

1. Fig. 7.1 below shows onion cells at various stages of mitosis.

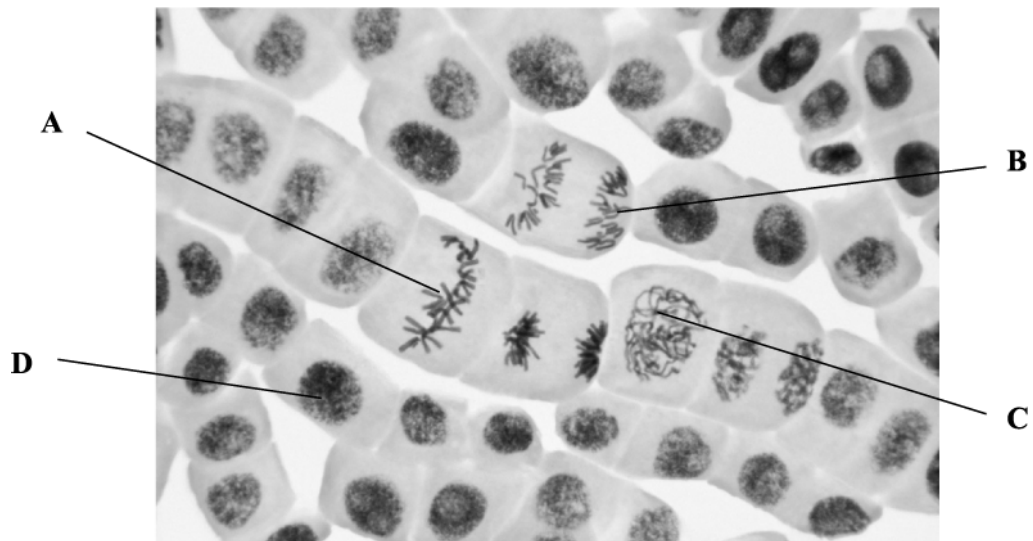


Fig. 7.1

Which cell shows the stage when the chromosomes attach to the spindle fibres?

Your answer

[1]

2. Which of the following events would **not** happen during mitosis in onion cells?

- A two nuclear envelopes will form
- B a cell plate will form
- C centrioles will move to opposite poles of the cell
- D the nuclear envelope will break down

Your answer

[1]

3. Flow cytometry can be used to determine the DNA content of cells during the cell cycle.

- A fluorescent dye is used, which binds to DNA.
- The greater the intensity of the fluorescence, the greater the mass of DNA present.

Fig. 7.1 shows a flow cytometer print-out from a population of dividing cells.

