Replication and division of nuclei and cells

Question Paper 2

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	The Mitotic Cell Cycle
Sub Topic	Replication and division of nuclei and cells
Booklet	Theory
Paper Type	Question Paper 2

Time Allowed : **74 minutes**

Score : **/ 61**

Percentage : **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 Fig. 1.1 is an electron micrograph of cells from the ciliated epithelium of the trachea.

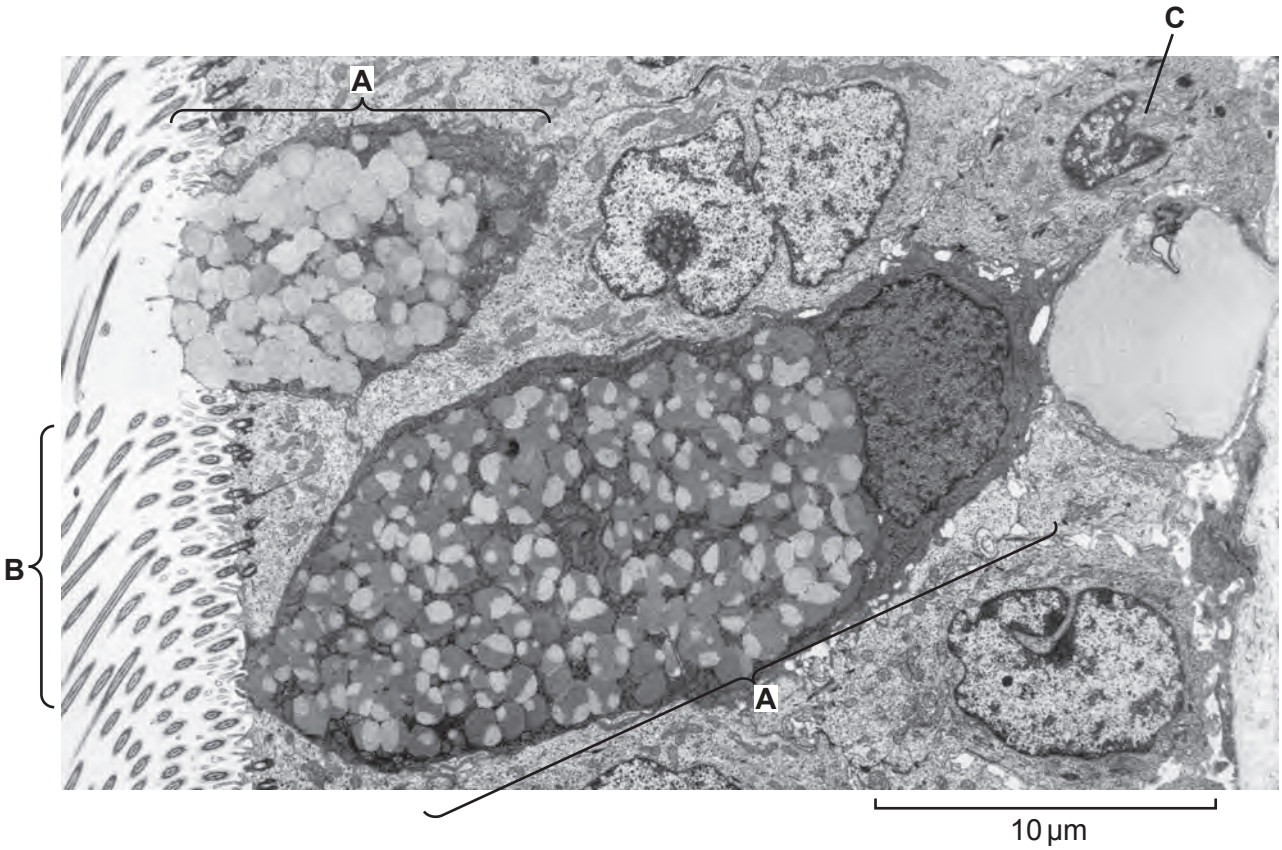

Fig. 1.1

(a) Calculate the magnification of the electron micrograph in Fig. 1.1.

