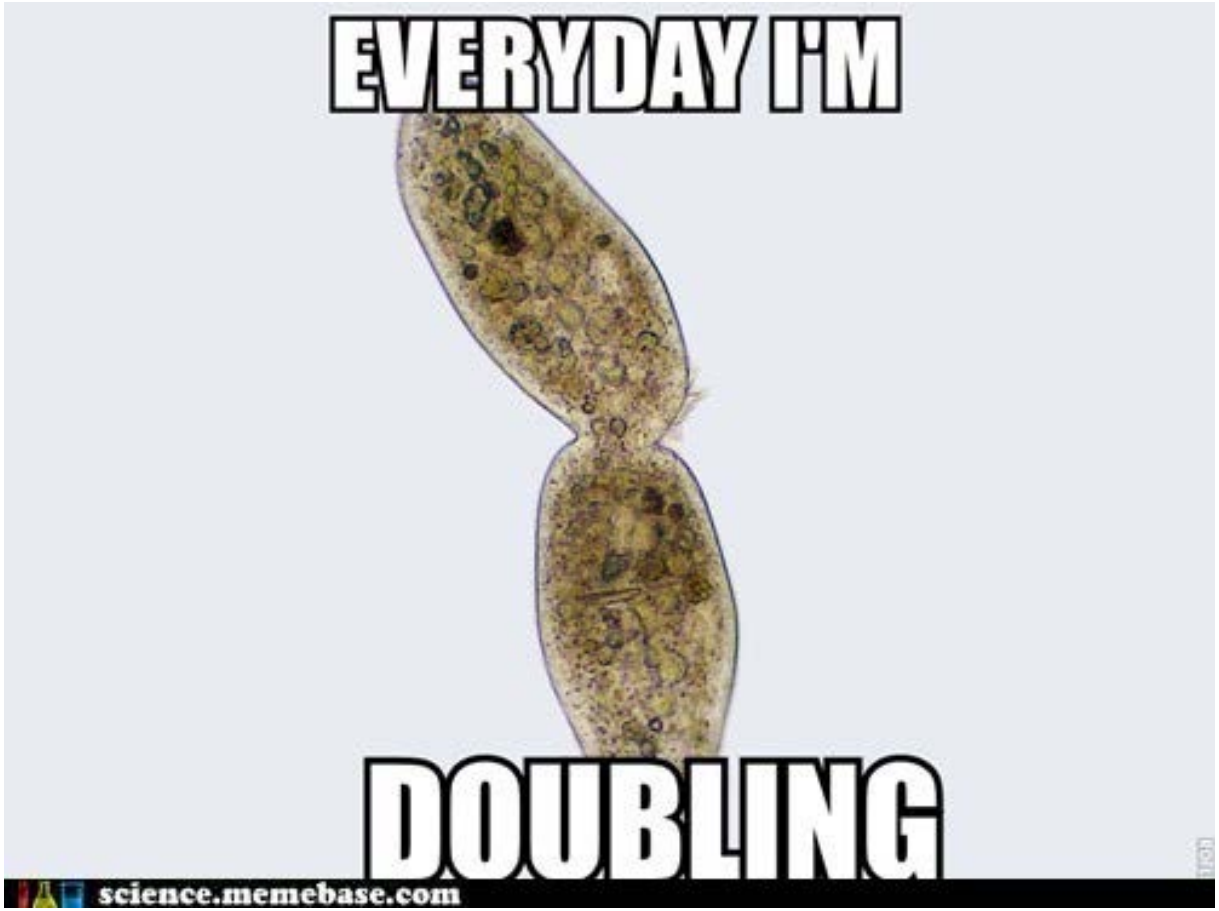
Mitosis



S1-1-01 Illustrate and explain the process of mitotic cell division in plants and animals. Include: chromosomes, mitosis, cytoplasmic division, cell cycle

