

1.4 Cells: Division

Question Paper

Course	DP IB Biology
Section	1. Cell Biology
Topic	1.4 Cells: Division
Difficulty	Medium

Time allowed: 70
Score: /51
Percentage: /100

Question 1a

- a) Distinguish between the terms chromosome and chromatid.

[3 marks]

Question 1b

- b) A student writes the statements below describing the different stages in mitosis but is missing some information.

Stage 1: Chromosomes become shorter and thicker, and the nuclear membrane breaks down.

Stage 2: Chromosomes line up along the equator of the cell and __(i)__,

Stage 3: __(ii)__, causing the chromatids to separate and move towards __(iii)__.

Stage 4: A new nuclear membrane forms around each group of chromosomes.

Complete **Stage 2** and **Stage 3** with an appropriate statement / statements.

[3 marks]

Question 1c

- c) The mitotic index is a measure of the proliferation status of a cell population (i.e. the proportion of dividing cells).

A student prepared a root tip squash and observed the cells under a microscope. A total of 147 cells were observed and 95 of these cells were observed in various stages of mitosis.

- i) Calculate the mitotic index for this dividing root tissue.

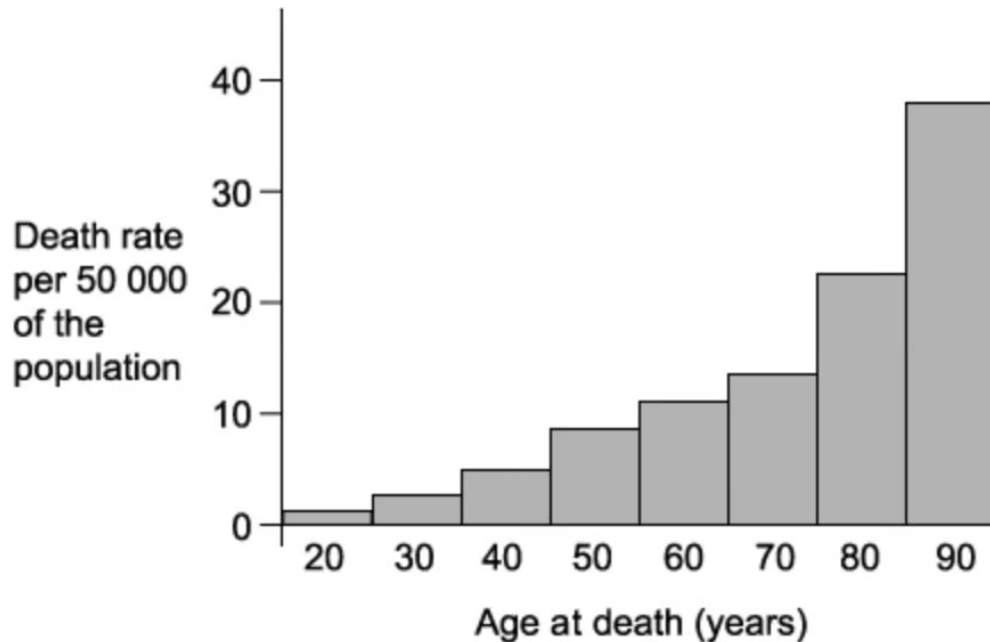
The teacher wanted to double-check this. The student had counted the total number of cells correctly but the teacher calculated a mitotic index of 0.81.

- ii) Calculate the number of cells undergoing mitosis that the teacher observed.

[2 marks]

Question 2a

- a) The death rate from brain cancer was investigated in the UK. The graph below shows the results for women in different age groups.



Suggest a possible explanation for the relationship seen in the graph above.

[1 mark]

Question 2b

- b) Melanoma is a type of skin cancer that develops from pigment-producing cells in the skin known as melanocytes. Some people who spend too much time sunbathing develop melanoma.

Explain why.

[2 marks]

Question 2c

- c) There are two main forms of tumours (one being benign tumours).

State the other main form of tumour and outline **two** ways in which a benign tumour differs from the other main form of tumour.

