The mitotic cell cycle – AS 9700 Biology Nov 2022

1. Nov/2022/Paper_11/No.18

How many of these processes produce genetically identical cells?

- growth of plant roots
- replacement of dead human skin cells
- repair of damaged muscle tissue
- asexual reproduction of coral

A 1 **B** 2 **C** 3 **D** 4

2. Nov/2022/Paper_11/No.19

Which row shows the correct number of each component of a single chromosome at the end of prophase of mitosis?

	centromeres	chromatids	polynucleotide strands	telomeres
A	1	0	2	2
B	1	2	4	4
C	2	0	4	2
D	2	2	2	4

3. Nov/2022/Paper_11/No.20

Which processes occur during interphase?

1 DNA replication

2 microtubule organisation

3 synthesis of ribosomes

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

4. Nov/2022/Paper_11/No.21

Embryonic stem cells are able to replicate continuously.

What happens to the telomeres during repeated mitotic cell cycles of embryonic stem cells?

A Their lengths increase.

B Their lengths decrease.

C They are completely lost.

D They stay the same length.

5. Nov/2022/Paper_12/No.18

The enzyme telomerase prevents loss of telomeres after many mitotic cell cycles.

Which cells need to transcribe telomerase enzyme?

1 cancer cells

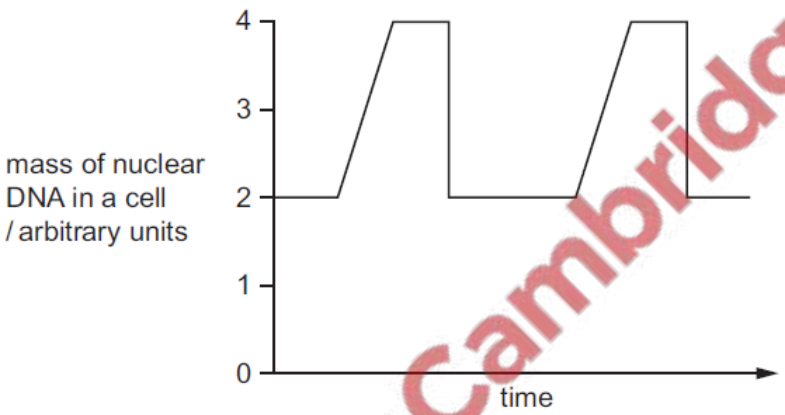
2 stem cells

3 activated memory B-lymphocytes

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

6. Nov/2022/Paper_12/No.19

Which processes that occur in the cell cycle are represented in the diagram?



A DNA replication and nuclear division only

B DNA replication, nuclear division and cytokinesis

C mitosis and cytokinesis

D mitosis only

7. Nov/2022/Paper_12/No.20

A gene codes for the production of a protein, p53, that binds to damaged DNA during interphase and prevents its replication. A carcinogen in cigarette smoke mutates the gene coding for the p53 protein, preventing production of the protein.

Which statement explains why this mutation may cause cancer?

A Cells with no p53 are able to undergo mitosis.

B Cells with no p53 replicate their damaged DNA.

C The carcinogen in cigarette smoke increases the rate of cell division.

D The mutated p53 causes uncontrolled cell division.

8. Nov/2022/Paper_12/No.21

Stained onion cells undergoing mitosis were observed using a microscope.

Which row is correct for mitosis in plant cells?

	prophase	metaphase	anaphase	telophase
A	centrioles visible	chromosomes pair up at the equator	two telomeres are visible on each chromatid	two nuclear membranes form
B	centromeres present	chromosomes align at the equator	chromosomes replicate to form chromatids	centrioles disappear
C	each chromosome is visible as two chromatids	centromeres attach to spindle fibres	chromatids separate and migrate to opposite poles	chromosomes decondense
D	spindle fibres formed by centrioles	centromeres attach to spindle fibres	chromatids are pulled apart by centrioles	spindle fibres form new nuclear membranes

9. Nov/2022/Paper_12/No.22

How many statements about semi-conservative replication of DNA in a eukaryotic cell are correct?

