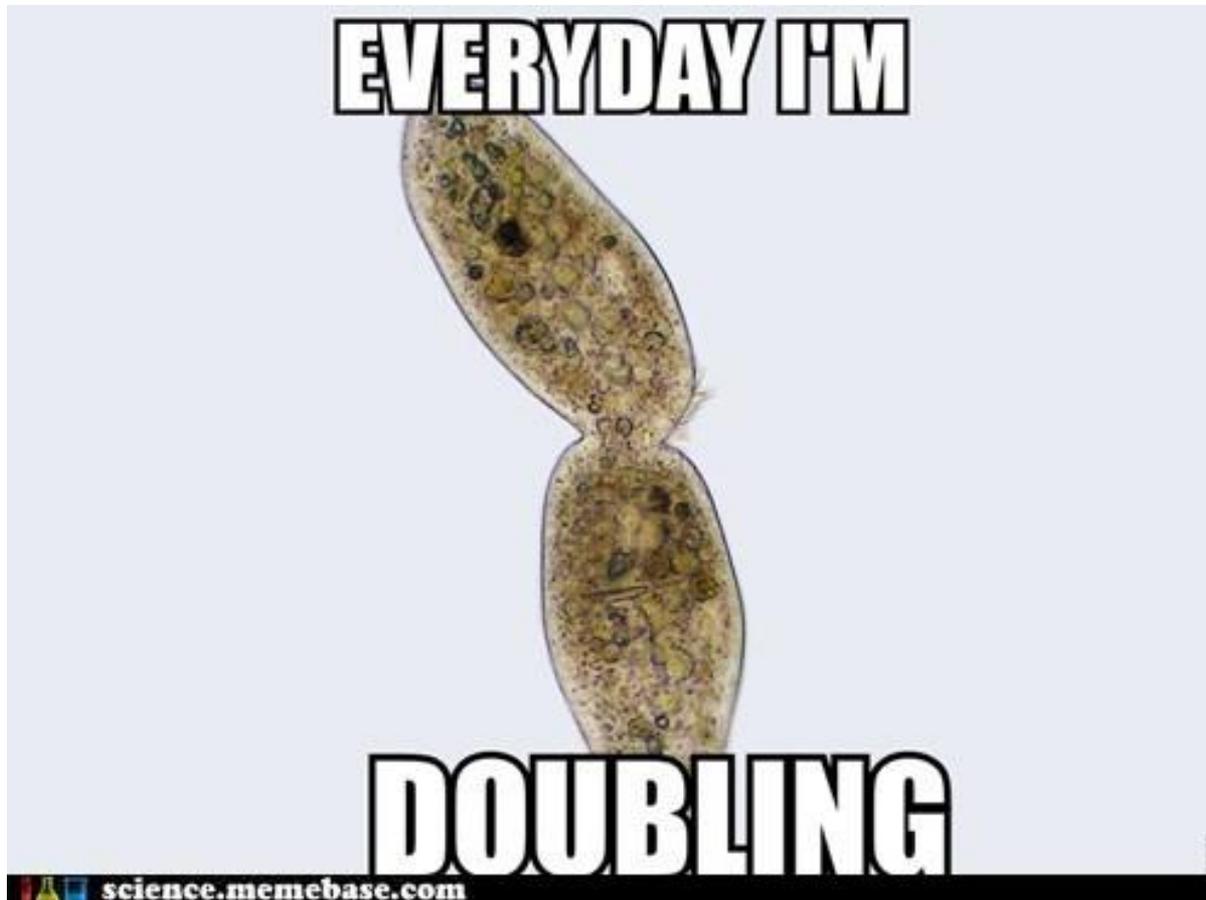


# Mitosis



- 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):

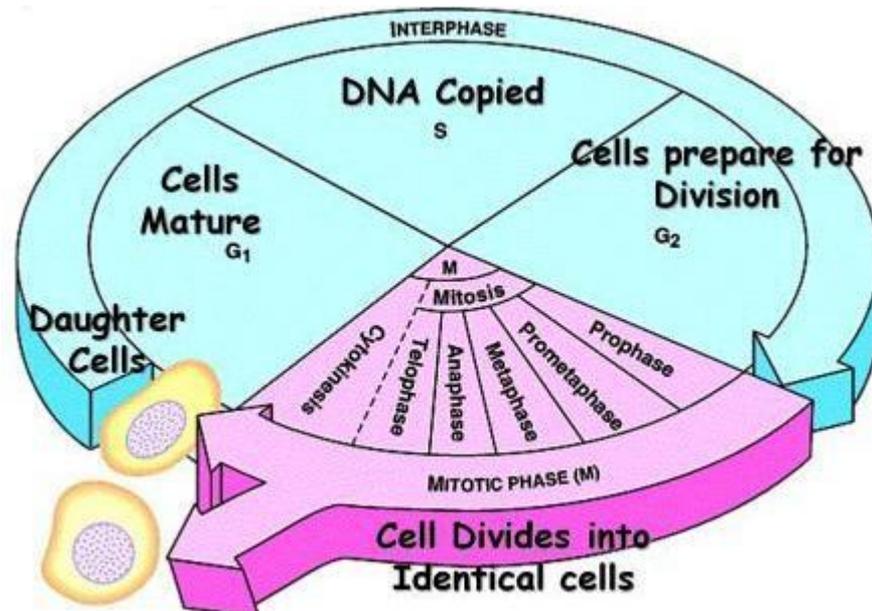
Cells can exist in one of two phases:

