Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

3467159578

BIOLOGY **9700/23**

Paper 2 AS Level Structured Questions **October/November 2018**

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 on all the work you hand in.
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.

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Answer **all** questions.

1 **(a)** Aphids are small insects which feed directly on phloem sap.

The salivary glands of aphids have secretory cells that make and release a variety of proteins that assist in feeding.

Fig. 1.1 is a transmission electron micrograph of a small area of a salivary gland cell of an aphid.

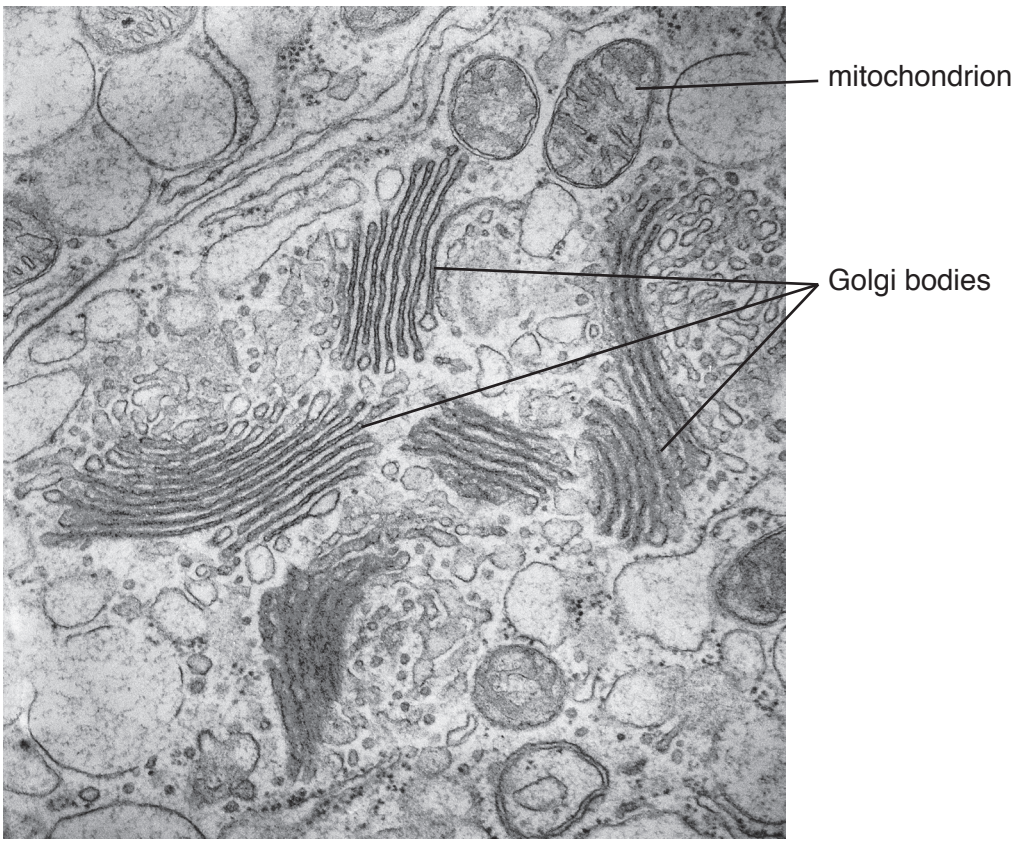


Fig. 1.1

Describe the role of Golgi bodies in secretory cells, such as the salivary gland cells of aphids.

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..... [3]

(b) (i) Explain why secretory cells have large numbers of mitochondria.

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..... [2]

(ii) Mitochondria are partly controlled by the nucleus, but can also function independently.

Suggest the features of mitochondria that allow them to function independently of the nucleus.

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..... [2]

(c) Aphids are important vectors of plant viral diseases.

(i) Describe the structure of a typical virus.

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..... [3]

(ii) Suggest how viruses are able to pass from one plant cell to the next without crossing membranes.

