

Exam Prep various command terms *[218 marks]*

1a. Outline how the amphipathic properties of phospholipids play a role in membrane structure. *[2 marks]*

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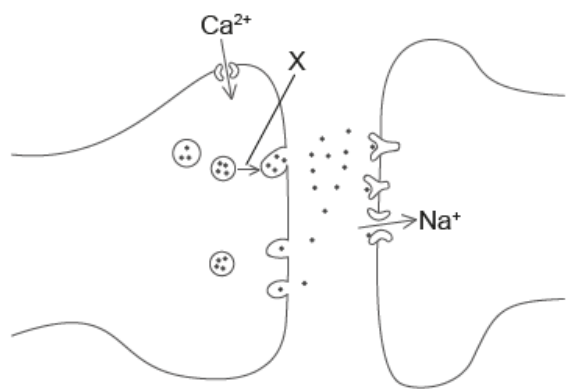
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The diagram shows part of two neurons.



[Source: © International Baccalaureate Organization 2020.]

1b. State the name of the structure shown. *[1 mark]*

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1c. X indicates the movement of a structure in the neuron. Explain what events trigger this movement and what happens next. [3 marks]

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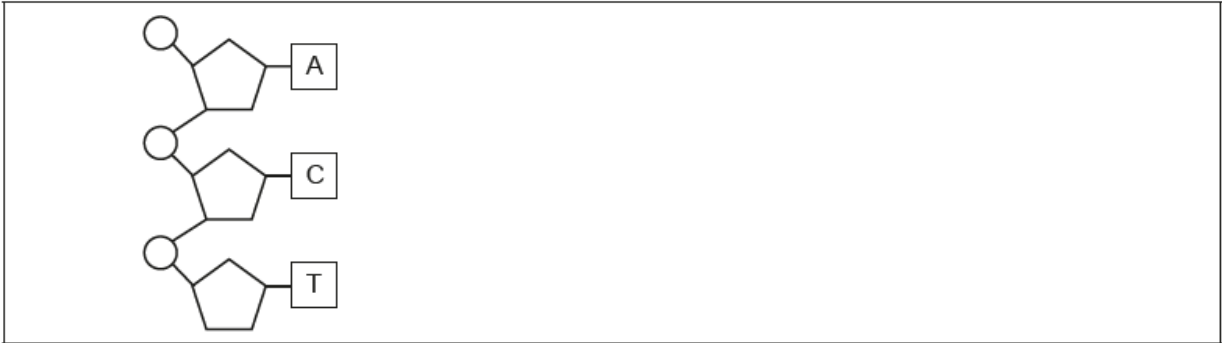
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2a. Sketch the complementary strand to complete the section of a DNA diagram. [3 marks]



2b. Define mutation.

[1 mark]

2c. Explain how evolution by natural selection depends on mutations.

[4 marks]

[illegible]

A short base sequence of mRNA and a table of the genetic code are shown below.
Sequence of mRNA

AUGAGCCGAAGGUAGCUG

Table of the genetic code

		2nd letter					
		U	C	A	G		
1st letter	U	Phe	Ser	Tyr	Cys	U	3rd letter
		Phe	Ser	Tyr	Cys	C	
		Leu	Ser	STOP	STOP	A	
		Leu	Ser	STOP	Trp	G	
	C	Leu	Pro	His	Arg	U	
		Leu	Pro	His	Arg	C	
		Leu	Pro	Gln	Arg	A	
		Leu	Pro	Gln	Arg	G	
	A	Ile	Thr	Asn	Ser	U	
		Ile	Thr	Asn	Ser	C	
		Ile	Thr	Lys	Arg	A	
		Met/START	Thr	Lys	Arg	G	
	G	Val	Ala	Asp	Gly	U	
		Val	Ala	Asp	Gly	C	
		Val	Ala	Glu	Gly	A	
		Val	Ala	Glu	Gly	G	

3a. Outline the function of codons. [1 mark]

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3b. Determine the sequence of amino acids that could be translated from the [1 mark] sequence of mRNA.

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3c. Determine the DNA base sequence transcribed to form this sequence of mRNA. [1 mark]

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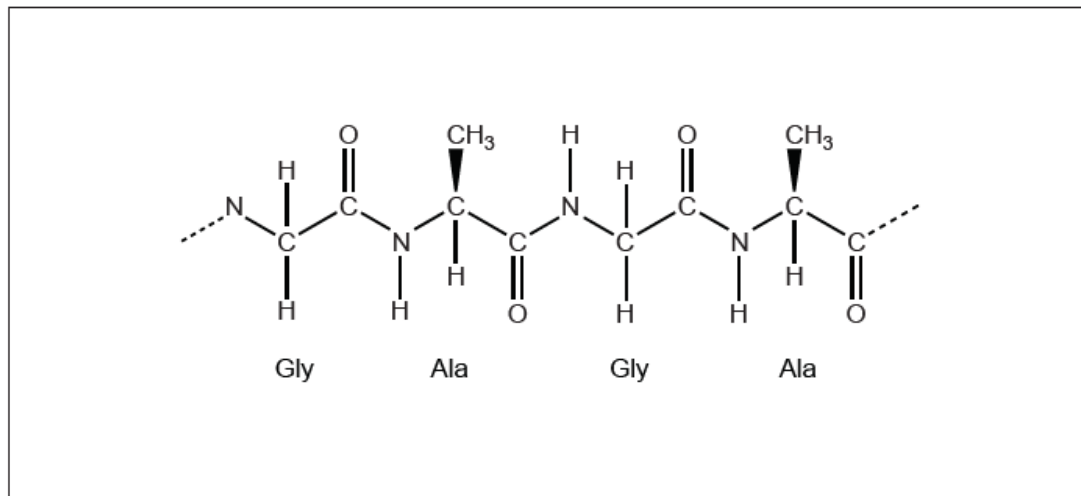
3d. Suggest a hypothesis that accounts for the slightly different meaning of some codons in a very limited number of organisms. [1 mark]

