

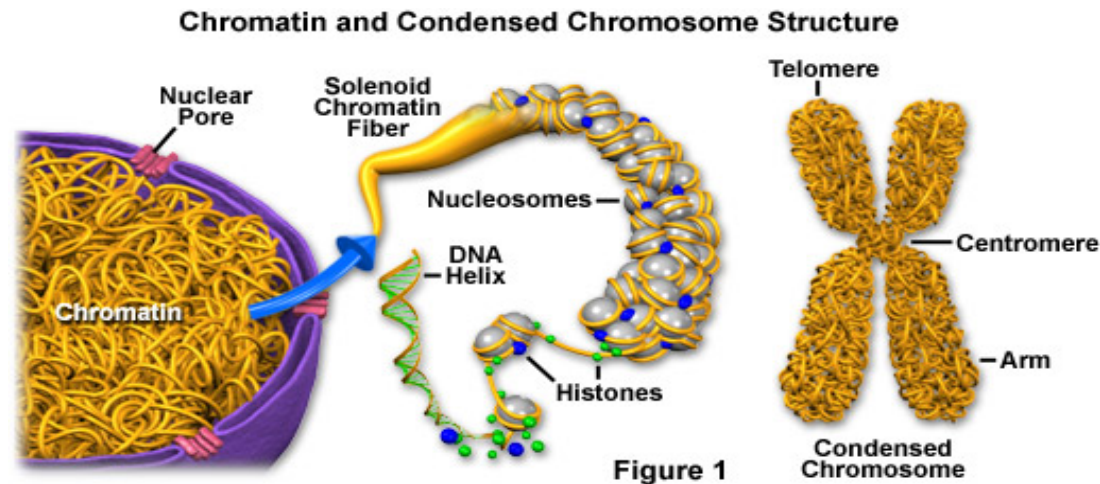
# Chapter 14 - Cell Division

## Learning objectives

- To explain the terms 'cell continuity', 'chromosome', 'haploid number' and 'diploid number'
- To describe the cell cycle and cell activities in interphase and mitosis
- To define the term 'cancer' and give two possible causes
- To define the term 'mitosis', explain it simply and identify its main function in single-celled and multicellular organisms
- To define the term 'meiosis' and explain its functions
- To perform a detailed study of mitosis, with the aid of diagrams.

# Chapter 14 - Cell Division

For a cell to divide it must first copy its DNA.  
Most of the time the DNA is thread-like and called **Chromatin**.



When the cell is about to divide the chromatin thickens into chromosome.  
Humans have **46** chromosomes.

Each chromosome has hundreds or thousands of genes.

A gene is a code that makes a **protein**.

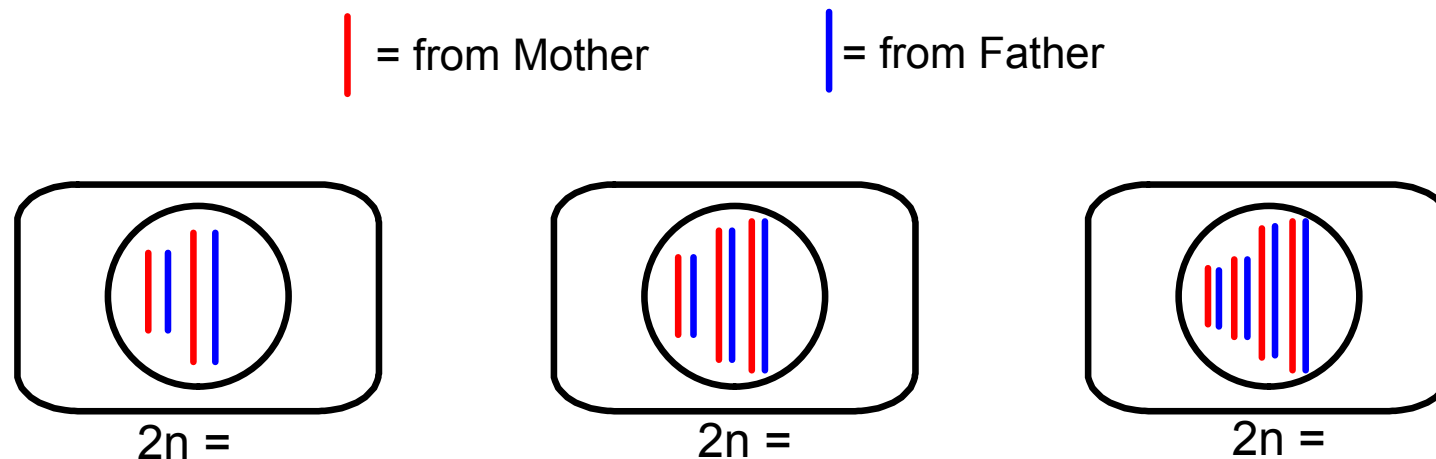
This protein (an enzyme) controls something in the body.

