

Past-paper walk-through

Replication and division of nuclei and cells ■ 5.1

eXercise

Questions in this set

- 9700/11 N25 Q20 ■ 1 mark
- 9700/12 N25 Q21 ■ 1 mark
- 9700/13 N25 Q21 ■ 1 mark
- 9700/13 N25 Q22 ■ 1 mark
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Question 20

9700/11 N25 ■ Q20 ■ 1 mark

20 Telomeres become shorter during each cell cycle of a specialised cell.

In which phase of the cell cycle do telomeres shorten?

- A** cytokinesis
- B** G_1
- C** S
- D** G_2

Solution 20

Answer: **C**

Why

- Telomeres are the ends of the DNA molecules, so they can only shorten when the DNA is copied.
- DNA replication happens in the S phase of interphase.
- G1 and G2 are growth phases and cytokinesis divides the cytoplasm.

Question 21

9700/12 N25 ■ Q21 ■ 1 mark

21 Telomeres prevent the loss of genes during DNA replication.

Which row correctly shows cell types that contain telomeres?

	typical animal cell	typical plant cell	typical bacterial cell
A	✓	✓	✓
B	✓	✓	✗
C	✗	✗	✓
D	✓	✗	✗

key

✓ = present

✗ = **not** present

Question 21

Solution 21

Answer: **B**

Why

- Telomeres are the protective ends of *linear* chromosomes.
- Animal and plant cells both have linear chromosomes in a nucleus, so both have telomeres.
- A typical bacterial chromosome is circular, so it has no ends and no telomeres.

Question 21

9700/13 N25 ■ Q21 ■ 1 mark

21 What are roles of adult stem cells in humans?

- 1 repair other cells by mitosis
- 2 divide to replace cells in tissues
- 3 differentiate into a new organism

A 1 and 3

B 1 only

C 2 and 3

D 2 only

Solution 21

Answer: **D**

Why

- Adult stem cells divide by mitosis to replace worn-out cells in a tissue.
- They are multipotent, so they can only form a limited range of cell types.
- They cannot form a whole new organism – that needs a totipotent cell.

Question 22

9700/13 N25 ■ Q22 ■ 1 mark

22 Which statements are correct for the mitotic cell cycle?

- 1 DNA is replicated semi-conservatively during mitosis.
- 2 DNA is never changed from one generation of cells to the next generation.
- 3 The daughter cells at the end of a mitotic cell division have the potential to produce the same enzymes as the parent cell.
- 4 The same quantity of DNA is distributed to the nuclei of two new cells at the end of a mitotic cell division.

A 1 and 2

B 1 and 4

C 2 and 3

D 3 and 4

Solution 22

Answer: **D**

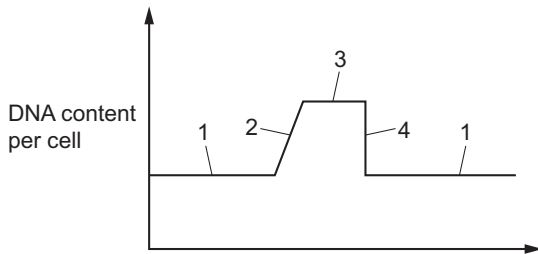
Why

- DNA replicates in interphase, not during mitosis itself, so statement 1 is wrong.
- Mutations can and do occur between generations of cells, so statement 2 is wrong.
- Mitosis produces genetically identical daughter cells, so statement 3 is right.

Question 19

9700/14 N25 ■ Q19 ■ 1 mark

19 The DNA content of a cell changes as the mitotic cell cycle proceeds through a series of stages.



Question 19

time

Which row correctly identifies when DNA replicates and when the nuclear envelope breaks down?

	DNA replicates	nuclear envelope breaks down
A	1	3
B	1	4
C	2	3
D	2	4

Solution 19

Answer: **C**

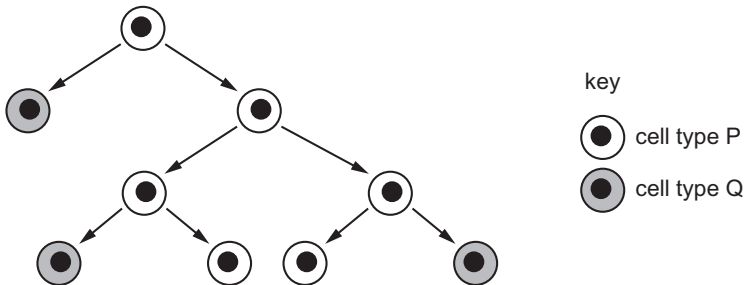
Why

- DNA content doubles during the S phase of interphase, so the rising section is replication.
- The nuclear envelope breaks down in prophase, once the DNA content is already doubled.
- The DNA content halves at cytokinesis, when the two daughter cells separate.

Question 20

9700/14 N25 ■ Q20 ■ 1 mark

20 The diagram shows three cycles of cell division from an original cell of cell type P in bone marrow. Some of the cells that form are cell type Q.



Question 20

not to scale

Which row correctly identifies cell type P and cell type Q?

	cell type P	cell type Q
A	cancer cell	differentiated cell
B	cancer cell	stem cell
C	differentiated cell	stem cell
D	stem cell	differentiated cell

Solution 20

Answer: **D**

Why

- Follow the branching: the cells that keep dividing are the stem cells.
- The cells that stop dividing have differentiated into a specialised type.
- Bone marrow contains adult stem cells that produce specialised blood cells.