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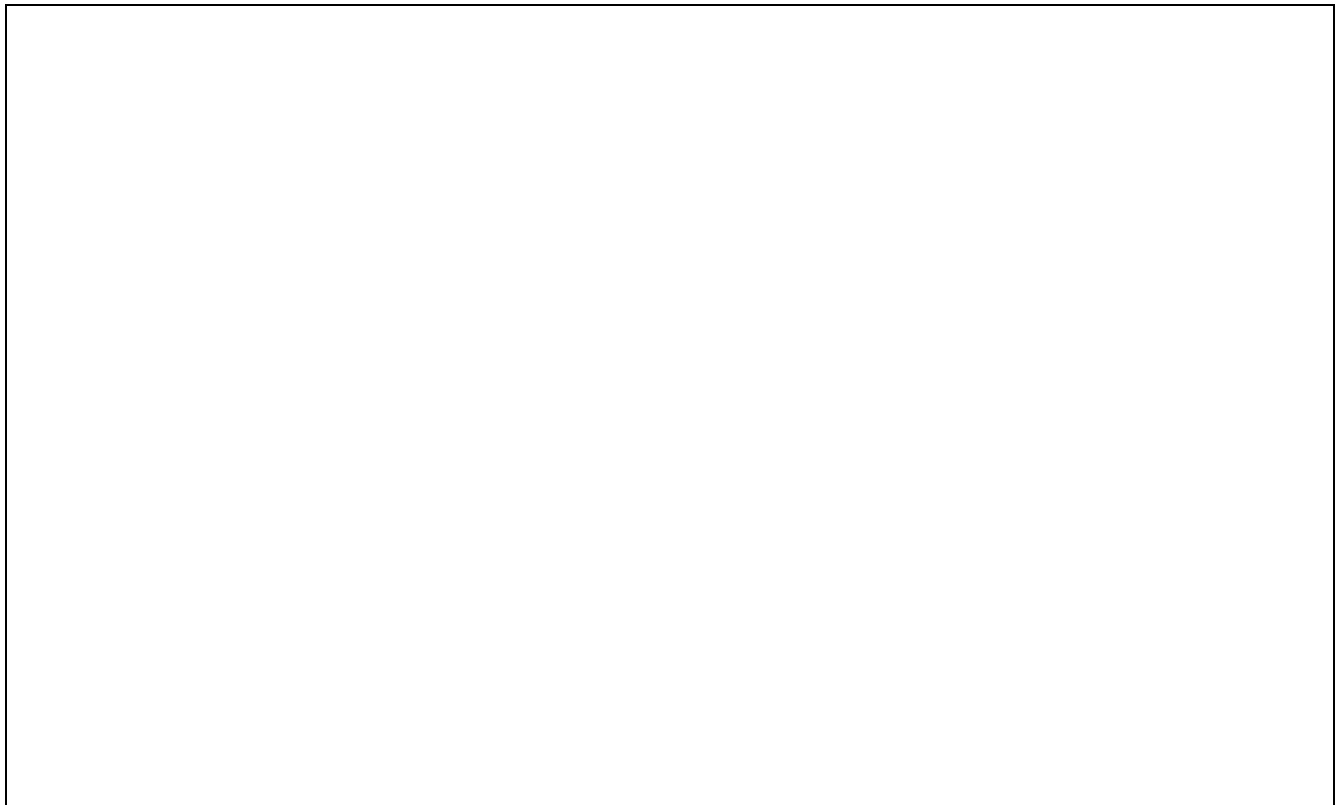
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The diagram shows a section of a polypeptide.



3e. Annotate the diagram to show a peptide bond between two amino acids. [1 mark]



3f. State the type of reaction that removes water while linking amino acids together to form polypeptides. [1 mark]

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3g. Outline the function of Rubisco and of spider silk in relation to their three-dimensional conformation.

[2 marks]

	Function	Conformation
Rubisco		
Spider silk		

4a. Outline the cell theory.

[2 marks]

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4b. State **two** functions of life.

[2 marks]

[illegible]

4c. List **three** characteristics of eukaryotic homologous chromosomes.

