

1 The cell cycle is involved in the production of new cells.

The table below shows the time spent in each stage for a cell with a cell cycle of 24 hours.

Stage of cell cycle	Time / hours
Production of proteins and organelles (G1 phase)	10
S phase	8
Production of proteins and organelles (G2 phase)	4
Mitosis	1
Cytokinesis	1

(a) Describe the **end result** of each of the following stages of this cell cycle.

(i) Mitosis

(2)

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(ii) S phase

(2)

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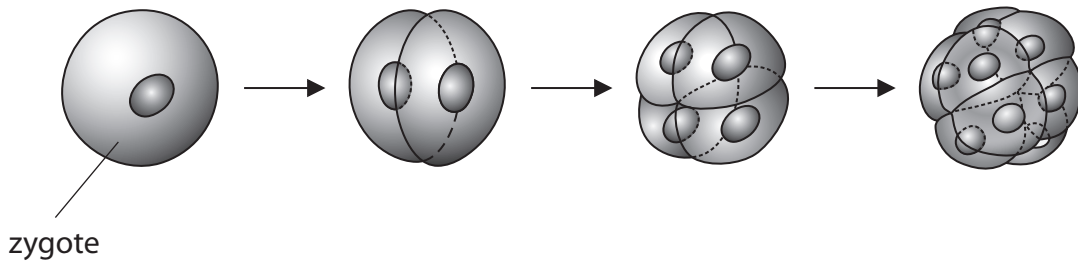
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(b) After fertilisation, a zygote divides rapidly to produce more cells.

The diagram below shows a zygote and the results of the first three cell cycles.



(i) State the number of cells that would be present after **three** more cell cycles.

Place a cross ☒ in the box next to the correct answer.

(1)

- A 16
- B 32
- C 64
- D 128

(ii) The first few cell cycles may be as short as 30 minutes. They do not have G1 or G2 phases, only alternating S phases and mitosis.

Using information from the table and your own knowledge, suggest why the cells produced become smaller after each cell cycle.

(2)

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2 The root tip squash procedure can be used to observe cells undergoing mitosis.

(a) Explain the role of mitosis in the development of roots.

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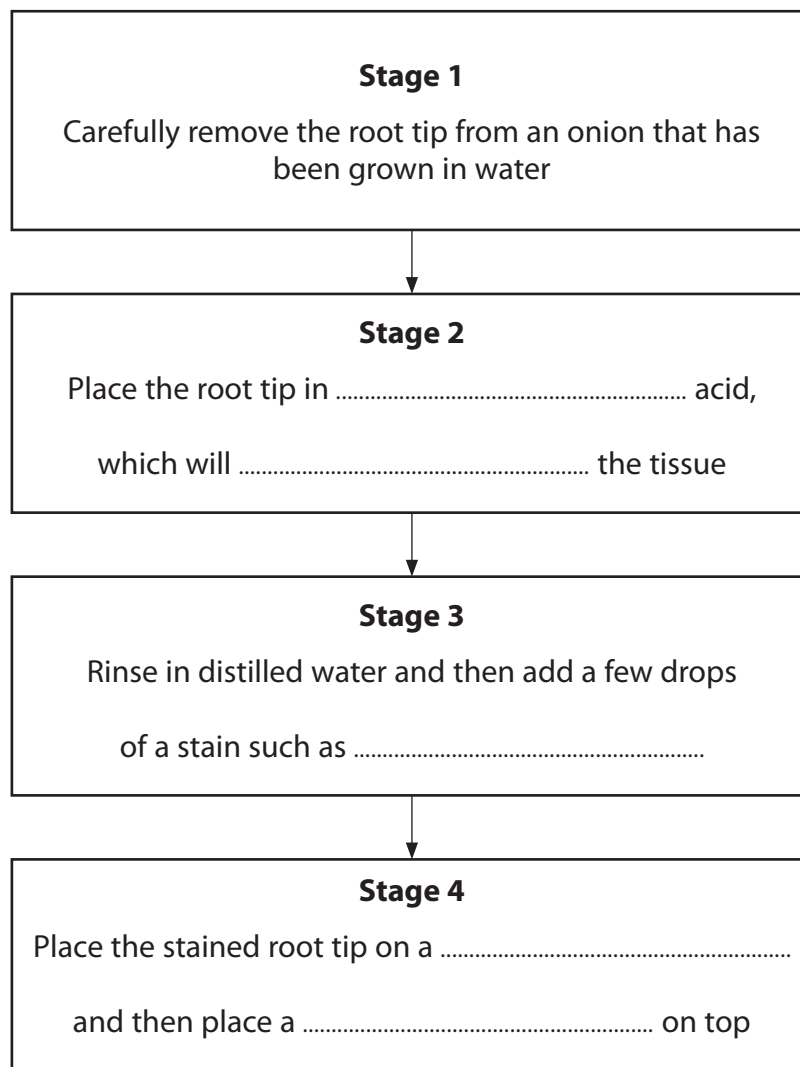
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(b) (i) The flow chart below describes the stages involved in staining a root tip squash to show mitosis.

