Replication and division of nuclei and cells

Question Paper 3

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 3

Time Allowed : **70 minutes**

Score : **/ 58**

Percentage : **/100**

Grade Boundaries:

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

1 Fig. 2.1 is a diagram of pair of homologous chromosomes during meiosis.

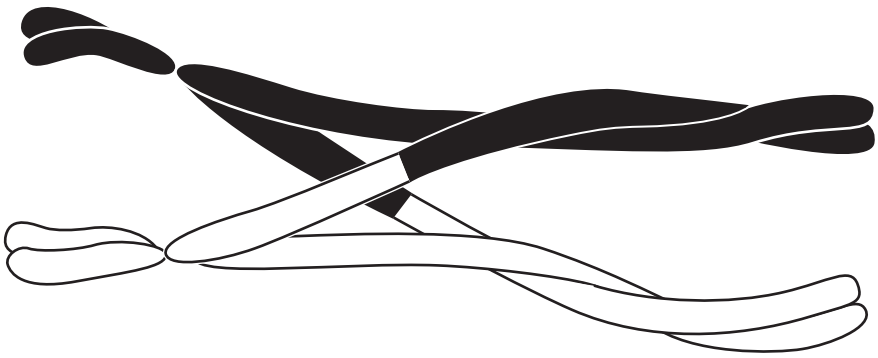

Fig. 2.1

(a) State what stage of meiosis is shown.

.....[1]

(b) Describe what has occurred between the two homologous chromosomes.

.....

.....

.....

.....

.....[3]

(c) Explain how this can lead to variation.

.....

.....

.....[2]

(d) Describe **two** other sources of variation that are possible as a result of meiosis.

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.....

.....

.....

.....[4]

[Total: 10]

2 Fig. 1.1 shows drawings of a cell at various stages in the mitotic cell cycle.

Fig. 1.1

(a) List the letters shown in Fig. 1.1 in the order in which these stages occur during a mitotic cell cycle. The first stage has been entered for you.

A ……. ……. ……. ……. [1]

(b) Explain what is happening in stage **D** in Fig. 1.1.

.....

.....

.....

.....[2]

(c) Describe in outline what happens to the DNA in the nucleus during stage **A** in Fig. 1.1.

.....

.....

.....

.....

.....

.....[3]

(d) State the importance of mitosis in the growth of a multicellular organism, such as a flowering plant or a mammal.

.....[1]

[Total : 7]

3 **(a)** A student cut thin sections of a root tip of *Allium cepa* and stained them to show chromosomes. A photomicrograph of part of one of these sections is shown in Fig. 4.1.