# Haploid and Diploid

## Diploid

Humans normally have 23 chromosomes from their mother **and** 23 from their father.

This type of cell is called a **Diploid** cell (as it has 2 sets of chromosomes).  
Diploid is also written as **2n**.



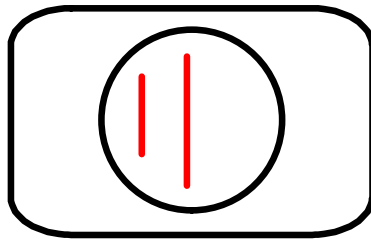
**All cells in the body are Diploid except for the sex cells (sperm and egg).**

# Haploid Cells

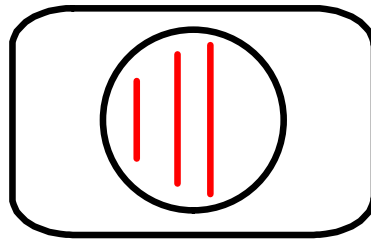
**H**aploid cells have **H**alf the number of chromosomes.

**Sex cells** are sperm and egg cells. These cells only have 23 chromosomes. The chromosomes only come from 1 parent.

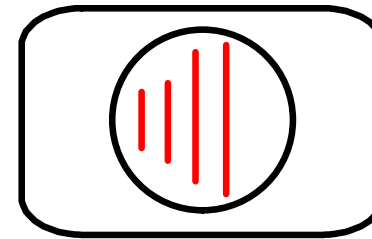
This type of cell is called a **Haploid** cell (as it has only **1** set of chromosomes). Haploid is also written as **n**.



$n =$



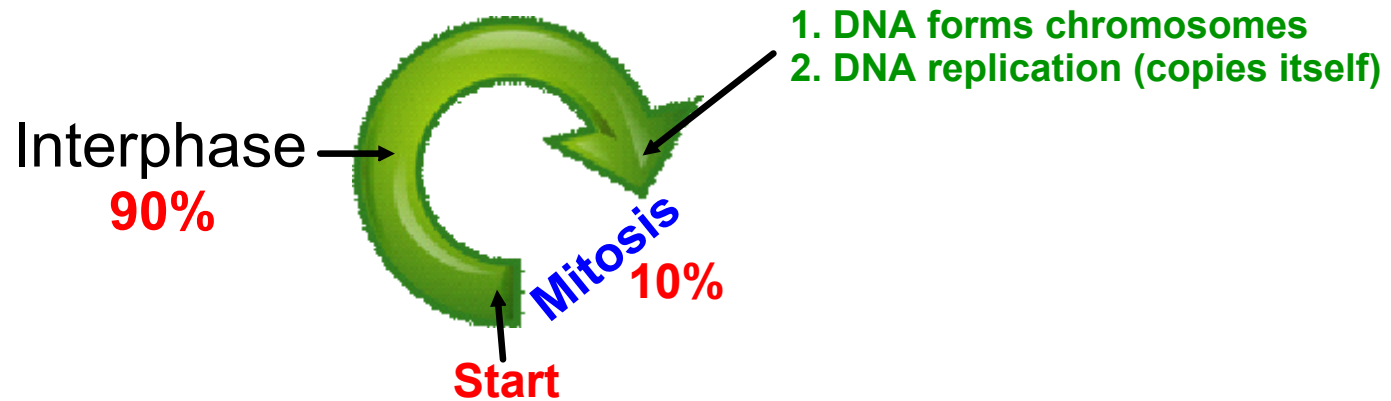
$n =$



$n =$

# The Cell Cycle

Cells have a natural life-cycle. Most cells are formed, grow bigger and then divide. The cell cycle is split into a growing phase (**Interphase**) and a dividing phase.