Complete the flow chart by writing the most appropriate word or words on the dotted lines.

(3)



(ii) Describe **one** safety precaution that should be taken when carrying out this procedure.

(1)

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*(c) Following mitosis, some cells undergo differentiation to become specialised tissues, such as xylem.

Explain how cells differentiate to become specialised tissues.

(4)

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(d) Similar staining techniques can be used to observe cells undergoing meiosis.

(i) Name a process that may be observed in cells undergoing meiosis but **not** mitosis.

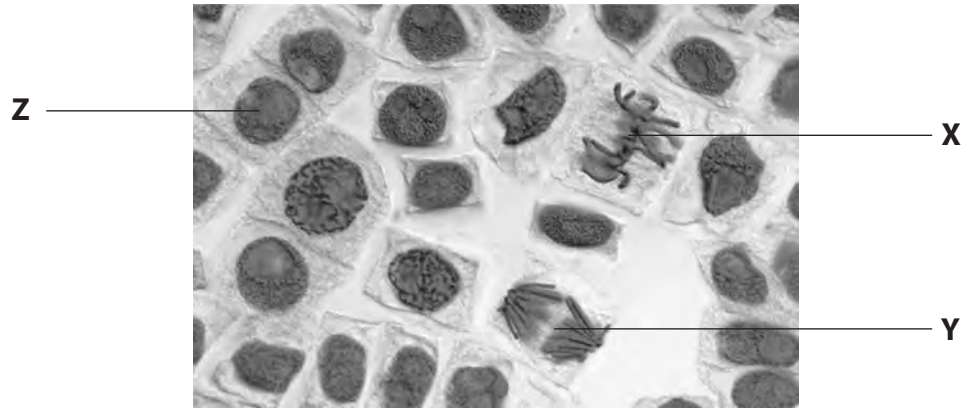
(1)

(ii) Explain how meiosis can give rise to genetic variation in the gametes produced.

(2)

(Total for Question 2 = 13 marks)

3 The photograph below shows plant cells at different stages in the cell cycle.



Magnification $\times 600$
Herve Conge,ISM / Science Photo library

(a) Name the stage of mitosis shown by each of the cells labelled **X** and **Y**.

(2)

X

Y

(b) Describe what occurs during prophase.

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(c) Cell **Z** is not undergoing mitosis.

Suggest which stage of the cell cycle it is undergoing.
Give a reason for your answer.

(2)

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(Total for Question 3 = 8 marks)

4 The photograph below shows a plant cell undergoing mitosis.



Magnification $\times 100$

(a) (i) Place a cross in the box () next to the stage of mitosis shown in the photograph.

(1)

A interphase

B metaphase

C prophase

D telophase

(ii) Explain the reason for your answer.

(2)

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(b) Place a cross in the box () which correctly identifies the stage in which DNA is replicated.

(1)

A anaphase

B interphase

C metaphase

D telophase

* (c) Describe what happens inside an animal cell as it undergoes the last stage of mitosis and forms two new cells.

(4)

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(Total for Question 4 = 8 marks)