Practice Evolution & Taxonomy Questions

[14 marks]

The diagram shows a leaf from Dryopteris arguta.

[https://commons.wikimedia.org/wiki/File:E20161208-0001%E2%80%94Dryopteris_arguta_(Reverse)%E2%80%94RPBG_(30698925004).jpg, E20161208-0001—Dryopteris arguta (Reverse)—RPBG Source: https://www.flickr.com/photos/john_d_rusk/30698925004/ Author: John Rusk from Berkeley, CA, United States of America, licensed under Creative Commons licence: https://creativecommons.org/licenses/by/4.0/legalcode]

1a. State the phylum of this plant. *[1 mark]*

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1b. State **two** characteristics of plants from the phylum you stated in (a)(i). *[2 marks]*

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1c. Outline why the number of trophic levels is limited in a food chain. *[1 mark]*

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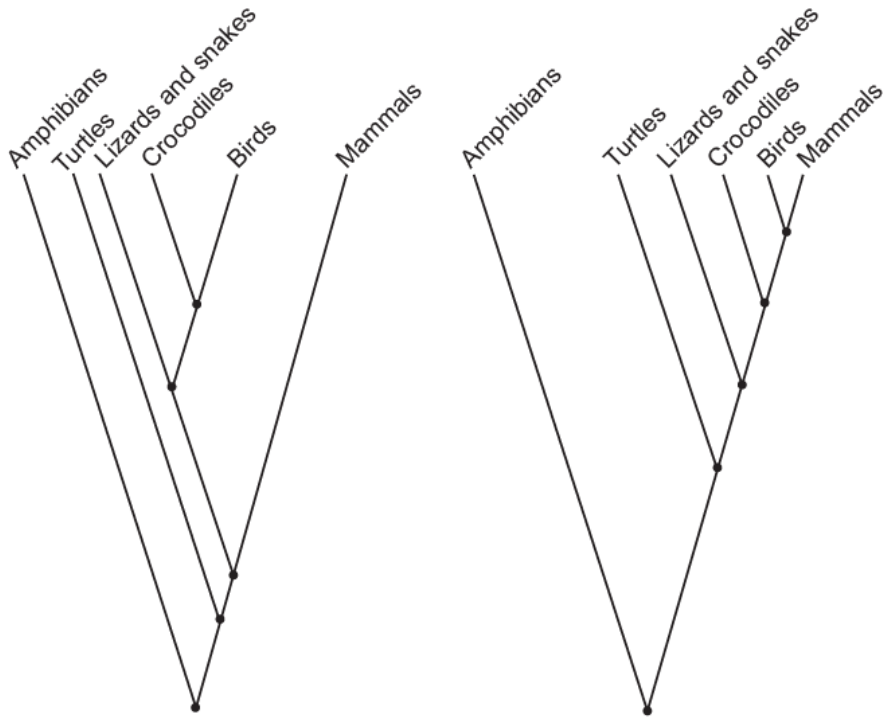
2. Cladograms can be created by comparing DNA or protein sequences. The cladogram on the left is based on DNA sequences and the cladogram on the right is based on comparing protein sequences. *[1 mark]*



What is the reason that cladograms based on DNA sequences are more reliable predictors of the phylogenetic relationship of species than cladograms based on protein sequences?

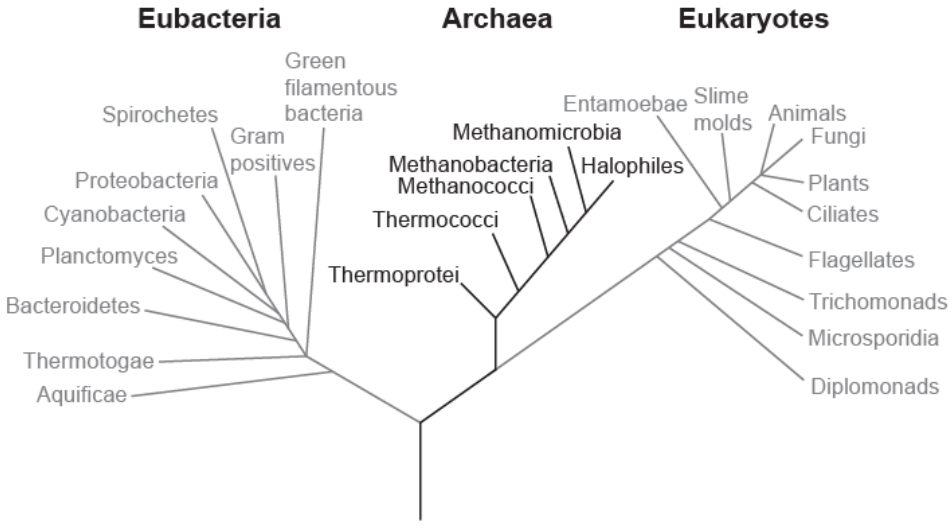
A. Amino acids are not as chemically stable as DNA nucleotides.