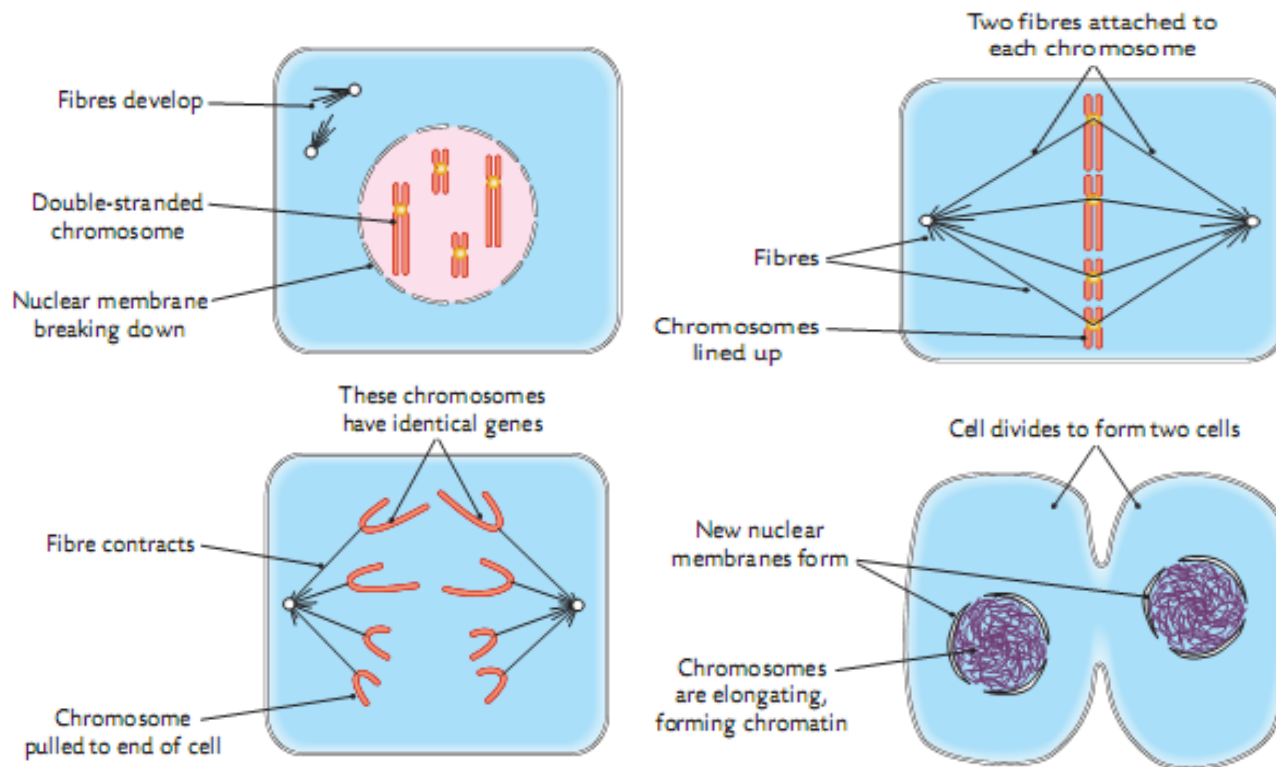
**Interphase** - this is where the cell builds up chemicals and grows bigger. A cell is in Interphase for 90% of its life.

1. The chromosomes are seen as threads of **chromatin** during this stage.
2. The cell makes **new parts** - mitochondria, chloroplasts and enzymes.
3. Near the end of Interphase the chromosomes produce **identical copies** of themselves.

# Mitosis

Is a form of Nuclear Division in which one nucleus divides to form 2 nuclei each containing identical sets of chromosomes.

**PARTY MONDAY AND TUESDAY!**



# Mitosis

## Interphase (before Prophase)

The DNA forms chromosomes and copies itself.

The chromosomes make double stranded chromosomes (x-shaped).