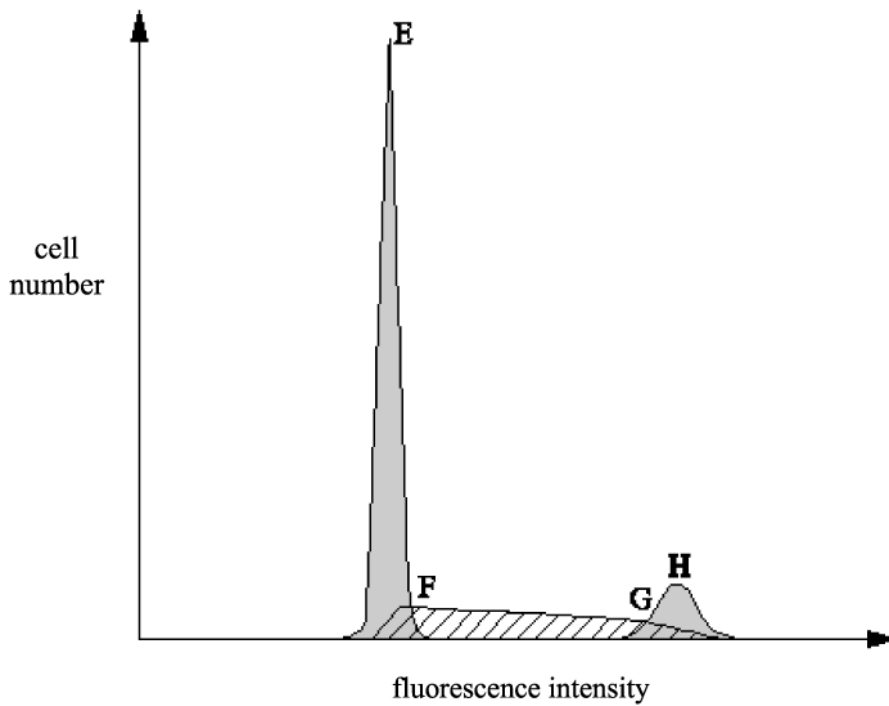


Fig. 7.1

Which of the following statements about the population of dividing cells is correct?

- A Region F to G shows the number of cells dividing by mitosis.
- B Peak H corresponds to cells in G1 phase.
- C Region F to G corresponds to cells in S phase.
- D Peak E corresponds to cells in G2 phase.

Your answer

[1]

4. Mesenchymal stromal cells (MSCs) are stem cells found in human wisdom teeth.

MSCs can differentiate into three cell types: chondrocytes, osteoblasts, and adipocytes.

To which category of stem cells do MSCs belong?

- A Pluripotent
- B Multipotent
- C Totipotent
- D Unipotent

Your answer

[1]

5. Some cells with damaged DNA undergo the process of apoptosis. Towards the end of the process, macrophages bind to a molecule on the cell.

What is the type of molecule to which macrophages bind?

- A Glycoprotein
- B Phospholipid
- C Glycolipid
- D Cholesterol

Your answer

[1]

6. Before a cell can undergo mitosis, the cell must duplicate its entire genome.

In which stage of the cell cycle is the genome duplicated?

- A Gap 1 (G1)
- B Cytokinesis
- C Synthesis (S)
- D Gap 2 (G2)

Your answer

[1]

7. Phosphatidylserine is a type of phospholipid found in some cell membranes. Phosphatidylserine has a role in the process of apoptosis.

Which of the options, A to D, describes the role of phosphatidylserine in the apoptosis of a damaged cell?

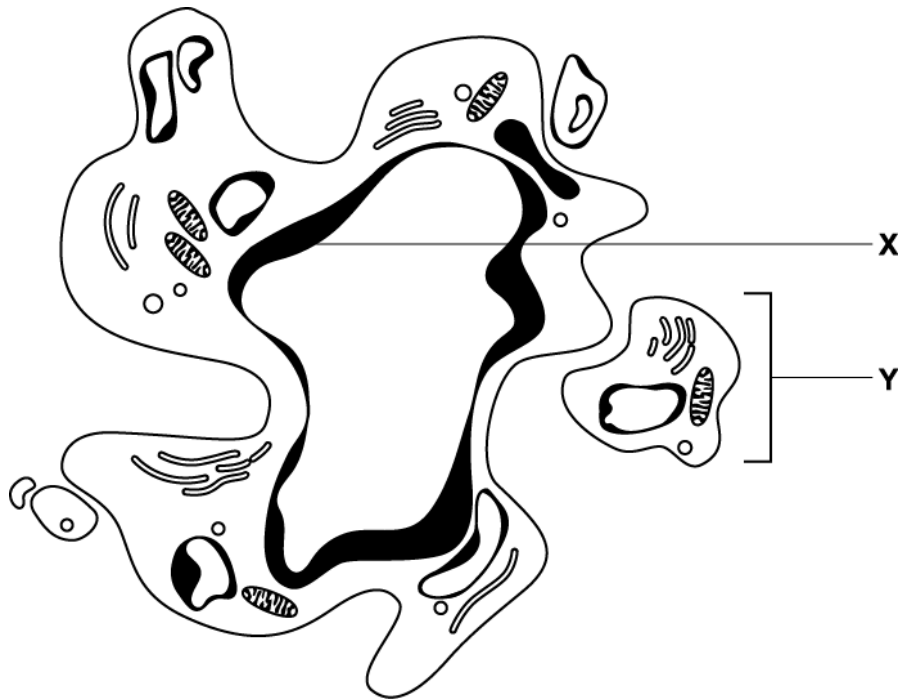
- A Binds to receptors on the plasma (cell surface) membrane of the damaged cell to allow formation of blebs.
- B Binds to receptors on the plasma (cell surface) membranes of macrophages to allow phagocytosis of apoptotic vesicles.
- C Binds to receptors on the plasma (cell surface) membranes of macrophages to allow formation of apoptotic vesicles.
- D Binds to receptors on the nuclear envelope of the damaged cell to allow breakdown of the nucleus.