Show your working and express your answer to the nearest whole number.

magnification × .....[2]

(b) Explain how the cells labelled **A** and the structures labelled **B** in Fig. 1.1 protect the lining of the trachea.

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.....[4]

(c) Cells, such as **C**, at the base of the epithelium of the trachea divide by mitosis.

Describe the changes that occur within the cell between the beginning of prophase and the end of metaphase.

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.....[5]

[Total: 11]

2 Fig. 1.1 is a photomicrograph of a root tip of onion, *Allium cepa*, showing cells in interphase and in stages of mitosis.

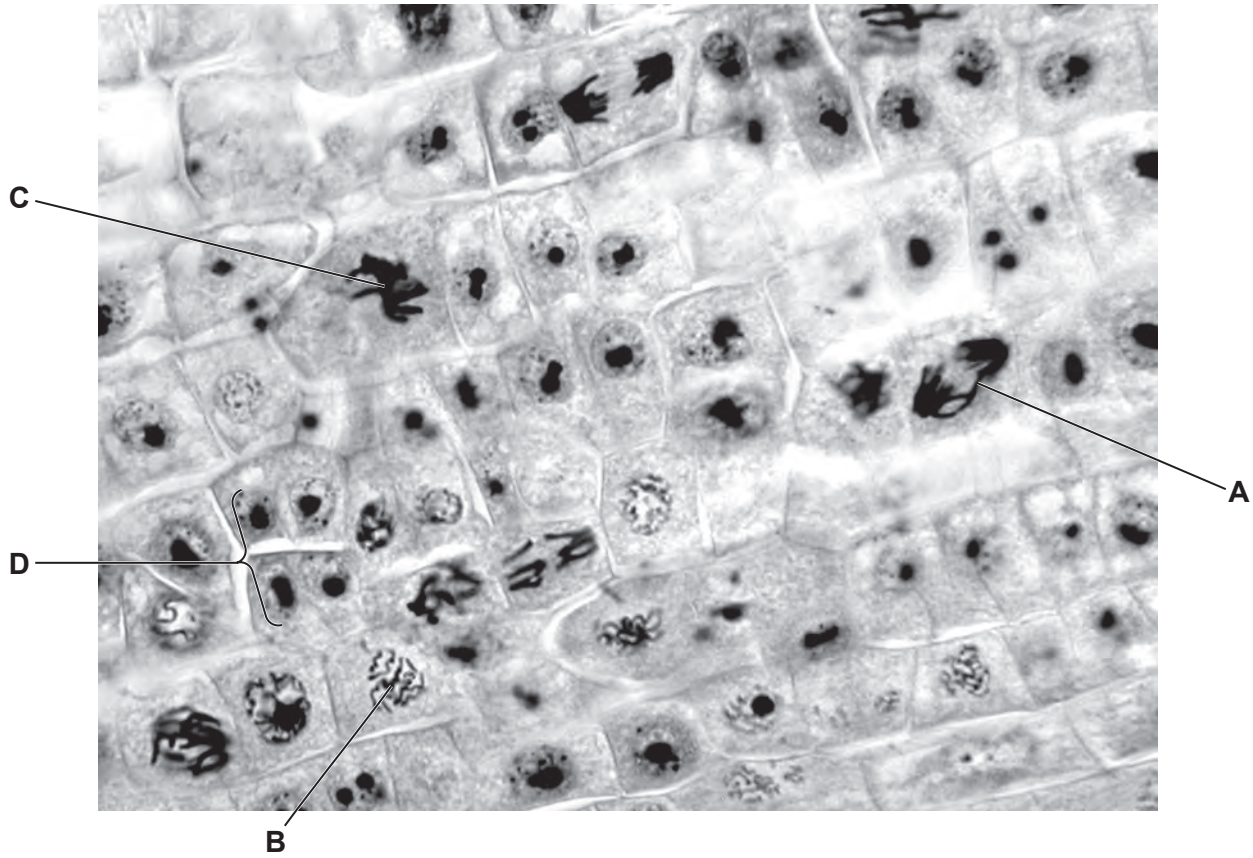

Fig. 1.1

(a) Name the stages of mitosis shown in cells **A**, **B** and **C**.

A .....

B .....

