UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

0303862545

BIOLOGY **9700/22**

Paper 2 Structured Questions AS **May/June 2012**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces provided at the top of this page.
Write in dark blue or black ink.
You may use a soft pencil for any diagrams, graphs, or rough working.
Do not use red ink, staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
Total	

This document consists of **14** printed pages and **2** blank pages.

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1 One role of the cell surface membrane is to control the entry and exit of substances.

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(a) Complete Table 1.1 to show the transport mechanisms across cell surface membranes and examples of materials transported.

Table 1.1

transport mechanism across cell surface membrane	example of material transported across membrane
active transport	sodium ions
	oxygen molecules
	bacteria
exocytosis	mucin (for mucus)
facilitated diffusion	
osmosis	

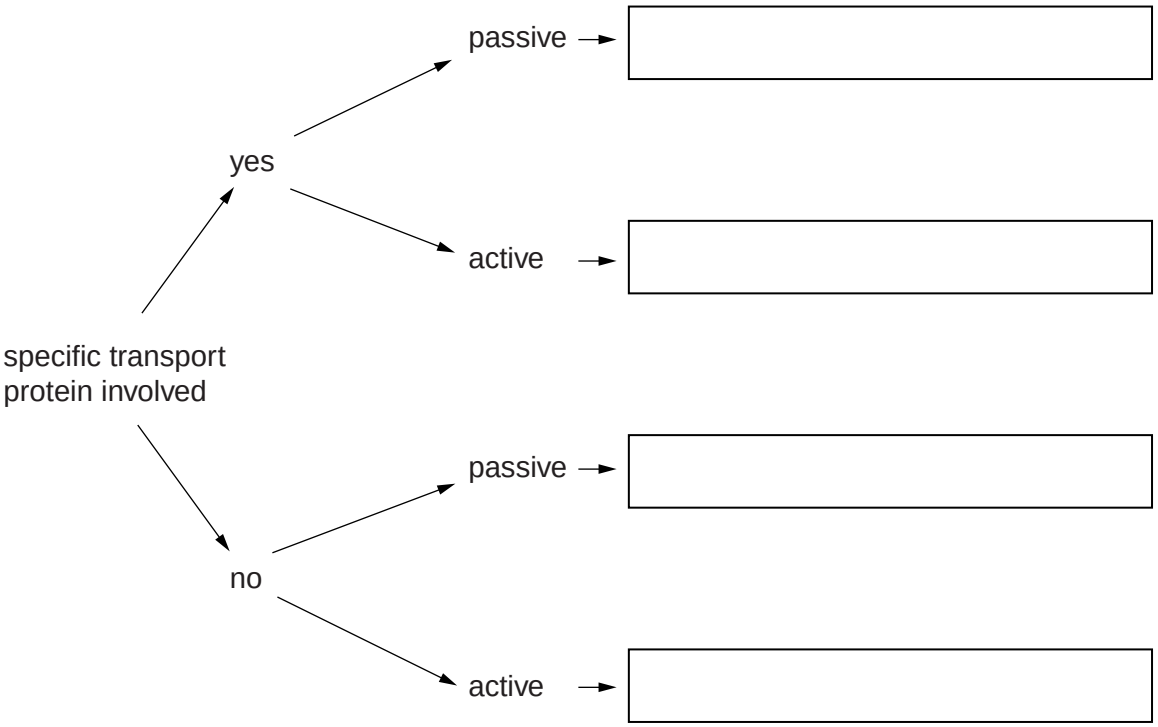
[2]

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(b) Each transport mechanism across cell surface membranes has a characteristic set of features.

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In **each** of the boxes below, state **one** example of a transport mechanism that matches the pathway shown.



[4]

[Total: 6]

2 Fig. 2.1 is a transmission electron micrograph of a plasma cell. Plasma cells are antibody-secreting cells that are formed from B-lymphocytes.

