

3 Prokaryotic and eukaryotic organisms can be classified depending on their cellular structure.

(a) Describe **three** structural differences between prokaryotic and eukaryotic cells.

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(b) In 1977, Carl Woese suggested that there are three domains of living organisms: the Archaea, the Bacteria and the Eukaryota.

He used molecular phylogeny to classify organisms into different domains.

Explain what is meant by the term **molecular phylogeny**.

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(c) The table below shows some of the cellular features of organisms belonging to the three different domains.

Feature	Archaea	Bacteria	Eukaryota
Cell membrane	Branched hydrocarbon chains attached to glycerol by ether bonds	Unbranched fatty acid chains attached to glycerol by ester bonds	Unbranched fatty acid chains attached to glycerol by ester bonds
Ribosome size	70S	70S	80S
Number of protein molecules in RNA polymerase	10	5	12
Peptidoglycan in cell wall	No	Yes	No
Type of chromosome	Circular	Circular	Linear

(i) Using information from this table, give evidence that supports Woese's conclusion that the Archaea are distinct from **both** the Bacteria and the Eukaryota.

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(ii) Using information from the table, explain why the Archaea are thought to be more closely related to Eukaryota than to Bacteria.

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(Total for Question 3 = 10 marks)