C ..... [3]

(b) Suggest why the cells labelled **D** are smaller than most of the other cells in Fig. 1.1.

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(c) Interphase is often described as a 'resting stage'.

Explain why the term 'resting stage' is not an appropriate description for cells in interphase.

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..... [2]

[Total: 6]

3 Fig. 1.1 shows a stage in the mitotic cell cycle in an animal cell.

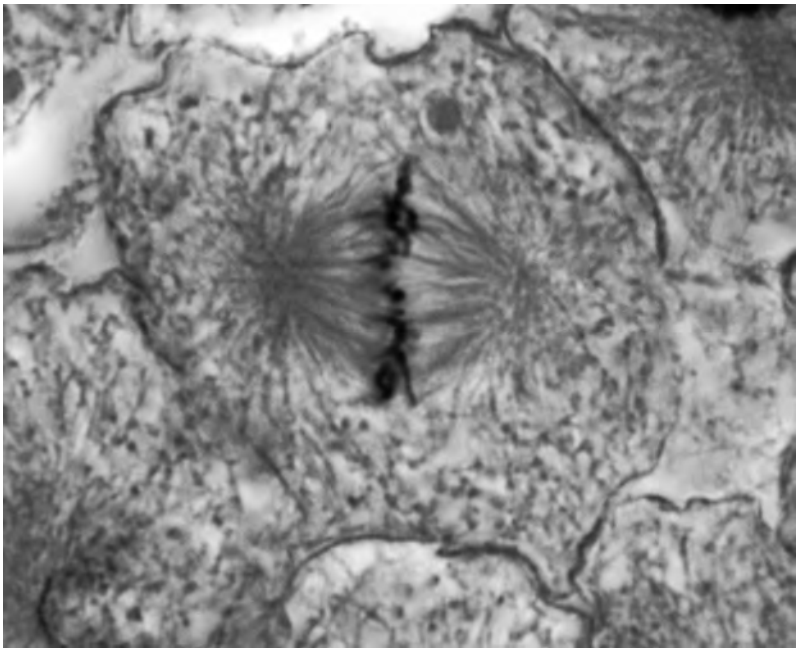

Fig. 1.1

(a) (i) Name the stage of mitosis shown in Fig. 1.1.

..... [1]

(ii) State three features which are characteristic of the stage of mitosis shown in Fig. 1.1.

1. .....

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2. .....

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3. .....

..... [3]

(b) Explain the importance of mitosis in organisms.

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(c) In many multicellular organisms, such as mammals, the time taken for the mitotic cell cycle varies considerably between different tissues, but is very carefully controlled in each cell.

Suggest the importance of this control in mammals.

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..... [2]

[Total: 9]