## 1. DIVIDING

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

## 2. NOT DIVIDING

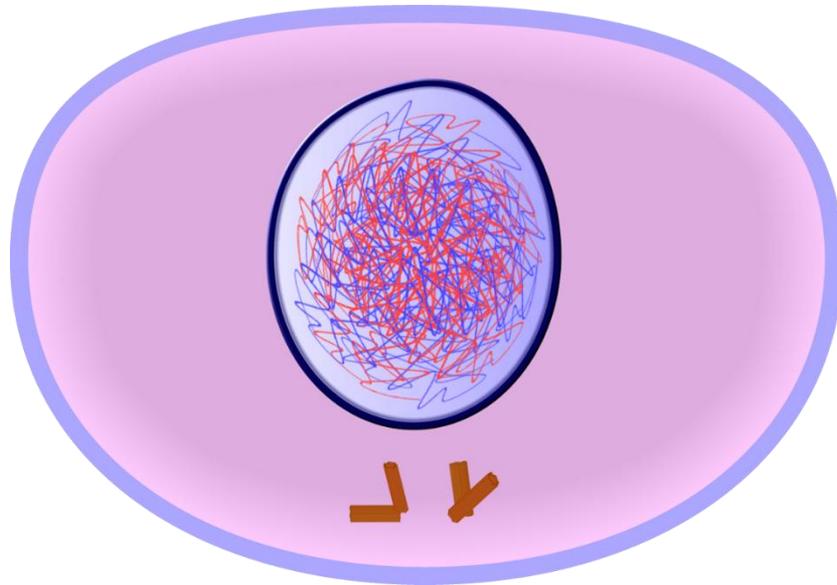
- Very **LONG** part of the life of a cell
- Called **INTERPHASE**



# Interphase – A time for growth and repair:

## **During Interphase:**

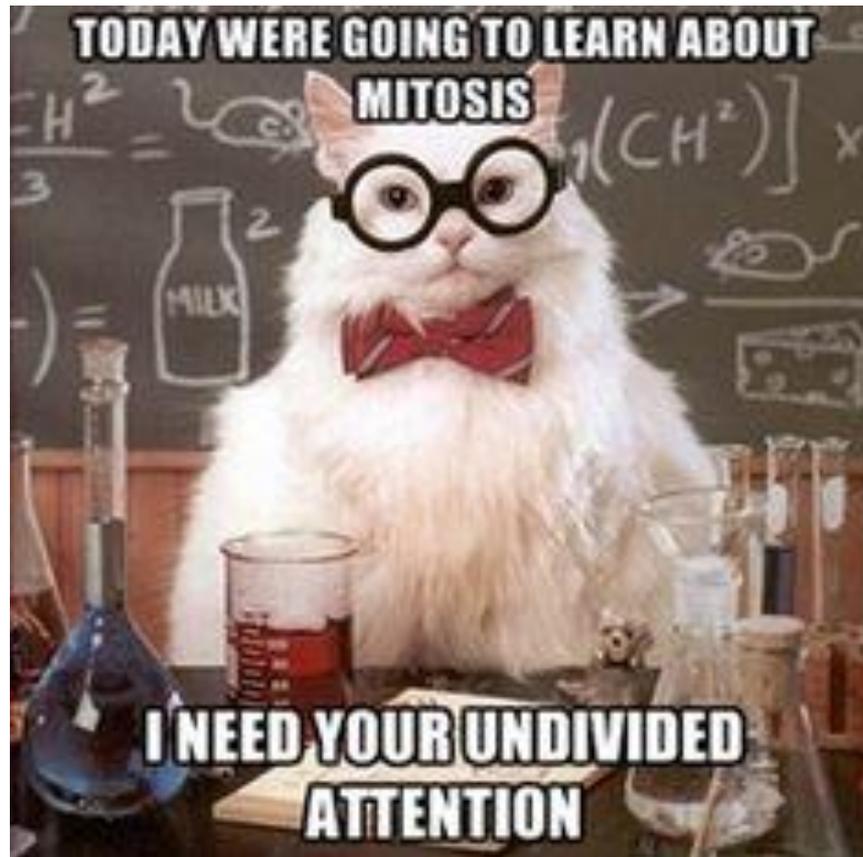
- Takes in **NUTRIENTS**.
- **REPAIRS** damaged parts
- **GROWS** rapidly
- Cell **PREPARES** for **DIVISION** by **DUPLICATING CHROMOSOMES** in the **NUCLEUS**.
  - Human cells go from **46** to **92** chromosomes during interphase
- Chromosomes look like long **STRINGS (SPAGHETTI)**



