



# Edexcel GCSE Biology



Your notes

## Cell Division

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Your notes

## Mitosis

# Mitosis

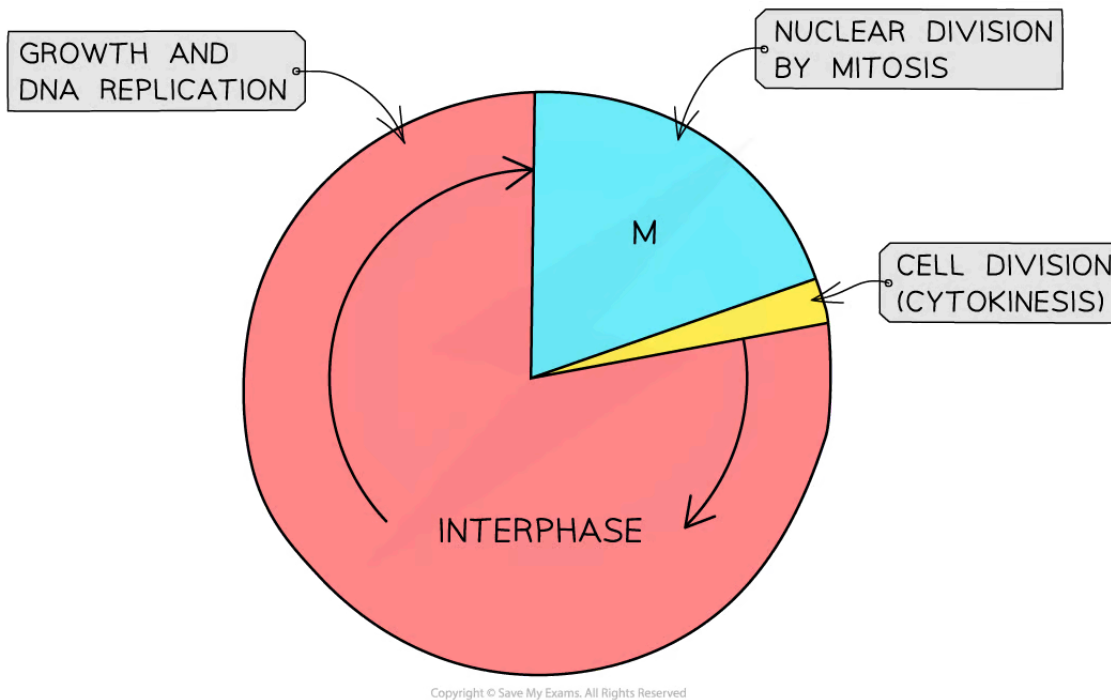
- Mitosis is a **nuclear division that** gives rise to **two genetically identical diploid daughter cells**
  - In a human, this diploid number is 23 pairs of chromosomes
- All **body cells** (and not gametes) are produced by mitosis of the zygote
- Mitosis is required for:
  - **Growth**: mitosis produces new cells
  - **Repair**: to replace damaged or dead cells
  - **Asexual reproduction**: mitosis produces offspring that are genetically identical to the parent

## The Cell Cycle

- There are 3 parts of the cell cycle
  - **Interphase** - Just before mitosis, the DNA in the nucleus copies itself **exactly** (forms x-shaped chromosomes)
  - **Mitosis - Chromosomes line up** along the centre of the cell where **cell fibres pull them apart**
  - **Cytokinesis** - The **cell cytoplasm and membrane divides** to produce **two daughter cells**; each new cell has a copy of each of the chromosomes