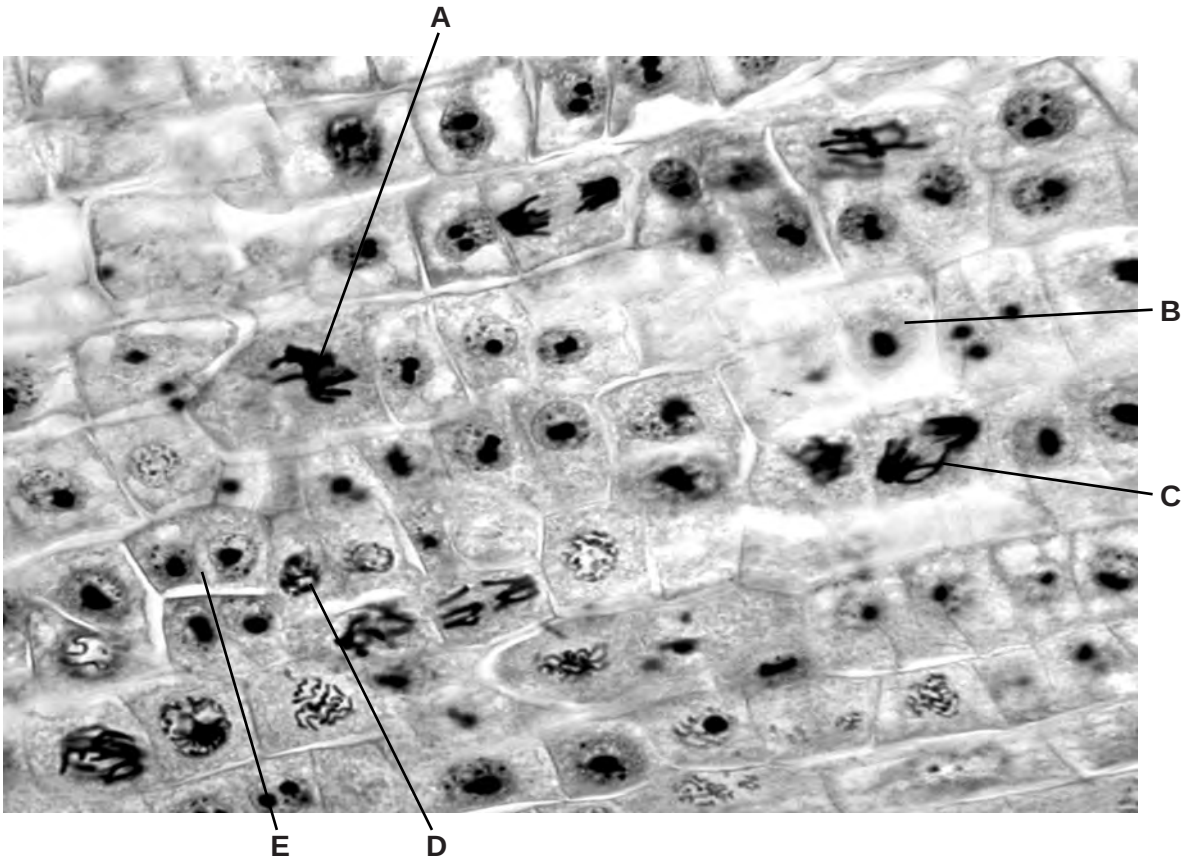

Fig. 4.1

Table 4.1 shows the behaviour of chromosomes and the changes that occur to the nuclear envelope during a mitotic cell cycle in the root tip of *A. cepa*.

Complete Table 4.1.

Table 4.1

name of stage	cell in Fig. 4.1	behaviour of chromosomes	nuclear envelope
	B	chromosomes uncoiled, may be replicating	intact
prophase			intact, but then breaks down
metaphase			not present
anaphase		chromosomes / chromatids, moving to opposite poles	
telophase		chromosomes uncoiling	

[5]

(b) Explain why the growth of roots, such as those of *A. cepa*, involves mitosis and **not** meiosis.

.....

.....

.....

.....

.....

.....

..... [3]

(c) State two processes, **other than growth**, in which mitosis is involved.

1. .....

2. .....

[2]

[Total: 10]