S1-1-02 Observe and explain the dynamic nature of cell division

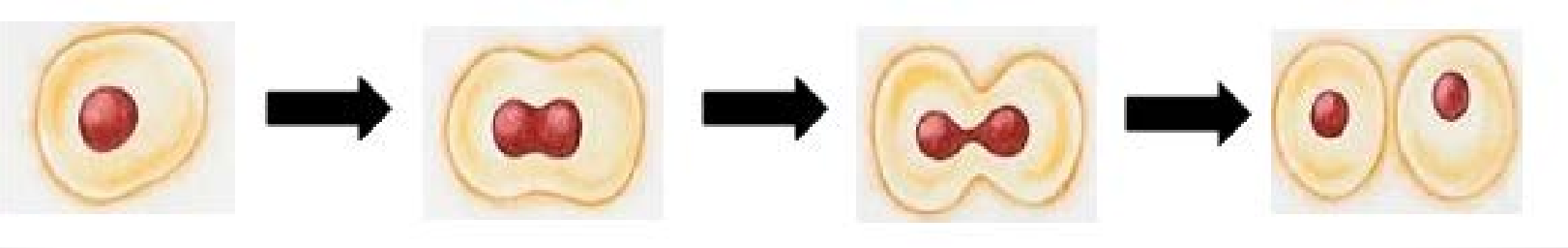
The Importance of Cell Division…

Your **SKIN** is a protective layer of **CELLS** that covers your bones and organs.

Cells are always **DYING** and have to be **REPLACED**.

It has been found that **50**% of all **DUST** in a **FURNACE** is dead human **SKIN CELLS**

In order to replace these cells, they must **REPRODUCE** by **DIVIDING**.



Cell Division…

ALL cells come from **OTHER CELLS**…NO EXCEPTIONS!

→All 100 trillion cells in your body came from one **FERTILIZED EGG** cell.

Functions of Cell Division:

REPLACEMENT CELLS:

- Every second, millions of your cells **DIE**, or are **INJURED**.
- The remaining cells must **REPRODUCE** or your body would **SHRINK** and **DIE**.

GROWTH:

- As the cells **REPRODUCE**, their numbers **INCREASE**, so your **SIZE** increases.
- All growth depends on **CELL DIVISION**.

REPRODUCTION:

- When **SINGLE-CELLED ORGANISMS** divide, **TWO NEW** organisms are produced (eg. **BACTERIA**)

Cell Division…

Million-Dollar Questions:

- How do cells know **WHEN** to divide?

- Why do cells divide **RAPIDLY** sometimes and **SLOWLY** others (**CALLUSES**)?

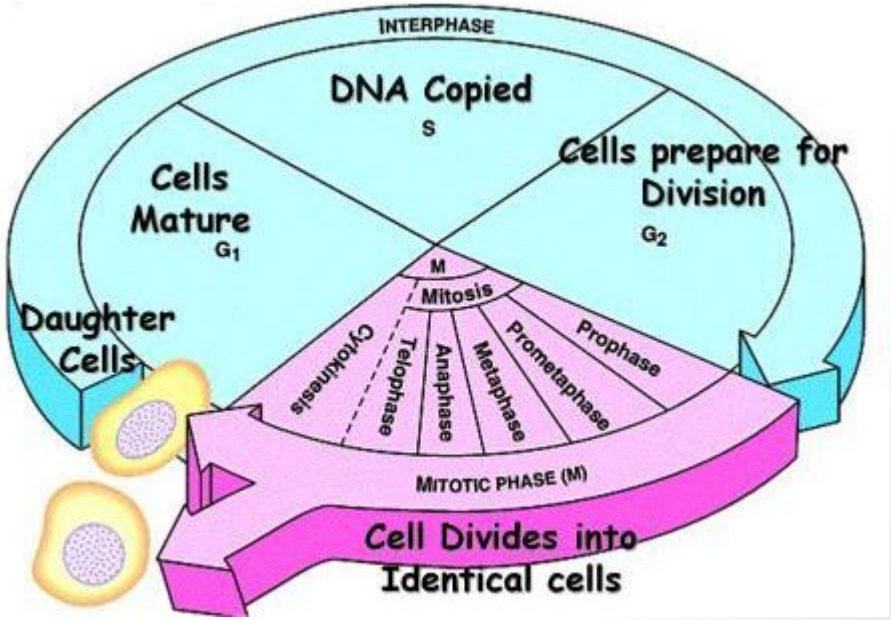
- Why do some cells always divide (**BLOOD**), and some rarely divide (**BRAIN**)?

