

Mitosis and the cell cycle: practice questions

8 questions • 23 marks • mark scheme at the back

For Pearson Edexcel International AS Biology XBI11 and International A Level Biology YBI11. **A Level only** is IA2 content (Units 4 to 6), not needed for the International AS.

Name

Total / 23

1 UNIT 2 STYLE [1 mark]

Which statement describes what happens during anaphase of mitosis?

- A. ☐ Chromosomes condense and the nuclear envelope breaks down
- B. ☐ Chromosomes line up on the equator of the cell
- C. ☐ Centromeres divide and sister chromatids move to opposite poles
- D. ☐ Nuclear envelopes re-form around the chromosomes

2 UNIT 2 STYLE [1 mark]

A student counted 200 cells in a root tip squash. 30 of the cells were in mitosis. What was the mitotic index?

- A. ☐ 0.15
- B. ☐ 0.17
- C. ☐ 6.7
- D. ☐ 0.85

3 UNIT 2 STYLE [4 marks]

Describe the events that take place during interphase and prophase of the cell cycle.

4

UNIT 2 STYLE

[3 marks]

Explain why mitosis produces daughter cells that are genetically identical to the parent cell, and give two uses of mitosis in a multicellular organism.

5

UNIT 3 STYLE

[5 marks]

A student prepared a root tip squash to observe mitosis. Describe how she should prepare the slide and explain the purpose of three of the steps.

6

UNIT 3 STYLE

[3 marks]

Identify two hazards in the root tip squash practical and state how each risk can be reduced.

The table shows a student's counts of cells from one root tip squash. Calculate the mitotic index. Show your working.

Cells counted in several fields of view	
Stage	Number of cells
Prophase	18
Metaphase	9
Anaphase	6
Telophase	7
Interphase	280

Answer = ...

The mitotic index of region X of a root tip was 0.02 and of region Y was 0.18. Suggest what this shows and one way the student could make the results more reliable.

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

C C

2. [1]

A A ($30 \div 200 = 0.15$)

3. [4]

- cell grows / organelles and proteins made in G1 and G2 (1)
- DNA replicated in S phase (1)
- each chromosome then consists of two (sister) chromatids joined by a centromere (1)
- in prophase chromosomes condense / become visible (1)
- nuclear envelope breaks down / nucleolus disappears (1)
- centrioles move to the poles and spindle forms (1)
- Max 4

4. [3]

- DNA is replicated (semi-conservatively) in interphase, so the two sister chromatids are identical (1)
- sister chromatids are separated, so each daughter cell receives one copy of every chromosome / same number of chromosomes as the parent (1)
- any two uses from: growth / repair / replacement of cells / asexual reproduction (1)
- Max 3

5. [5]

- cut 2 to 3 mm from the end of the root tip (1)
- warm in (1 M) hydrochloric acid to separate / fix the cells (1)
- stain with acetic orcein / toluidine blue to show the chromosomes (1)
- squash under a coverslip to make a layer one cell thick, so that light passes through (1)
- do not slide the coverslip, to avoid damaging / smearing the cells (1)
- root tip used because it has meristem cells that divide (1)
- Max 5

6. [3]

- hydrochloric acid is an irritant / corrosive (1)
- wear eye protection and rinse spills with water (1)
- hot water bath can scald (1)
- use a thermostatically controlled bath, keep it away from the edge of the bench (1)
- scalpel sharp (1)
- cut on a hard surface away from the body (1)
- Max 3

7. [3]

- total cells in mitosis = $18 + 9 + 6 + 7 = 40$ (1)
- total cells = $40 + 280 = 320$ (1)
- mitotic index = $40 \div 320 = 0.125$ / 12.5% (1)
- accept 0.13 / 13%; do not accept $40 \div 280 = 0.14$

8. [3]

- Y has a higher proportion of cells dividing / is the meristem (1)
- X is a region where cells are elongating / not dividing (1)
- count more cells / more fields of view / more root tips (1)
- Max 3