[3 marks]

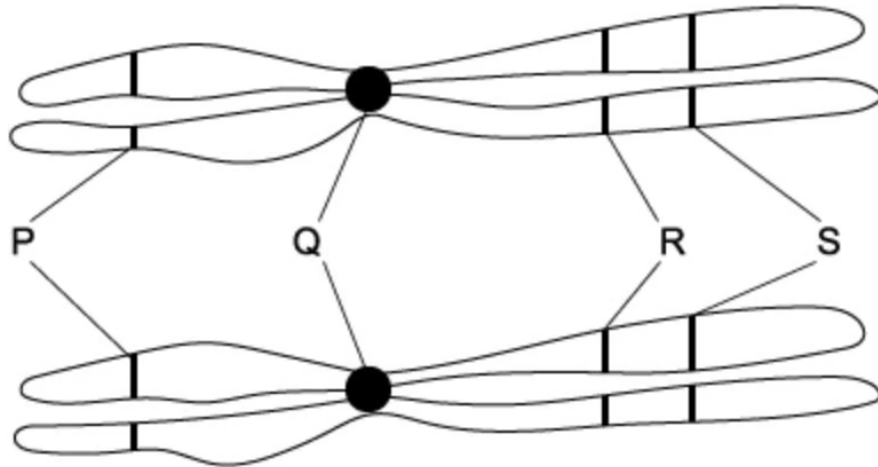
Question 2d

- d) Describe **two** ways in which both types of tumour may cause harm to the body.

[2 marks]

Question 3a

- a) The diagram below shows two chromosomes in a cell undergoing mitosis.



Identify structure **Q** and explain what happens to it during anaphase.

[2 marks]

Question 3b

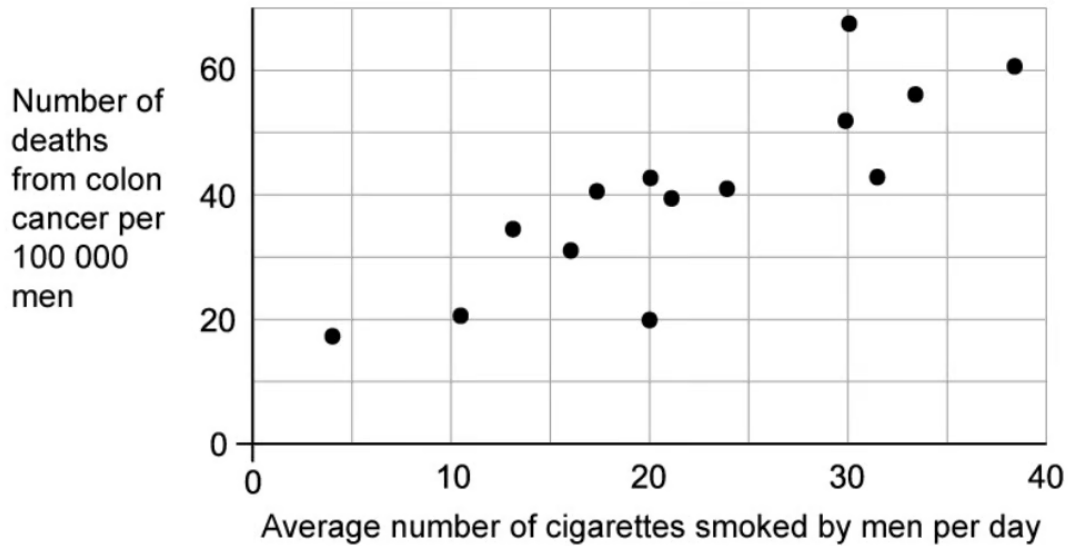
- b) After looking at the diagram in part **(a)**, a scientist concludes that the two chromosomes are homologous.

Use the diagram in part **(a)** to explain why the scientist has come to this conclusion.

[2 marks]

Question 3c

- c) A group of researchers investigated the relationship between the average number of cigarettes smoked by men per day and the number of men dying from colon cancer in 14 different countries. The data from the study is provided in the graph below.



A website reported the results of this investigation using the headline ‘Smoking causes cancer’.

Explain why the researchers could not support this view based on the results of their investigation alone.

[4 marks]

