Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

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| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | |

*2870991955 6*

**BIOLOGY** **9700/21**

Paper 2 Structured Questions AS **October/November 2015**

**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 pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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


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Answer **all** the questions

**1** Fig. 1.1 is an electron micrograph of a mitochondrion.

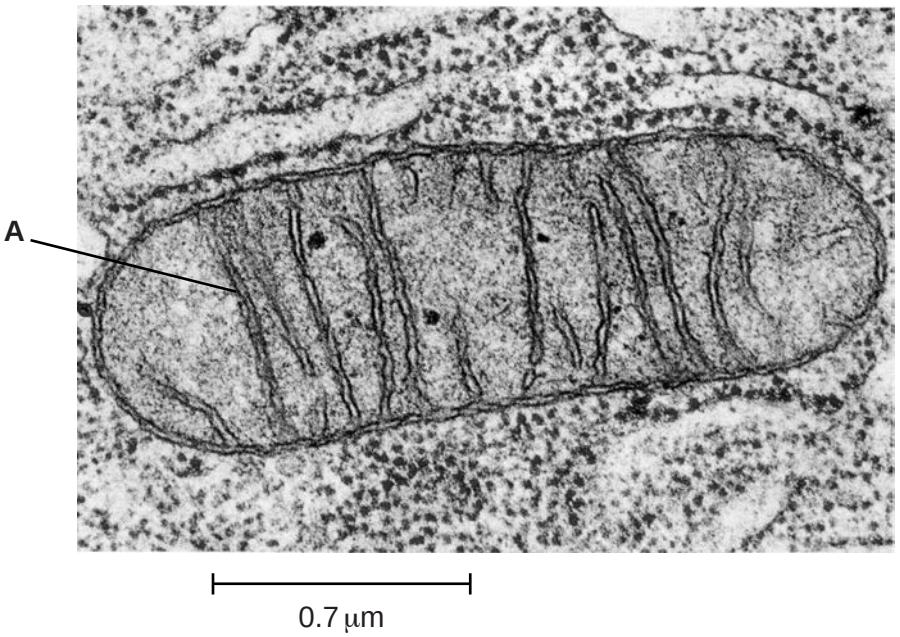



**Fig. 1.1**

**(a)** State the function of mitochondria.

..... [1]

**(b)** Name structure **A**.

..... [1]

**(c)** Calculate the magnification of the image in Fig. 1.1.

Show your working.

magnification × ..... [2]

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**(d)** Explain why the light microscope could **not** be used to produce the image in Fig. 1.1.

.....

.....

.....

.....

..... [2]

**(e)** Scientists think that mitochondria were once prokaryotes. The evidence for this is that mitochondria have features in common with prokaryotes.

State two features that mitochondria have in common with prokaryotes.

1. .....

2. .....

[2]

[Total: 8]

**2** Fig. 2.1 is a diagram of the structure of a protein channel for ions in a cell surface membrane.

Fig. 2.1a shows the channel when open and Fig. 2.1b shows the same channel when closed.

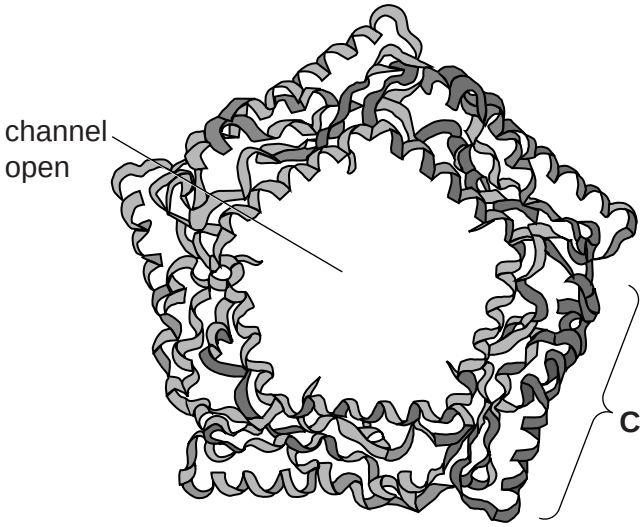



**Fig. 2.1a**

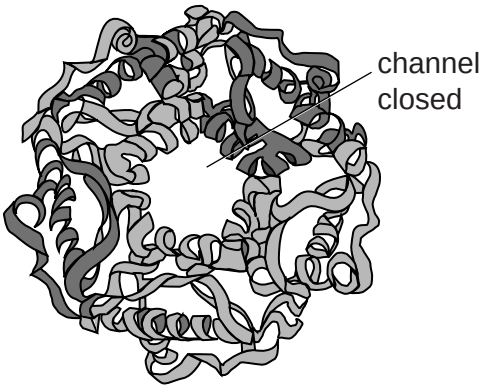



**Fig. 2.1 b**

**(a) (i)** Name the process by which ions pass across the membrane using channel proteins.

..... [1]

**(ii)** Explain why a channel protein is needed for ions to pass across a cell membrane.

.....