4 Fig. 6.1 is an electron micrograph of a cancer cell in the process of dividing by mitosis.

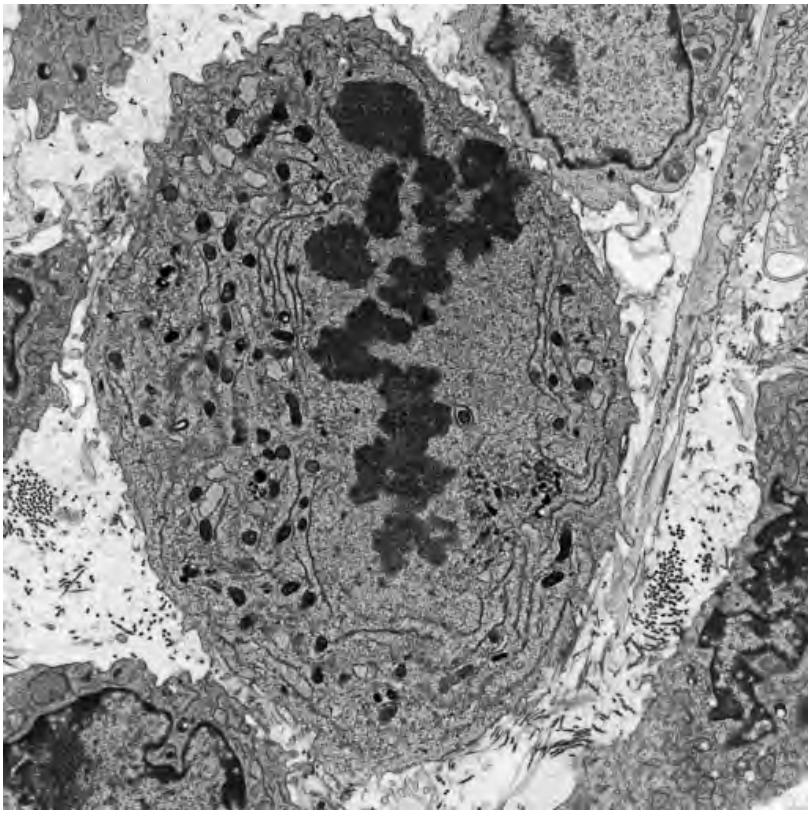

Fig. 6.1

(a) The stage of mitosis visible in Fig. 6.1 is metaphase.

State which features of the cell shown in Fig. 6.1 indicate that it is at metaphase and not at anaphase.

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(b) People who have smoked cigarettes for many years are at risk of developing lung cancer.

Describe how cigarette smoke is responsible for the development of lung cancer.

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(c) Fig. 6.2 shows the change in the percentage of smokers in the male population of the UK between 1950 and 2005.

Fig. 6.3 shows the change in mortality rate in the UK in men aged 75 to 84 between 1950 and 2005.

