

GCSE Combined Science: Trilogy

Worksheet: Mitosis and the cell cycle

TIME 30 min	TOTAL 30 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Mitosis and the cell cycle

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

A student looked at cells from an onion root tip using a light microscope. The student counted 200 cells. 24 of these cells were in the mitosis stage of the cell cycle.

0 1 . 1	Calculate the percentage of the cells that were in the mitosis stage.

Percentage = %

[2 marks]

0 1 . 2	Describe what happens to the chromosomes during the mitosis stage.

[1 mark]

0 2

Cells divide in a series of stages called the cell cycle.

0 2 . 1

The statements describe three stages of the cell cycle.

A One set of chromosomes is pulled to each end of the cell and the nucleus divides.

B The cell grows, the number of sub-cellular structures increases and the DNA replicates.

C The cytoplasm and the cell membrane divide to form two cells.

Write the letters **A**, **B** and **C** in the order in which the stages happen.

Start with the stage that happens first after a new cell has formed.

[1 mark]

0 2 . 2

Which type of cell division produces two genetically identical cells?

Tick (✓) **one** box.

Differentiation

☐

Fertilisation

☐

Meiosis

☐

Mitosis

☐

[1 mark]

0 2 . 3

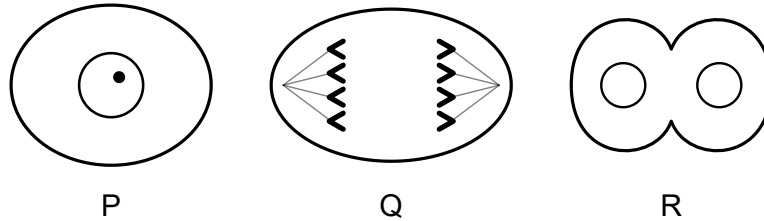
Give **two** reasons why mitosis is important in multicellular organisms.

[2 marks]

0 3

Figure 1 shows drawings of cells at three different stages of the cell cycle.

Figure 1



0 3 . 1

Write the letters **P**, **Q** and **R** in the order in which the stages happen. Start with the stage that happens first after a new cell has formed.

.....

.....

[1 mark]

0 3 . 2

Which drawing, **P**, **Q** or **R**, shows chromosomes being pulled to each end of the cell?

.....

.....

.....

[1 mark]

0 3 . 3

Which **two** things happen during the stage shown in drawing **P**?

Tick (✓) **two** boxes.

The cell grows.

The cytoplasm divides.

The DNA replicates.

The nucleus divides.

Two cells separate.

☐

☐

☐

☐

☐

[2 marks]

0 3 . 4

Cells near the tip of a plant root divide by mitosis.
Give the reason why these cells divide.

.....

.....

[1 mark]

0 4

A student looked at cells from a culture of human skin cells. The student counted 400 cells, of which 32 were in the mitosis stage.
One complete cell cycle takes 30 hours. The number of cells in each stage is proportional to the time spent in that stage.

0 4 . 1

Calculate the time the cells spend in the mitosis stage.
Give your answer in minutes.

.....

.....

.....

.....

.....

Time = minutes

[3 marks]

0 5

A student investigated the percentage of cells that were dividing in the root tip of a garlic clove. The student:

1. cut 5 mm from the tip of a root
2. warmed the root tip in dilute hydrochloric acid for 5 minutes to soften it
3. put the root tip on a slide and added a stain
4. put a coverslip on top and pressed down to squash the tissue into a thin layer
5. counted the number of cells in the mitosis stage and the total number of cells in the field of view.

0 5 . 1

Suggest why the student squashed the tissue into a thin layer.

[1 mark]

0 5 . 2

Suggest why the student added a stain.

[1 mark]

0 5 . 3

Give **one** hazard in this method and describe how the student could reduce the risk from this hazard.

[2 marks]

0 5 . 4

The student counted 36 cells in the mitosis stage and 480 cells in total.
Calculate the percentage of cells in the mitosis stage.

.....

.....

.....

.....

