

Mitosis and meiosis

Revision notes • Mitosis gives genetically identical cells for growth and repair; stem cells; meiosis halves the chromosome number to make gametes.

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Mitosis and meiosis **Spec 17.2, 17.3** **Supplement**

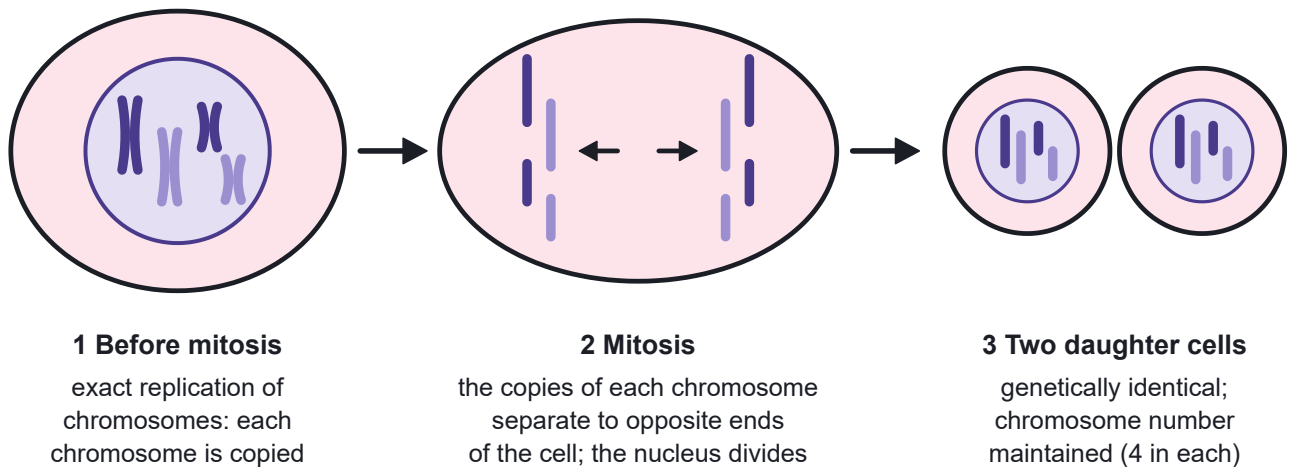
Mitosis **Spec 17.2.1, 17.2.2, 17.2.3, 17.2.4**

Mitosis

Nuclear division giving rise to genetically identical cells.

Before a cell divides by mitosis, the chromosomes are copied. The **exact replication of chromosomes** occurs before mitosis, so each chromosome is made of two identical copies. During mitosis the **copies of chromosomes separate**, and one copy goes into each new nucleus. This maintains the **chromosome number** in each daughter cell.

Supplement



Chromosomes are copied before mitosis, then the copies separate, so each daughter cell keeps the **same chromosome number**.

The two daughter cells have the same number of chromosomes and the same genes as the parent cell. A diploid cell divides to make two diploid cells.

The role of mitosis

Roles of mitosis	
Role	Explanation
Growth	more cells are made so that the organism gets bigger
Repair of damaged tissues	new cells replace those that are damaged
Replacement of cells	cells such as skin cells are lost and replaced all the time
Asexual reproduction	one parent makes offspring that are genetically identical to it

Exam tip: Use the phrase 'genetically identical' for mitosis. You do not need the names of the stages of mitosis.

Stem cells Spec 17.2.5

Stem cell	An unspecialised cell that divides by mitosis to produce daughter cells that can become specialised for specific functions.
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Stem cells are **unspecialised**. They divide by **mitosis** to make daughter cells. Some of these daughter cells stay as stem cells, so the supply is not used up. Others become **specialised** for specific functions, such as a red blood cell or a nerve cell.