The Cell Cycle (Life of a Cell):

Cells can exist in one of two phases:

1. **DIVIDING**
    - Very **SHORT** part of the life of a cell
    - Called **MITOSIS**

2. **NOT DIVIDING**
    - Very **LONG** part of the life of a cell
    - Called **INTERPHASE**

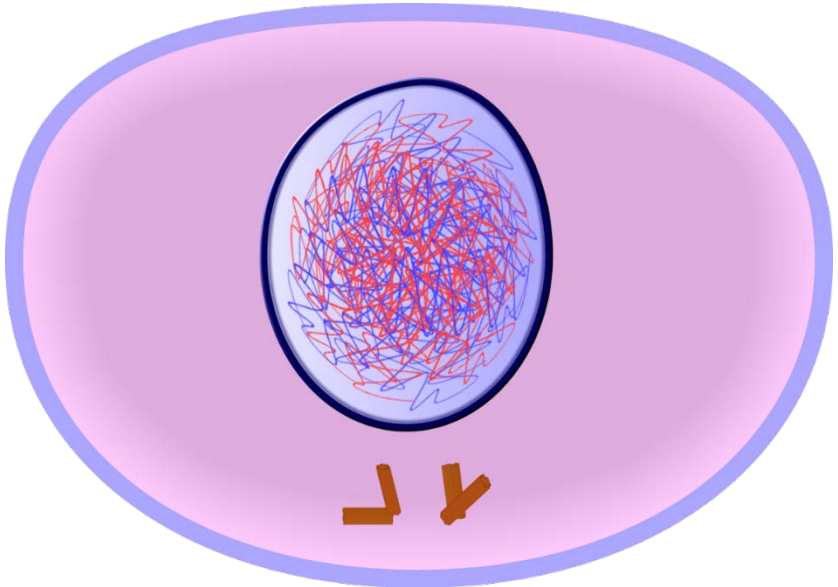


Interphase – A time for growth and repair:

During Interphase:

- Takes in **NUTRIENTS**.
- **REPAIRS** damaged parts
- **GROWS** rapidly
- Cell **PREPARES** for **DIVISION** by **DUPLICATING CHROMOSOMES** in the **NUCLEUS**.

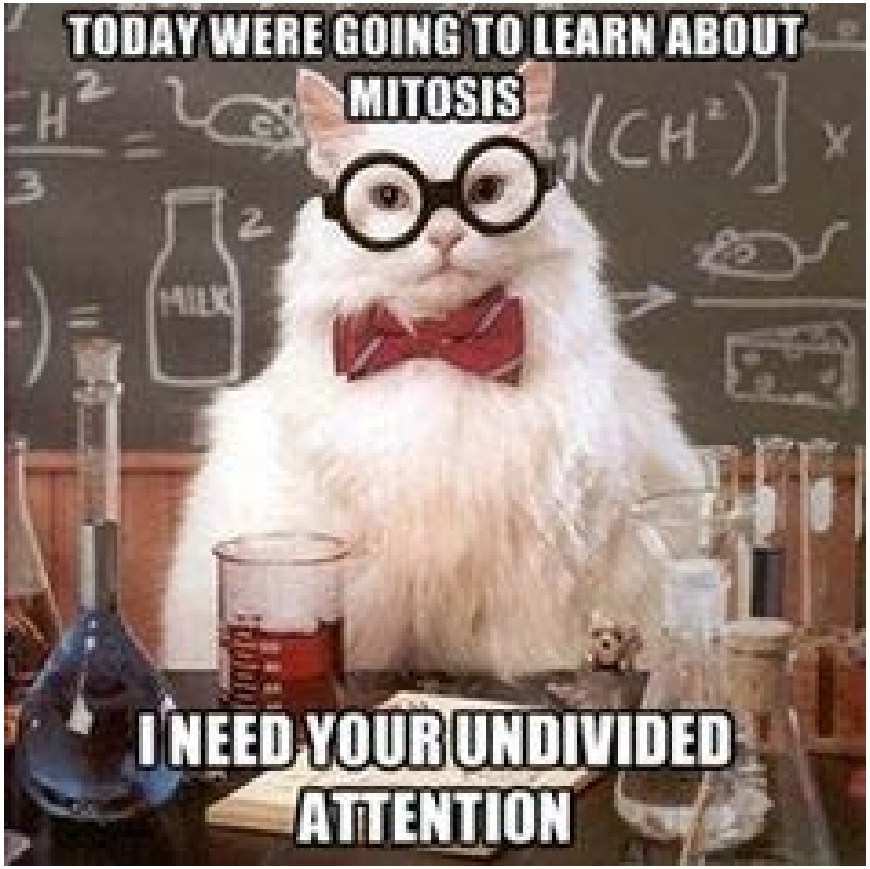
  → Human cells go from **46** to **92** chromosomes during interphase
- Chromosomes look like long **STRINGS** (**SPAGHETTI**)



