Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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7949124229

BIOLOGY **9700/23**

Paper 2 AS Level Structured Questions **October/November 2017**

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.

This document consists of **15** printed pages and **1** blank page.

CAMBRIDGE International Examinations

Answer **all** questions.

1 Fig. 1.1 is a transmission electron micrograph of a part of an animal cell.

Fig. 1.1

(a) Calculate the actual width of the organelle labelled **A**, as shown by line **X**–**Y**.

State the formula that you will use and show your working.

Give your answer in μm and to one decimal place.

formula

..... μm [3]

(b) **(i)** Name the organelle **A** and state its role in cells.

name .....

role .....

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.....[2]

(ii) Name the cell structure labelled **B** and state **one** reason for your answer.

name .....

reason .....

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.....[2]

[Total: 7]

2 **(a)** Explain why the wall of the left ventricle in the heart is thicker than the wall of the right ventricle.

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Fig. 2.1 shows the heart and blood vessels at three stages of the cardiac cycle.

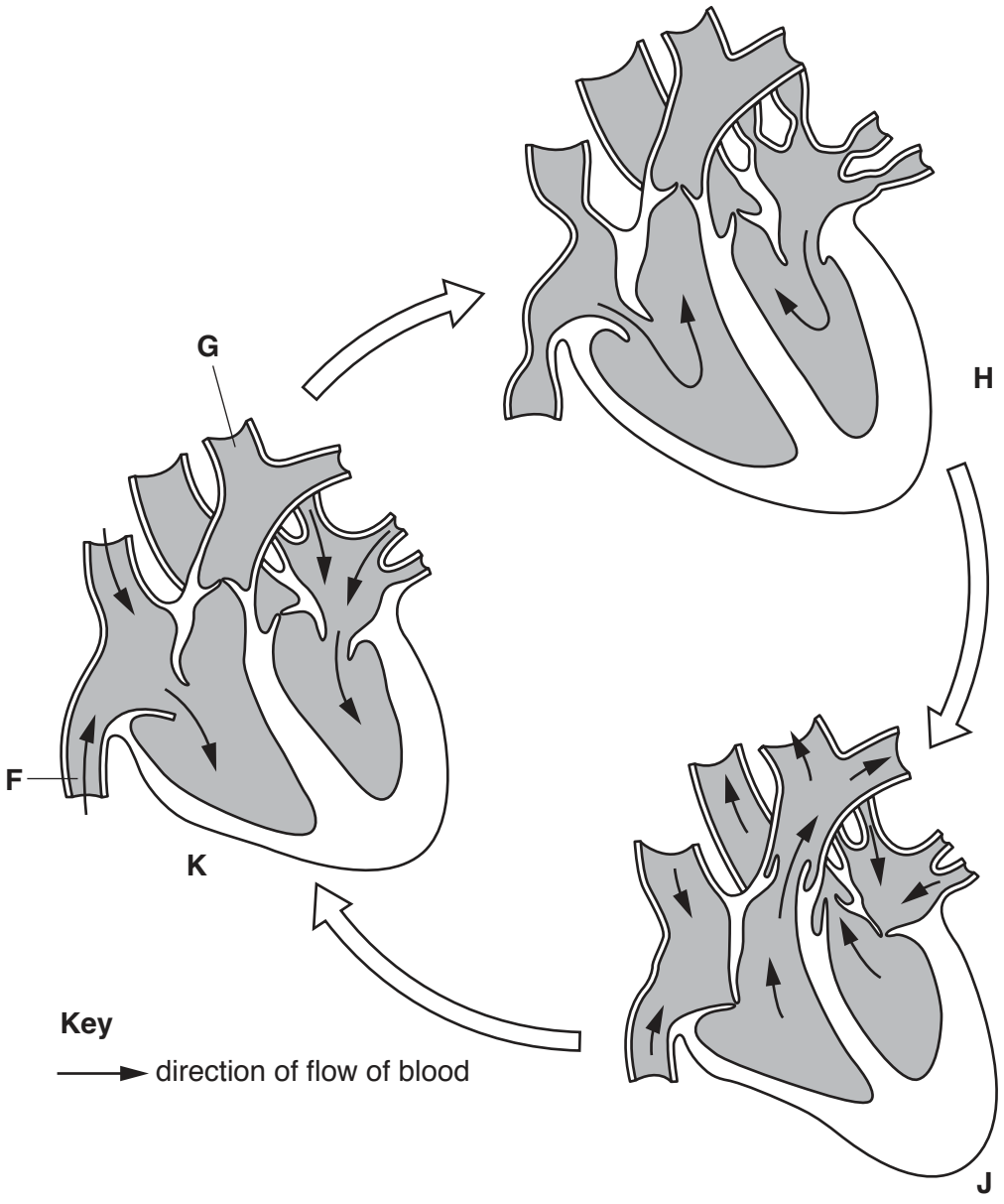

Fig. 2.1

(b) (i) Name the blood vessels labelled **F** and **G**.

