

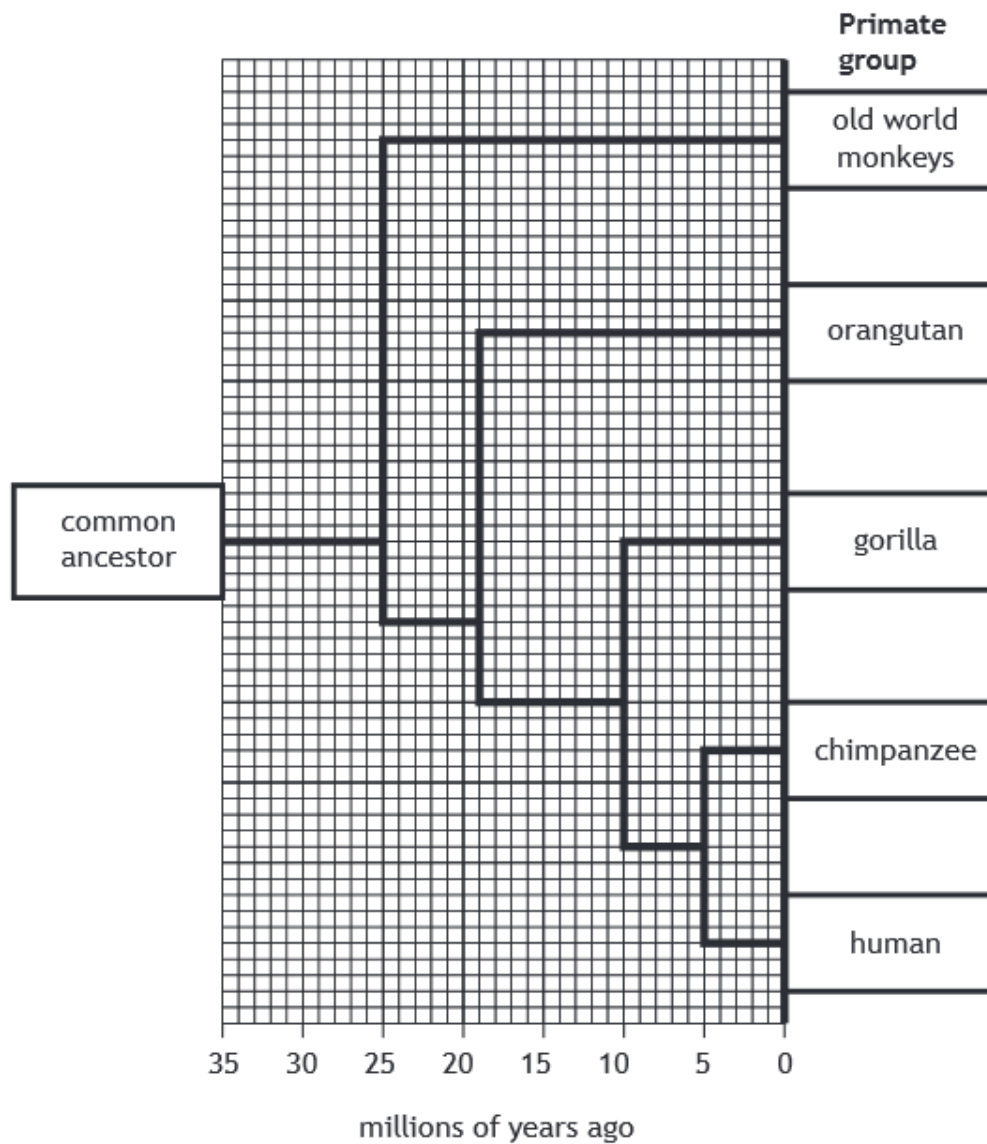
## **Genomic Sequencing**

9. When comparing genomic sequence data, bioinformatics is the use of
- A statistical analysis and fossil evidence
  - B fossil evidence and computer analysis
  - C computer analysis and pharmacogenetics
  - D computer analysis and statistical analysis.

18. In which of the following domains of life are microorganisms found?

- A Bacteria only
- B Archaea only
- C Bacteria and archaea only
- D Bacteria, archaea and eukaryotes

(c) The phylogenetic tree illustrates the evolutionary relationships between primate groups.



(i) State how long ago the last common ancestor of gorillas and old world monkeys existed.

1

\_\_\_\_\_ million years ago

- (ii) Humans are more closely related to chimpanzees than to orangutans.

Explain how this is known, using information from the phylogenetic tree.

1

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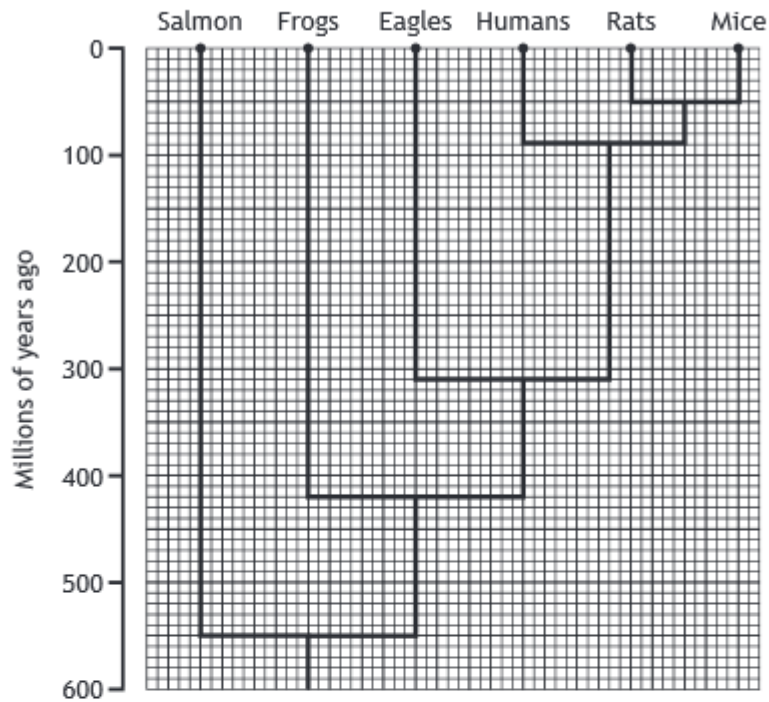
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20. The analysis of DNA sequences from different organisms is used in the production of molecular clocks.