Your answer

[1]

8. The diagram below shows a cell in a late stage of apoptosis.

Two features are labelled X and Y.



Which of the following statements is/are correct?

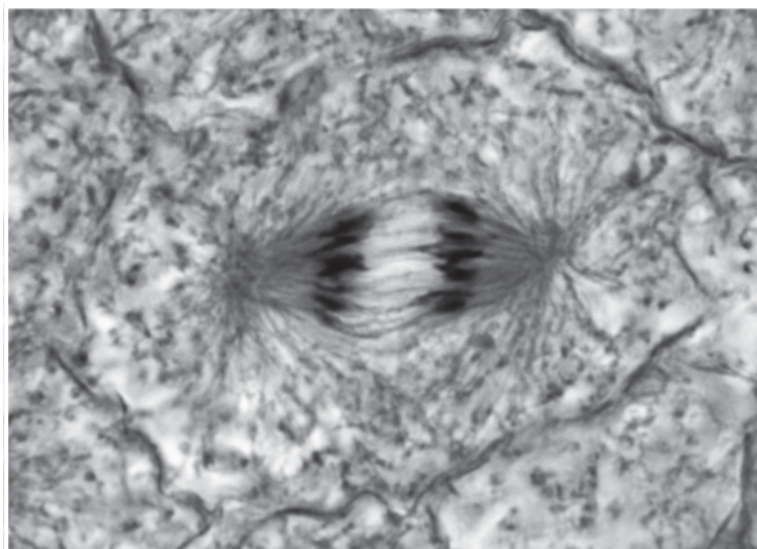
- 1 X is a complex of DNA and protein.
- 2 Phosphatidylserine is present on the surface of Y.
- 3 The contents of Y are digested in a lysosome.

- A 1, 2 and 3 are correct
B Only 1 and 2 are correct
C Only 2 and 3 are correct
D Only 1 is correct

Your answer

[1]

9. The micrograph below shows a cell in mitosis.



Which of the options, A to D, identifies the stage of mitosis shown in the micrograph?

- A anaphase
- B metaphase
- C prophase
- D telophase

Your answer

[1]

10. Embryonic stem cells can be used in cell replacement therapies. Embryonic stem cells can differentiate into any type of body cell but cannot form a whole organism.

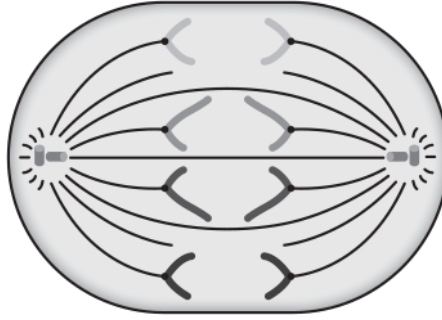
Which of the options, A to D, is the type of stem cell being described?

- A pluripotent
- B totipotent
- C unipotent
- D multipotent

Your answer

[1]

11. The diagram below shows a cell during cell division. The diploid number of this cell is four.



Which of the options, A to D, is correct?

- A the cell is in telophase 1 of meiosis
- B the cell is in telophase of mitosis
- C the cell is in anaphase of mitosis
- D the cell is in anaphase 1 of meiosis

Your answer

[1]

12. Here are three statements about the *BRCA1* gene:

- 1 Women with mutations in *BRCA1* are at increased risk of breast cancer.
- 2 *BRCA1* mutations can be inherited by males.
- 3 *BRCA1* is a proto-oncogene.

Which of the statements is/are correct?

