Centre Number	Candidate Number	Name

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

BIOLOGY **9700/02**

Paper 2 Structured Questions AS

May/June 2004

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 in the spaces provided on the Question Paper.
You may use a soft pencil for any diagrams, graphs, or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

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

This document consists of **12** printed pages and **4** blank pages.

Answer **all** the questions.

Write your answers in the spaces provided.

1 Fig. 1.1 is a vertical section of the heart to show the regions concerned with initiating and conducting impulses.

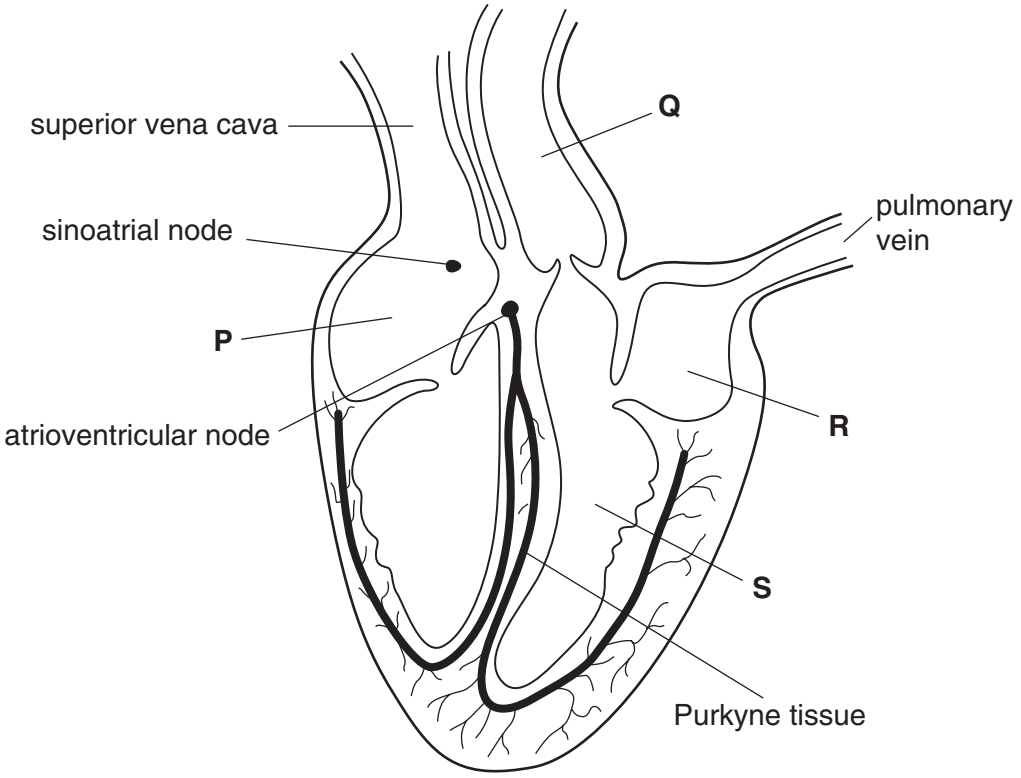

Fig. 1.1

(a) Name chamber **P** and blood vessel **Q**.

P .....

Q .....[2]

(b) Explain why the wall of chamber **S** is much thicker than the wall of chamber **R**.

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.....[2]

(c) Describe how the following three structures shown on Fig. 1.1 initiate and coordinate the contraction of the heart:

- sinoatrial node (SAN)
- atrioventricular node (AVN)
- Purkyne tissue.

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.....[4]

(d) Outline the effects of atherosclerosis in coronary arteries on the blood flow through these coronary arteries and the resulting effects on the heart itself.

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.....[4]

[Total: 12]

2 Food webs in hot deserts are much simpler than those of other areas, such as temperate woodlands or coral reefs. The physical conditions in deserts are so extreme that few organisms can survive. However, there are plants and animals that have special adaptations to withstand big changes in temperature and lack of rainfall. Desert plants provide shade and food for herbivorous animals, such as insects, lizards and rodents. Snakes, scorpions and spiders feed on the herbivores. Animals such as the fennec fox and hawks feed as top carnivores.

(a) State the term that best describes each of the following.

(i) Organisms, such as desert plants, that form the first trophic level in a food web.

term .....[1]

(ii) All the fennec foxes living in one area at the same time.

term .....[1]

(iii) All the different species that inhabit a desert at the same time.

term .....[1]

(iv) A natural unit, such as a desert, consisting of all the living organisms and the physical environment interacting together to give a stable system.

term .....[1]

(v) Herbivorous animals, such as lizards and rodents, which are prey for carnivores.

term .....[1]

(b) Using information from the passage, explain the term *habitat*.