Mitosis & Cytokiniesis:

In all cases of cell division, the **MOTHER CELL** divides into **TWO DAUGHTER CELLS.**

CYTOKINESIS is the point where the cell **SPLITS** into two equal parts

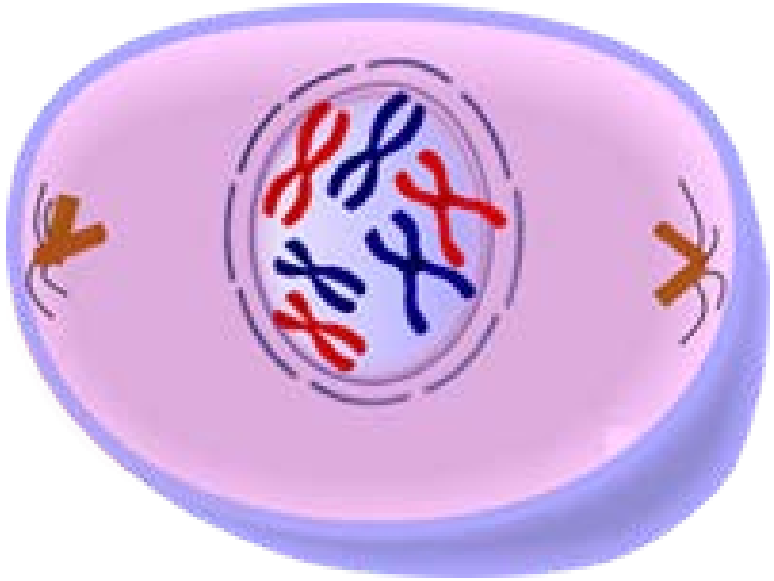


Mitotic Cell Division:

MITOSIS has five different **PHASES** (**STEPS**). We will use an example of a human cell going through mitosis

1. PROPHASE:

- **LONG**, thin **CHROMOSOMES** begin to **SHORTEN** and **THICKEN**.
- Nuclear membrane **DISSOLVES**

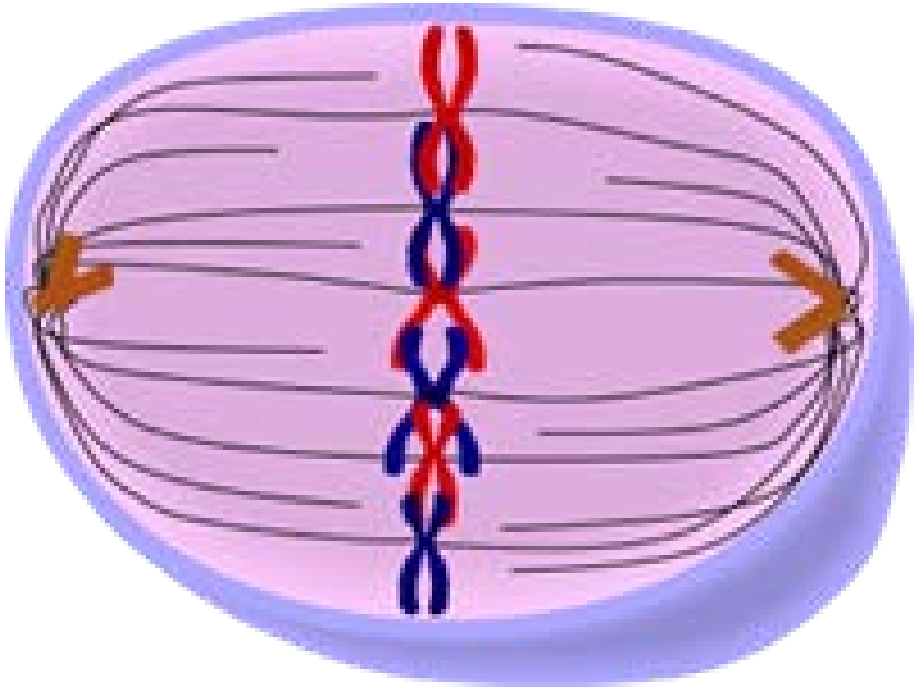


→ **92 CHROMOSOMES** are present (remember that they were **DOUBLED** in **INTERPHASE**)