1 The process takes place in the cytoplasm.

2 An adenine nucleotide will line up against uracil on the template strand.

3 Each daughter molecule will contain half of the original DNA molecule.

4 If the DNA molecule contained 40% guanine nucleotides, each daughter molecule will contain 20% guanine nucleotides.

A 1 **B** 2 **C** 3 **D** 4

10. Nov/2022/Paper_13/No.18

Which row shows the correct number of each component in a single chromosome at the start of telophase of mitosis?

	centromeres	polynucleotide strands	telomeres
A	1	2	2
B	1	4	4
C	2	4	2
D	2	2	4

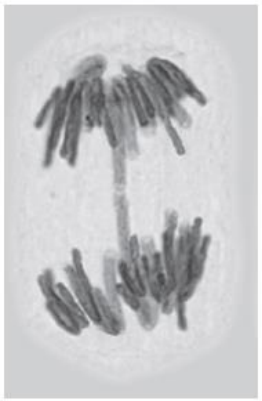
11. Nov/2022/Paper_13/No.19

The photomicrographs show cells in various stages of the cell cycle.

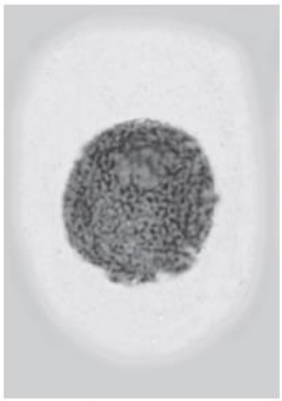
In which stage does semi-conservative replication of DNA take place?

A

B



C



D

12. Nov/2022/Paper_21/No.6(a_ b)

(a) Fig. 6.1 is a photomicrograph of plant cells in stages of the mitotic cell cycle.

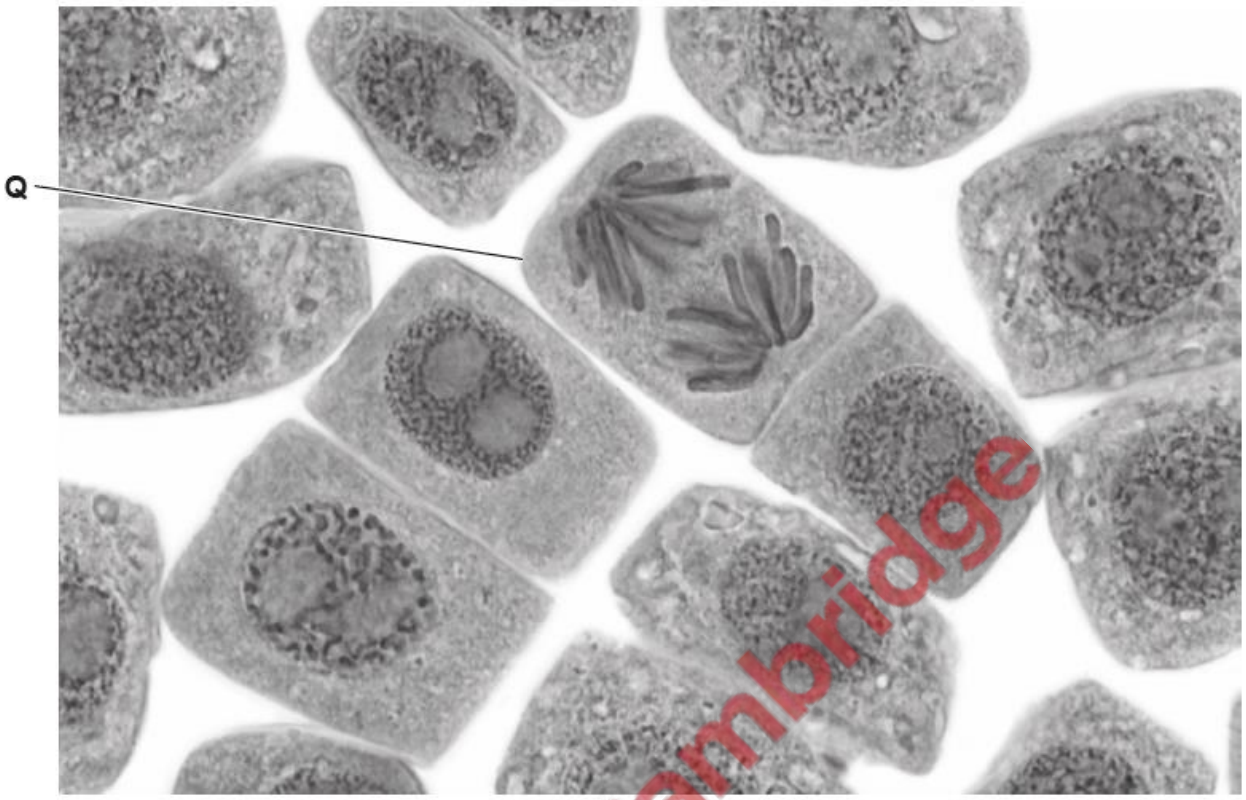


Fig. 6.1

(i) Name the stage of mitosis shown in cell **Q**.