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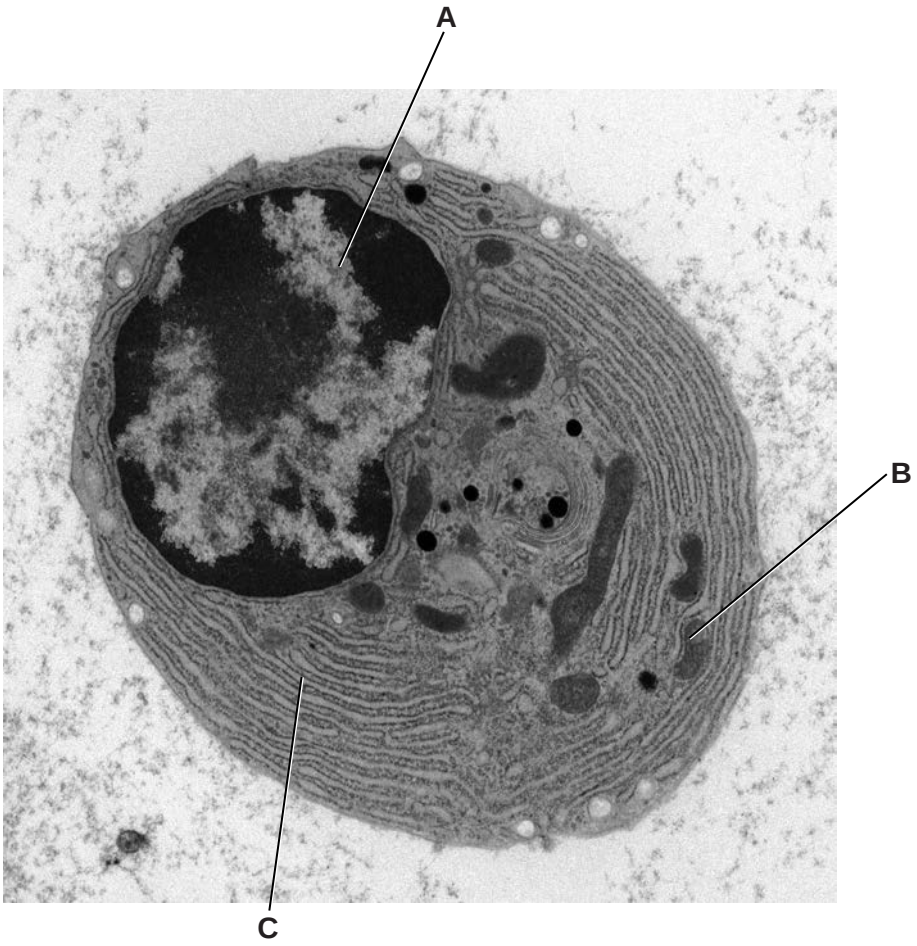


Fig. 2.1

(a) Complete Table 2.1 to:

- name in full, structures **A**, **B** and **C**
- outline how each structure functions to contribute to the **specific role of the plasma cell**.

Table 2.1

structure	name of structure	function of structure within plasma cell
A		
B		
C		

[6]

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(b) An activated B-lymphocyte divides repeatedly by mitosis to produce many identical plasma cells.

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(i) Explain why it is important that many identical plasma cells are produced.

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(ii) B-lymphocytes have centrioles and a spindle that can be observed during mitosis.

Describe and explain how the behaviour of the centrioles and spindle of a cell dividing by mitosis is associated with the behaviour of the chromosomes.

You may use the space below for labelled diagrams.

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[Total: 13]

For Examiner's Use

3 **(a)** With reference to the structure of a leaf, explain the difference between evaporation and transpiration.

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(b) Apple, *Pyrus malus*, sour cherry, *Prunus cerasus,* and peach, *Prunus persica*, are dicotyledonous trees that are of importance to commercial growers for the fruit that they produce.

A student chose a small area of land where all three species of fruit tree were growing. Leaf samples were removed and, using a microscope, the mean number of stomata per square millimetre was estimated for each species.

The rate of transpiration of each species was then measured on each of three separate occasions. The student performed the investigation outside where the trees were located and recorded the weather conditions on each day.

The mean transpiration rate was calculated per unit area of leaf.

The results are shown in Table 3.1.