Mitotic Cell Division:

2. METAPHASE:

- The **DOUBLE STRANDED CHROMOSOMES** line up in the **MIDDLE** of the cell
- **SPINDLE FIBERS** extend from **CENTRIOLES**

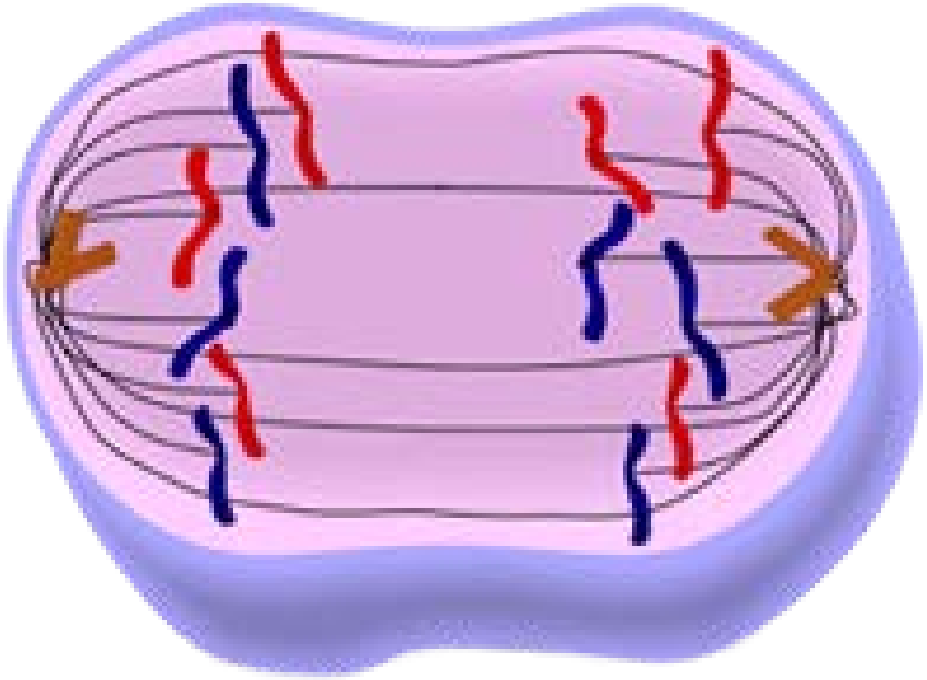


→ The cell still has **92** chromosomes.

Mitotic Cell Division:

3. ANAPHASE:

- Each chromosome **SPLITS**, and is pulled to opposite **POLES** (**SIDES**) of the cell.
- This is the **GENETIC MATERIAL** provided to each **DAUGHTER CELL**.