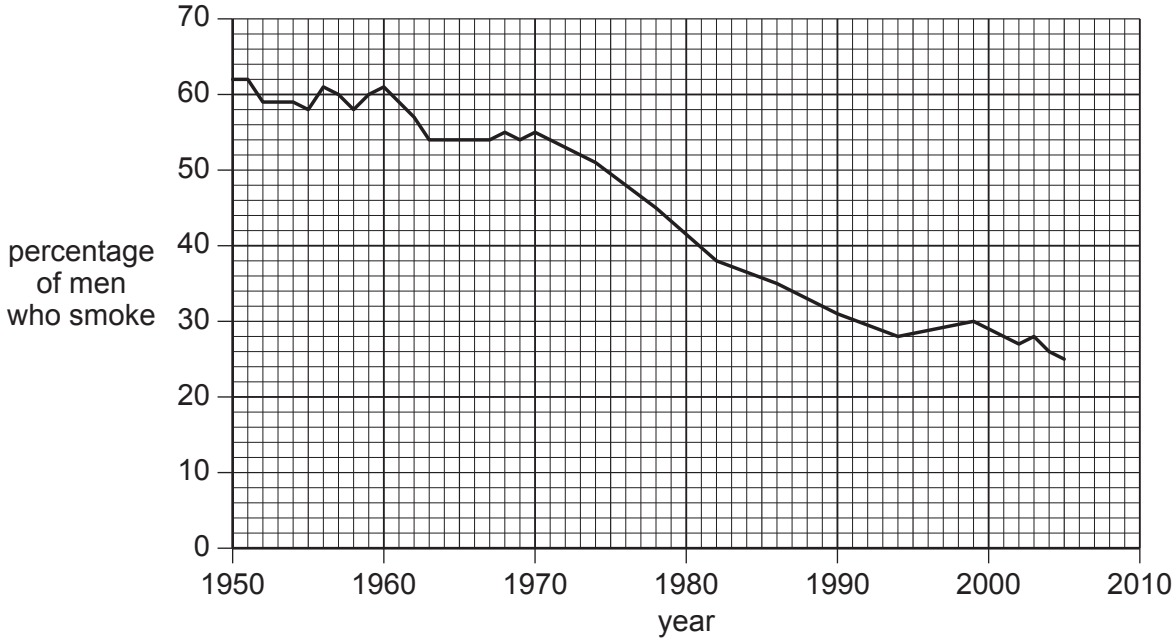

Fig. 6.2

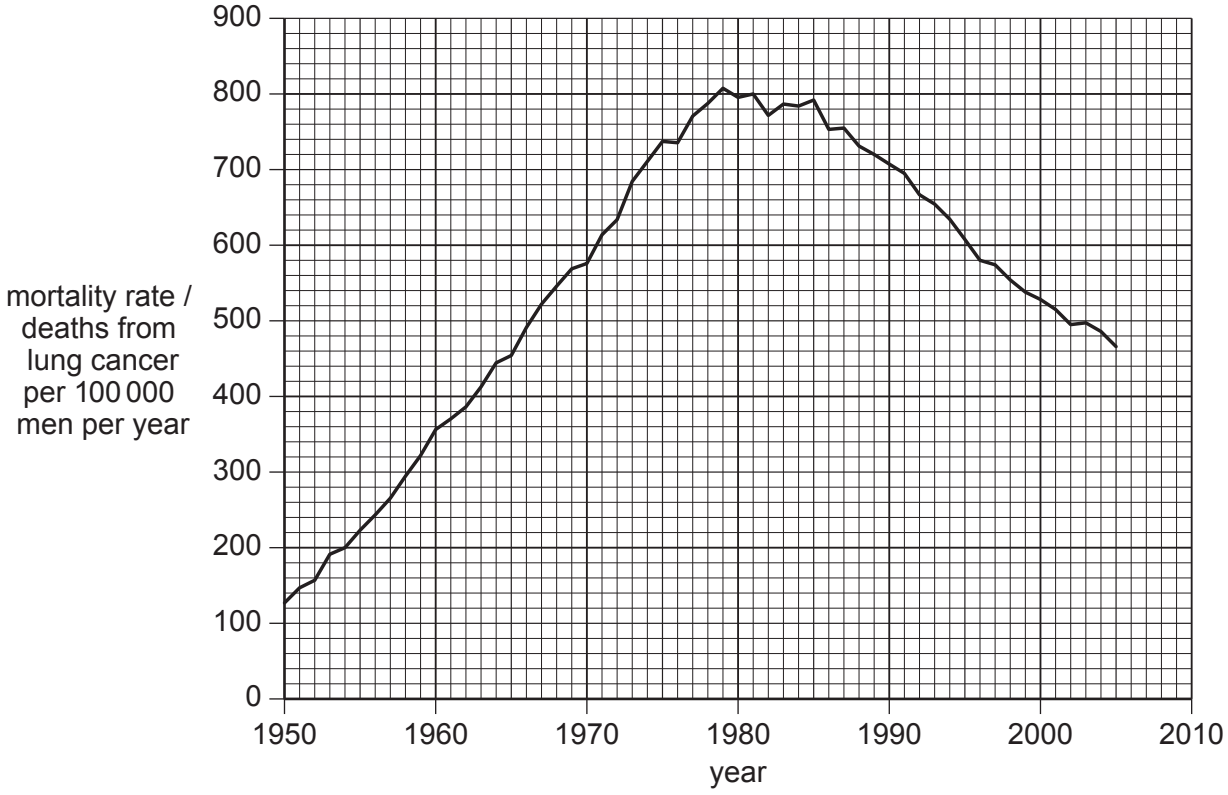

Fig. 6.3

Fig. 6.2 and Fig. 6.3 appear to show that there is no link between the percentage of the population that smoke and the death rate from lung cancer.

Explain why the mortality rate from lung cancer among men increased and then decreased over the period shown in Fig. 6.3, even though the percentage of smokers decreased over the same period of time.

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[Total: 9]