B. DNA mutates but amino acids do not.

C. Several different triplets of bases can code for the same amino acid.

D. There are 20 different amino acids but only 4 nucleotides.

3. Below is a phylogenetic tree of the three domains. *[1 mark]*



There are important differences between the three domains. Which of these domains have organelles?

A. Eubacteria and archaea

B. Archaea only

C. Eukaryotes and archaea

D. Eukaryotes only

4. Which is a characteristic of both bryophyta and filicinophyta? *[1 mark]*

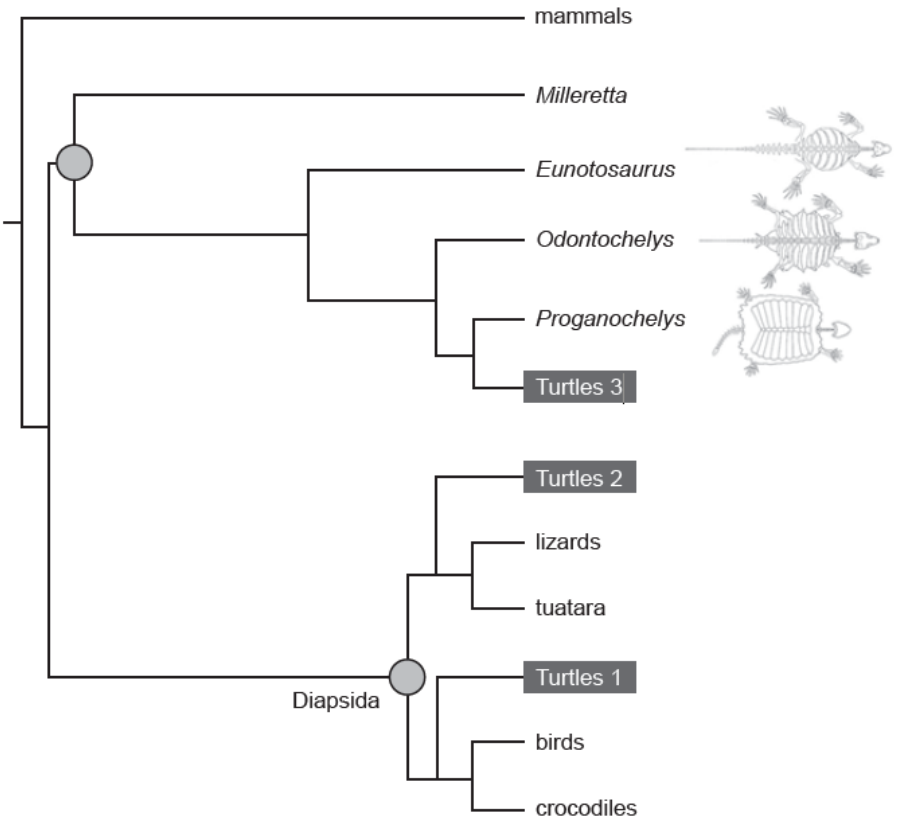
A. Vascular tissue

B. Membranous leaves

C. Release of spores

D. Evergreen spines

The following cladogram shows three possible evolutionary routes for the turtle (Turtles 1, Turtles 2 and Turtles 3). The taxa in italics are extinct.



[Source: Tyler R. *et al*., Transitional fossils and the origin of turtles, *Biology Letters* 6, Dec 23, 2010, pages 830–833, by permission of the Royal Society.]

5a. State the organism most closely related to the lizards. *[1 mark]*

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5b. Based on the taxa shown, deduce a difficulty in gathering data to study turtle ancestry. *[1 mark]*

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5c. Molecular evidence is often used to construct a cladogram. Describe **one** type of molecular-based evidence to identify members of a clade. *[2 marks]*

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5d. Suggest **one** type of additional evidence that could provide strong support for Turtles 3 as the evolutionary route for turtles rather than Turtles 1 or Turtles 2. *[1 mark]*

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5e. Taxonomists aim to place species into genera, families and higher taxa according to their evolutionary origins. This is known as natural classification. *[2 marks]*

Explain the usefulness of natural classification in biodiversity research.

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