Your notes



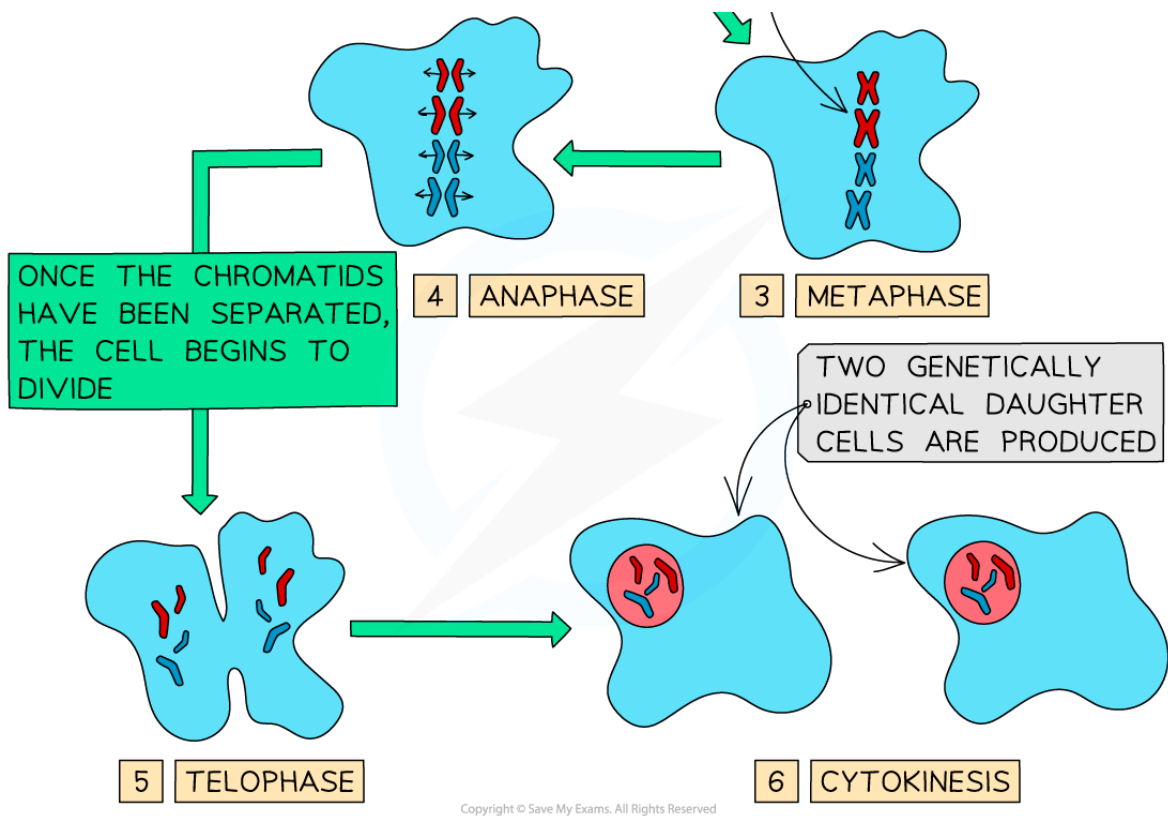
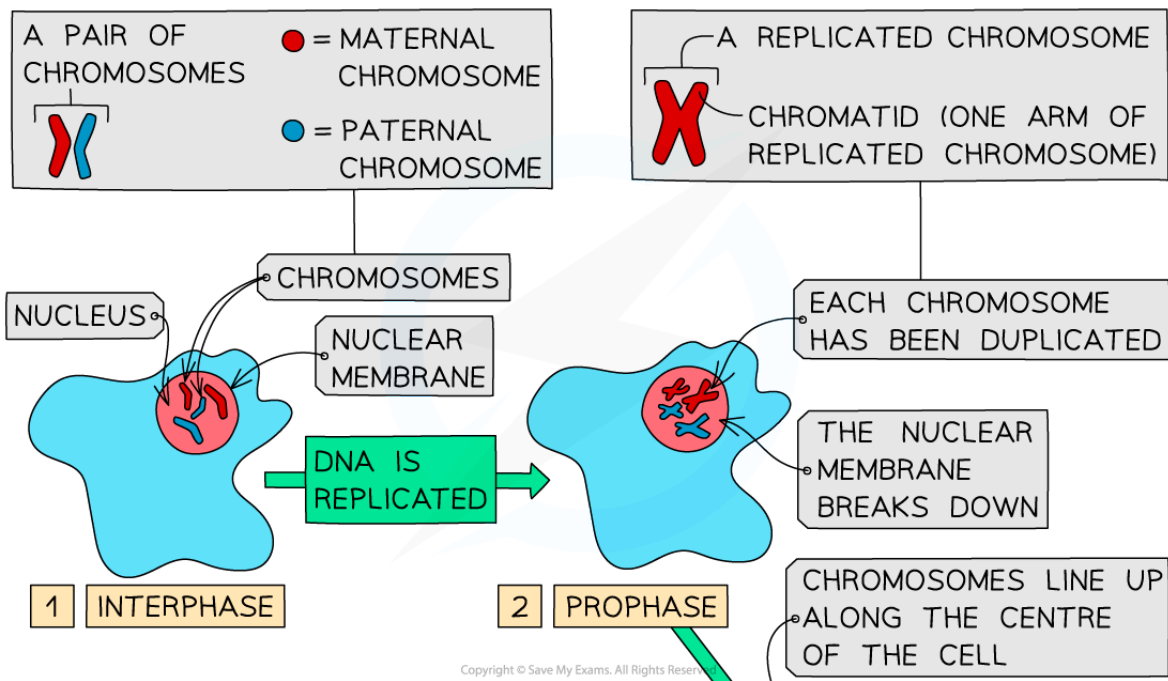
### *The three stages of the cell cycle*