.....

.....

.....

..... [2]

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**(b)** The channel protein in Fig. 2.1 is made from five identical polypeptide chains.

**(i)** Name the level of protein structure which is present when five polypeptide chains form the protein.

..... [1]

**(ii)** The part labelled **C** in Fig. 2.1 is another level of protein structure.

Name this level.

..... [1]

**(c)** Channel proteins are examples of transmembrane proteins. The polypeptides are held together and also interact with phospholipids in the membrane.

Suggest how the polypeptides are held together **and** suggest how they interact with phospholipids.

.....

.....

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.....

.....

.....

.....

.....

.....

..... [3]

[Total: 8]

**3** Fig. 3.1 is a light micrograph of cells in the root tip of the garlic plant *Allium sativum*. It has a diploid number (2n) of 16.

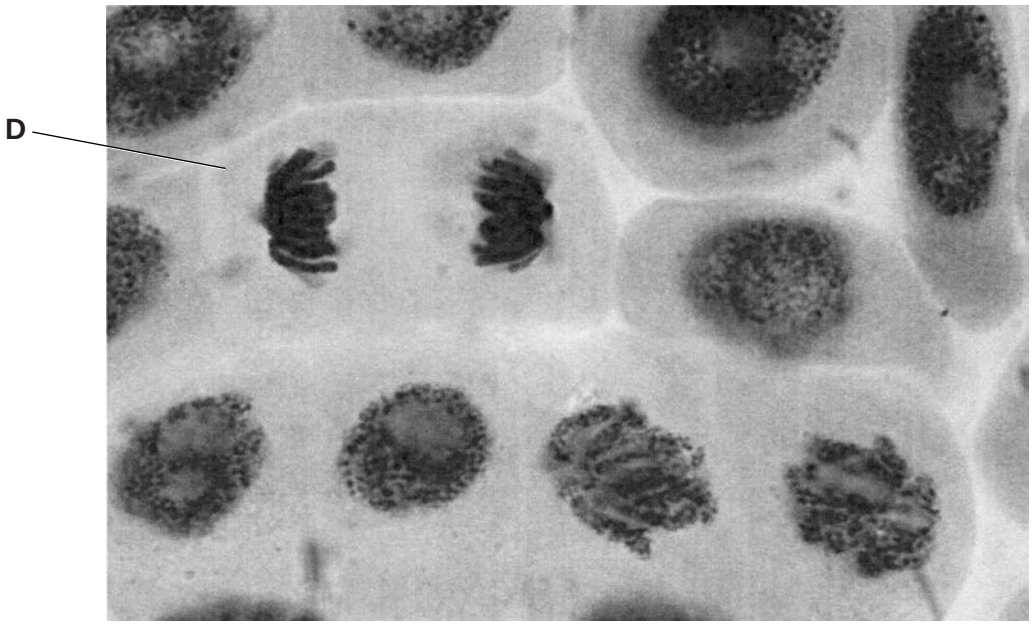



**Fig. 3.1**

**(a)** Name the stage of mitosis shown in cell **D**.

..... [1]

**(b)** Explain why mitosis occurs in a plant such as *A. sativum*.

.....

.....

.....

.....

..... [2]

**(c)** **(i)** State the haploid number of *A. sativum*.

..... [1]

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**(ii)** Explain why a plant such as *A. sativum* produces haploid cells.

.....

.....

.....

.....

.....

.....

..... [3]

**(d)** DNA replication must occur before cell division.

Describe the process of DNA replication.

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..... [5]

[Total: 12]

**4** Marram grass, *Ammophila arenaria*, is a xerophyte adapted to grow in sandy soils in exposed locations.

Fig. 4.1 is a light micrograph of a section through a leaf of marram grass.

