Exercise walk-through

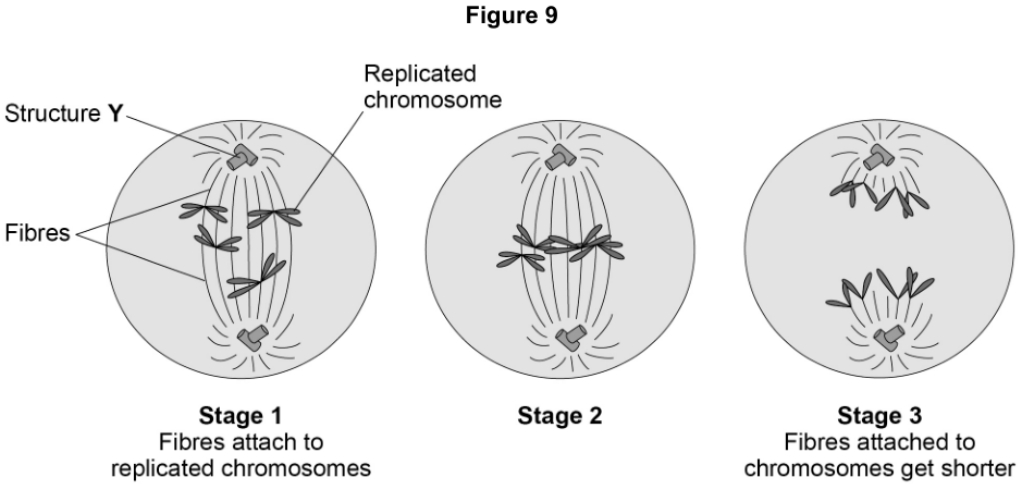
1.2
Cell division and stem cells (4.1.2)

AQA · GCSE · Biology

Cell division

- The **nucleus** contains **chromosomes** , long molecules of DNA.
- Each chromosome carries many **genes** .
- In body cells **chromosomes** are found in pairs: human body cells have 23 pairs, 46 chromosomes in all.
- **The cell cycle.** The **cell cycle** has three stages:

Figure: Cell division



- Fibres pull the copied **chromosomes** apart during **mitosis** (AQA GCSE Biology Paper 1H, June 2024, Figure 9)
- Match each part of the diagram to the text.

Stem cells

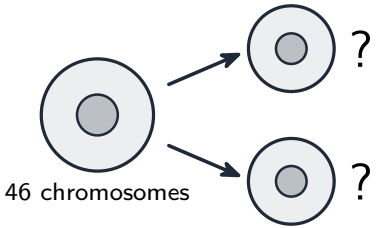
- A **stem cell** is **undifferentiated**: it can divide to make more stem cells and can differentiate into other kinds of cell.
- **Uses. Embryonic stem cells** might one day replace faulty cells, for example insulin-making cells in diabetes or nerve cells in paralysis.

Stem cells (2)

- In **therapeutic cloning** , an embryo is made with the same **genes** as the patient, so its stem cells are not **rejected** by the patient's immune system.
- **Meristem** cells are used to clone plants quickly and cheaply, to save rare species from extinction, or to produce many identical crop plants with useful features such as disease resistance.

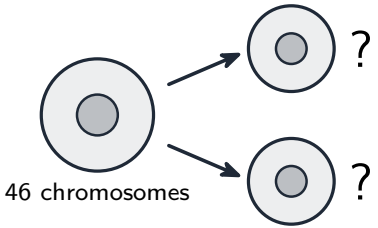
Exercise 2.1

2.1 A human body cell has 46 chromosomes. It divides by mitosis. How many chromosomes are in each new cell? How do the new cells compare with the parent cell? [2]



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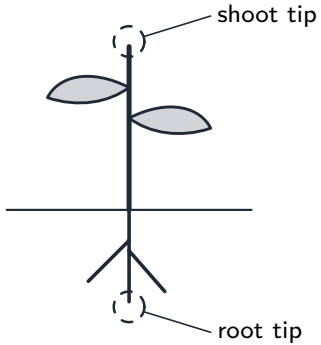


2.1

- **46**; they are genetically identical to the parent cell

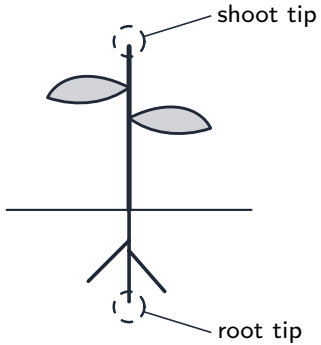
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2.2 Where are stem cells found in a plant? What can they become? [2]