## The Stages of Mitosis

- The process of mitosis is itself made up of a series of stages that begin **after interphase** has occurred. These stages occur in the following order:
  - **Prophase** – DNA condenses, chromosomes become visible and the nuclear membrane breaks down
  - **Metaphase** – Chromosomes line up on the equator of the cell (the metaphase plate)
  - **Anaphase** – Spindle fibres (also known as cell fibres) split the chromosomes down the centre and pull one chromatid to either side of the cell
  - **Telophase** – New membranes form around the chromosomes at either end of the cell



Your notes



### *The stages of mitosis*



Your notes



#### **Examiner Tips and Tricks**

Sometimes you will be asked to calculate the number of cells that would result from a certain number of divisions. In order to work this out, you need to calculate 2 to the power of the number of divisions ( $2^n$ ). For example, if we started with 1 cell and it divided 7 times, we would end up with  $2^7$  cells, which is 128 cells.



Your notes

## Uncontrolled Cell Division

# Uncontrolled Cell Division

- Cells in the body divide by **mitosis** to produce more cells - this is essential for **growth** and to **repair** damaged cells
  - For example, the cells of the intestines are constantly dividing to replace those that are shed as food moves through the digestive system
- Mitosis is just one part of the cell cycle which is **regulated by many different genes** to ensure that cells divide only when they need to and **stop** when required
- Cancer is caused as a result of **mutations** in the DNA of cells that lead to **uncontrolled cell growth and division** - this can result in the formation of a **tumour** (a mass of cells)
  - Usually, tumours form as a result of loss of control of the cell cycle

## Types of Tumour

- There are two main types of tumour:
  - Benign** tumours
  - Malignant** tumours
- Benign** tumours are **growths** of abnormal cells which are **contained** in one area, usually within a **membrane**
  - Crucially, benign tumours **do not invade** other parts of the body
  - This means these tumours are not considered cancerous
- Malignant** tumours are cancerous - the cells of these tumours invade neighbouring tissues and spread to different parts of the body via the blood and lymphatic system where they form secondary tumours
  - Malignant tumours are more likely to **disrupt the functioning of the organ** they originate in (as they invade healthy tissue) and the organs they spread to - this is why they are dangerous and how they lead to death