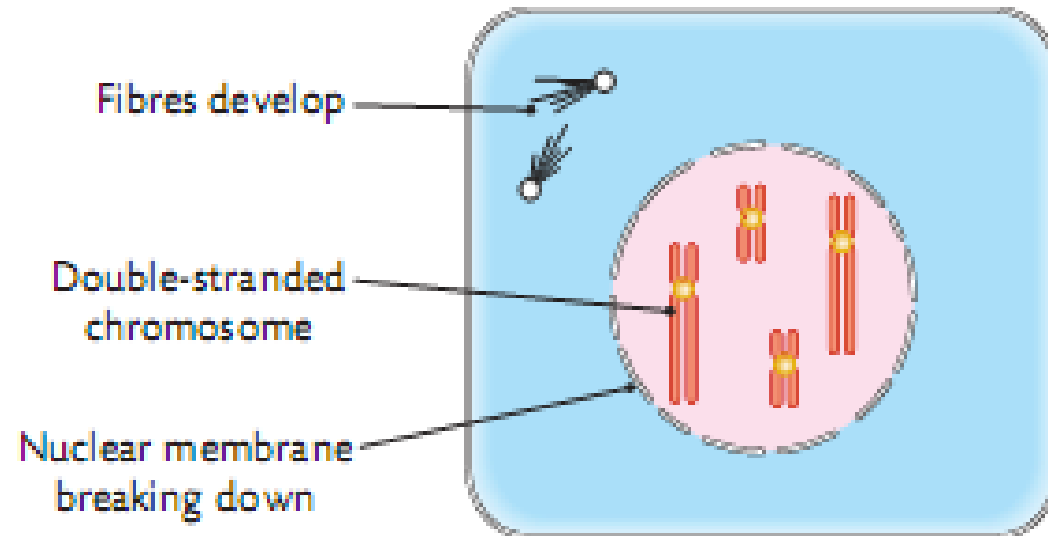
## Prophase (Stage 1)

The chromosomes are double stranded.

The spindle fibres start to move to the poles.

The membrane of the nucleus breaks down.

Takes about 30 minutes.



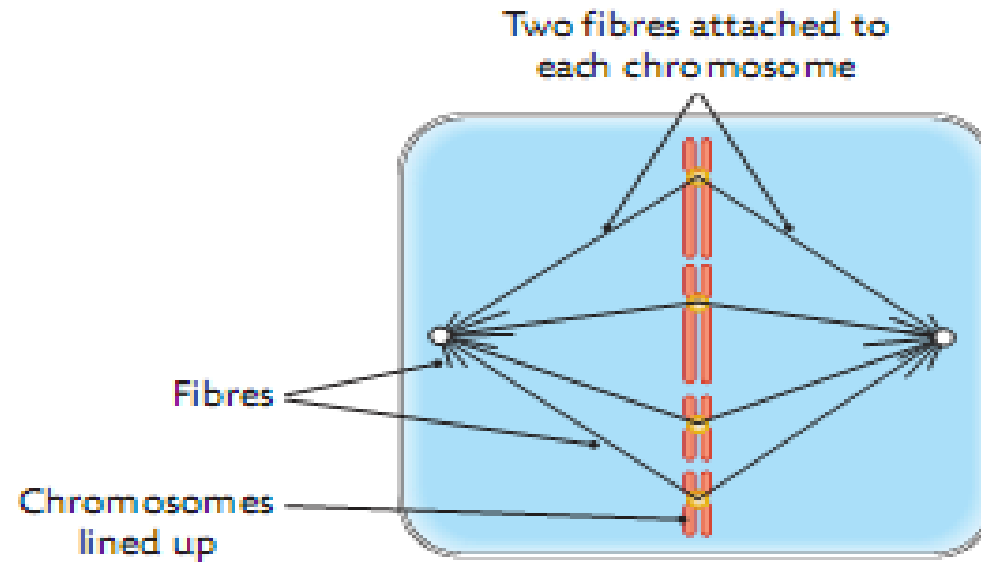
## Metaphase (Stage 2)

The chromosomes line up in the **M**iddle (equator)

The spindle fibres attach to the chromosomes.

The membrane of the nucleus is broken down.

Takes about 30 minutes.





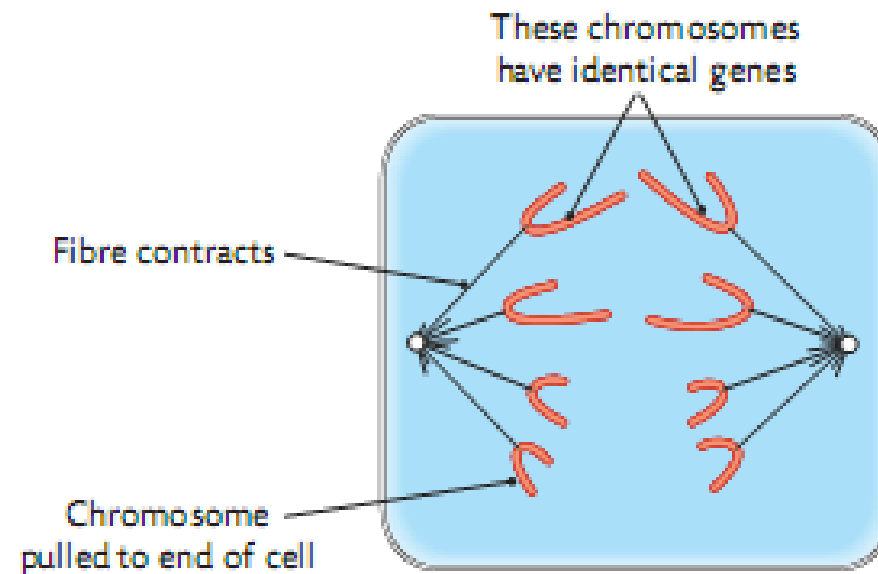
## Anaphase (Stage 3)