[3 marks]

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4d. Using the following table, compare and contrast anaerobic cell respiration in yeasts and in humans. The first row has been completed as an example. [3 marks]

	Yeasts	Humans
Small yield of ATP	yes	yes
Require oxygen		
Produce ethanol and CO ₂		
Produce lactate		

5a. State the immediate consequence of a species producing more offspring than the environment can support. [1 mark]

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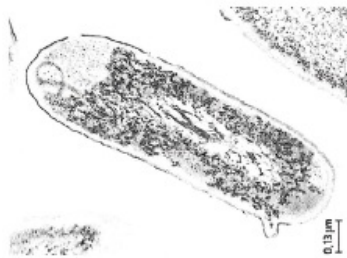
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[3 marks]

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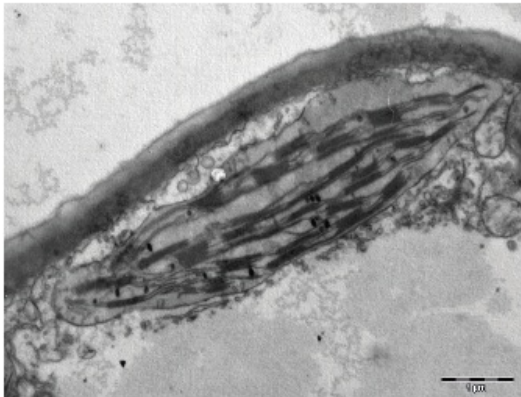
6a. Identify which electron micrograph shows a mitochondrion, providing **one** [1 mark] observation to support your choice.

A



[Source: Pradana Aumars, https://commons.wikimedia.org/wiki/Category:Bacteria#/media/File:Bacteria_cell_division.jpg]

B



[Source: and3k and caper437/ https://bs.wikipedia.org/wiki/Datoteka:Chloroplast_in_leaf_of_Anemone_sp_TEM_12000x.png]

C



[Source: republished with permission of McGraw-Hill Education, from *Harrison's Principles of Internal Medicine*, J L Jameson *et al.*, 16th edition, 2004; permission conveyed through Copyright Clearance Center, Inc]

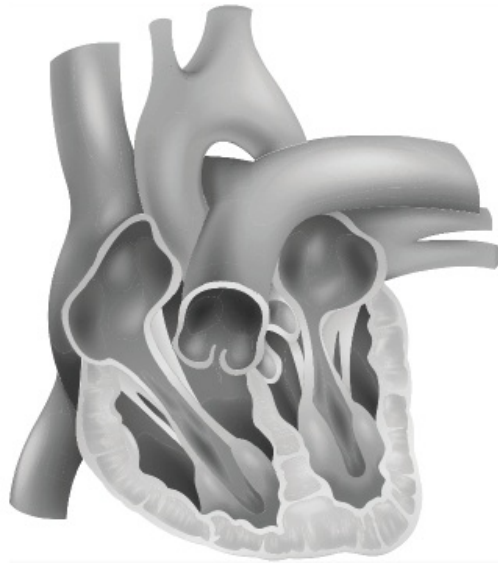
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[illegible]

The diagram shows the human heart.



[Source: BlueRingMedia/Shutterstock]

7a. On the diagram, label the aorta.

[1 mark]

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7b. On the diagram, label the right atrium.

[1 mark]

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7c. Explain how valves control the flow of blood through the heart. [2 marks]

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7d. Outline the causes and consequences of blood clot formation in coronary arteries. [2 marks]

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7e. Outline the role of lymphocytes in defence against disease. [2 marks]

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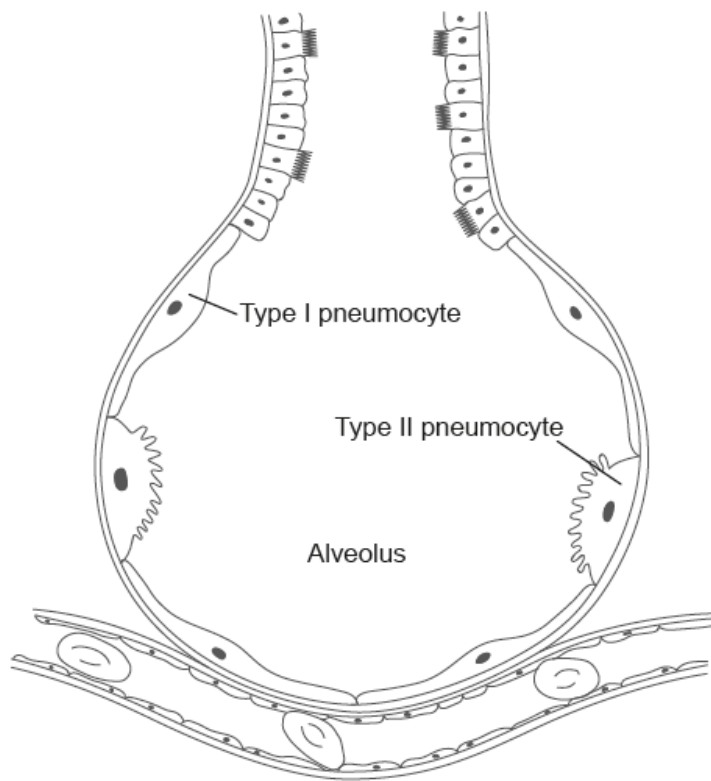
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The diagram shows the structure of an alveolus and an adjacent capillary.



[Source: © International Baccalaureate Organization 2019]

8a. Outline the functions of type I and type II pneumocytes.

[2 marks]

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8b. Explain how gases are exchanged between the air in the alveolus and the blood in the capillaries. [3 marks]

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The table gives common names and binomial names for some mammals.