5 Fig. 2.1 is an electron micrograph of part of an animal cell. A centriole is labelled.

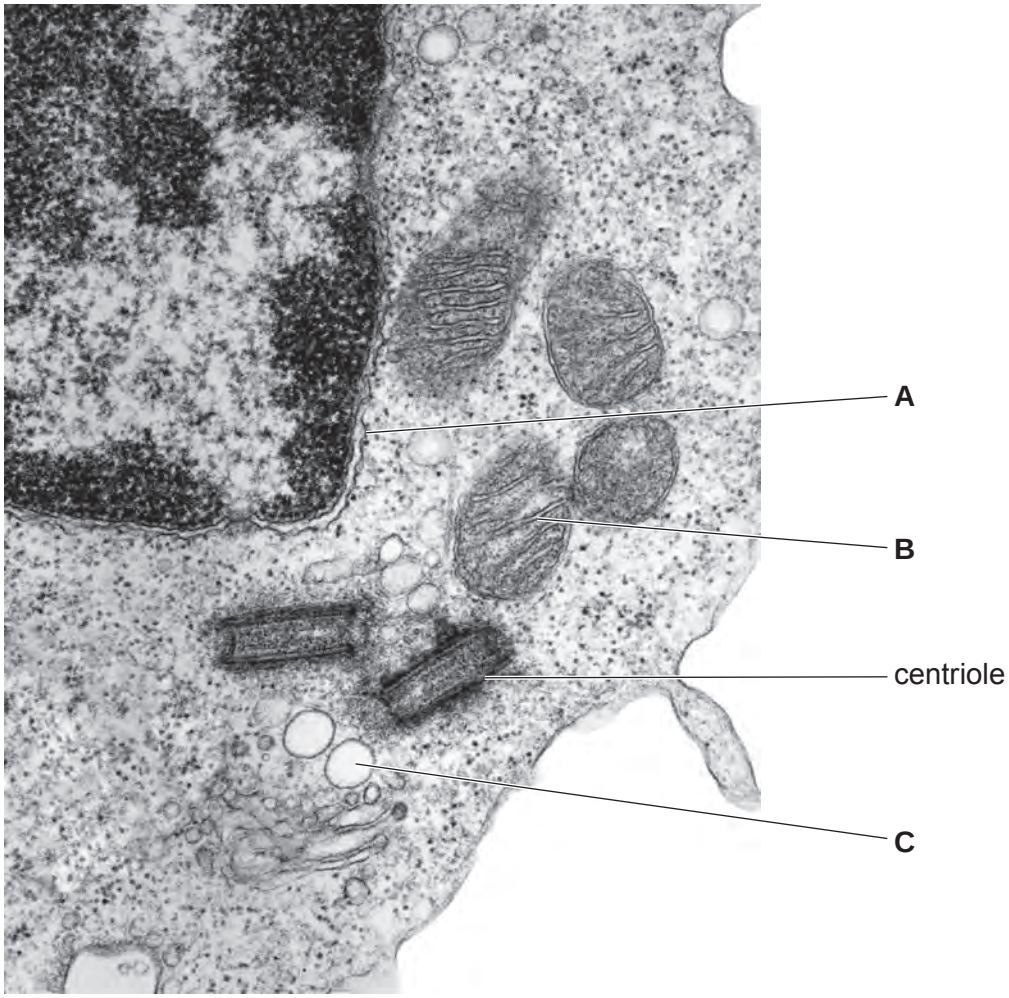

Fig. 2.1

(a) Name the structures labelled **A** to **C**.

A .....

B .....

C ..... [3]

(b) Describe the roles of centrioles in animal cells.

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..... [3]

(c) Explain why it is possible to see the internal membranes of a cell in electron micrographs, such as Fig. 2.1, but it is not possible to see them when using the light microscope.

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..... [3]

(d) A student investigated the effect of temperature on beetroot tissue. Beetroot cells contain a dark red pigment known as betalain, which is stored inside their vacuoles.

The student

- cut the beetroot tissue into cubes of the same size
- washed the cubes thoroughly in distilled water
- placed the same number of cubes into distilled water at seven different temperatures.

After 30 minutes, samples of the water were removed and placed in a colorimeter to measure the transmission of light. The lower the percentage transmission the more betalain is present in the water.

The results are shown in Fig. 2.2.