F .....

G .....[2]

(ii) Name the stage of the cardiac cycle at **K**.

.....[1]

(c) Describe what happens in the heart between stages **H** and **J** as shown in Fig. 2.1.

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.....[5]

[Total: 10]

3 Fig. 3.1 shows the structure of an alveolus and surrounding structures in a mammalian lung. The lining of each alveolus is formed by two types of epithelial cell, alveolar type 1 and alveolar type 2.

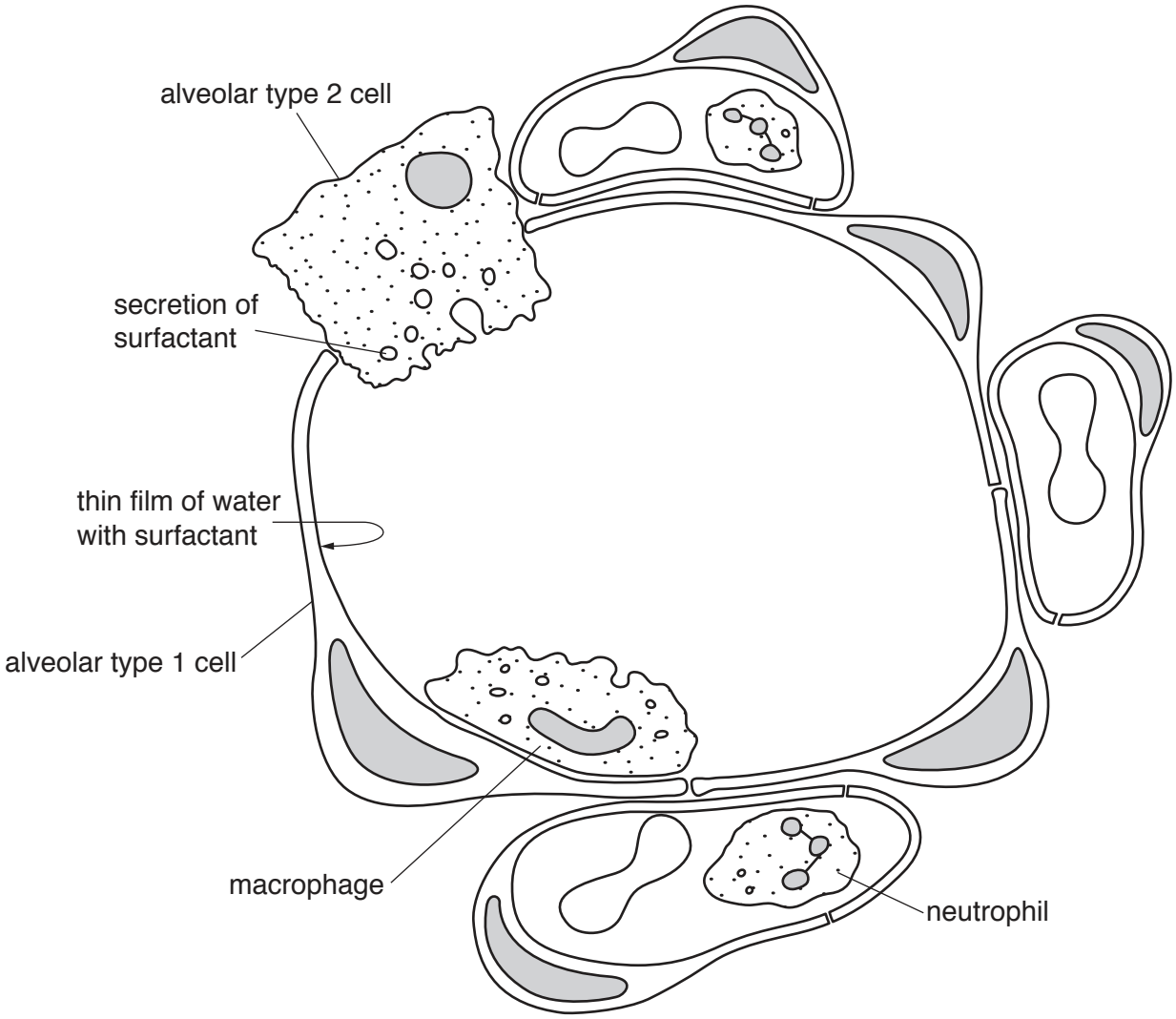

Fig. 3.1 not to scale

(a) Explain how the structure of an alveolar type 1 cell is adapted to its function.