..... [1]

(ii) Outline the roles of mitosis in a healthy plant.

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..... [2]

(b) Uncontrolled mitosis can cause cancer in humans.
Paclitaxel is a drug used in the treatment of some forms of cancer.

Researchers investigated the effect of Paclitaxel on the mitotic cell cycle of cancer cells.

- The cancer cells were grown for two days and then divided into groups.
- Each group was treated with a different concentration of Paclitaxel.

After 28 hours (one cell cycle):

- the percentage of cells in stages of mitosis was calculated
- the ratio of the number of cells in anaphase to the number of cells in metaphase was determined.

The results of the investigation are shown in Fig. 6.2.

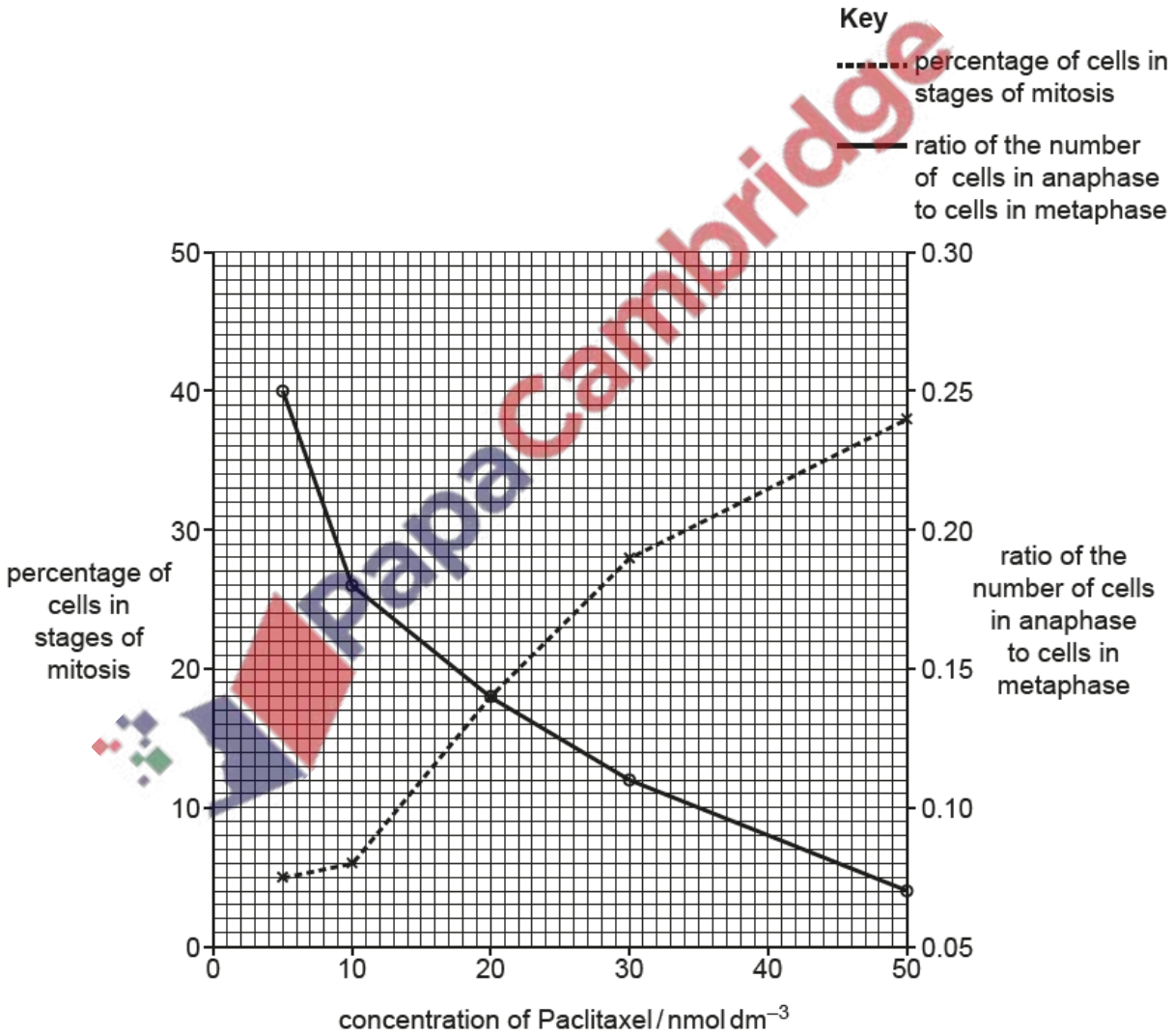

Fig. 6.2

With reference to Fig. 6.2, describe the results and suggest an explanation for the effect of Paclitaxel on the mitotic cell cycle.

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..... [4]

[Total: 7]

13. Nov/2022/Paper_23/No.4(a_ b)