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..... [1]

[Total: 11]

2 **(a)** Proteins are macromolecules composed of many amino acids.

(i) Two amino acids are represented in the diagram in Fig. 2.1.

Complete the diagram to show how the two amino acids react together to form a dipeptide.

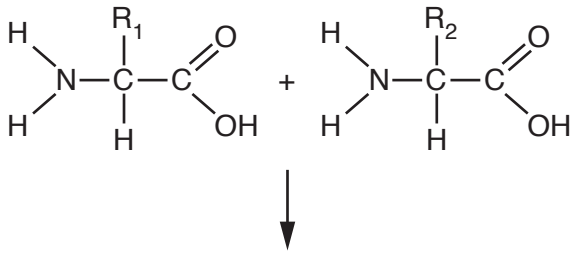


Fig. 2.1

[3]

(ii) State what is represented by R_1 and R_2 in Fig. 2.1.

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..... [2]

(b) Amylose and cellulose are polysaccharides.

Fig. 2.2 shows the structure of part of a cellulose molecule.

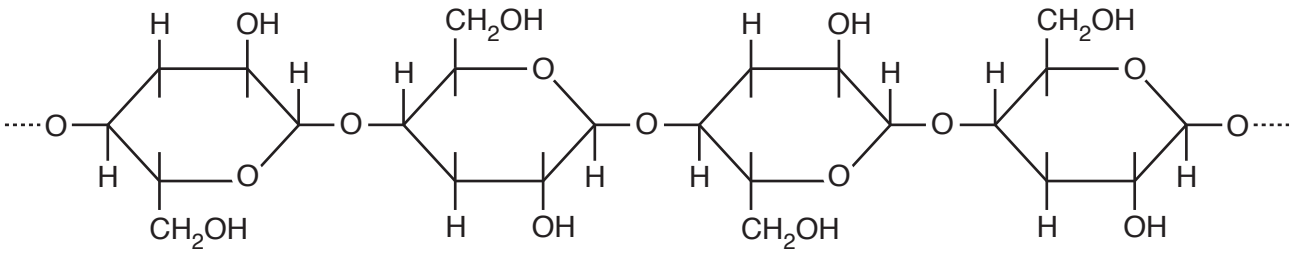


Fig. 2.2

With reference to Fig. 2.2, state how the **structure** of a cellulose molecule differs from the **structure** of an amylose molecule.

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..... [2]

(c) Cellulose is the main component of plant cell walls.

Explain why cellulose is suitable as a component of plant cell walls.

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..... [4]

[Total: 11]

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3 **(a)** Fig. 3.1 is a diagram of a monomer of the nucleic acid, messenger RNA.

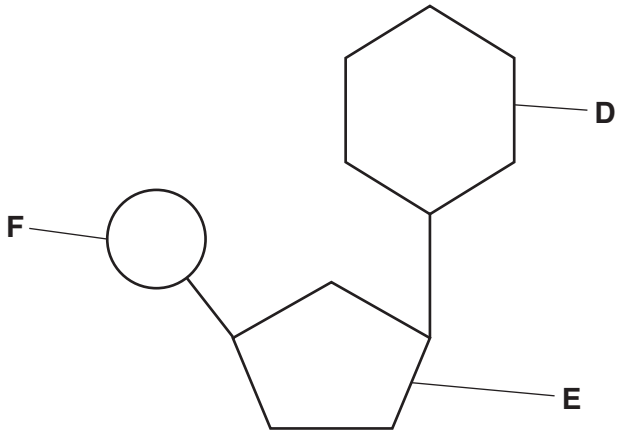


Fig. 3.1

(i) Name **D**, **E** and **F** in Fig. 3.1.

D .....

E .....

F .....

[3]

(ii) State **one** way in which the **structure** of DNA differs from the structure of messenger RNA.

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..... [1]

(b) Telomeres are repeating sequences of bases located at the ends of DNA molecules. These repeating sequences do not code for proteins.