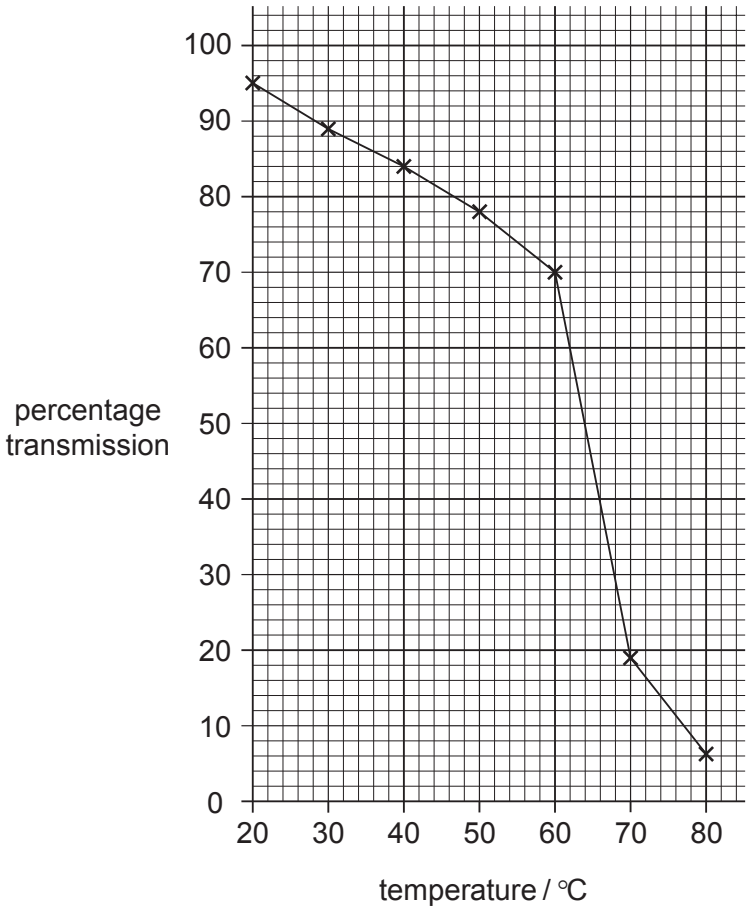

Fig. 2.2

Using the information in Fig. 2.2,

(i) describe the student's results;

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(ii) explain the effect of increasing temperature on the beetroot tissue.

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[Total: 15]

6 Muntjac are small deer found throughout Asia. Cells at the base of the epidermis in the skin continually divide by mitosis. Fig. 3.1 shows the chromosomes from a skin cell of a female Indian muntjac deer at metaphase of mitosis.

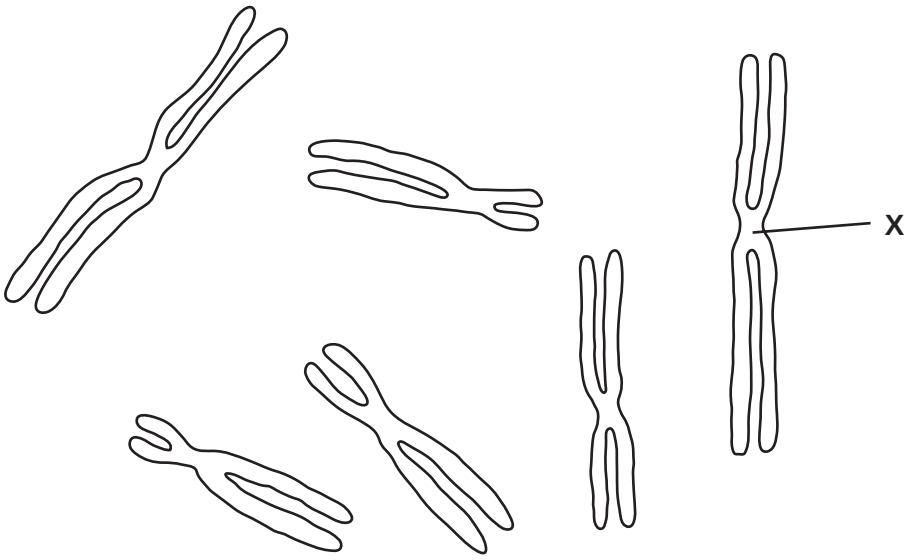

Fig. 3.1

(a) (i) State the diploid chromosome number of the female Indian muntjac deer.

.....[1]

(ii) Name **X** and state its role in mitosis.

name .....

role .....

.....[2]

(iii) On Fig. 3.1, **shade in** a pair of homologous chromosomes. [1]

(iv) In the space below, draw one of the chromosomes shown in Fig. 3.1 as it would appear during **anaphase** of mitosis.

(b) Outline what happens to **a chromosome** between the end of anaphase and the start of the next mitosis.

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.....[3]

(c) During the formation of eggs in the ovary of the female Indian muntjac deer, the chromosome number changes.

State what happens to the chromosome number and explain why this change is necessary.

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[Total: 11]