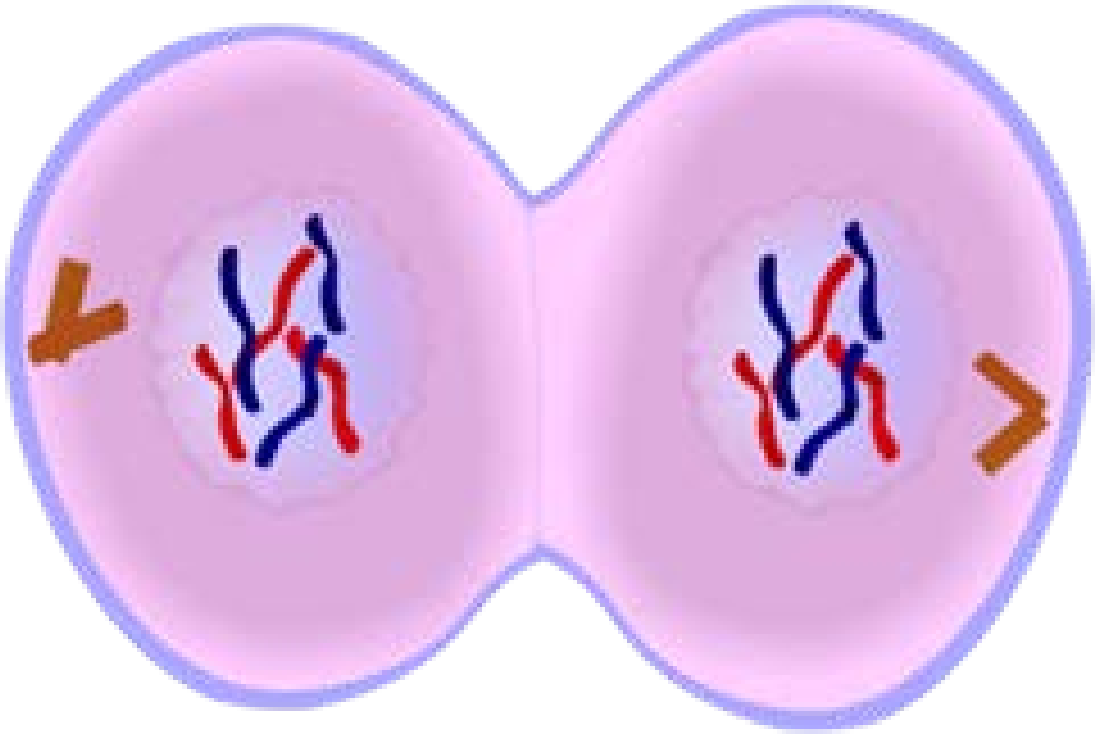


→ **46** chromosomes move to each **SIDE** (now **SINGLE STRANDED**)

Mitotic Cell Division:

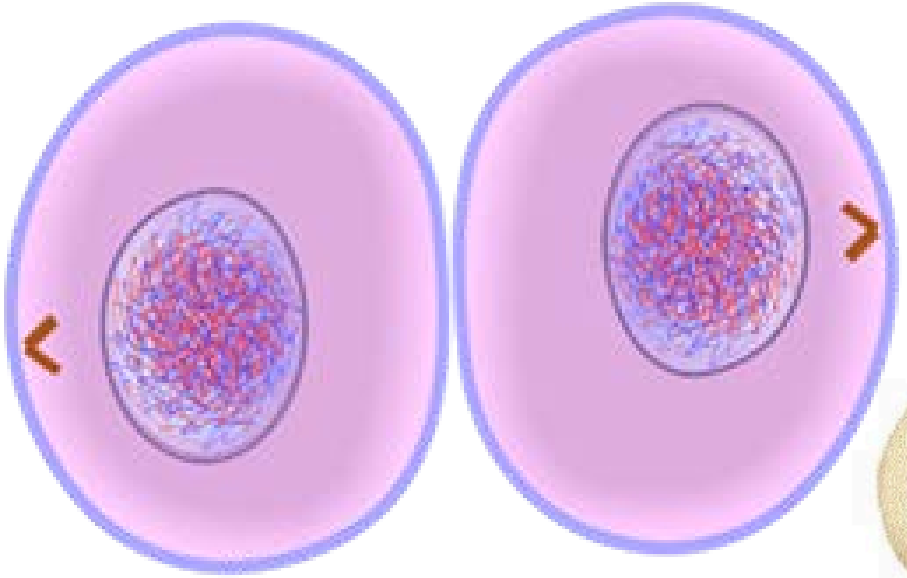
4. TELOPHASE:

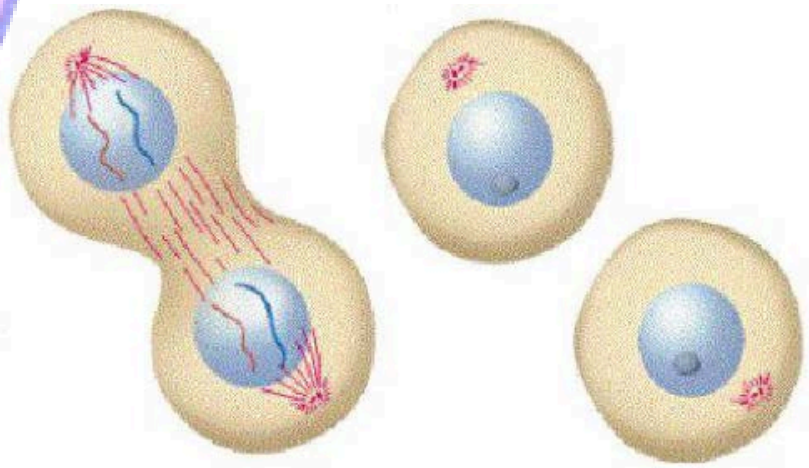
- New **NUCLEAR MEMBRANE** forms around each **CHROMOSOME** set.