The spindle fibres contract.

The chromosomes are pulled **A**part.

The chromosomes move towards the poles.

Takes about 10 minutes.

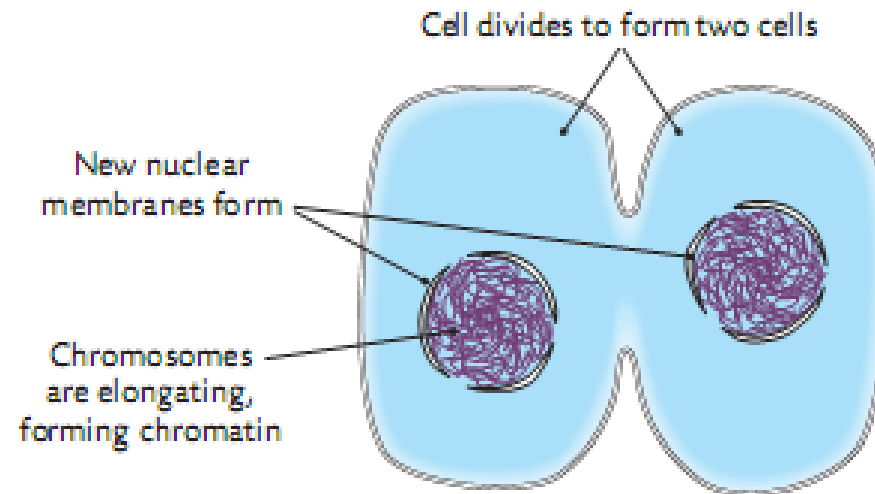


## Telophase (Stage 4)

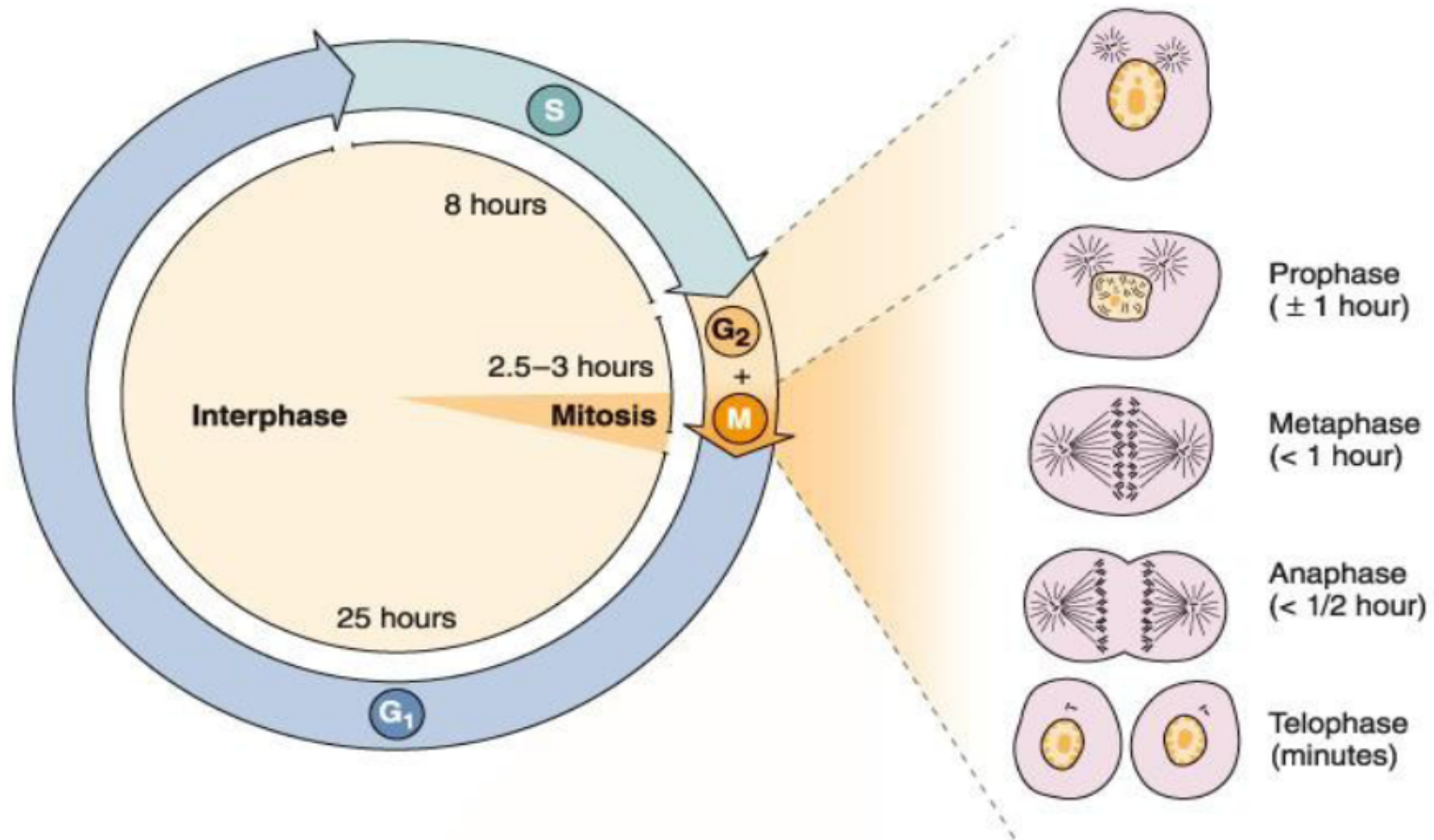
The chromosomes change back into **Chromatin**.

The membrane of the nucleus is reformed.

Takes about 30 minutes.