Percentage = %

[2 marks]

0 5 . 5

The student then used one root tip from a garlic clove that had been treated with a chemical. In this root tip, 13.5% of the cells were in the mitosis stage.
The student concluded that the chemical makes cells divide faster.
Give **two** reasons why this conclusion may not be valid.

.....

.....

.....

.....

[2 marks]

0 6

Before a cell divides by mitosis, it goes through a stage of growth. During this stage the number of ribosomes and mitochondria increases and the DNA replicates.

0 6 . 1

Explain why the number of ribosomes and mitochondria increases before the cell divides.

.....

.....

.....

.....

[2 marks]

0 6 . 2

Explain why the DNA must replicate before the cell divides.

.....

.....

.....

.....

[2 marks]

0 6 . 3

Describe what happens to the chromosomes and the nucleus during the mitosis stage of the cell cycle.

.....

.....

.....

.....

[2 marks]

0 6 . 4

Describe the final stage of the cell cycle.

.....

.....

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Mitosis and the cell cycle · 30 marks

Question 1 (3 marks)

01.1 [2 marks]

Answer: 12%

- $24 \div 200 \times 100$ (1)
 - 12 (%) (1)
-

01.2 [1 mark]

- one set of chromosomes is pulled to each end of the cell (and the nucleus divides) (1)
-

Question 2 (4 marks)

02.1 [1 mark]

Answer: B, A, C

- $B \rightarrow A \rightarrow C$ (1)
-

02.2 [1 mark]

Correct: Mitosis

02.3 [2 marks]

- growth / development (1)
- repair (of damaged tissue) (1)
- replacement (of worn-out / dead cells) (1)
- asexual reproduction (1)

Any 2 of the points above.

Notes: 'Growth' and 'development' given together score only 1 mark.

Question 3 (5 marks)

03.1 [1 mark]

Answer: P, Q, R

- $P \rightarrow Q \rightarrow R$ (1)

03.2 [1 mark]

Answer: Q

- Q (1)

03.3 [2 marks]

Correct: The cell grows.; The DNA replicates.

03.4 [1 mark]

- for growth (of the root) (1)

Notes: Allow 'to produce new cells that can differentiate'.

Question 4 (3 marks)

04.1 [3 marks]

Answer: 144 minutes

- $32 \div 400 = 0.08$ (1)
- $0.08 \times 30 = 2.4$ (hours) (1)
- 144 (minutes) (1)

Notes: An answer of 2.4 hours scores 2 marks.

Question 5 (8 marks)

05.1 [1 mark]

- so that the cells form a single layer / do not overlap / so that light passes through, so each cell and its chromosomes can be seen clearly (1)

05.2 [1 mark]

- to make the chromosomes visible / easier to see (1)

05.3 [2 marks]

- hydrochloric acid is corrosive / an irritant (1)
- wear eye protection / gloves (1)

Notes: Allow: a sharp scalpel – cut away from the fingers onto a tile; broken glass when pressing the coverslip – press gently through a paper towel. The precaution must match the hazard.

05.4 [2 marks]

Answer: 7.5%

- $36 \div 480 \times 100$ (1)
- 7.5 (%) (1)

05.5 [2 marks]

- only one root tip was used for each condition / no repeats (1)
- root tips vary naturally, e.g. different ages / different distances from the tip were viewed (1)
- only one field of view was counted (1)
- other variables, e.g. temperature, may not have been kept the same (1)

Any 2 of the points above.

Question 6 (7 marks)

06.1 [2 marks]

- each of the two new cells needs its own ribosomes and mitochondria (1)
 - ribosomes are needed to make proteins / mitochondria are needed to release energy by respiration (1)
-

06.2 [2 marks]

- to make two copies of each chromosome (1)
 - so that each new cell receives a full / identical set of chromosomes (1)
-

06.3 [2 marks]

- one set of chromosomes is pulled to each end of the cell (1)
 - the nucleus divides (1)
-

06.4 [1 mark]

- the cytoplasm and cell membrane divide to form two identical cells (1)
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