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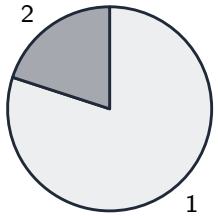


2.2

- in the meristems at the tips of the shoots and roots; any type of plant cell

Exercise 3.1

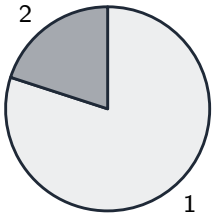
3.1 The diagram shows the cell cycle. Describe what happens in the cell during stages 1 and 2. [3]



the cycle goes clockwise

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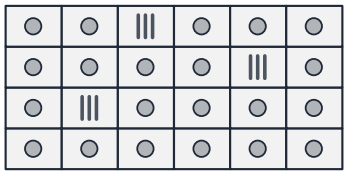
- stage 1: the cell grows and makes more ribosomes and mitochondria
- the DNA is copied, so each chromosome has two copies
- stage 2 (mitosis): one set of chromosomes is pulled to each end, then the cytoplasm and cell membrane divide to make two cells

Exercise 3.2 (a)

3.2 A student looks at cells from an onion root tip with a microscope. She counts the cells that are dividing.

cells	not dividing	in mitosis	total
number	172	28	200

(a) Calculate the percentage of cells in mitosis. [2]

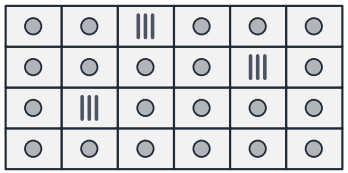


Exercise 3.2 (a)

3.2 A student looks at cells from an onion root tip with a microscope. She counts the cells that are dividing.

cells	not dividing	in mitosis	total
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(a) Calculate the percentage of cells in mitosis. [2]



(a) $\frac{28}{200} \times 100 = \mathbf{14}\%$

Exercise 3.2 (b)

3.2 A student looks at cells from an onion root tip with a microscope. She counts the cells that are dividing.

cells	not dividing	in mitosis	total
number	172	28	200

(b) The cell cycle in these cells takes 16 hours. Calculate how long the cells spend in mitosis. [3]

Exercise 3.2 (b)

3.2 A student looks at cells from an onion root tip with a microscope. She counts the cells that are dividing.

cells	**not dividing**	**in mitosis**	**total**
number	172	28	200

(b) The cell cycle in these cells takes 16 hours. Calculate how long the cells spend in mitosis. [3]

(b) fraction in mitosis $= 0.14$; 0.14×16; $=$ **2.2** hours

Exercise 3.2 (c)

3.2 A student looks at cells from an onion root tip with a microscope. She counts the cells that are dividing.

cells	not dividing	in mitosis	total
number	172	28	200

(c) Explain why many cells are dividing in a root tip. [2]

Exercise 3.2 (c)

3.2 A student looks at cells from an onion root tip with a microscope. She counts the cells that are dividing.

cells	not dividing	in mitosis	total
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(c) Explain why many cells are dividing in a root tip. [2]

(c) the root tip has meristem tissue; the cells divide by mitosis so the root can grow

Exercise 3.2 (d)

3.2 A student looks at cells from an onion root tip with a microscope. She counts the cells that are dividing.

cells	not dividing	in mitosis	total
number	172	28	200

(d) Scientists hope to use stem cells from embryos to treat type 1 diabetes. Evaluate the use of embryonic stem cells to treat diseases. [6]

Exercise 3.2 (d)

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(d) Scientists hope to use stem cells from embryos to treat type 1 diabetes. Evaluate the use of embryonic stem cells to treat diseases. [6]

(d) points to include:

- embryonic stem cells can divide and become any type of cell, such as insulin-making cells
- they could cure diseases with no other cure, such as diabetes or paralysis
- with therapeutic cloning the cells have the patient's own genes, so they are not rejected
- risks: cells grown in the lab could carry a virus; the cells might divide out of control
- ethical issues: some people think an embryo is a potential life and should not be destroyed
- adult stem cells avoid the embryo problem but can become only a few types of cell; a conclusion that weighs these

Levels: **5–6** a full, logical answer with correct biology and correct terms; **3–4** several correct points, partly linked; **1–2** one or two relevant points.