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(b) Alveolar type 2 cells secrete pulmonary surfactant into the watery fluid that lines the alveolus. The surfactant reduces the surface tension of the fluid so that the alveolus does not collapse.

Pulmonary surfactant is a mixture of phospholipids and proteins. The phospholipids form a monolayer on the surface of the fluid.

Explain how phospholipids interact with water to form a monolayer on the surface of the fluid.

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Macrophages and neutrophils are found in the lungs, as shown in Fig. 3.1.

(c) Describe the role of macrophages in the lungs.

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(d) Neutrophils leave the blood and secrete the extracellular enzyme, elastase.

(i) Suggest why neutrophils secrete elastase.

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.....[2]

(ii) The protein alpha-1 antitrypsin is produced in cells in the liver and is transported to the lungs, where it inhibits the action of elastase.

Some people produce a different form of this protein that remains within liver cells. These people are at an increased risk of developing emphysema, in which alveolar walls break down. Emphysema is one of the conditions associated with chronic obstructive pulmonary disease (COPD).

Explain why these people are at increased risk of developing emphysema.

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.....[3]

[Total: 12]

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4 Malaria is a disease transmitted by a vector.

(a) (i) State the name of the pathogen that causes malaria.

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(ii) State the name of the vector that transmits the pathogen.

.....[1]

In 2014, the World Health Organization (WHO) estimated that 3200 million people were at risk of malaria. This was almost half of the world population in 2014.

Table 4.1 shows the number of cases of malaria and the number of deaths from malaria between 1998 and 2013. The table shows numbers for all the countries of the world and for the countries in the WHO African region.

The table also shows the numbers in the African region as percentages of the numbers for all countries.

Table 4.1

year	number of cases of malaria in millions		cases in the African region as a percentage of all countries	number of deaths from malaria in thousands		deaths in the African region as a percentage of all countries
	all countries	African region		all countries	African region	
1998	272.9	237.6	87.1	1110.0	961.0	90.1
2003	236.0	186.6	79.1	872.0	800.0	91.7
2008	225.1	181.0	80.4	747.0	677.0	90.6
2013	198.0	158.4	80.0	584.0	525.6	90.0

(b) Describe the trends shown in Table 4.1.

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(c) Suggest reasons why the number of cases of malaria and the number of deaths from malaria changed between 1998 and 2013.

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(d) Malaria is very difficult to control even though there is improved understanding of the disease.

Explain why malaria is very difficult to control.

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[Total: 12]

5 The tree species *Caryocar brasiliense* grows in areas where there is very little rainfall for five months of the year. During this long dry season the trees have mechanisms to reduce the rate of transpiration.

An investigation was carried out on *C. brasiliense* to find out how the rate of transpiration and the mean water potential of leaf cells changed over 12 hours in one day during the dry season.

The results are shown in Fig. 5.1 **A** and **B**.

