

5 Chromosomes and mitosis – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	Write it 3 times (English)
chromosomes	_____
genes	_____
DNA	_____
chromosome	_____
histones	_____
nucleus	_____
replication	_____
sister chromatids	_____
centromere	_____
telomeres	_____
cell cycle	_____
interphase	_____
mitosis	_____
cytokinesis	_____
stem cell	_____

differentiate

Recall

At IGCSE you learned that **chromosomes** in the nucleus carry the **genes**, and that cells divide to make new cells.

- **DNA** is the molecule that stores the genetic information.
- A cell copies its DNA before it divides.

Nothing here is harder than IGCSE – it just adds the right words and a clearer picture.

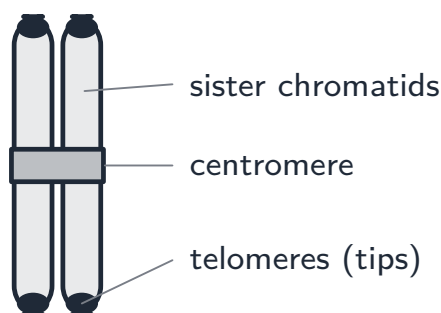
New ideas

Read these first, then do the Practice.

■ 1 The structure of a chromosome

A **chromosome** is one long molecule of DNA wound tightly around proteins called **histones**. Winding it up lets a huge length fit inside the **nucleus**.

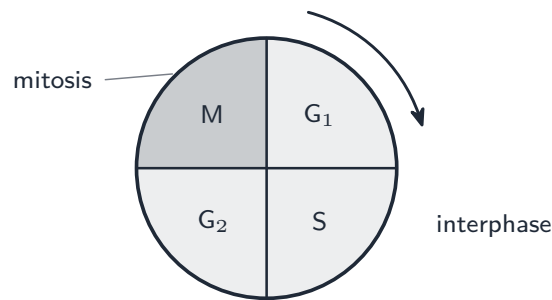
Before a cell divides, its DNA is copied (**replication**). Each chromosome is then two identical copies – the **sister chromatids** – joined at the **centromere**. The tips are capped by **telomeres**.



■ 2 The cell cycle

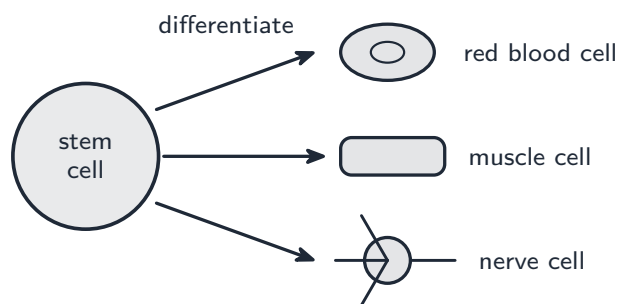
The **cell cycle** is the full life of a cell from one division to the next:

1. **interphase** – the longest part: the cell grows, then copies its DNA (replication), then grows again.
2. **mitosis** – the nucleus divides into two identical nuclei.
3. **cytokinesis** – the rest of the cell splits into two.



■ 3 Telomeres and stem cells

- **telomeres** carry no genes. A little is lost at each division, so the telomeres shorten **instead of** important genes.
- a **stem cell** is an unspecialised cell that keeps dividing and can **differentiate** (change) into many specialised cell types.



Watch out: after replication a chromosome is *two* sister chromatids joined at the centromere – but it is still *one* chromosome until anaphase separates them. Telomeres are sacrificed at each division so the gene-carrying DNA is not lost.

Practice

Try these in order.

5.1 A chromosome is DNA wound around proteins. Name those proteins. [1]

5.2 After replication a chromosome has two identical parts. Name (a) these parts, (b) the point where they are joined. [2]

5.3 Put the cell cycle in order: mitosis, cytokinesis, interphase. [1]

5.4 In which stage of the cell cycle is the DNA copied? [1]

5.5 Telomeres carry no genes. Explain why this is useful when DNA is copied. [2]

5.6 What is a stem cell? [2]

5.7 Challenge. Most body cells can divide only a limited number of times before they stop. Suggest how the shortening of telomeres could explain this limit. [2]