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.....[2]

(c) Explain how the **leaves** of desert plants may be adapted for survival in areas with little rainfall.

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.....[3]

[Total: 10]

3 (a) The table below includes statements about the roles of water
- in living organisms
- as an environment for living organisms.

Complete the table by indicating with a tick (✓) which **one** of the properties of water is responsible for each role.

You should put only **one** tick in each row.

roles of water	properties of water			
	high specific heat capacity	strong cohesive forces between water molecules	high heat of vaporization	solvent for polar molecules and ions
transport medium in blood plasma and phloem				
surface for small insects to walk on				
major component of sweat used in heat loss				
transpiration pull in xylem				
preventing wide variations in body temperature				

[5]

[Turn over

Fig. 3.1 shows a potometer that is used for measuring rates of water uptake by leafy shoots.

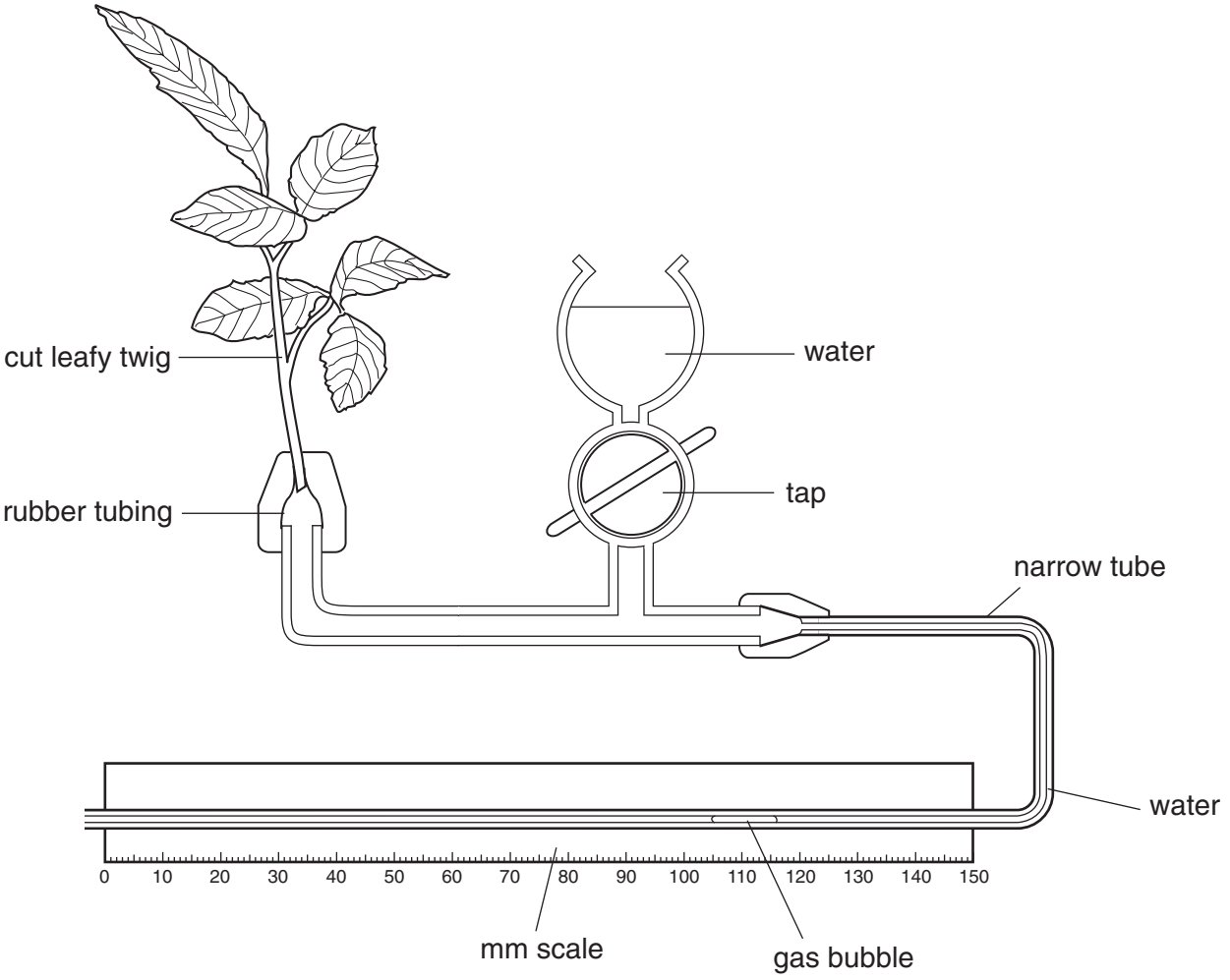

Fig. 3.1

A student used the potometer shown in Fig. 3.1 to investigate the rate of water uptake of a leafy shoot under six different sets of conditions. The student changed two environmental conditions around the plant:

- temperature
- wind speed.