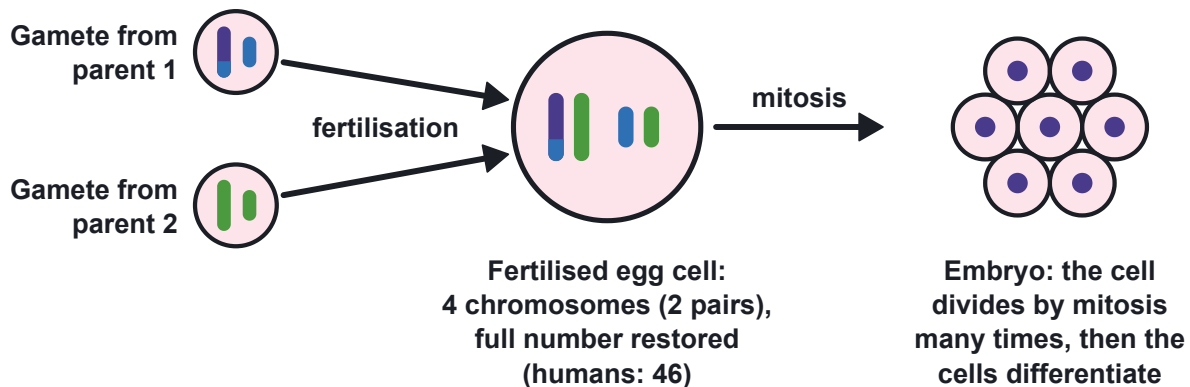
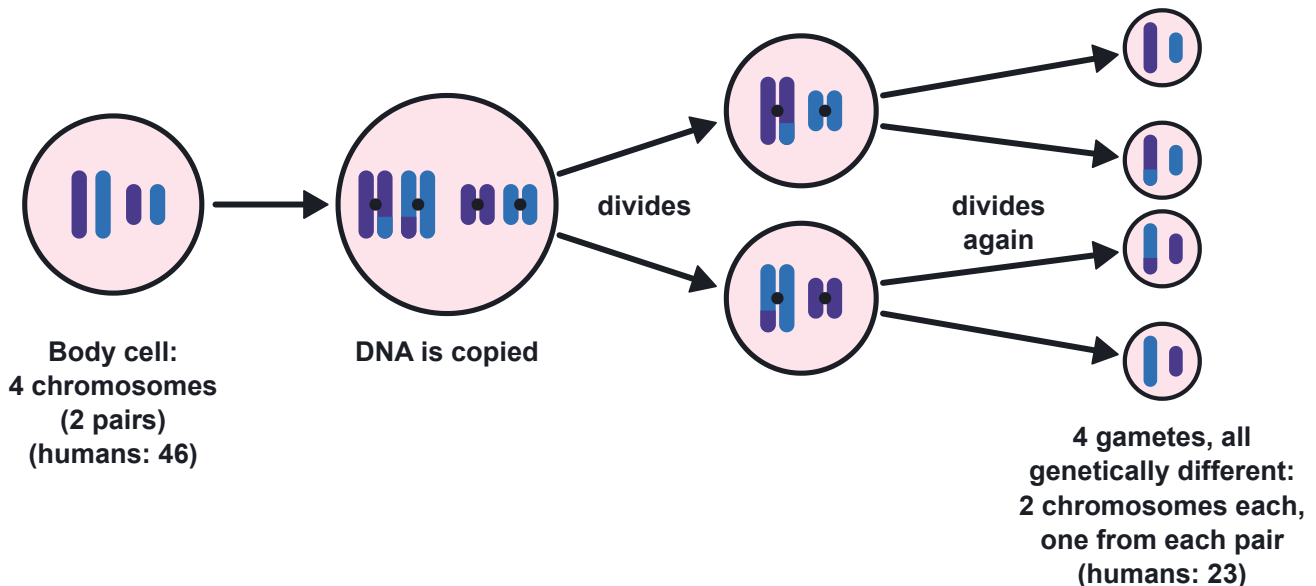
Cells become specialised because only some of their genes are expressed. This links to gene expression: the genes that are switched on decide which proteins the cell makes, and so what the cell can do.

Common mistake: Do not say that stem cells 'turn into' any cell. Say that stem cells divide by mitosis and the daughter cells can become specialised.

Meiosis Spec 17.3.1, 17.3.2

Meiosis is involved in the production of gametes. It takes place in the reproductive organs (the testes and ovaries in humans).

Meiosis is a **reduction division**. The chromosome number is **halved from diploid to haploid**. It results in cells that are **genetically different** from each other and from the parent cell.



Meiosis **halves** the chromosome number in gametes; fertilisation **restores** the full number, then mitosis builds the embryo.

In humans, meiosis makes gametes with 23 chromosomes from a cell with 46 chromosomes. When a sperm fertilises an egg, the full number of 46 chromosomes is restored in the zygote. If gametes were diploid, the chromosome number would double in every generation.

Mitosis compared with meiosis		
	Mitosis	Meiosis
Number of daughter cells	2	4
Chromosome number in daughter cells	same as parent (diploid)	half of parent (haploid)
Genetically	identical to the parent	different from each other and the parent
Used for	growth, repair, replacement, asexual reproduction	production of gametes

Exam tip: You do not need the stages of meiosis. Learn the keywords: gametes, reduction division, diploid to haploid, genetically different.

Quick check

1. **Supplement** Define mitosis.
2. **Supplement** State four roles of mitosis.
3. **Supplement** What happens to the chromosomes before mitosis?
4. **Supplement** What is a stem cell?
5. **Supplement** What happens to the chromosome number in meiosis?

Quick check answers

Mitosis and meiosis

1. Nuclear division giving rise to genetically identical cells.
2. Growth, repair of damaged tissues, replacement of cells, asexual reproduction.
3. They are copied exactly (replicated).
4. An unspecialised cell that divides by mitosis to produce daughter cells that can become specialised.
5. It is halved, from diploid to haploid.