# Mitosis & Cytokinesis:

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

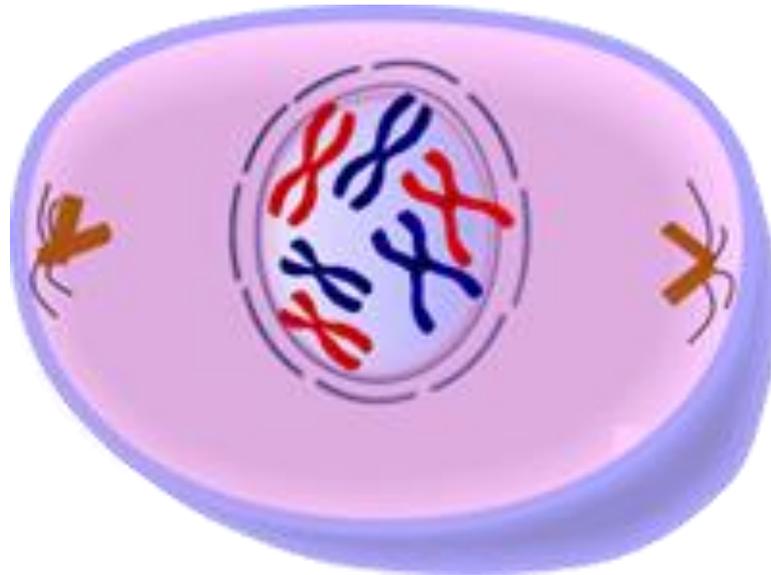


# Mitotic Cell Division:

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

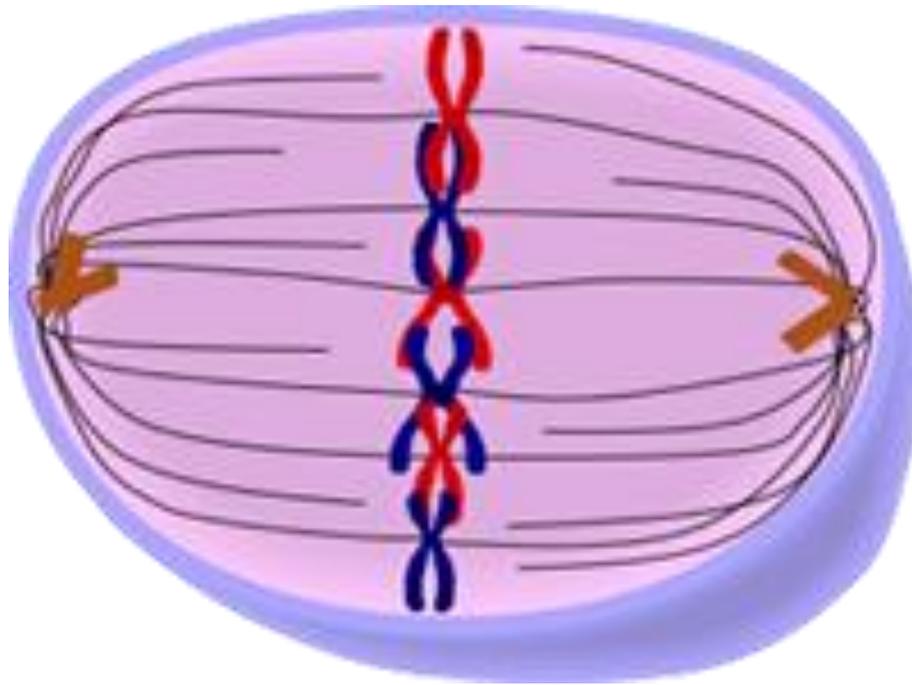


→ 92 CHROMOSOMES are present (remember that they were DOUBLED in INTERPHASE)