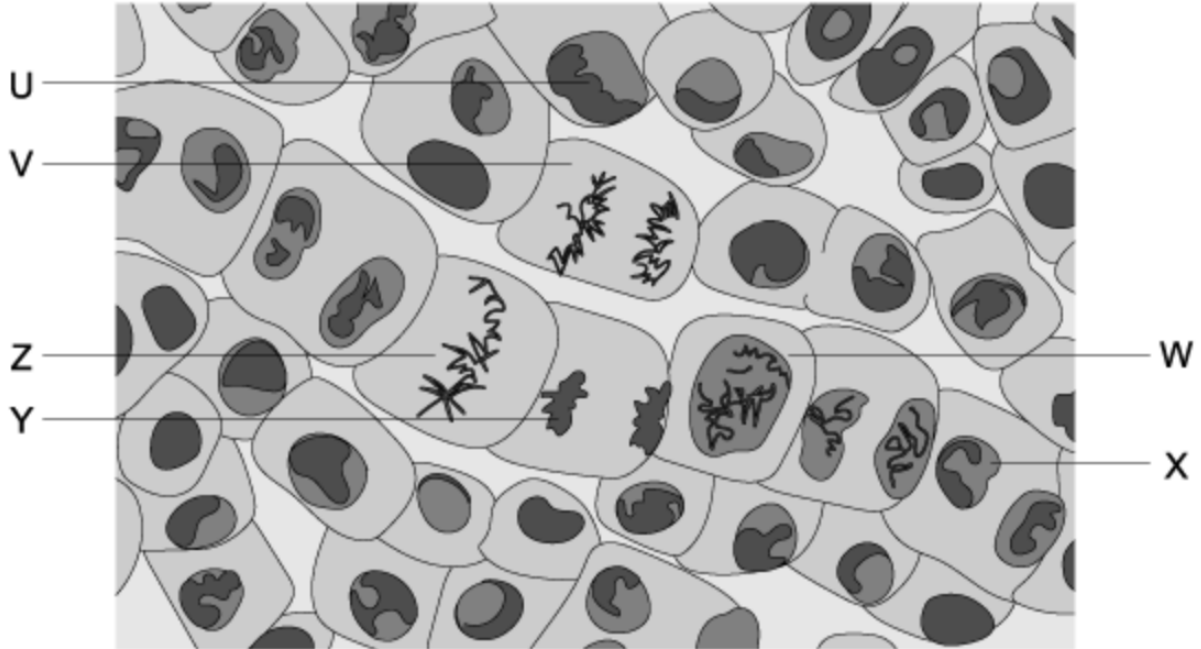
Question 3d

- d) Explain why the death rate from colon cancer in part (c) is given per 100 000 men and not given as the total number of deaths.

[2 marks]

Question 4a

- a) The drawing below shows a micrograph of actively dividing cells in the tissue taken from the tip of a plant root.



Using the micrograph drawing above, complete the table.

Cell	Name of the stage of cell division
U	
V	
Z	

[3 marks]

Question 4b

- b) In which of the cells (**U**, **V**, **W**, **X**, **Y** or **Z**) in the micrograph drawing in part (**a**) can vesicles now fuse to form new cell membranes across the cytoplasm (in order to separate the cell into two daughter cells).

[1 mark]

Question 4c

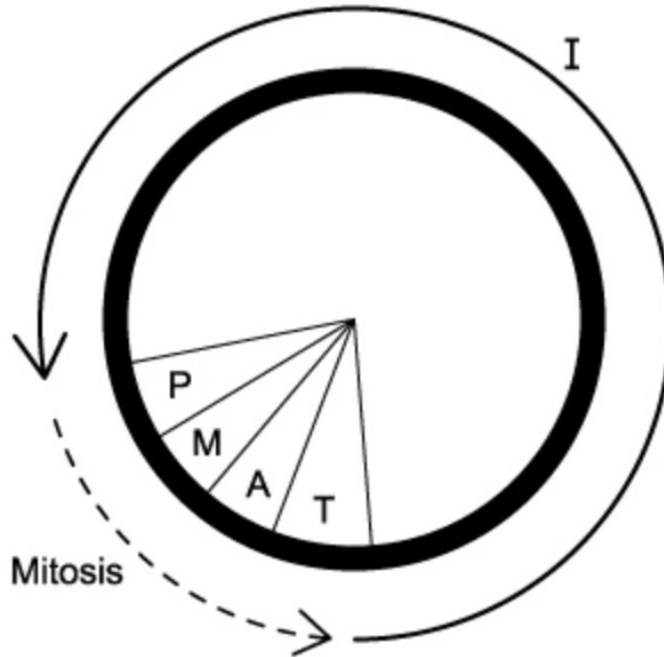
- c) Tumour-suppressing genes are a type of gene that controls cell division.

Identify the other type of gene, then explain how it controls cell division and why a mutation in this type of gene can lead to cancer.

[4 marks]

Question 4d

d) The diagram below shows a cell cycle.



Explain what occurs during the part of the cell cycle labelled I.

[2 marks]

Question 5a

One mark is available for clarity of communication throughout this question.

a) Describe what happens during cytokinesis in animal cells and plant cells.

[3 marks]

Question 5b

- b) Explain how the cell cycle is controlled.

[5 marks]

Question 5c

- c) Describe the events that take place during mitosis, including the name of the stage of mitosis during which each event occurs.

[7 marks]