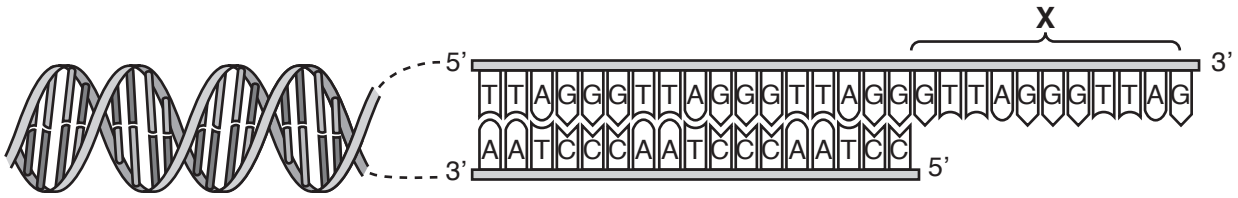
The enzyme telomerase ensures that telomeres do not shorten each time DNA is replicated.

Fig. 3.2**A** shows the end of a DNA molecule during replication. DNA polymerase cannot attach to the region labelled **X**, so it cannot complete the synthesis of the new strand without the action of telomerase.

Telomerase synthesises additional lengths of DNA that are added to the telomere. These additional lengths are used by DNA polymerase to complete the process of replication.

Fig. 3.2**B** is an enlarged view of region **X** to show the action of the enzyme telomerase.

A



B

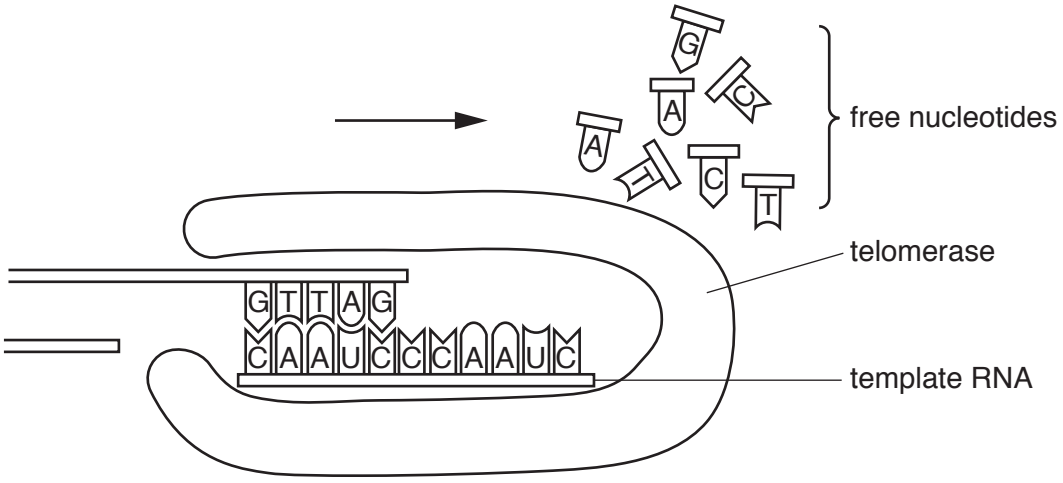


Fig. 3.2

Telomerase contains a short length of RNA that acts as a template for the synthesis of DNA as shown in Fig. 3.2**B**.

Explain how a molecule of telomerase synthesises additional lengths of DNA.

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..... [4]

(c) Telomerase is not present in prokaryotic cells.

Suggest why prokaryotes do not have telomerase.

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..... [1]

(d) One of the ways to diagnose lung cancer is to determine the concentration of telomerase in cells from the lining of the bronchus.

Explain why determining the activity of telomerase may be useful in the diagnosis of lung cancer.

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..... [2]

[Total: 11]

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4 **(a)** Describe the roles of the sinoatrial node (SAN) and the atrioventricular node (AVN) in the initiation and control of the cardiac cycle.

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..... [4]

(b) The Purkyne fibres pass down the septum and extend to the cardiac muscle at the base (apex) of the heart.