Common name	Binomial name
Golden bamboo lemur	<i>Hapalemur aureus</i>
Golden jackal	<i>Canis aureus</i>
Grey wolf	<i>Canis lupus</i>
Red fox	<i>Vulpes vulpes</i>

9a. State **one** feature that characterizes these species as mammals. [1 mark]

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9b. Identify the **two** species most closely related.

[1 mark]

- 1.
- 2.

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9c. Identify **two** species from the list that are classified in different genera.

[1 mark]

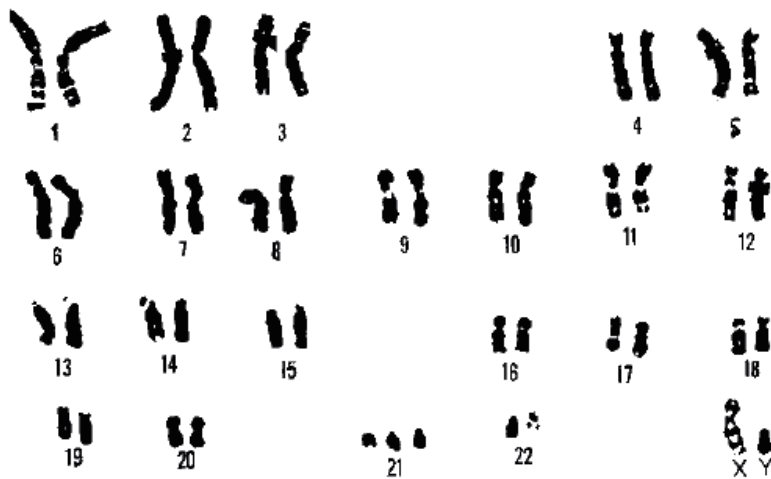
- 1.
- 2.

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The image shows the chromosomes from a body cell of an adult human.



[Source:
http://www.ornl.gov/sci/techresources/Human_Genome/graphics/slides/elsikaryotype.
U.S. Department of Energy Human Genome Program.]

10a. Identify, with a reason, the sex of this individual.

[1 mark]

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10b. Identify the chromosome that is affected by a trisomy in this individual, [1 mark]
naming the condition that this trisomy gives rise to.

Chromosome number:

Name of condition:

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[1 mark]



<p>.....</p> <p>.....</p> <p>.....</p>
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[3 marks]

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12a. State **two** causes of the decrease of biomass along food chains in terrestrial ecosystems. *[2 marks]*

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12b. The table shows the global carbon budget over two decades; the years 1990 to 1999 and 2000 to 2009. *[3 marks]*

Carbon	Global carbon budget / $\times 10^{12}$ kg	
	1990 to 1999	2000 to 2009
Atmospheric carbon dioxide	3.0	4.0
Fossil fuel and cement	6.5	8.0
Land use change	1.5	1.0
Carbon storage in land	2.5	2.0
Carbon storage in oceans	2.0	2.5

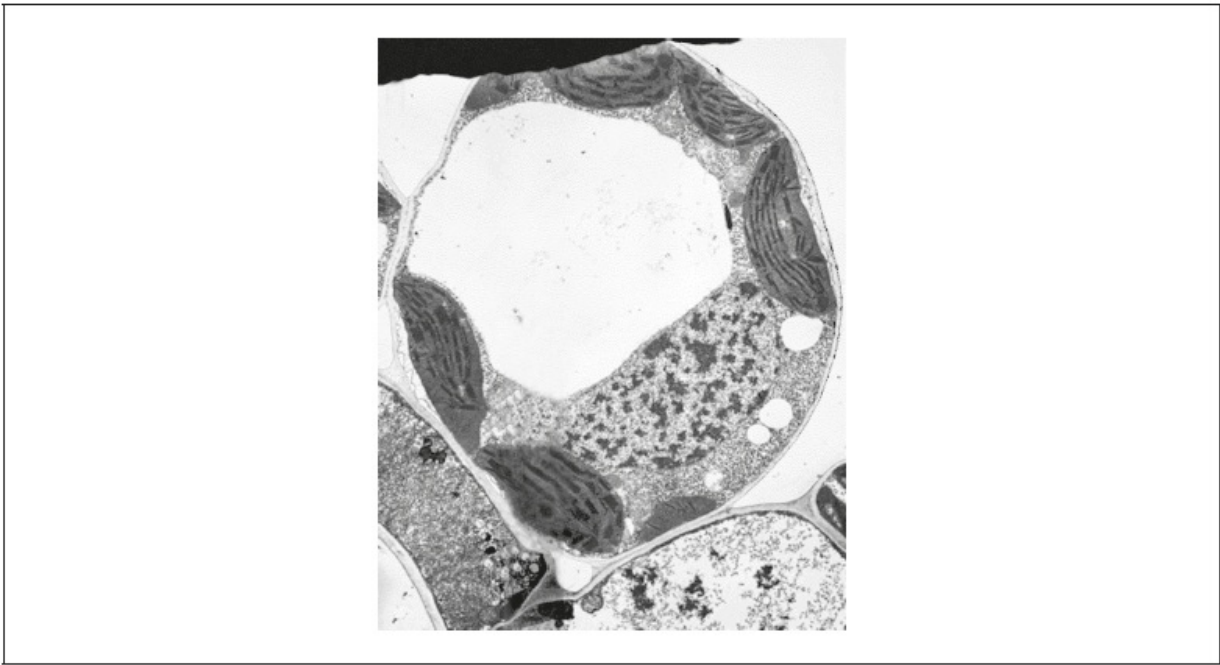
[Source: © International Baccalaureate Organization 2019]

Using the table, explain causes of the changes in carbon flux over the two decades.