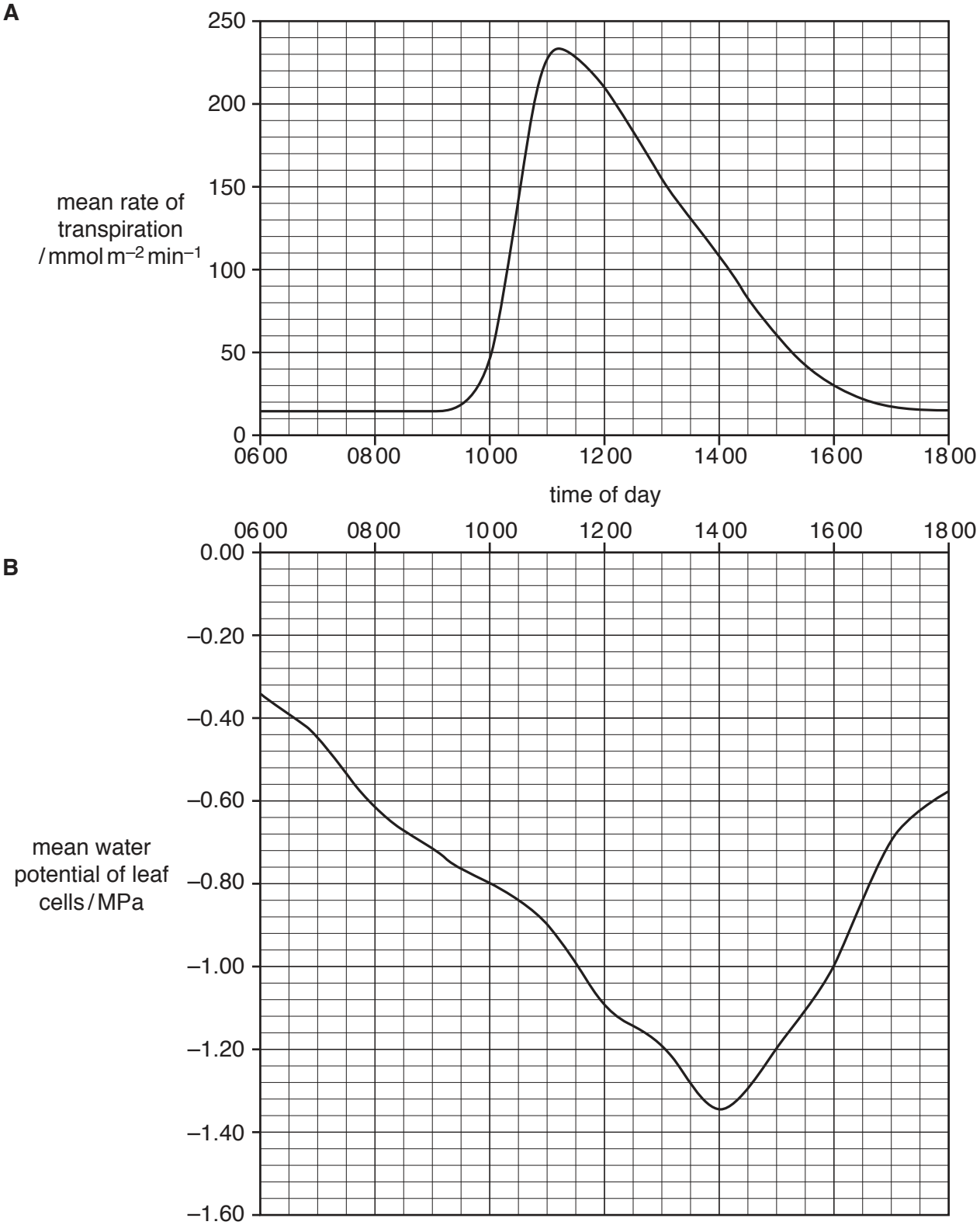

Fig. 5.1

(a) Define the term *transpiration*.

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(b) With reference to Fig. 5.1**A** and **B**, describe the changes recorded in the mean water potential of leaf cells over the 12 hour period. Suggest explanations for these changes.

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(c) The tree *C. brasiliense* is able to survive through long dry periods.

Many plant species that live in areas with little rainfall have features that reduce transpiration rates. Some adaptations reduce the water potential gradient for water vapour between the air spaces inside the leaves and the surrounding air.

Outline how leaves are adapted to reduce transpiration rates in this way.

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[Total: 9]

6 Extracellular growth factors are involved in the control of cell cycles in some mammalian cells. One of these growth factors is epidermal growth factor (EGF).

Fig. 6.1 shows the events that occur when EGF is present at the surfaces of two cells, **A** and **B**.

