

# Replication and division of nuclei and cells

## Question Paper 4

<b>Level</b>	International A Level
<b>Subject</b>	Biology
<b>Exam Board</b>	CIE
<b>Topic</b>	The Mitotic Cell Cycle
<b>Sub Topic</b>	Replication and division of nuclei and cells
<b>Booklet</b>	Theory
<b>Paper Type</b>	Question Paper 4

**Time Allowed :** 77 minutes

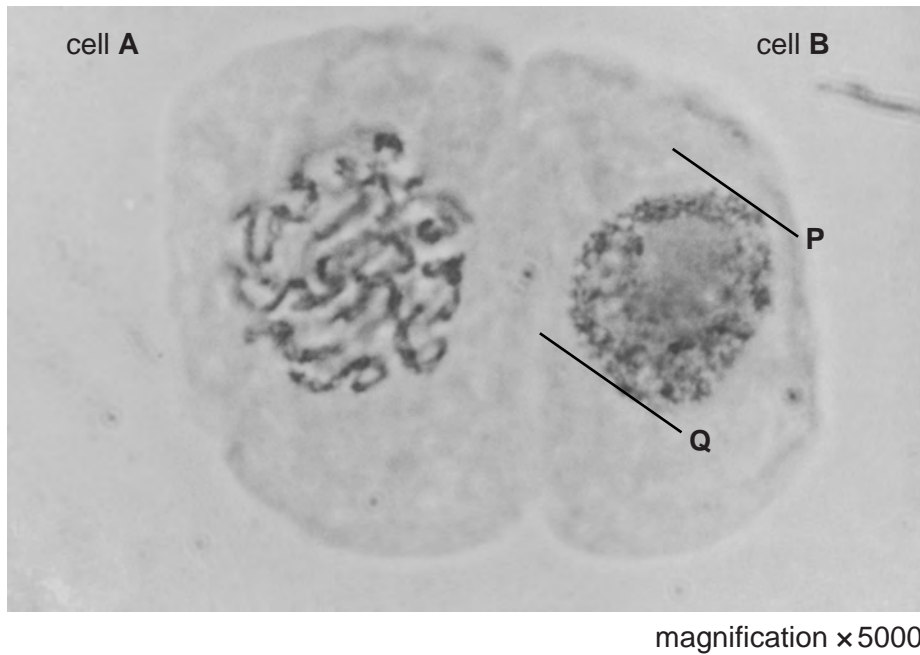
**Score :** / 64

**Percentage :** /100

**Grade Boundaries:**

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

- 1 Fig. 3.1 is a photomicrograph of two animal cells, **A** and **B**, at different stages of the mitotic cell cycle.



**Fig. 3.1**

- (a) (i) For each cell, state the name of the stage of the cell cycle shown in Fig. 3.1.

cell **A** .....

cell **B** .....

[2]

- (ii) Describe the events that occur during the stage of the cell cycle named for cell **A** in (a)(i).

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[4]

(b) The magnification of Fig. 3.1 is  $\times 5000$ .

Calculate the diameter of the nucleus of cell **B** between lines **P** and **Q**.

Show your working and give your answer to the nearest micrometre ( $\mu\text{m}$ ).

answer .....  $\mu\text{m}$  [2]

(c) State the advantages of light microscopy, rather than electron microscopy, for studies of the cell cycle.

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..... [3]

[Total: 11]

- 2 Bone marrow contains stem cells that divide by mitosis to form blood cells. Each time a stem cell divides it forms a replacement stem cell and a cell that develops into a blood cell.

Fig. 3.1 shows changes in the mass of DNA in a human stem cell from the bone marrow during three cell cycles.

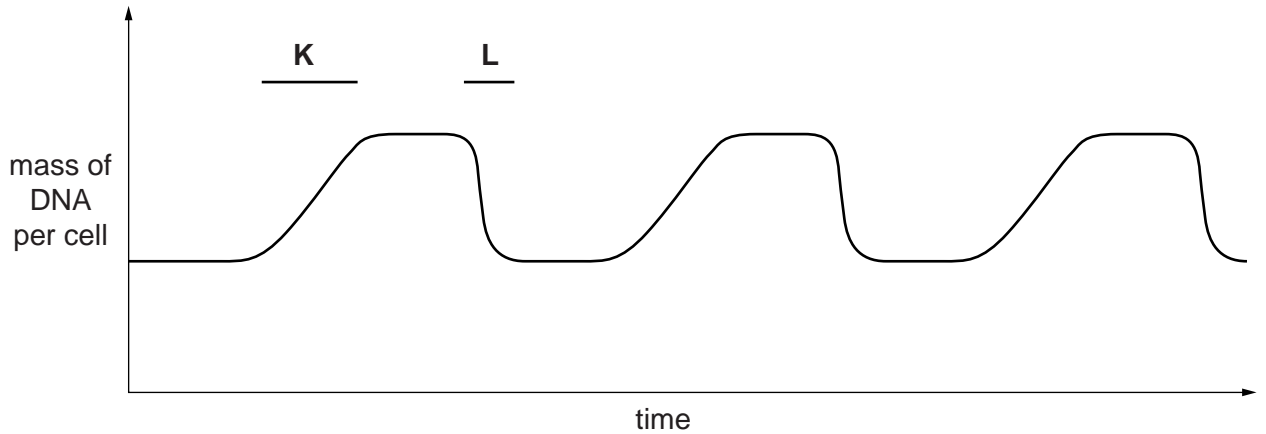


Fig. 3.1

(a) With reference to Fig. 3.1, state:

- (i) what happens to bring about the changes in the mass of DNA per cell at **K** and at **L**

**K** .....

.....