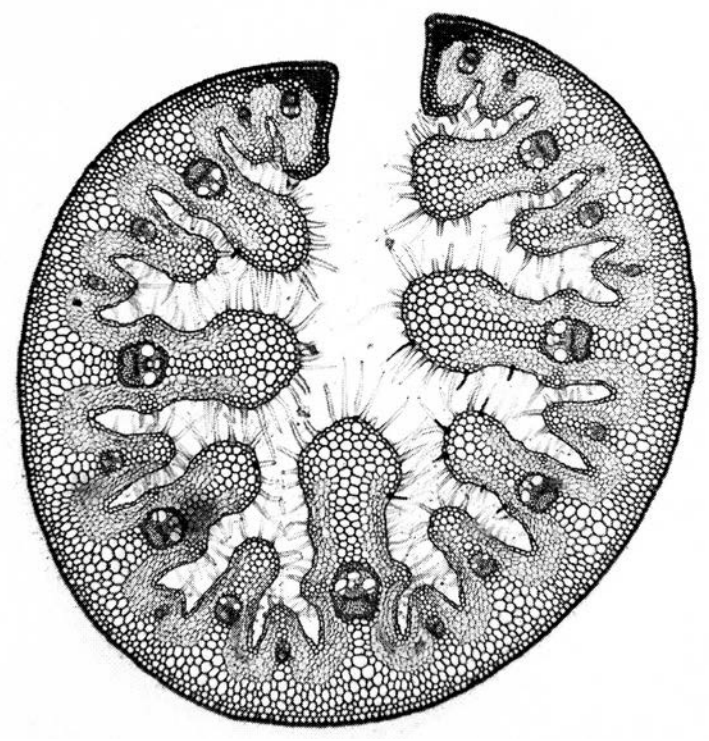


**Fig. 4.1**

**(a)** *A. arenaria* is adapted to reduce transpiration.

**(i)** State what is meant by the term *transpiration*.

.....

.....

.....

.....

.....

.....

..... [3]

**(ii)** One adaptation of *A. arenaria* is the curled leaf.

Give **one** other adaptation, **visible in Fig. 4.1**, and explain how this reduces transpiration.

*adaptation*

.....

.....

*explanation*

.....

.....

.....

.....

..... [3]

**(b)** A student investigated the rates of transpiration and absorption of water by two species of plants, **P** and **Q**, over an 18 hour period between 0600 and 2400. The environmental conditions for the two species were the same.

The results are shown in Fig. 4.2.