For each experiment, the apparatus was left in the conditions until the rate of water uptake by the leafy shoot became constant. The student took several measurements during each experiment and calculated the mean rate of movement of the gas bubble. The results are recorded in Table 3.1.

Table 3.1

experiment	temperature / °C	wind speed	mean rate of movement of gas bubble / mm h^{-1}
1	15	low	12
2	15	high	22
3	25	low	24
4	25	high	45
5	35	low	64
6	35	high	120

(b) Using the data in Table 3.1, describe and explain the effect of the two conditions that the student changed during the investigation on the rate of water uptake.

temperature .....

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wind speed .....

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.....[4]

The rate of water movement up the leafy shoot was measured before it was cut from the plant. The rate was found to be less than the rate of water uptake from the potometer when kept in the same temperature and windspeed conditions.

(c) Suggest why the rate of water movement in an intact shoot is less than that measured in the potometer.

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.....[2]

[Total: 11]

4 Fig. 4.1 is an electron micrograph of a mesophyll cell from a leaf.

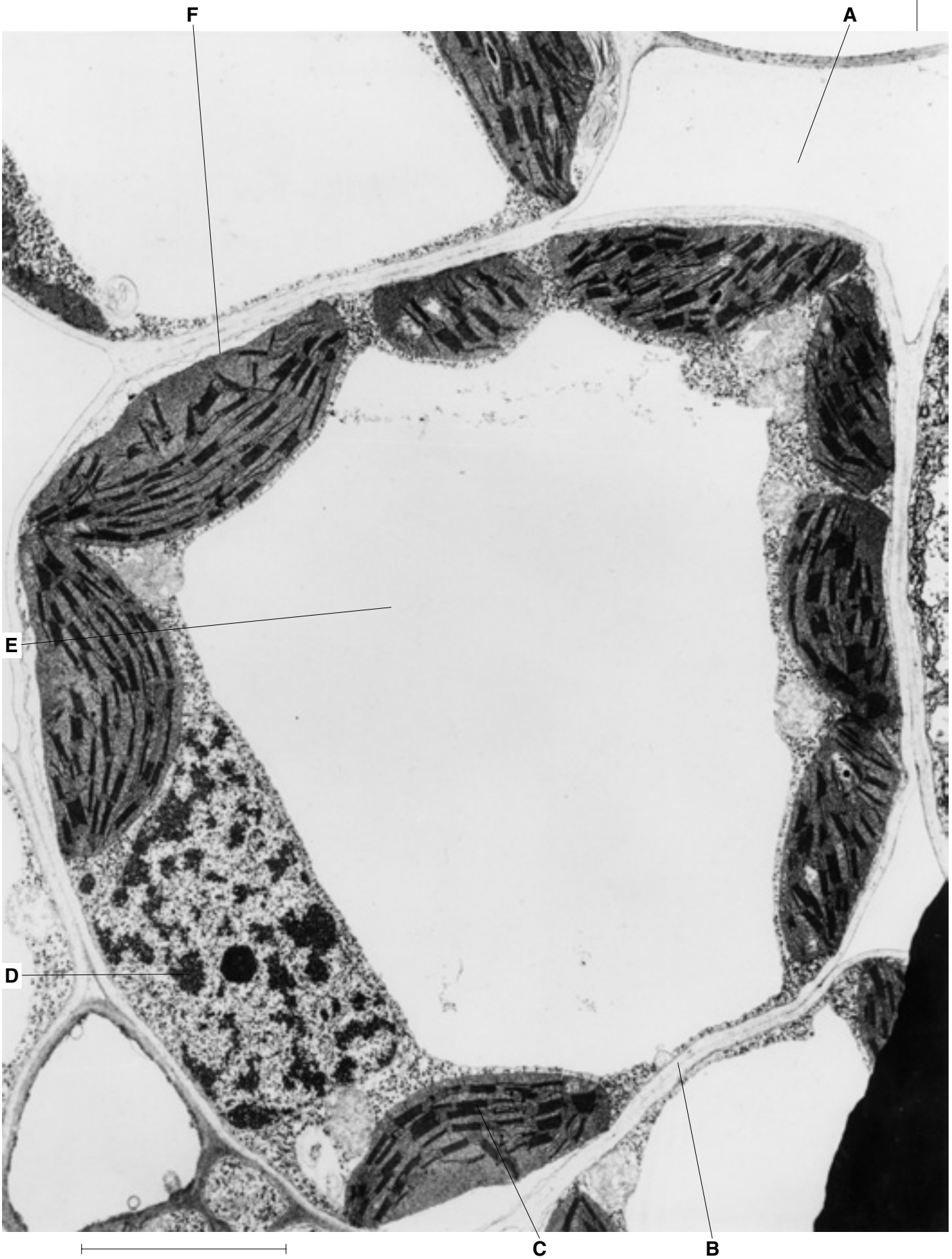

Fig. 4.1

(a) Calculate the magnification of Fig. 4.1. Show your working and express your answer to the nearest whole number.