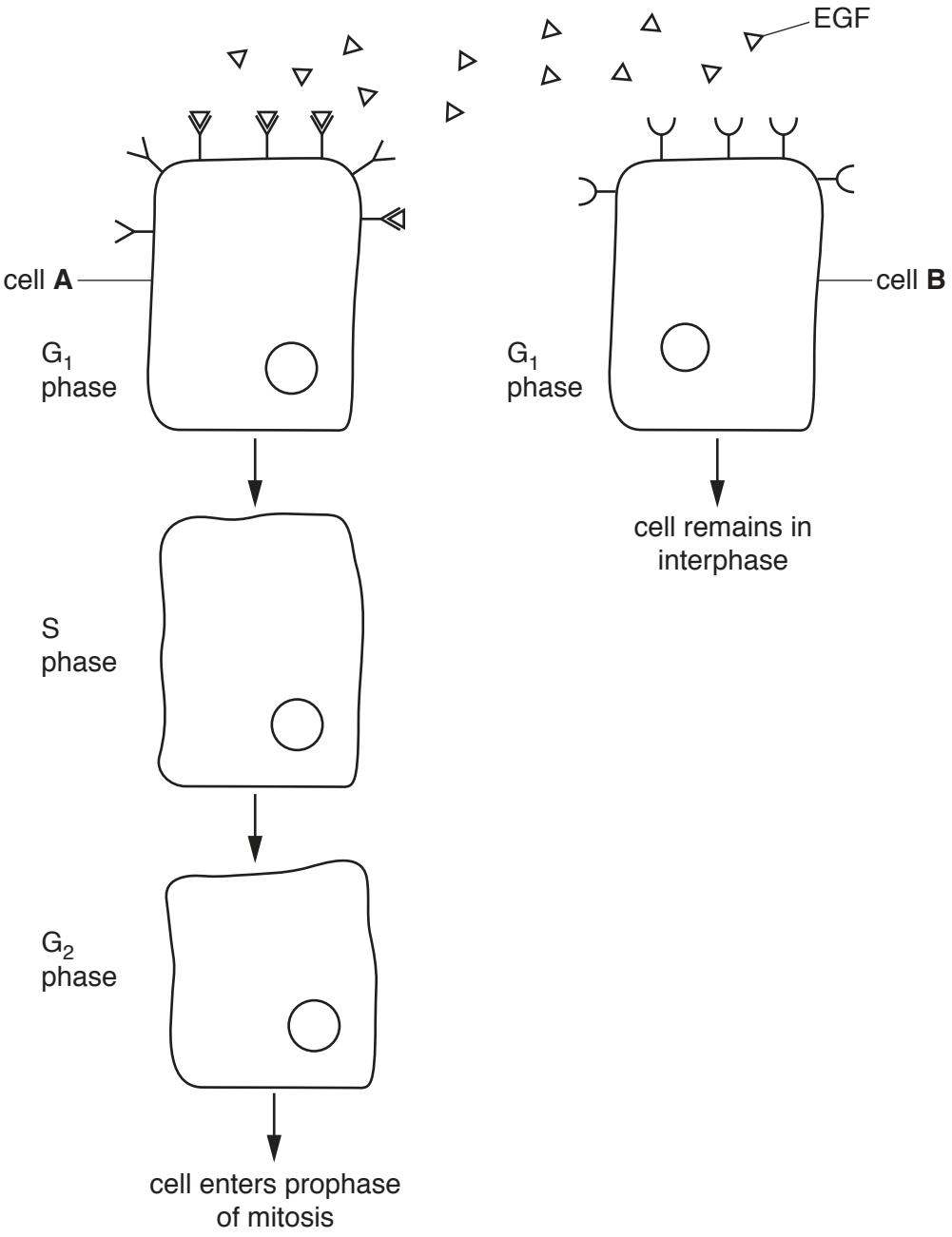

Fig. 6.1

(a) Explain why cell **A** in Fig. 6.1 responds to EGF, but cell **B** does not.

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.....[2]

(b) In the cell cycle, more mRNA is produced in the G_1 phase than during mitosis.

Suggest why this is so.

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.....[1]

(c) DNA is replicated during the S phase of the cell cycle. EGF is one of many factors that stimulate the change from the G_1 phase to the S phase.

State the substances used to synthesise DNA during the S phase.

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.....[3]

Question 6 continues on page 16

(d) Fig. 6.2 is a drawing of chromosome 1 from rice, *Oryza sativa*, during metaphase of mitosis.

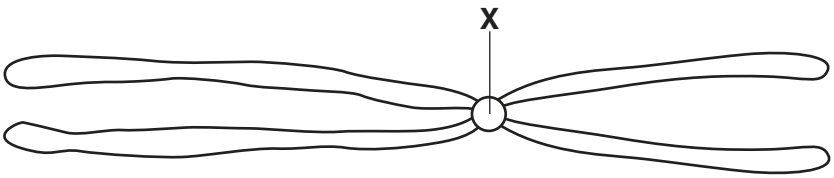

Fig. 6.2

(i) State the name and function of the region of the chromosome labelled **X**.

name .....

function .....

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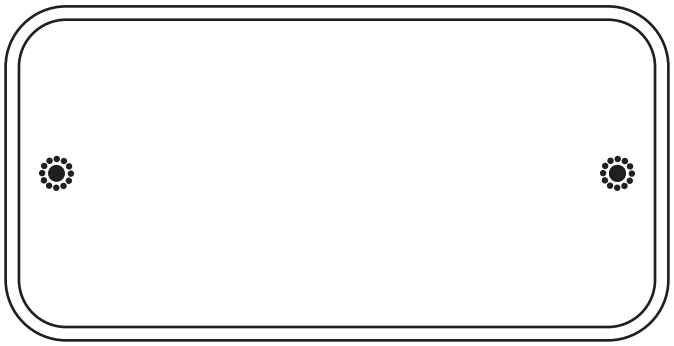
.....[2]

(ii) In the outline of the cell below, draw the chromosome from Fig. 6.2 as it would appear in anaphase of mitosis.



[2]

[Total: 10]