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12c. Suggest how climate change can influence the natural selection of organisms that live in the Arctic oceans. [3 marks]

13a. Label the area where cellulose is found in the micrograph of a plant cell. [1 mark]



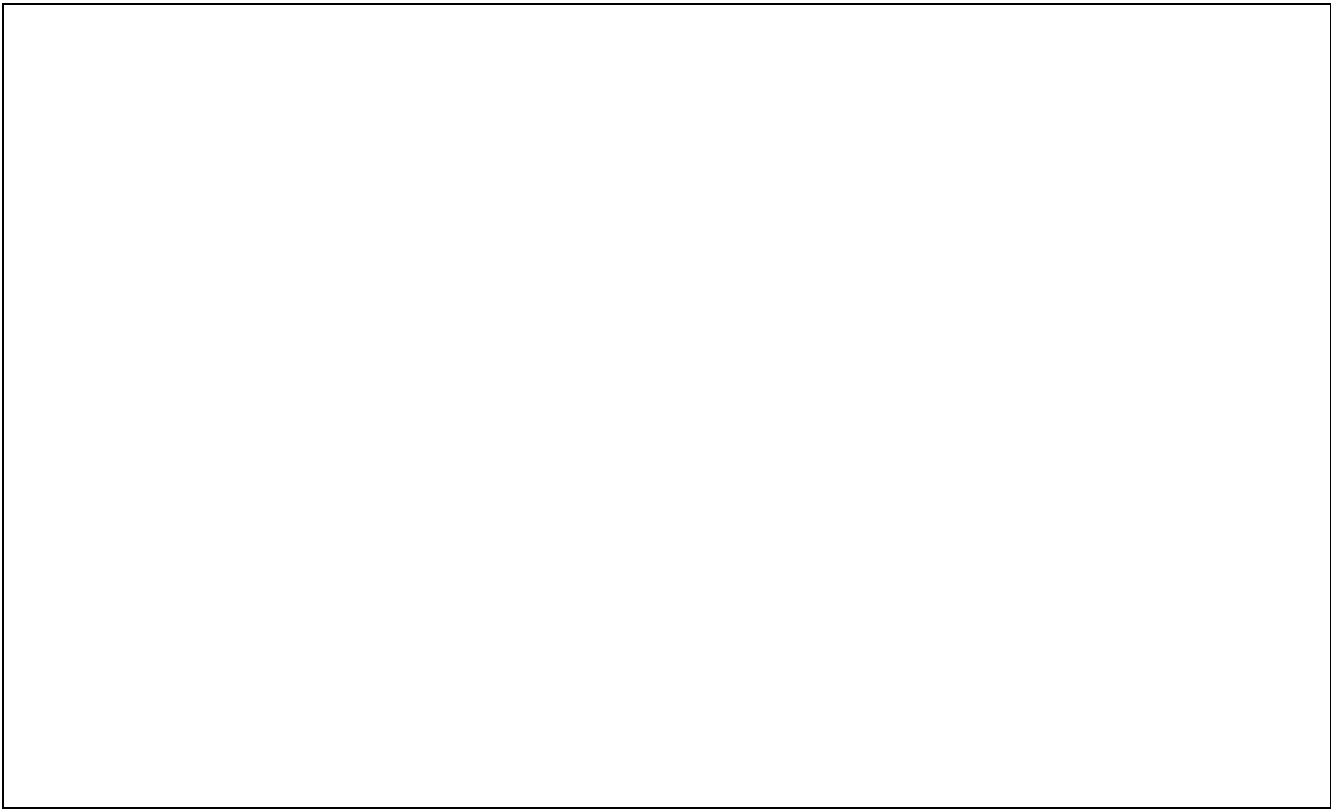
[Source: BIOPHOTO ASSOCIATES/Getty Images]

13b. Cellulose is the most abundant organic polymer on Earth. Describe the *[3 marks]* structure of cellulose.

13c. Outline **one** reason for humans being unable to digest cellulose. *[1 mark]*

13d. Explain the advantages of having both lipid and carbohydrate as energy*[2 marks]* stores in the human body.

14a. The structure of prokaryotic cells has been investigated using electron [4 marks]
microscopy. Draw a labelled diagram to show prokaryotic cell structure.



14b. Outline the reasons for differences between the proteomes of cells [4 marks]
within a multicellular organism.

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14c. Discuss the cell theory and its limitations.

[7 marks]

[illegible]

15a. Isolated communities in rural Finland, Hungary and some of the Scottish[3 marks]
islands have a high incidence of red-green colour blindness. Describe
the inheritance of red-green colour blindness.

[illegible]

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[7 marks]

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[1 mark]

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16b. Suggest the reason for cellulose passing undigested through the human gut. *[1 mark]*

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16c. Draw an annotated diagram to show how a peptide bond is formed. *[3 marks]*

16d. State **two** structural features that differ between RNA and DNA. *[2 marks]*

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17a. Using the Punnett grid, explain how two parents can have children with *[3 marks]* any of the different ABO blood groups.