Explain why it is important that the Purkyne fibres extend to the base of the heart.

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..... [2]

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(c) The activity of the SAN is controlled by the nervous system. Noradrenaline is released by nerve cells in the SAN.

Fig. 4.1 shows the role of noradrenaline in causing calcium ions (Ca^{2+}) to enter a cell in the SAN.

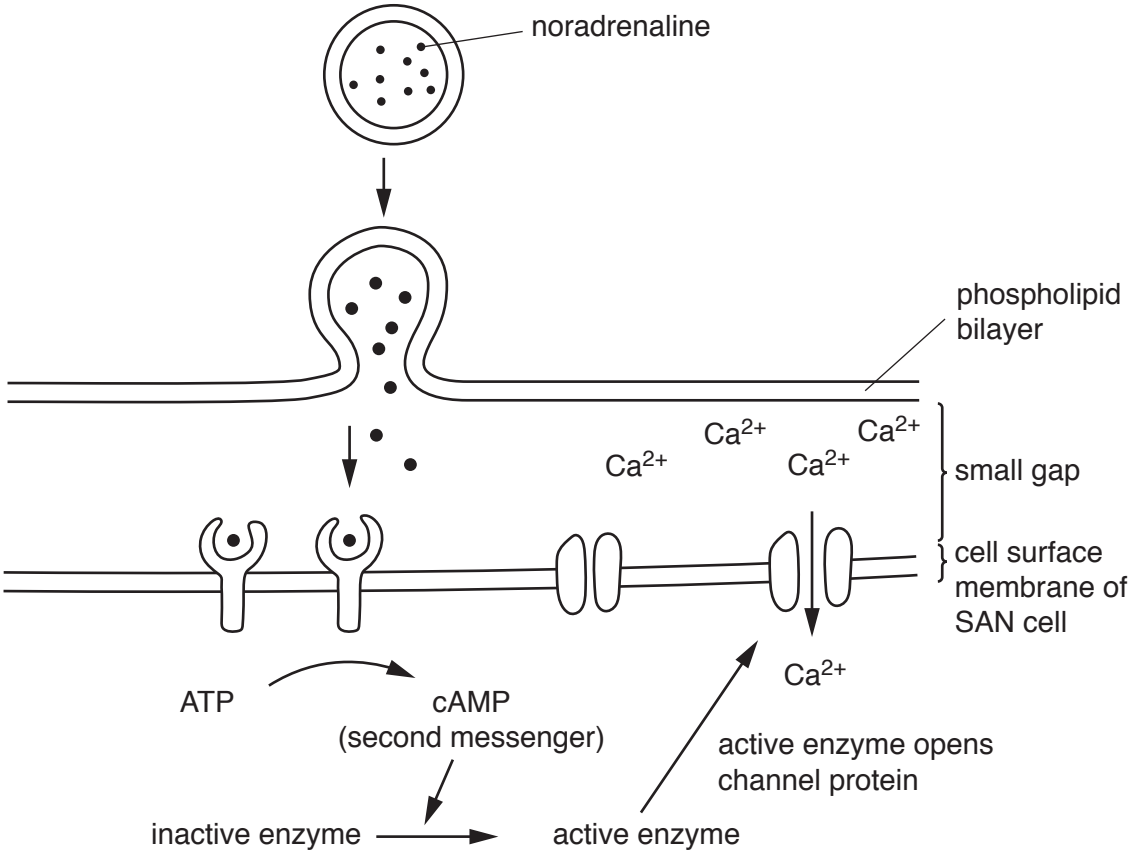


Fig. 4.1

With reference to Fig. 4.1, outline the process of cell signalling.

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..... [4]

[Total: 10]

5 The bacteria that cause tuberculosis (TB) can be found in many parts of the body including the lungs.

(a) (i) State the name of the bacterium that causes TB.