Mitotic Cell Division:

- At the end of telophase, **CYTOKINESIS** begins →cell membrane **PINCHES** in.
- Two **DAUGHTER CELLS** with **46 CHROMOSOMES** are formed.





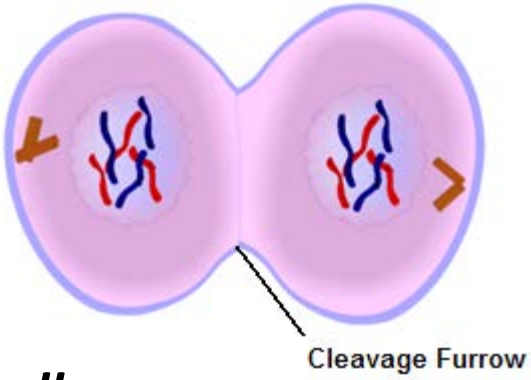
We-eeeeee are never ever ever getting back together

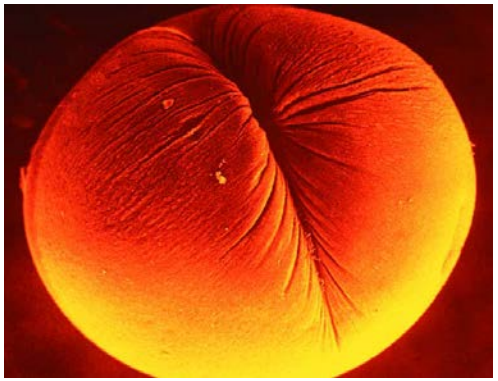
Cytokinesis:

Note: Cytokinesis is different in plant and animal cells:

In animal cells

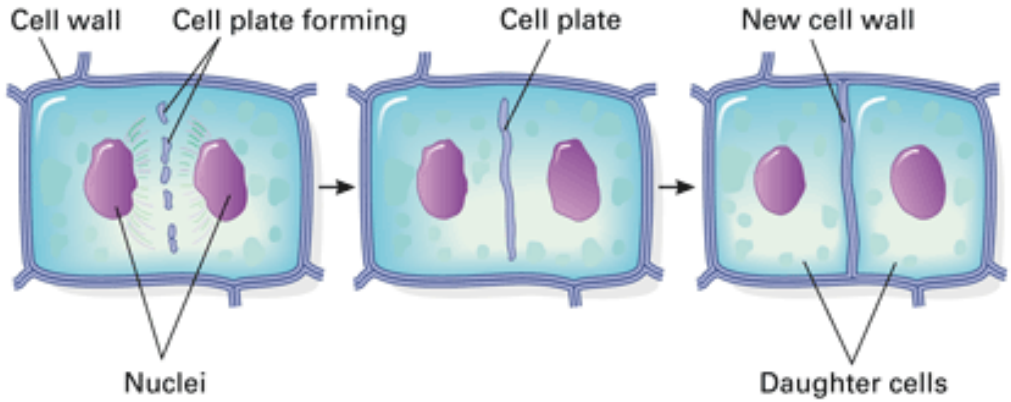
- The cell membrane pinches in and forms a **CLEAVAGE FURROW**.





In plant cells

- A **CELL PLATE** forms to divide the cells



Cell Division:

It is important to note that the whole cell cycle is <u>CONTINUOUS</u> (each phase <u>FLOWS</u> into the next).

- A cell goes through **<u>INTERPHASE</u>**, which flows into **<u>PROPHASE</u>** then **<u>METAPHASE</u>**, **<u>ANAPHASE</u>** and **<u>TELOPHASE</u>** (**<u>MITOSIS</u>**).
- Once the new cells are formed, they are right back in **<u>INTERPHASE</u>**.

Remember:

<u>I→P→M→A→T→I</u>