17b. Distinguish between the structure of arteries and the structure of veins. *[3 marks]*

17c. Explain how cuts in the skin are sealed by blood clotting. [2 marks]

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18a. State **one** reason that viruses are not classified as living organisms. [1 mark]

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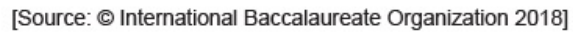
18b. State the plant phylum which is characterised by the absence of vascular tissue. [1 mark]

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[2 marks]

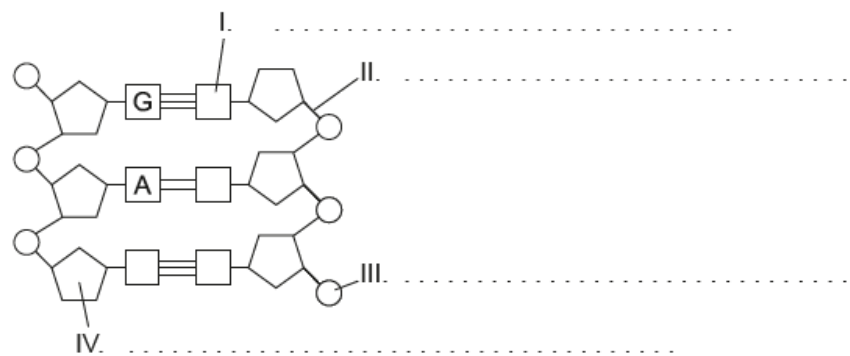


[3 marks]

[illegible]

19a. Label the parts of the DNA diagram indicated by I, II, III and IV.

[2 marks]



[Source: © International Baccalaureate Organization 2018]

19b. Explain how model making helped Watson and Crick to establish the structure of DNA.

[2 marks]

19c. Distinguish between the chromosomes of eukaryotic cells and prokaryotic cells.

[1 mark]

19d. Outline the role of the enzyme helicase in replication. [1 mark]

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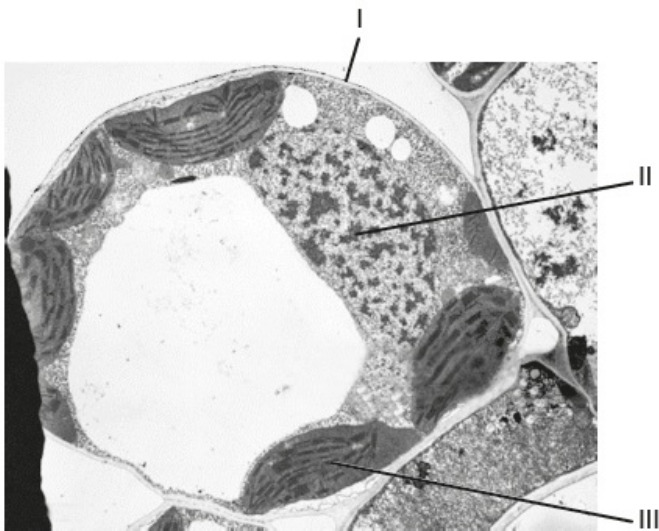
19e. Outline the role of the enzyme DNA polymerase in replication. [2 marks]

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The electron micrograph shows a palisade mesophyll cell.



[Source: BIOPHOTO ASSOCIATES/Getty Images]

20a. State the name of the structures labelled I and II. [1 mark]

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20b. Outline the function of the structure labelled III. [2 marks]

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20c. The plant from which this cell was taken is in the group [1 mark]
angiospermophyta. State **one** characteristic that is unique to this group
of plants.

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20d. Distinguish between autotrophic nutrition and heterotrophic nutrition. [2 marks]

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20e. Explain how energy and nutrients are transferred in ecosystems. [3 marks]

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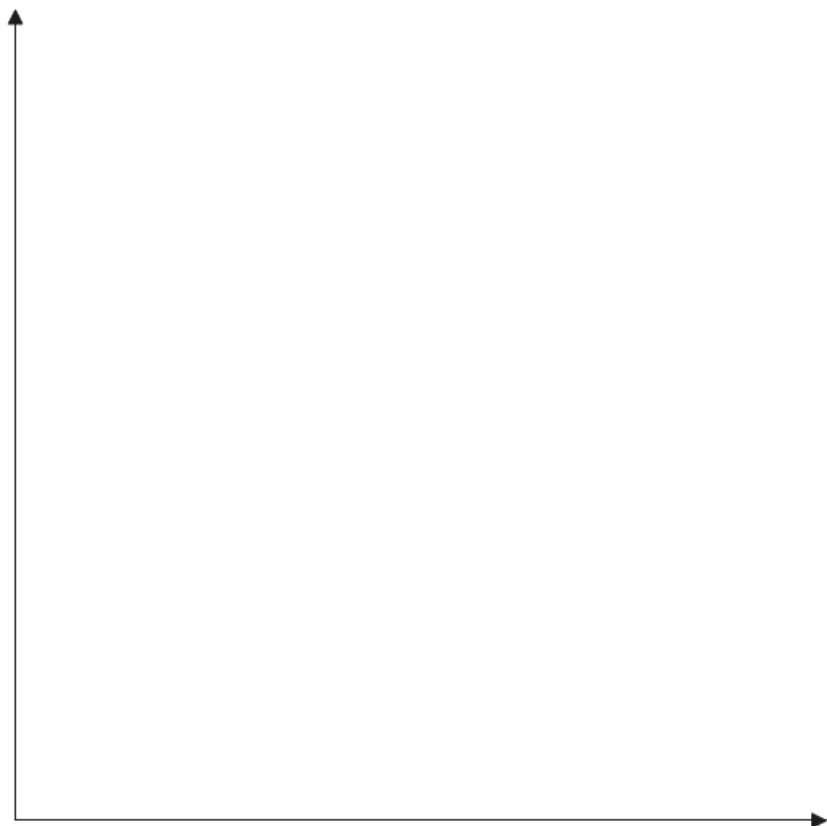
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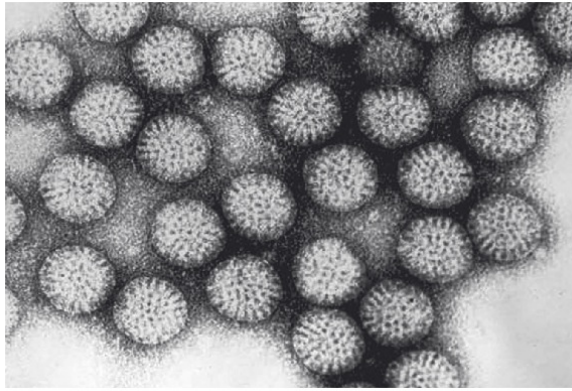
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21a. Sketch a graph to show the effect of temperature on the activity of enzymes. [2 marks]