4 Fig. 1.1 is a photomicrograph of plant root cells near the growing tip. Some of the cells are undergoing mitosis.

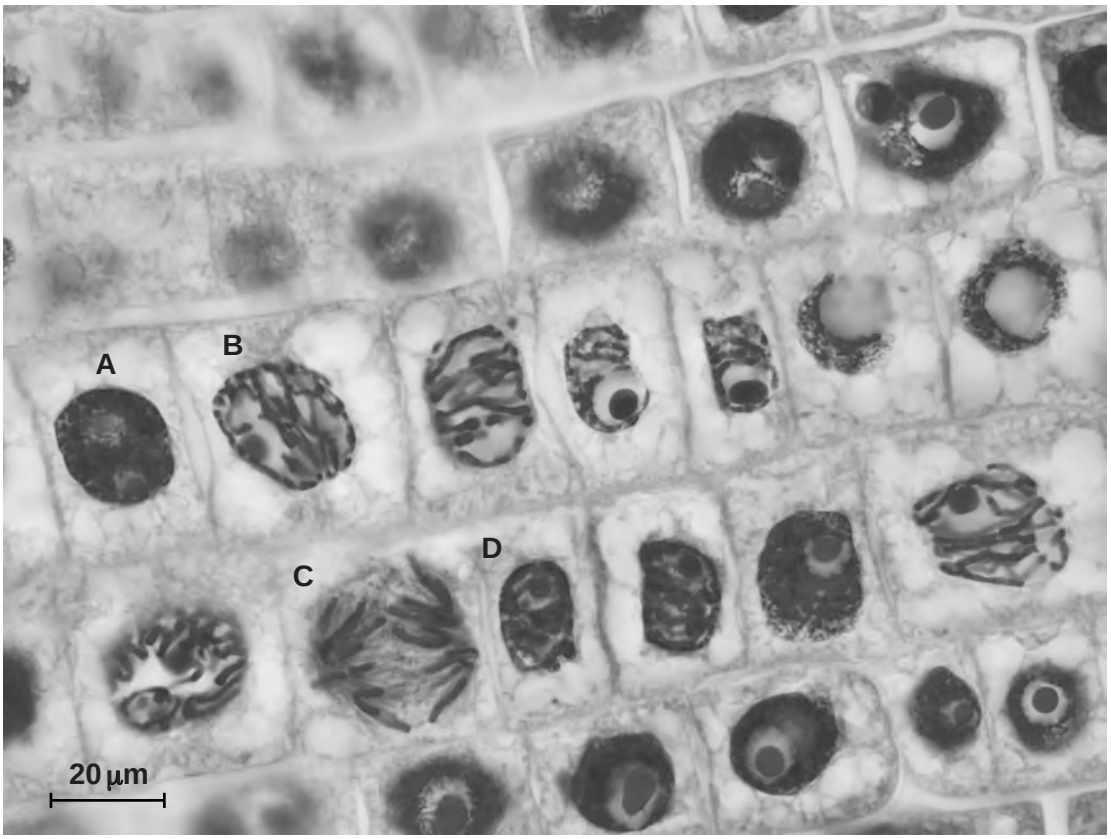

Fig. 1.1

(a) State **one** feature, visible in Fig. 1.1, which indicates that the section is taken from plant tissue and not animal tissue.

.....

.....[1]

(b) State the letter, **A** to **D**, of the cell in Fig. 1.1 which is in:

(i) prophase .....

(ii) anaphase. ..... [2]

(c) Describe two events occurring in cell **B**.

1. .....

.....

2. .....

.....

[2]

(d) (i) Describe the role of mitosis in a growing plant root tip.

.....

.....

.....

.....

..... [2]

(ii) Mutations can sometimes occur in cells which are rapidly dividing.

Outline how a mutation can cause an altered polypeptide to be produced.

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.....

.....

.....

.....

.....

..... [2]

(e) Calculate the magnification of Fig. 1.1.

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

magnification × .....
[2]

[Total: 11]

5 Fig. 1.1 shows a cell of a female fruit fly, *Drosophila melanogaster*, during a stage of mitosis.

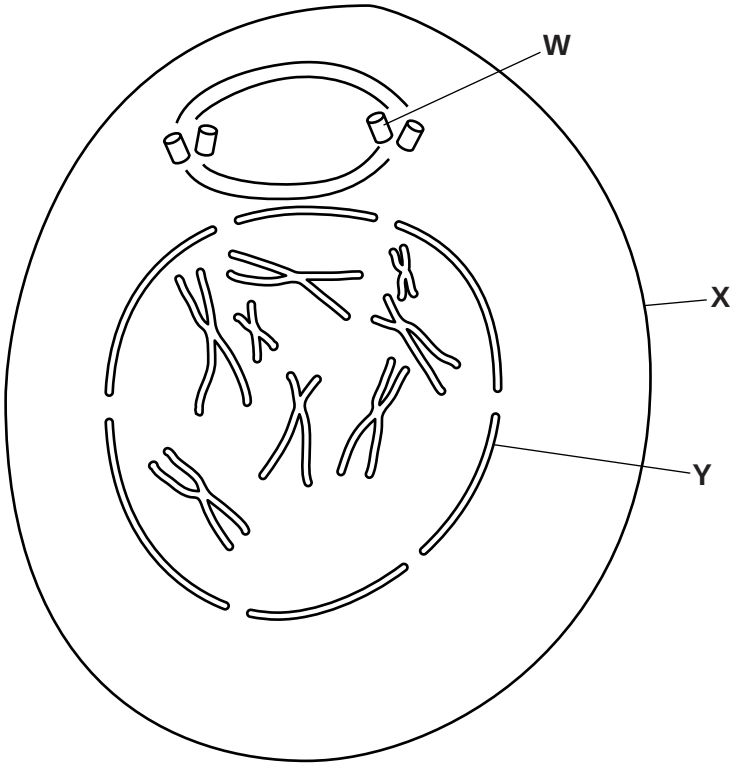

Fig. 1.1

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

.....[1]

(ii) Shade a pair of homologous chromosomes. [1]

(iii) Name the structure labelled **W** and state its function.

.....

.....

.....[2]

(b) State what happens to structure **X** and to structure **Y** between the stage shown in Fig. 1.1 and the end of cell division.

.....

.....

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.....

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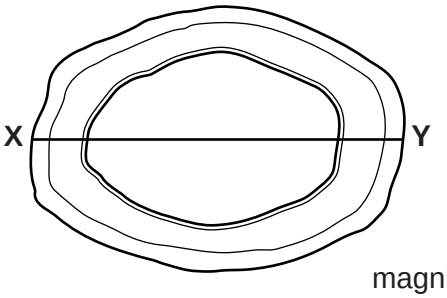
.....[3]

[Total: 7]

6 Fig. 1.1 is a diagram of a transverse section through a vein.



magnification × 35

Fig. 1.1

(a) Calculate the actual diameter of the vein marked by the line **X**–**Y**.