..... [1]

(ii) The presence of the pathogen in the lungs attracts phagocytes to the area of infection. The phagocytes release elastase, which digests elastin.

Many people with TB feel tired all the time.

Suggest **and** explain how the effect of phagocytes on tissues in the lungs leads to people feeling tired all the time.

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(b) Discuss the **biological** factors and **social** factors that make TB a difficult disease to control.

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..... [5]

[Total: 9]

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Question 6 starts on page 14

6 **(a)** As part of a study of the mitotic cell cycle, a student made stained sections of a root tip of onion, *Allium cepa*, and observed them with a light microscope.

The student made drawings of six of the cells, **A** to **F**, using the high power of the microscope, as shown in Fig. 6.1.

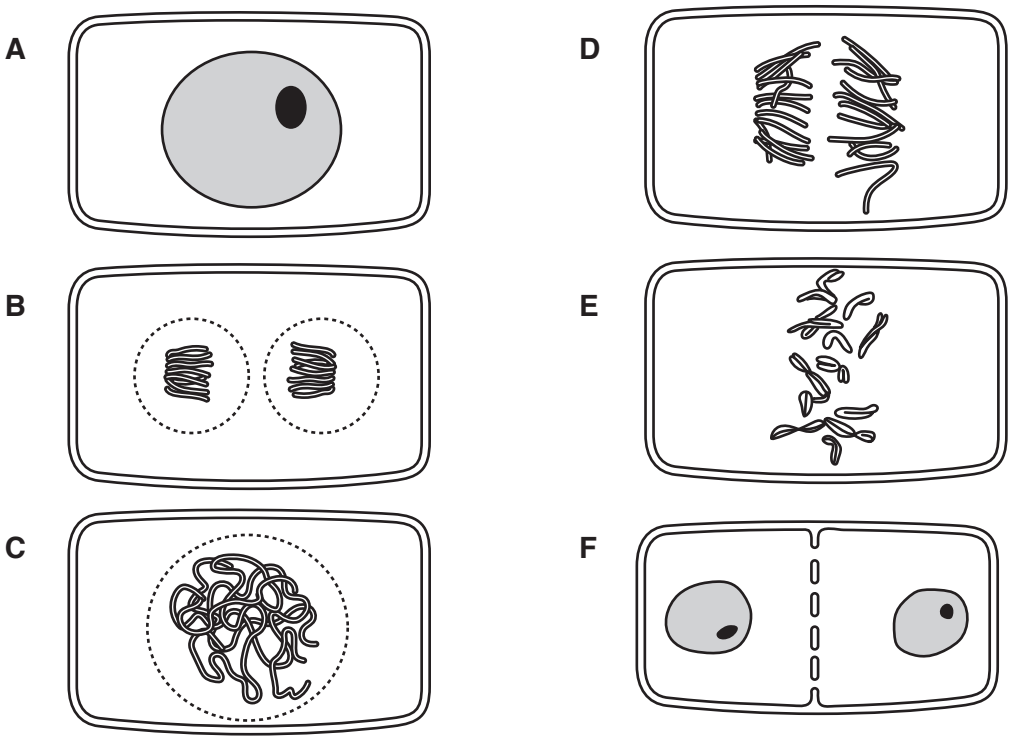


Fig. 6.1

(i) Complete Table 6.1 to show the sequence of stages in the mitotic cell cycle, using the letters, **A** to **F**, as shown in Fig. 6.1.

Table 6.1

sequence of stages	cell
1	**A**
2	
3	
4	
5	
6	

[1]

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(ii) Table 6.2 shows some events that occur during the mitotic cell cycle in *A. cepa*.

Complete Table 6.2 by naming the stage of the cell cycle when each event occurs.

Table 6.2

event in the cell cycle	name of the stage in the cell cycle
DNA replication	
division of centromeres	
condensation of chromatin	
contraction of spindle fibres	
organisation of chromosomes at the equator	metaphase

[4]

(b) Explain the importance of mitosis in the immune response.

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..... [3]

[Total: 8]

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