**L** .....

..... [2]

- (ii) how many blood cells are formed from the stem cell in the time shown

..... [1]

- (iii) what happens to the number of chromosomes in the stem cell.

..... [1]

Stem cells in bone marrow give rise to phagocytes, B-lymphocytes and T-lymphocytes.

**(b)** Describe how a red blood cell develops from a stem cell.

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..... [3]

**(c)** During an immune response, cells divide by mitosis.

Describe how mitosis is involved in an immune response.

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..... [3]

**(d)** Describe the modes of action of T-lymphocytes during an immune response.

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..... [3]

[Total: 13]



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**4 (a) (i)** Name two factors that increase the chances that cancer will develop.

1. ....

2. .... [2]

**(ii)** State why lung cancer is categorised as a non-infectious disease.

.....

..... [1]



The effectiveness of anti-cancer drugs may be determined by growing different tumours in culture.

The effectiveness of two drugs on two human tumours (**A** and **B**) from different tissues was assessed. The two drugs, T138067 and vinblastine, were added to the tumours in culture on days 5, 12 and 19. The volumes of the tumours were compared with the volumes of tumours that were not treated with any drugs.

The results are shown in Fig. 4.1.

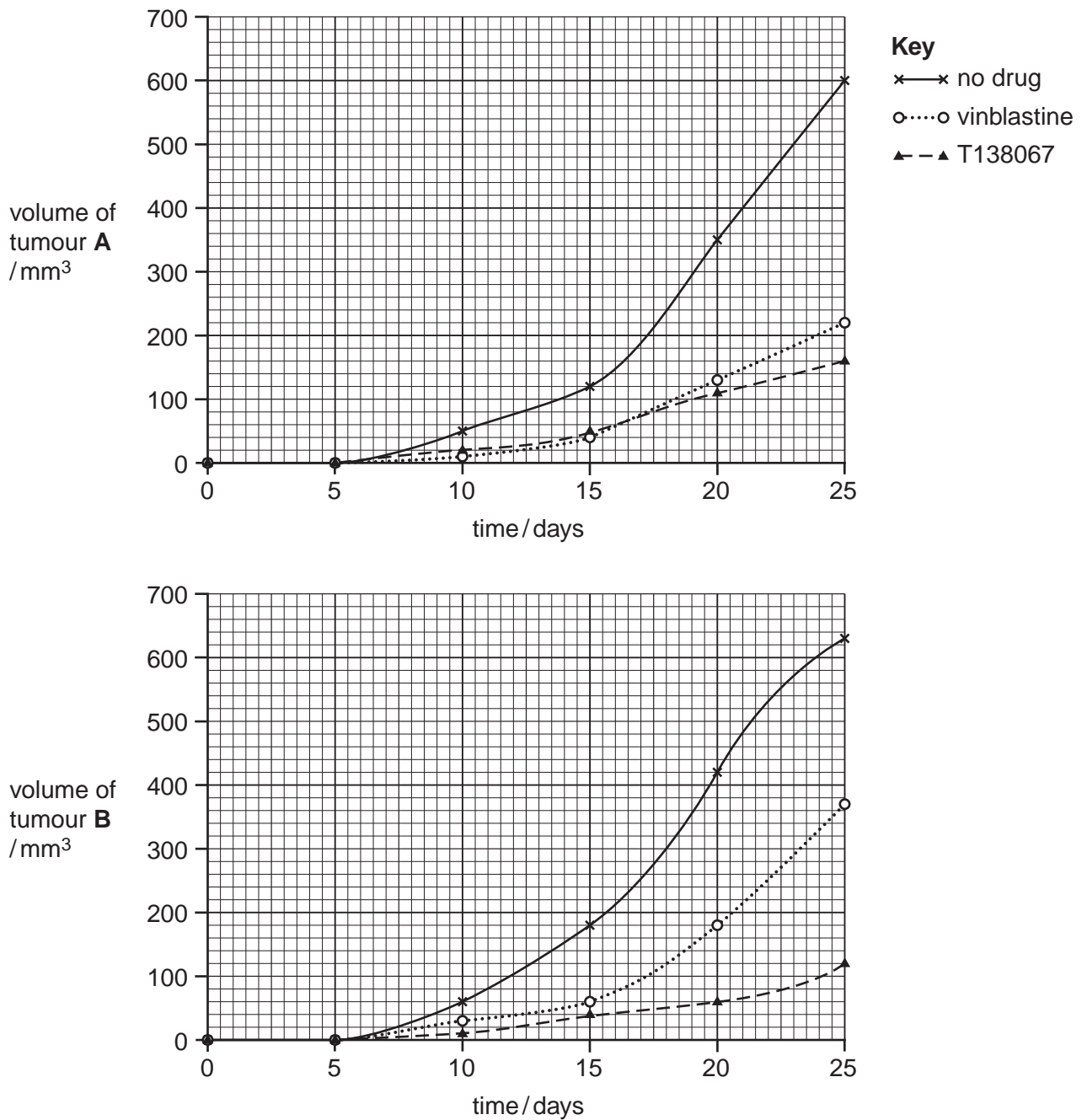


Fig. 4.1

**(b)** Use the data in Fig. 4.1 to compare the effectiveness of the two drugs used to treat the tumours.

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.....[4]

**(c)** Vinblastine disrupts the formation of the spindle apparatus during mitosis.

Explain how vinblastine has its effect as an anti-cancer drug.

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.....[3]

[Total: 10]



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