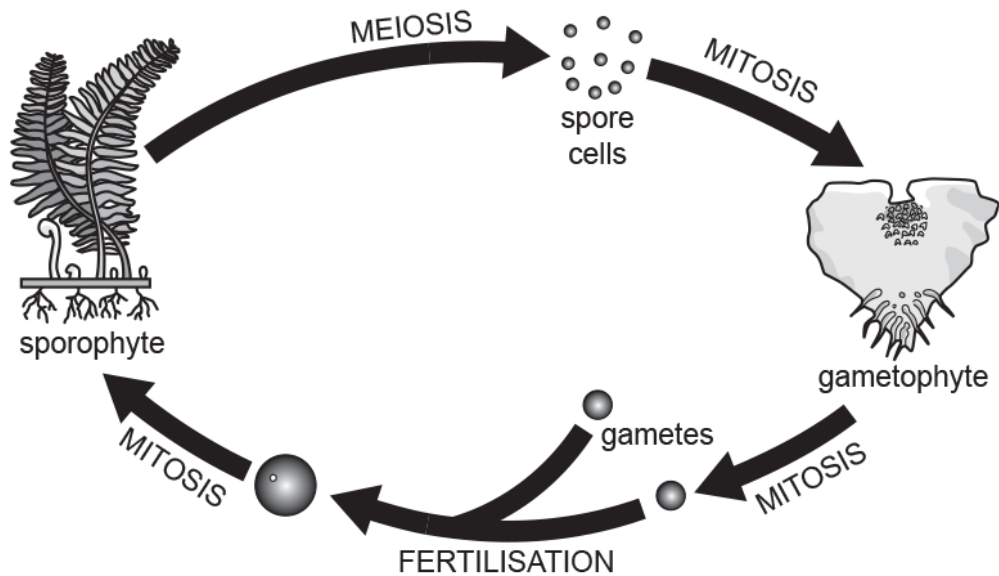
- A 1, 2 and 3 are correct
- B Only 1 and 2 are correct
- C Only 2 and 3 are correct
- D Only 1 is correct

Your answer

[1]

13. Plant life cycles show alternation of generations. The term alternation of generations is used to describe a process whereby mitosis and meiosis occur and the plant alternates between haploid and diploid forms during its life cycle.

Alternation of generations in the life cycle of a fern (*Polypodium* species) is shown in the diagram below.



Which of the rows, A to D, is correct?

	Sporophyte	Gametophyte	Spore cell	Gamete
A	diploid	haploid	haploid	haploid
B	haploid	diploid	haploid	haploid
C	diploid	haploid	diploid	diploid
D	diploid	diploid	haploid	haploid

Your answer

[1]

END OF QUESTION PAPER

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
1			A	1	
			Total	1	
2			C	1	
			Total	1	
3			C	1	
			Total	1	
4			B	1	
			Total	1	
5			B	1	
			Total	1	
6			C	1	<p>Examiner's Comments</p> <p>Although the word genome may have distracted some candidates, this was a straightforward recall question to start the paper.</p>
			Total	1	
7			B	1	<p>Examiner's Comments</p> <p>This question proved challenging for some and required careful reading to choose the most appropriate response for the role of phosphatidylserine in apoptosis.</p>
			Total	1	
8			A ✓	1	
			Total	1	
9			A ✓	1	<p>Examiner's Comments</p> <p>This question was straightforward recall and the majority of candidates chose the correct response.</p>
			Total	1	

Mark Scheme

Question		Answer/Indicative content	Marks	Guidance
10		A	1	Examiner's Comments There were many correct responses for the type of stem cell being described.
		Total	1	
11		C	1	Examiner's Comments In this question candidates had to process both textual and diagrammatic information about cell / nuclear division. Candidates who noticed and understood the reference to the diploid number of the cell being four were then able to apply this knowledge to analysing the diagram and choosing C as the correct option.
		Total	1	
12		B	1	Examiner's Comments Almost all candidates opted for either A or B. However, <i>BRCA1</i> is a tumor suppressor gene.
		Total	1	
13		A	1	Examiner's Comments In this question candidates had to process both textual and diagrammatic information about the consequences of mitosis and meiosis in the novel context of plant life cycles. Many candidates who could apply their knowledge to the information provided in the diagram went on to choose A as the correct option.
		Total	1	