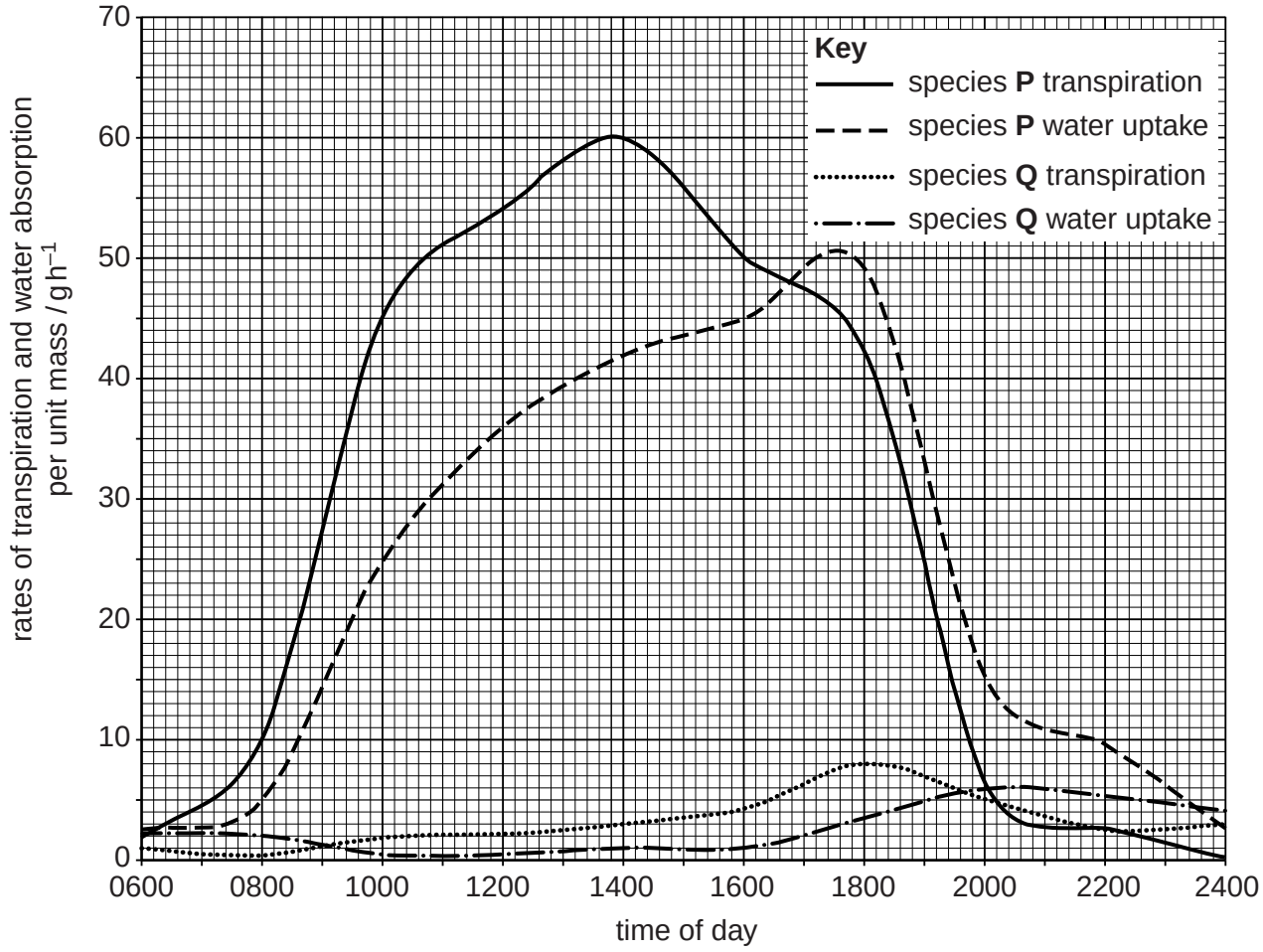



**Fig. 4.2**

**(i)** Use Fig. 4.2 to calculate the difference between the rates of transpiration and water absorption for species **P** at time 1400.

answer ..... [2]

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**(ii)** Describe **and** explain the patterns of transpiration **and** water absorption for species **P**.

.....

.....

.....

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..... [4]

**(iii)** Suggest why the pattern of transpiration for species **Q** is not the same as for species **P**.

.....

.....

.....

.....

.....

.....

..... [2]

[Total: 14]

**5** **(a)** State the name of the causative organism (pathogen) of measles.

..... [1]

**(b)** Describe how the measles pathogen is transmitted.

.....

.....

.....

.....

..... [2]

**(c)** The measles pathogen contains a single stranded RNA molecule and no DNA.

The cells that the measles pathogen infects contain double stranded DNA molecules.

State two **other** ways in which the RNA in the measles pathogen differs from the DNA in the infected cells.

1. .....

.....

2. .....

.....
[2]

**(d)** The measles pathogen must carry out RNA replication to make new RNA molecules for the new pathogens. This happens inside the infected cell.

The pathogen carries its own enzyme for RNA replication, but no other enzymes.

Explain why the measles pathogen cannot use an enzyme from the cell to carry out RNA replication.

.....

.....

.....

.....

..... [2]

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**(e)** The outer part of the measles pathogen contains an antigen called the H-protein. This antigen appears on the surface of cells infected with the measles pathogen.

Describe the role played by T-lymphocytes in a primary immune response to an infection by the measles pathogen.

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..... [5]

[Total: 12]

**6** Fig. 6.1 is a food web.

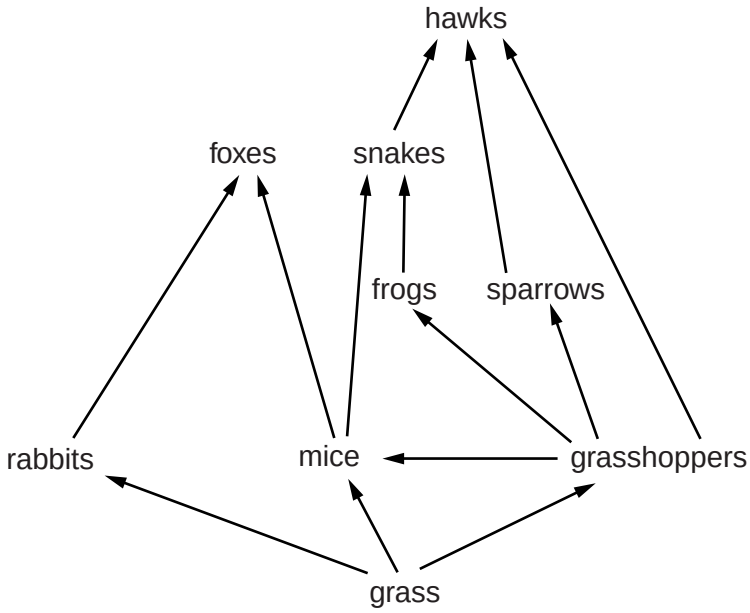



**Fig. 6.1**

**(a)** From the food web in Fig. 6.1, name:

**(i)** the producer

..... [1]

**(ii)** an organism feeding only as a primary consumer.

..... [1]

**(iii)** The hawks are top predators.

Name **one other** top predator shown in Fig. 6.1.

..... [1]

**(b)** Name the processes in the nitrogen cycle in which the following changes occur:

nitrate ions ⟶ nitrogen gas

.....

ammonium ions ⟶ nitrate ions

.....

nitrogen gas ⟶ ammonium ions.

..... [3]

[Total: 6]

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