Table 3.1

fruit tree	mean number of stomata / mm^{-2}	mean transpiration rate / $cm^3 h^{-1}$		
		hot dry day	warm dry day	warm rainy day
apple	266	0.19	0.35	0.21
sour cherry	284	0.09	0.28	0.25
peach	190	0.03	0.08	0.07

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(i) With reference to Table 3.1, describe **and** explain the results of the investigation.

For Examiner's Use

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(ii) The mean transpiration rate of each species was calculated over a 24 hour period.

Describe how the transpiration rate during the night would differ from the transpiration rate during the day.

Explain your answer.

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(iii) Suggest which of the three species of fruit tree has been described as 'drought-resistant' and would be economical to grow in areas where water is scarce.

..... [1]

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[Turn over

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(c) Many fruits are thought to have beneficial health effects. Sour cherries and peaches may contribute to improved health for tobacco smokers.

Read the following statements. For each, explain how the fruit contributes to protecting smokers from smoking-related diseases.

(i) Glutathione is a protein known to be involved in the repair of damaged DNA. Regularly eating sour cherries increases the level of glutathione in the body.

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(ii) A diet rich in peaches can help reduce inflammation of the bronchi and bronchioles.

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[Total: 16]

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4 DNA and RNA are important biological molecules that are involved in the production of polypeptides.

(a) Fig. 4.1 shows two nucleotides joined by a covalent bond.

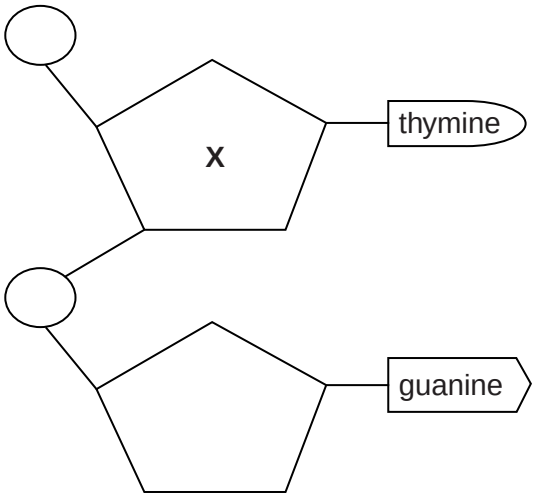


Fig. 4.1

(i) Fig. 4.1 represents part of a DNA molecule, **not** part of an RNA molecule.

Explain why.

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(ii) Name the covalent bond between the two nucleotides.

..... [1]

(iii) Name component **X**.

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(b) Outline the role of transfer RNA (tRNA) in the production of a polypeptide.

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(c) Describe how a peptide bond is formed between two amino acids during polypeptide production.

You may use the space below to help with your answer.

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[Total: 8]

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5 **(a)** State the name of the organism that causes cholera.

..... [1]

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(b) NQR is an important respiratory enzyme located in the cell surface membrane of the bacterium that causes cholera.

A student suggested that an inhibitor of the enzyme NQR could be used as a drug in the prevention and control of cholera.

Suggest and explain how this inhibitor would function.

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(c) Table 5.1 shows the statistics for cholera reported to the World Health Organization (WHO) in four regions of the world in 2008.

For Examiner's Use

Table 5.1

region	number of cases	number of deaths	fatality rate / %
Africa	179 323	5 074	2.83
Asia	10 778	69	0.64
Europe	22	0	0.00
North America	7	0	0.00
Total	190 130	5 143	

(i) Calculate the total cholera fatality rate for 2008.

Show your working.

answer ..... % [2]

(ii) Apart from differences in total population size in each of the regions, suggest explanations for the differences shown in Table 5.1.

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[Total: 10]

6 Microorganisms play an important role in the cycling of nitrogen in ecosystems.

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Fig. 6.1 is a diagram of a nitrogen cycle.