The early development of an animal involves divisions of the zygote and daughter cells by mitosis to form an embryo consisting of genetically identical cells.

Fig. 4.1 shows several cells at various stages of the cell cycle in an embryo of whitefish, *Coregonus artedi*.

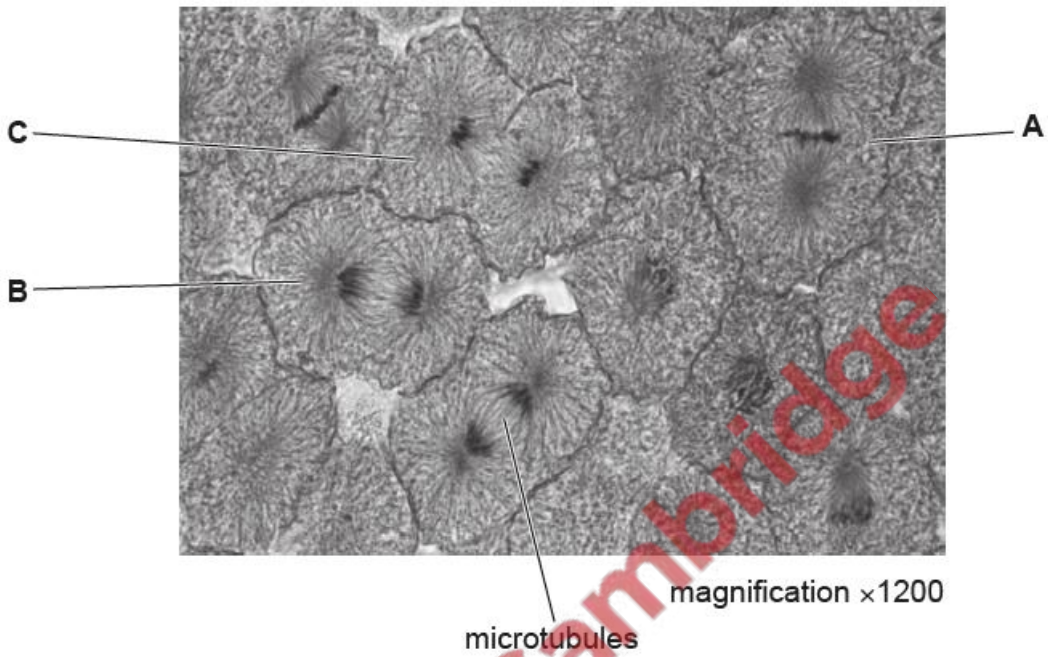

Fig. 4.1

(a) (i) Name the stage of mitosis in cell **A** and in cell **B**, shown in Fig. 4.1.

A .....

B .....

[2]

(ii) Fig. 4.1 shows microtubules in the cells that are dividing.

Describe the role of microtubules in mitosis.

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..... [3]

(iii) State what happens in cell **C**, shown in Fig. 4.1, until two new cells are formed.

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..... [3]

(b) The cells produced in the developing whitefish are genetically identical.

Identify **and** explain **two** events that occur during the cell cycle that lead to daughter cells being genetically identical.

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..... [3]

[Total: 11]