21b. Explain enzyme-substrate specificity. [3 marks]

The figure shows a transmission electron micrograph of rotavirus particles. Each rotavirus is about 70 nanometres in diameter.



[Source: CDC / Dr. Erskine L. Palmer]

22a. State a reason for using an electron microscope to view this virus rather than a light microscope. *[1 mark]*

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22b. Rotavirus causes diarrhea and vomiting. Explain why viral diseases cannot be treated using antibiotics. *[2 marks]*

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22c. State an application of plasmids in biotechnology. *[1 mark]*

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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](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>]

23a. State the phylum of this plant.

[1 mark]

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23b. State **two** characteristics of plants from the phylum you stated in (a)(i). [2 marks]

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23c. Outline why the number of trophic levels is limited in a food chain.

[1 mark]

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24a. State **one** disaccharide and the **two** monomers from which it can be synthesized. *[2 marks]*

Disaccharide:

1:

Monomers:

1:

and 2:

24b. Discuss the roles of the enzymes secreted by the pancreas during digestion. *[3 marks]*

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24c. Compare and contrast cis-fatty acids and trans-fatty acids. *[2 marks]*

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Reproduction in eukaryotes can be sexual or asexual.

25a. Describe the origin of eukaryotic cells according to the endosymbiotic theory. [4 marks]

25b. Explain how hormones are used to control the human menstrual cycle. [8 marks]

[illegible]

25c. Outline natural methods of cloning in some eukaryotes.

[3 marks]

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Plants have widespread influences, from food chains to climate change.

26a. Draw a diagram of a palisade mesophyll cell labelling only the structures that would not be present in a pancreatic cell.

[3 marks]

26b. Explain the process of photosynthesis.

[8 marks]

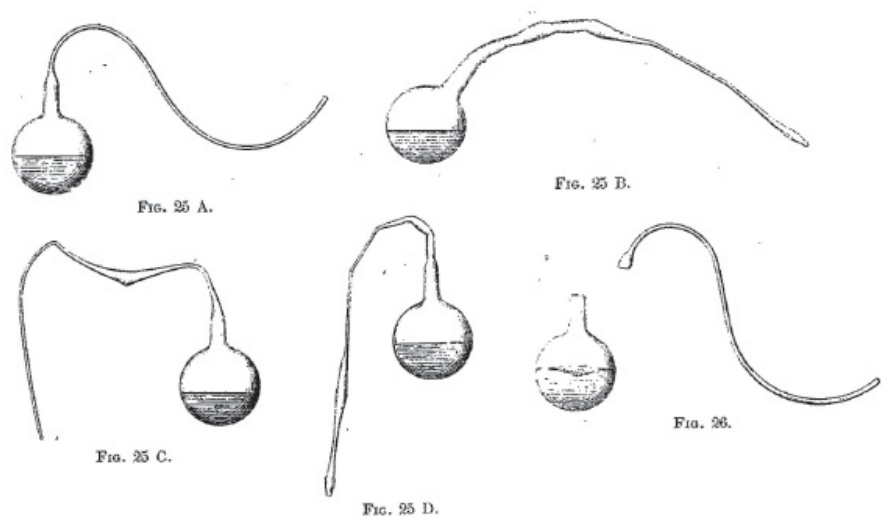
This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no text or other markings on the paper.

26c. Describe the process of peat formation.

[4 marks]

[illegible]

27a. Pictured below are Louis Pasteur's original drawings of swan-necked flasks. [3 marks]



[Source: L Pasteur and L Pasteur Vallery-Radot, (1922), *Œuvres de Pasteur*, Vol II Fermentations et générations dites spontanées, pages 260–261]

Describe how Pasteur's experiments provided convincing evidence to falsify the concept of spontaneous generation.

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27b. State the function of life in *Paramecium* that is carried out by: [1 mark]
cilia.

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[1 mark]

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[3 marks]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

27e. Explain the role of decomposers in an ecosystem.