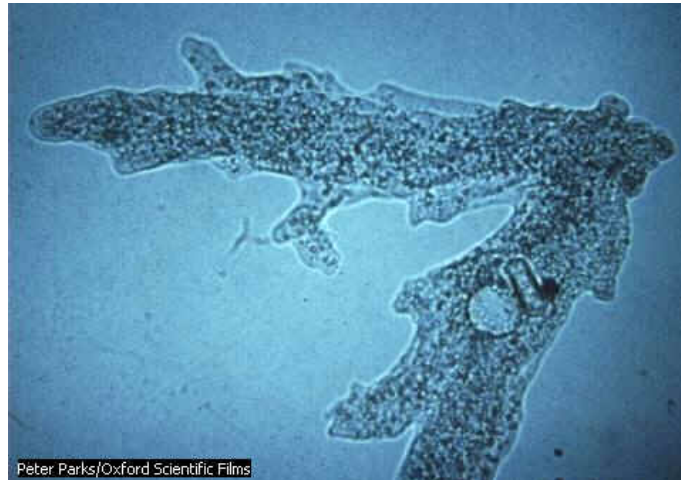
# THE CELL CYCLE



# Functions of Mitosis

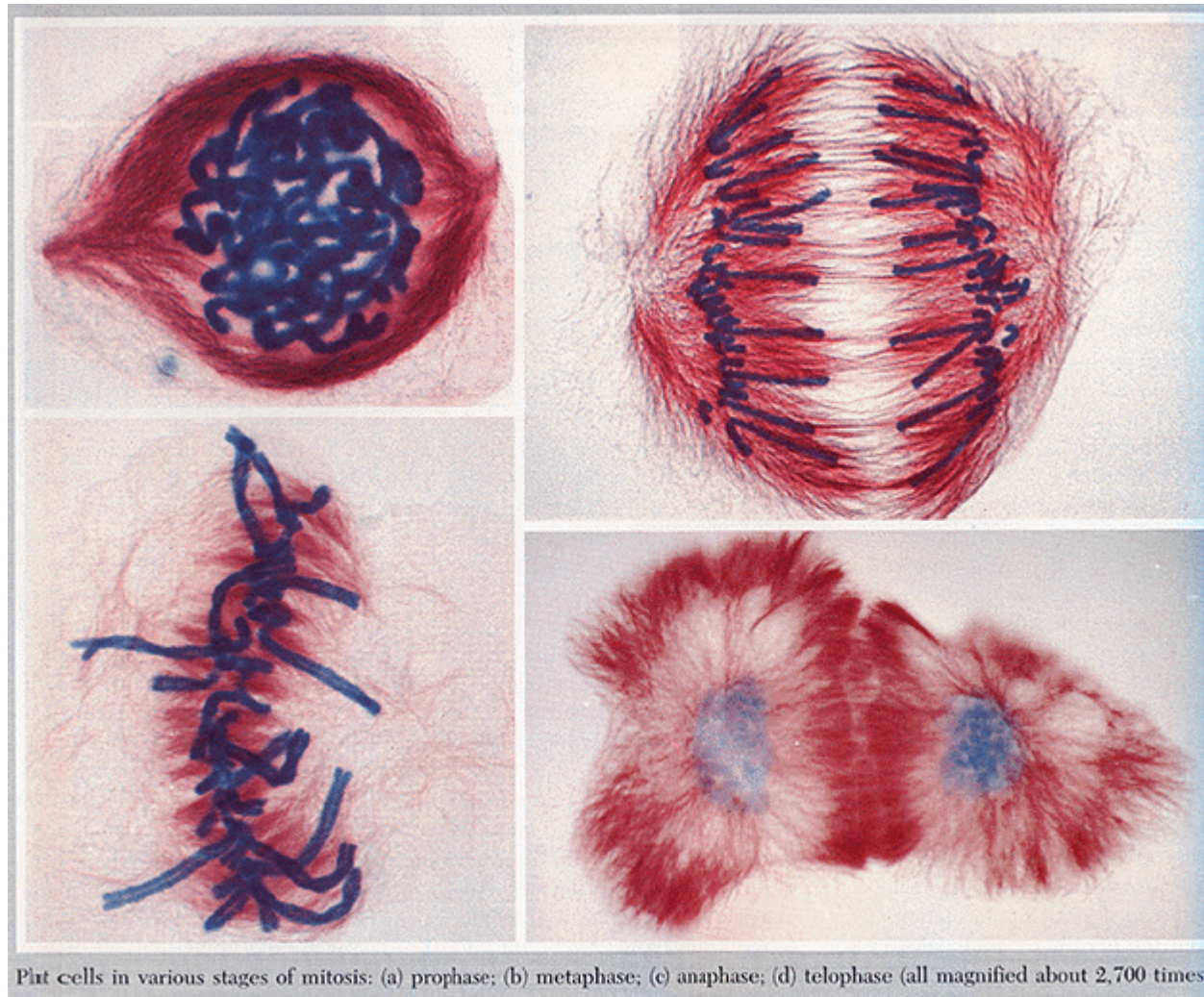
## Unicellular Organisms

In an animal made of only one cell any cell division will make 2 animals  
So this is **Asexual** Reproduction.



## Multicellular Organisms

1. Grow larger
2. Repair damaged cells





# Cancer

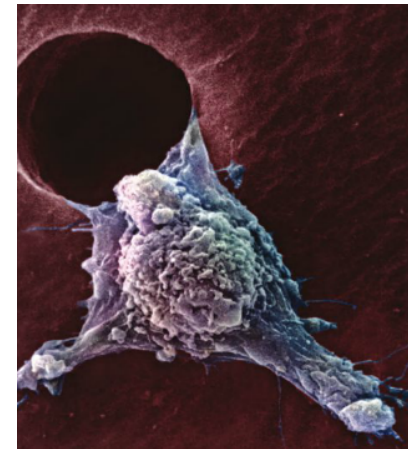
**Cancer is a group of disorders in which certain cells lose their ability to control the rate of mitosis and the number of times it happens.**

**Benign** - means 'kind'. This kind of cancer stops dividing after a certain amount of time. Examples are warts and skin tags.

**Malignant** tumours are caused by genes that have been changed. (Oncogenes) These changes in the gene are caused by carcinogens. These are chemicals that can cause cancer. Some common carcinogens are cigarette smoke, asbestos, dioxins, UV radiation and viruses.