Answer X.....[2]

(b) Identify, by using the letters **A** to **F**, a part of the cell shown in Fig. 4.1 where the following substances are located.

chlorophyll .....

cellulose .....

DNA .....

phospholipid .....

[4]

(c) State three ways in which the **structure** of a red blood cell differs from the structure of the cell shown in Fig. 4.1.

1 .....

2 .....

3 .....

[3]

Table 4.1 shows the red blood cell counts for two people from Peru – one who lived at sea level and the other who lived at 5 000 metres above sea level.

Table 4.1

	red blood cell count / cells mm^{-3}
sea level	5.0×10^6
5 000 metres above sea level	6.3×10^6

(d) Explain why the red blood cell count is much higher in the person who lived at high altitude.

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.....[2]

[Total:11]

[Turn over

5 Fig. 5.1 shows part of a DNA molecule.

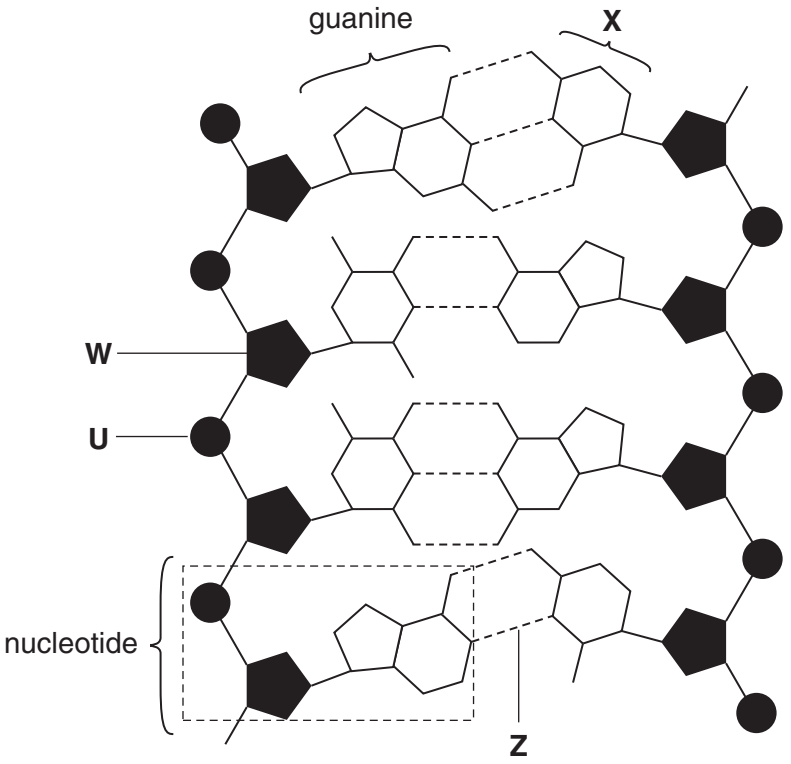

Fig. 5.1

(a) (i) Name **U** to **X**.

U .....

W .....

X .....[3]

(ii) Name the bonds indicated by **Z**.

.....[1]

(b) Describe **three** features of a polypeptide molecule that are different from those found in a DNA molecule.

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.....[3]

[Total: 7]

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6 Fig. 6.1 is a diagram that shows three different T lymphocytes and the events that occur during an immune response to an antigen.