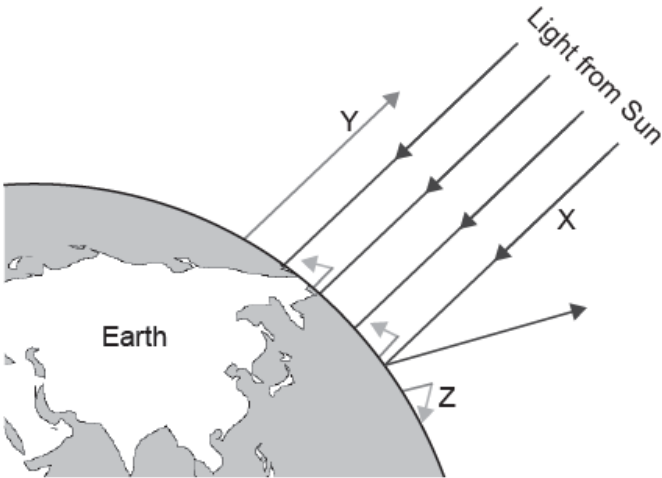
[2 marks]

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The diagram shows the greenhouse effect.



[Source: © International Baccalaureate Organization 2017]

28a. State the type of wavelength of the radiation labelled X and Y.

[2 marks]

X:
Y:

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28b. Outline reasons for the change occurring at Z.

[2 marks]

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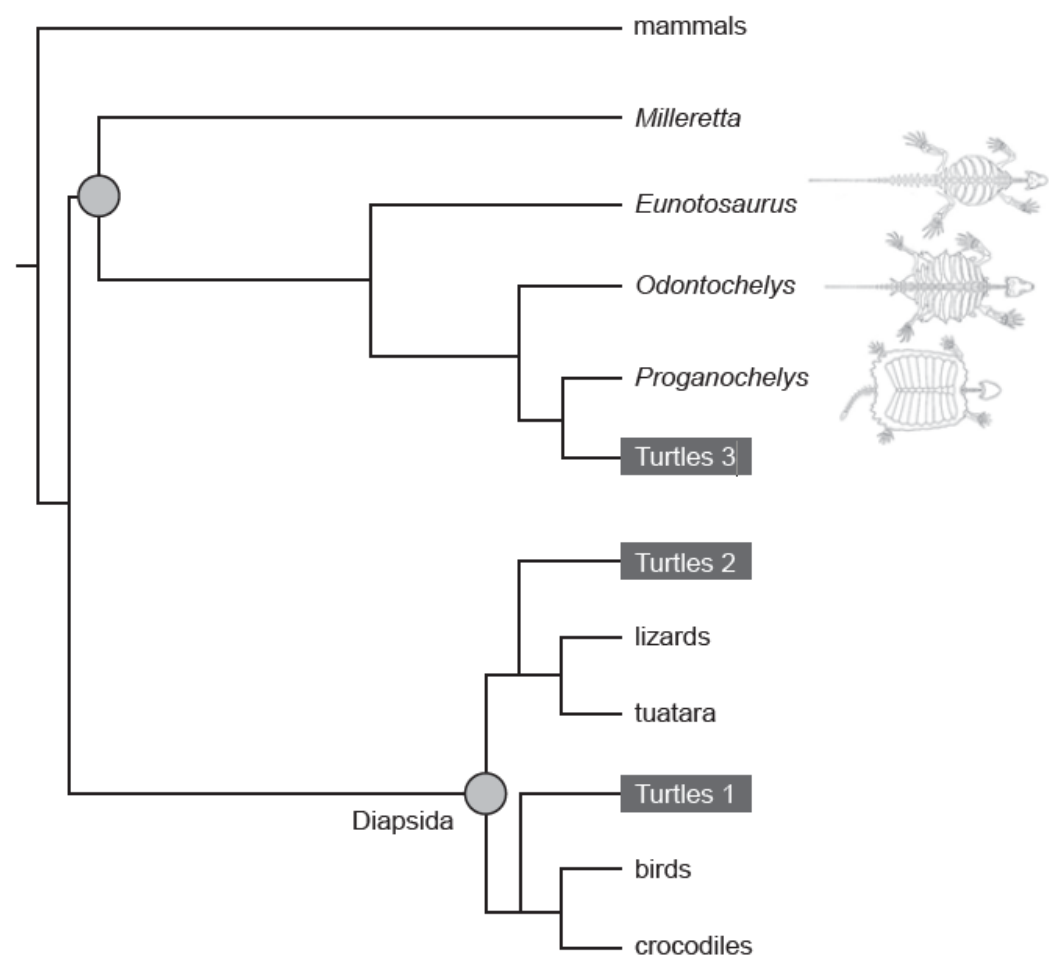
28c. The short-tailed albatross (*Phoebastria albatrus*) nests and breeds on remote low-lying coral islands in the Pacific Ocean. Predict how global warming may threaten the survival of such an ocean bird. [1 mark]

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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.]

29a. State the organism most closely related to the lizards. [1 mark]

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29b. Based on the taxa shown, deduce a difficulty in gathering data to study turtle ancestry. [1 mark]

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29c. 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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29d. 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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29e. Taxonomists aim to place species into genera, families and higher taxa [2 marks] according to their evolutionary origins. This is known as natural classification.

Explain the usefulness of natural classification in biodiversity research.

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