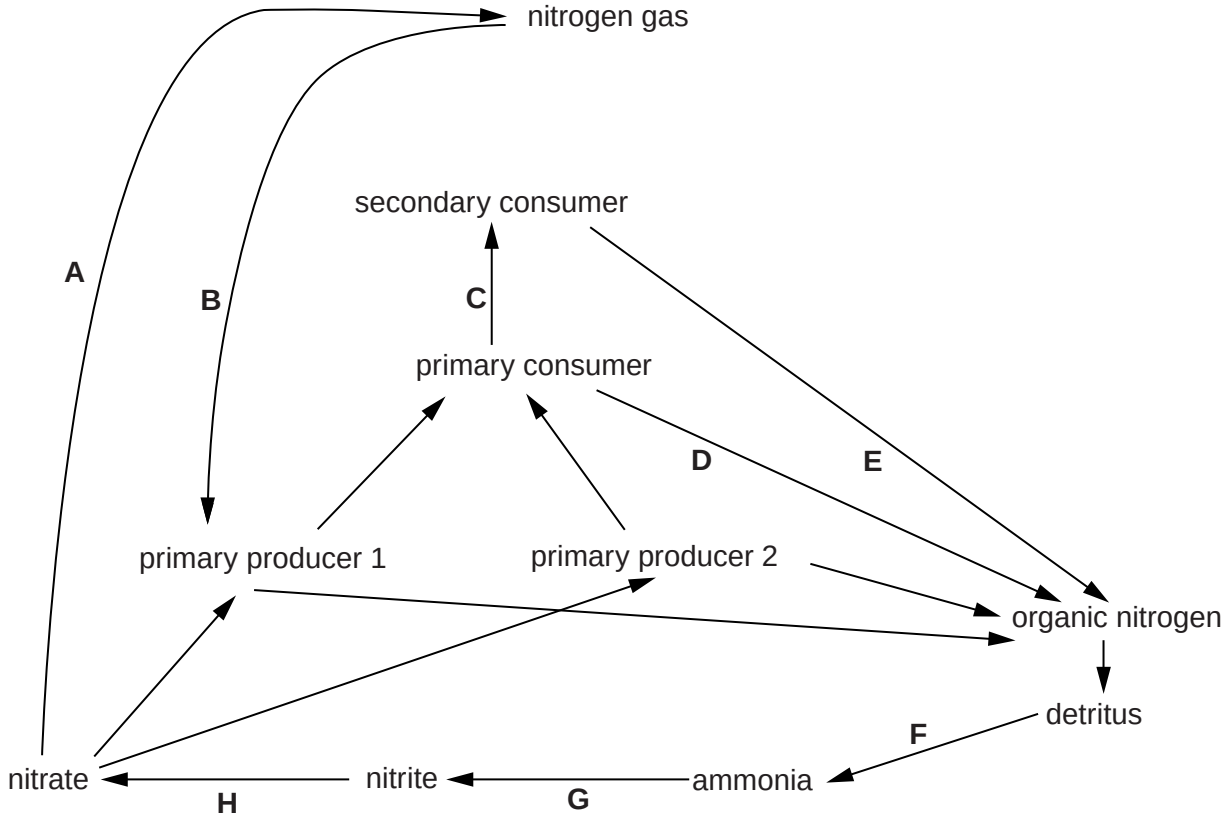


Fig. 6.1

(a) Read the information below about four different species of soil bacteria. In the box provided, write the appropriate letter that matches each microorganism to its corresponding stage in the nitrogen cycle in Fig. 6.1.

- *Nitrosomonas europaea* is an ammonia-oxidising bacterium.
- *Bacillus cereus* is a denitrifying bacterium.
- *Azospirillum lipoferum* lives in the roots of some cereals and grasses and supplies fixed nitrogen to plants.
- *Streptomyces coelicolor* is a bacterium that secretes powerful hydrolases to break down compounds such as proteins and cellulose.

[4]

(b) Some fungi form beneficial associations with plant roots. They enable the plant to increase the uptake of nutrients, such as phosphates, which are not readily available to the plants from the soil.

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Suggest how increasing phosphate ion uptake will lead to increased plant growth.

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.....[3]

[Total: 7]

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Copyright Acknowledgements:

Question 2 Fig. 2.1 © STEVE GSCHMEISSNER / SCIENCE PHOTO LIBRARY
Question 5 Table 5.1 © *Cholera*; Weekly Epidemiological Record; WHO Geneva; www.who.int/wer ; 2009.

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