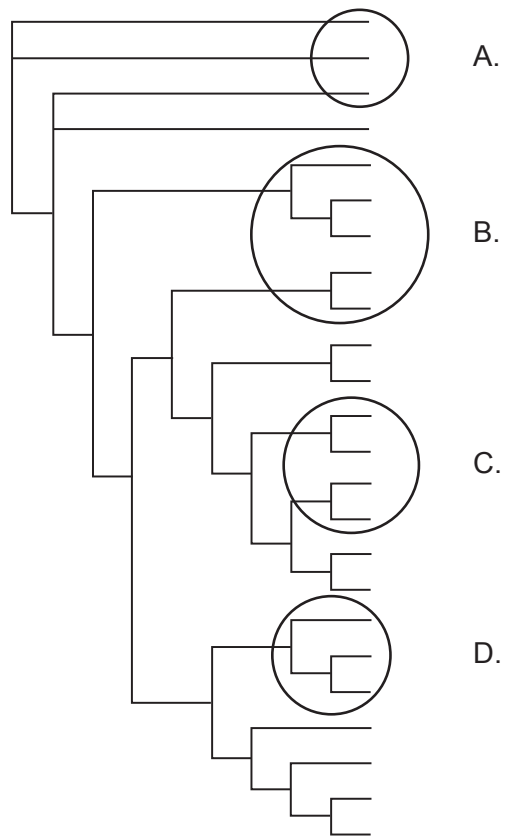
| Organism | Genus           | Species           |
|----------|-----------------|-------------------|
| W        | <i>Felis</i>    | <i>catus</i>      |
| X        | <i>Conus</i>    | <i>catus</i>      |
| Y        | <i>Ameiurus</i> | <i>catus</i>      |
| Z        | <i>Felis</i>    | <i>silvestris</i> |

What can be concluded?

- A. W, X and Y are the most closely related.
- B. X and Y are the most closely related.
- C. W and Z are the most closely related.
- D. W is equally related to all the other species.

Turn over

**22.** Which encircled area shows a clade?



- 21.** Domain is a taxonomic level above kingdom that has been used to classify living organisms into three groups.

What has provided the evidence for classification of organisms into domains?

- A. Ribosomal RNA (rRNA) base sequences
- B. Mitochondrial DNA base sequences
- C. Cell wall structure
- D. Amino acid sequence of ATP synthase

- 24.** The image shows an organism from the phylum Arthropoda.

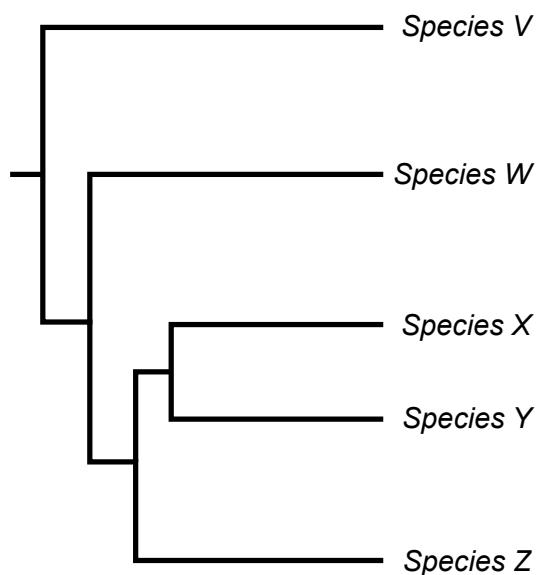


A dichotomous key was used to classify this arthropod. To which group does it belong?

Dichotomous key:

1. antennae pointing forwards ..... go to 2  
antennae pointing sideways ..... go to 3
2. branched antennae ..... A.  
unbranched antennae ..... B.
3. one pair of legs in each body segment ..... C.  
two pairs of legs in each body segment ..... D.

25. Scientists studied differences in the base sequences of a gene found in five animal species in order to determine their evolutionary relationships. A cladogram was constructed based on these differences.



What can be deduced from the cladogram?

- A. There are only three clades shown.
- B. Morphological differences between V and Z increase with time.
- C. There is only one difference between the amino acid sequences of X and Y.
- D. Y and Z have a more recent common ancestor than W and X.

**Turn over**