Show your working and give your answer in millimetres (mm).

answer ..... mm [2]

(b) The presence of a valve would help to confirm that the blood vessel in Fig. 1.1 is a vein and not an artery.

Describe three structural features of the blood vessel shown in Fig. 1.1 that would help to identify it as a vein and **not** as an artery.

1. .....

.....

.....

2. .....

.....

.....

3. .....

.....

.....[3]

(c) Explain how the following structural features of a capillary are related to its function.

(i) The capillary wall is composed of a single layer of squamous epithelial cells.

.....

..... [1]

(ii) The diameter of the capillary lumen is approximately 8 μm.

.....

..... [1]

(d) The inner lining of arteries and veins is composed of a layer of epithelial cells supported by a layer of elastic and connective tissue. The epithelial cells are capable of cell division by mitosis.

(i) State the role of mitosis in cell division of epithelial cells.

.....

.....

.....

..... [2]

(ii) Explain why the epithelial cells undergo mitosis and **not** meiosis.

.....

.....

.....

..... [2]

(e) Fig. 1.2 is a diagram of a cell in late prophase of mitosis.

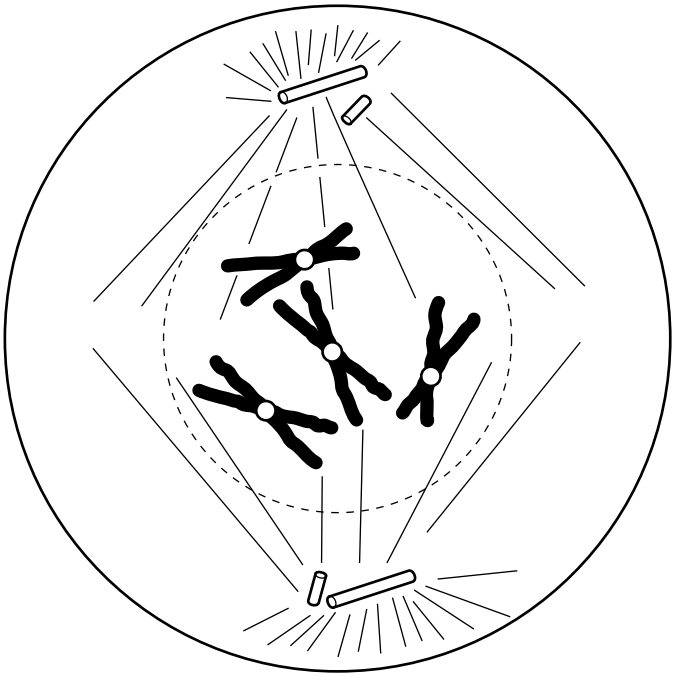


Fig. 1.2

Complete Fig. 1.3 to show the **same cell** in the **anaphase** stage of mitosis.

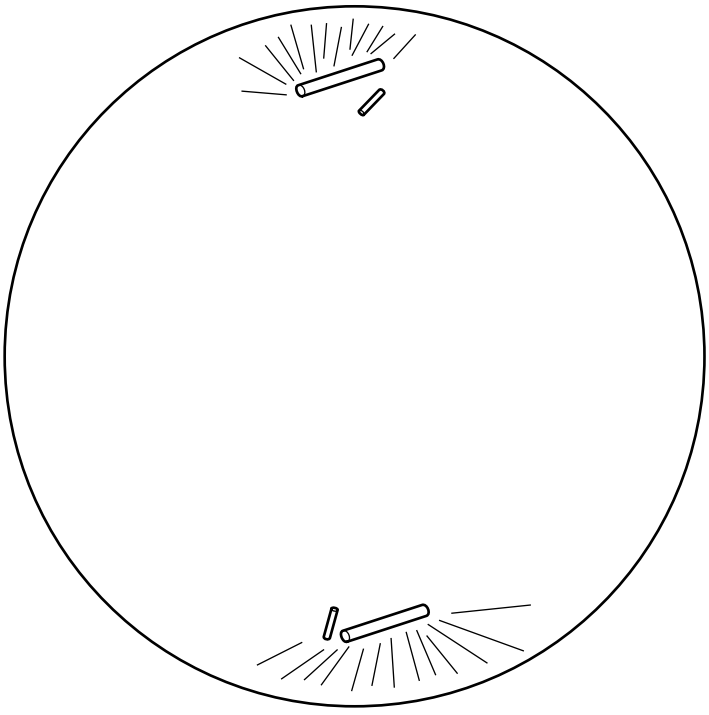


Fig. 1.3

[2]

[Total: 13]