Unit 2 Multicellular Organisms

Key Area 1 Producing new cells

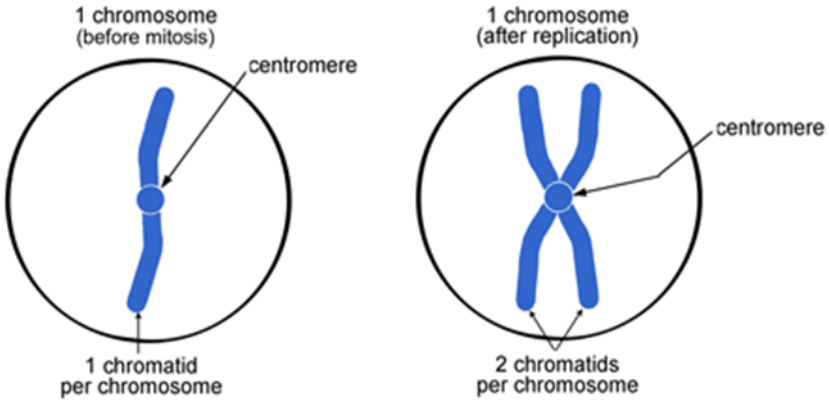
Mitosis is the name given to the process where **cells divide** to produce new cells.

Mitosis provides news cells for **GROWTH & REPAIR OF DAMAGED CELLS**.

DNA is carried on structures in the nucleus of a cell called **chromosomes**.

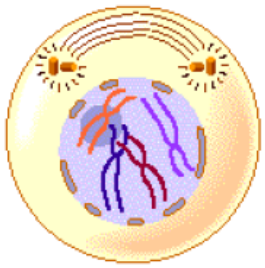
At the start of mitosis, DNA must be replicated and so each chromosome must be copied.

When a chromosome makes a copy of itself, each copy is then referred to as a **chromatid** so long as they remain attached to each other by a **centromere**.

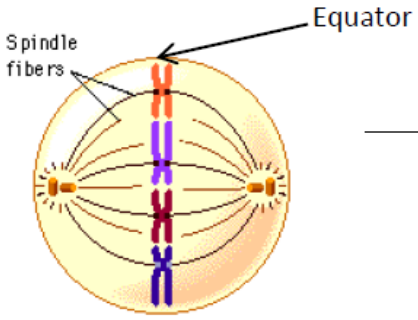


When chromatids are separated during mitosis, they are then referred to as **chromosomes** again.

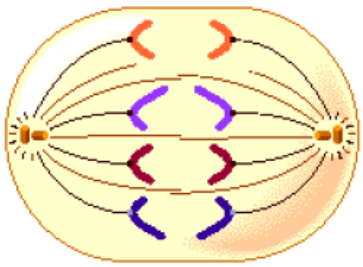
Sequence of events in Mitosis



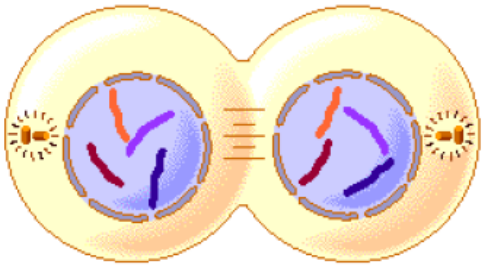
Each **chromosome** makes a **copy** of itself to form 2 **chromatids**. In this diagram there are 4 chromosomes consisting of 8 chromatids. The **nuclear membrane disappears**.



The chromatids **line up at the equator** of the cell, held in place by **spindle fibres**.



The spindle fibres contract (shorten) and **separate chromatids to opposite sides** (poles) of the cell.



A **nuclear membrane forms** around each set of chromosomes and the **cytoplasm divides** to **form 2 identical daughter cells**.

Mitosis **maintains chromosome complement** e.g. if a parent cell contains 4 chromosomes, each of the daughter cells produced from it at the end of mitosis will also have 4 chromosomes.

Diploid cells contain **2 matching sets of chromosomes**. Skin cells, muscle cells, liver cells etc are all diploid. The diploid number of chromosomes remains constant (unchanged) after mitosis.

(Gametes e.g. sperm/eggs, pollen/ovules are **Haploid** and only contain 1 set of chromosomes).

Stem cells

Stem cells in animals are **unspecialised cells** which can divide in order to **self-renew (make more stem cells).**

Stem cells have the **potential to become different types of cell**.

Stem cells are involved in **growth and repair**.

There are **2 types of stem cells**:

Embryonic

These stem cells can be obtained from the **embryo** at a very early stage. Embryonic stem cells **can differentiate into a wide range of cell types.**

Tissue

These stem cells can be **found in the body throughout life**

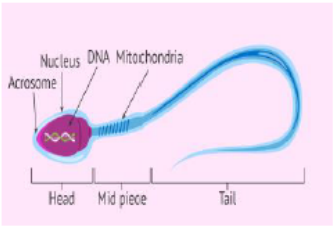
e.g. skin, bone marrow. Tissue stem cells can only **differentiate into a narrow range of cell types**. E.g stems cells in bone marrow can only differentiate into products found in blood such as red blood cells, white blood cells & platelets.

Specialisation of cells

Specialisation of cells leads to the formation of a **variety** of **cells, tissues and organs.**

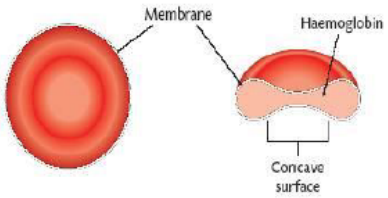
Examples of specialised cells :

Sperm cells



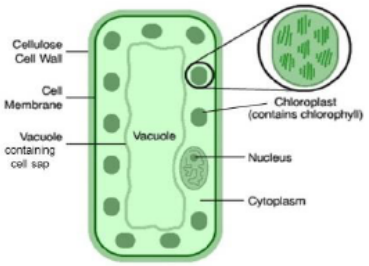
Tail allows it to swim towards an egg.

Red Blood cell



Biconcave shape increases surface area and **haemoglobin** transports oxygen.

Leaf cell



Many chloroplasts present containing chlorophyll for photosynthesis.

Multicellular organisms **have more than one cell type** and are made up of **tissues** and **organs**.

A hierarchy exists:

Cells → **Tissues** → **Organs** → **Organ System** → **Organism**

Simplest → Most complex

The cells in organs are specialised for their function and work together to form organ systems (e.g digestive system consists of gullet, stomach, pancreas, liver, small intestine, large intestine and each organ consists of tissue made up of a variety of different types of specialised cells).