## **Treatment of Cancer**

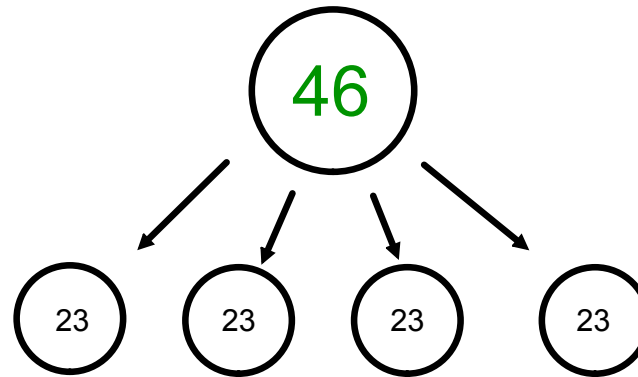
Many cancers can be treated or cured. Treatments include surgery, radiation, and chemicals (Chemotherapy).



# Meiosis

This is a form of nuclear division in which 4 daughter nuclei contain half the number of the parent chromosome.

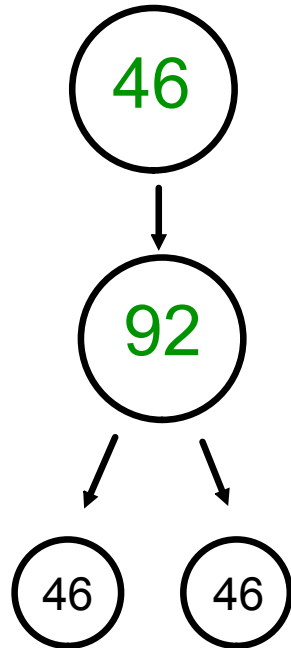
If a human parent cell has 46 chromosomes it divides into 4 cells (each has 23).



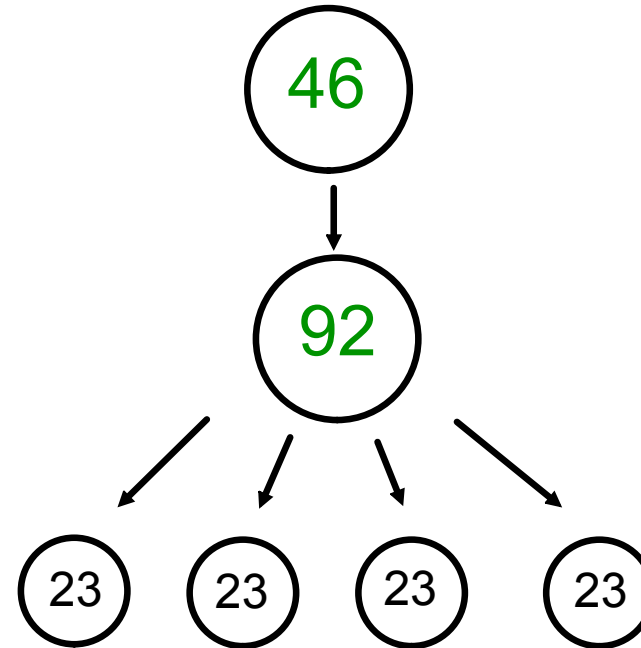
Meiosis makes **sex cells** (sperm and eggs) and allows for  
(1) Sexual Reproduction - make new individuals.  
(2) Variation - individuals are all different (evolution).

**Meiosis halves the number of chromosomes.**

Mitosis



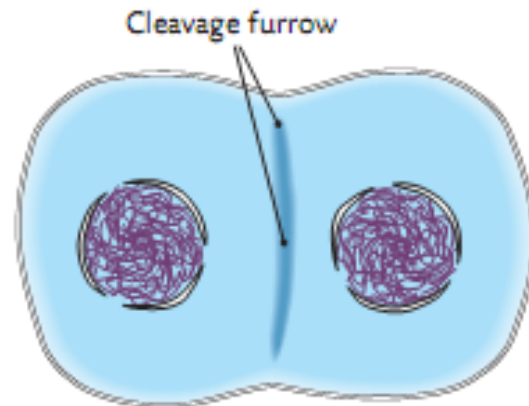
Meiosis





## Cell Division in an Animal Cell

Cell division - occurs **after** Mitosis. In an animal cell a shallow groove called a cleavage furrow grows. It gets deeper until it divides the cell in two. This is called **cytokinesis**. The new cells are called **daughter cells**.



## Cell Division in a Plant Cell

In a Plant cell a line of bubbles (**vesicles**) form down the centre. The vesicles contain **cellulose** (structural polysaccharide) which forms a new cell wall. This divides the cell in two.