This analysis is based on the assumption that over time DNA sequences undergo mutations

- A randomly
- B spontaneously
- C at a varying rate
- D at a constant rate.

5. (a) The phylogenetic tree illustrates the evolutionary relatedness of six groups of animals.



- (i) Using information from the phylogenetic tree state when the last common ancestor of salmon and frogs lived. 1

\_\_\_\_\_ million years ago

- (ii) Calculate how many million years separate the divergence of eagles and humans from the divergence of rats and mice. 1

*Space for calculation*

\_\_\_\_\_ million years

- (iii) Rats are more closely related to humans than they are to frogs.

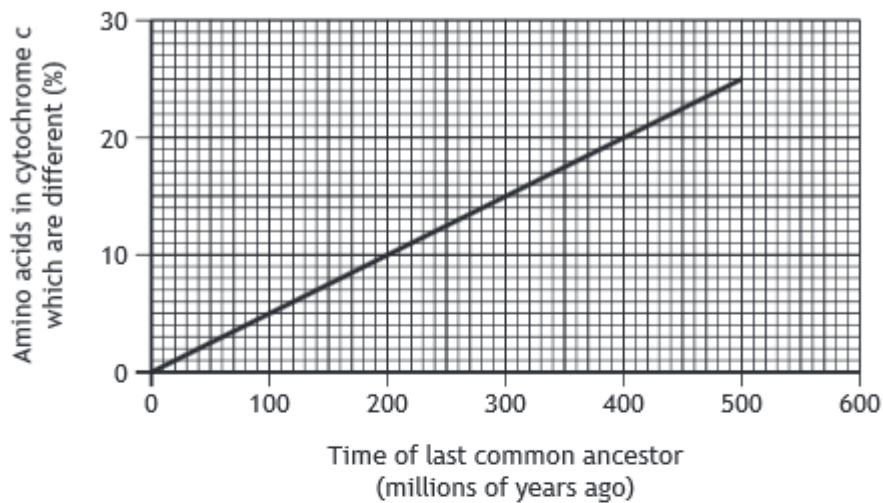
Use evidence from the phylogenetic tree to justify this statement. 1

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- (b) The graph shows a molecular clock which compares the amino acid sequence of the protein cytochrome c between a range of species.



- (i) Cytochrome c is a protein containing 112 amino acids.

Calculate the number of amino acids in cytochrome c that are different between two species whose last common ancestor lived 500 million years ago.

1

*Space for calculation*

- (ii) Predict the percentage of amino acids in cytochrome c which would be different between two species who shared a common ancestor 550 million years ago.

1

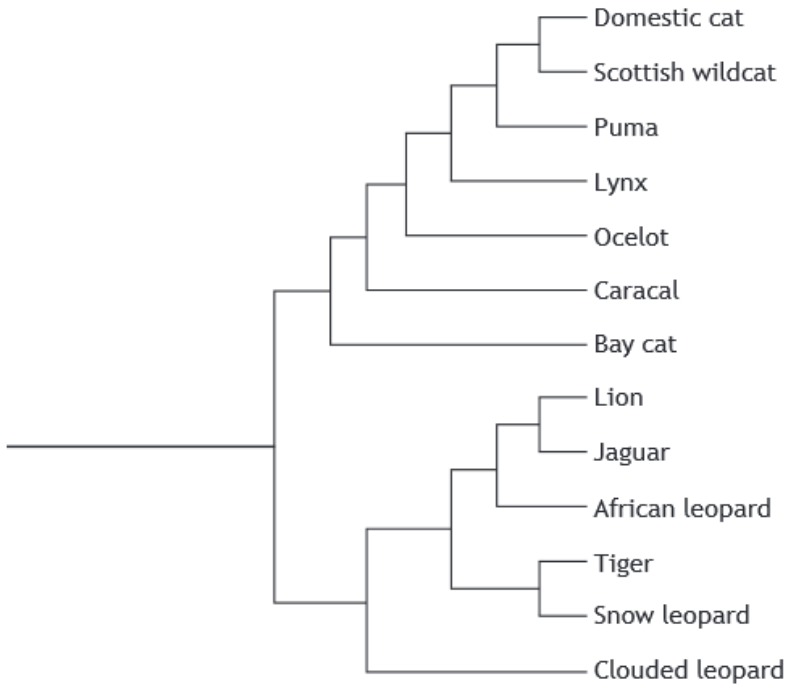
\_\_\_\_\_ %

- (c) Using information from the phylogenetic tree and the graph, state the percentage of amino acids in cytochrome c that are different between rats and frogs.

1

\_\_\_\_\_ %

5. The diagram below represents a phylogenetic tree showing the evolutionary relatedness of several species of cat.



With how many species does the African leopard share a common ancestor in this phylogenetic tree?

- A 2 only
- B 5 only
- C 12 only
- D 13