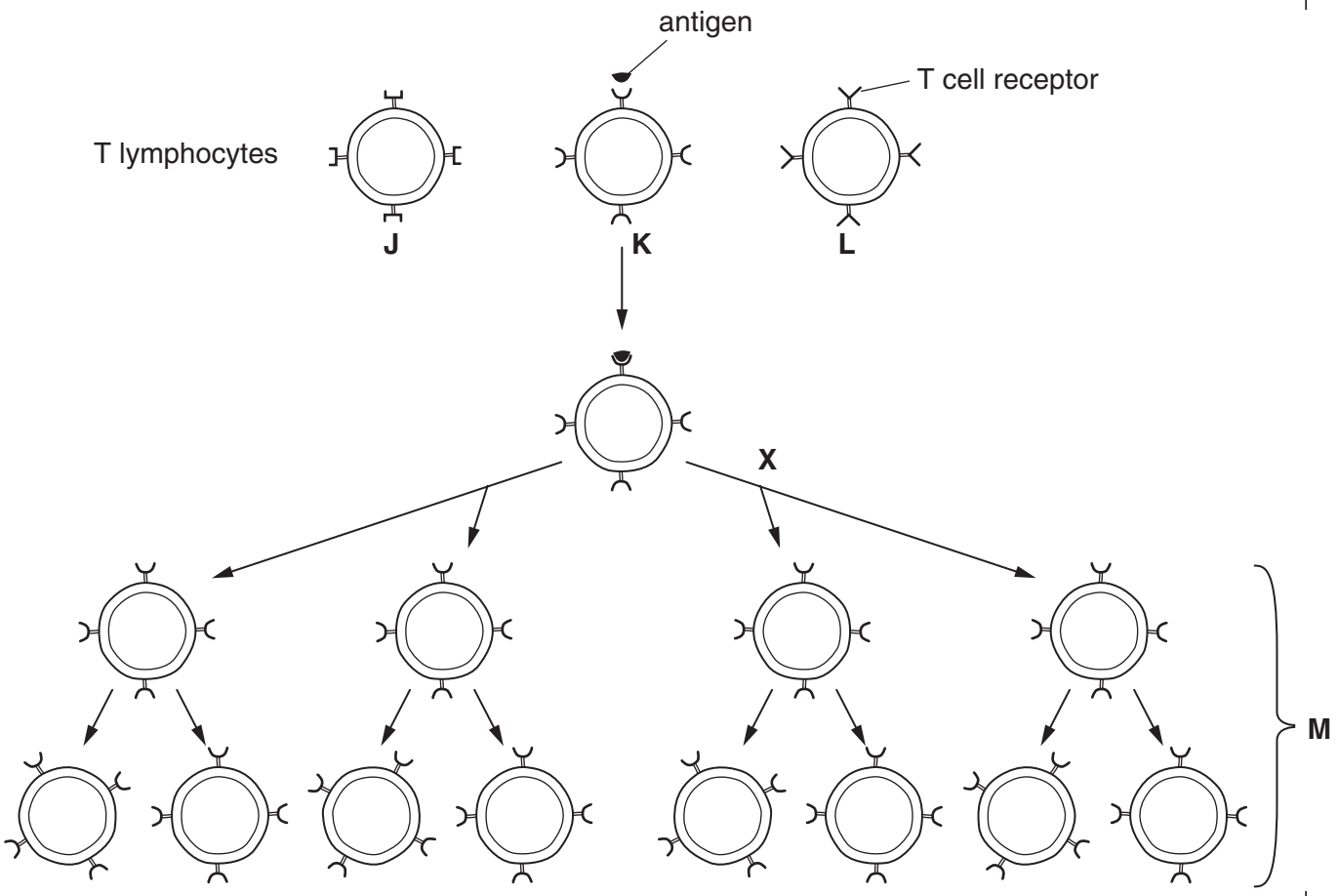

Fig. 6.1

(a) Name the type of nuclear division that occurs at **X** on Fig. 6.1.

.....[1]

(b) State the term used to describe a group of identical cells, such as those shown at **M** on Fig. 6.1.

.....[1]

(c) Explain why T lymphocyte **K** has responded to the antigen during the immune response, but not T lymphocytes **J** and **L**.

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.....[2]

(d) Describe **one** role of T lymphocytes in fighting an infectious disease.

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.....[2]

In certain types of cancer, T cells do not mature properly, fail to develop antigen receptors on their cell membranes and do not function normally.

(e) (i) State the name given to agents that increase the chances of cancerous growth.

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(ii) Suggest the likely effects on the body of T cells that do not function normally.

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.....[2]

[Total: 9]

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