# Mitotic Cell Division:

## 2. METAPHASE:

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

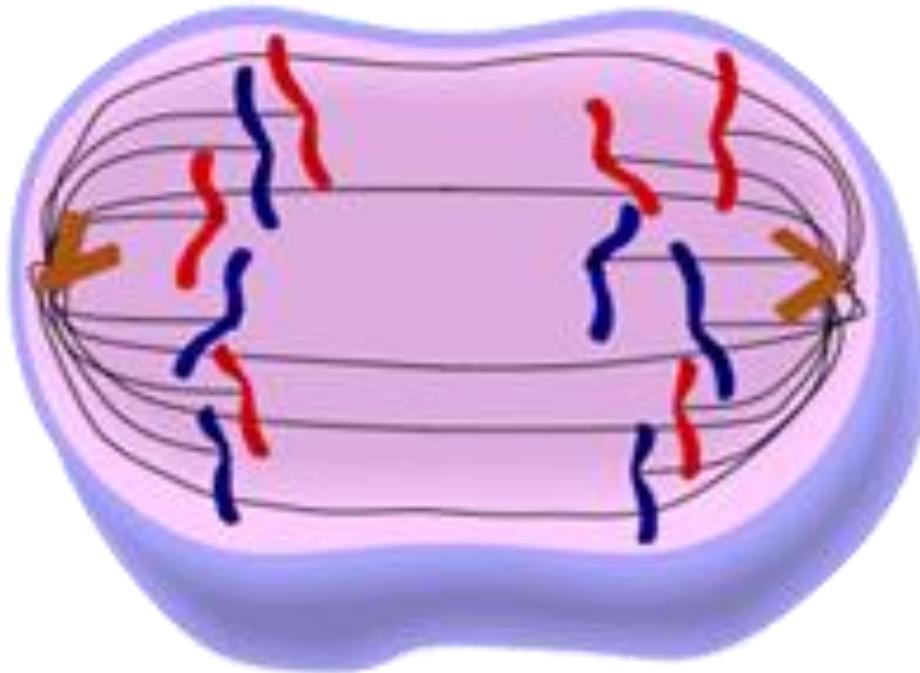


→ The cell still has 92 chromosomes.

# 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**.

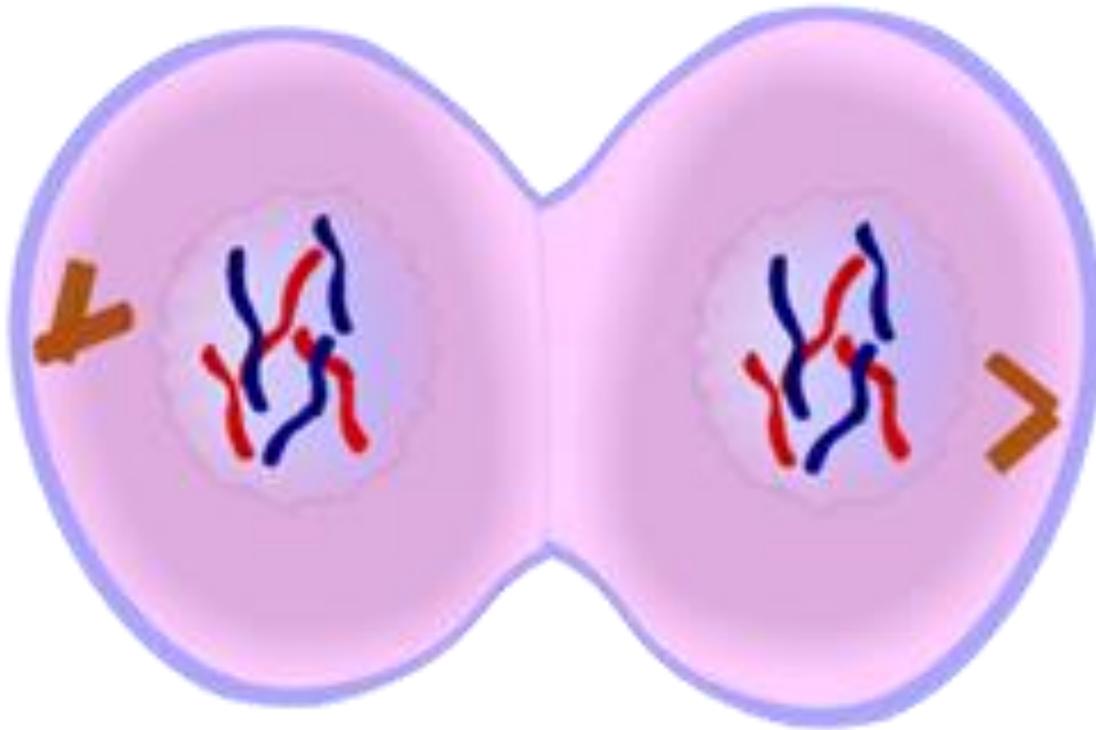


→ **46** chromosomes move to each **SIDE** (now **SINGLE STRANDED**)

# Mitotic Cell Division:

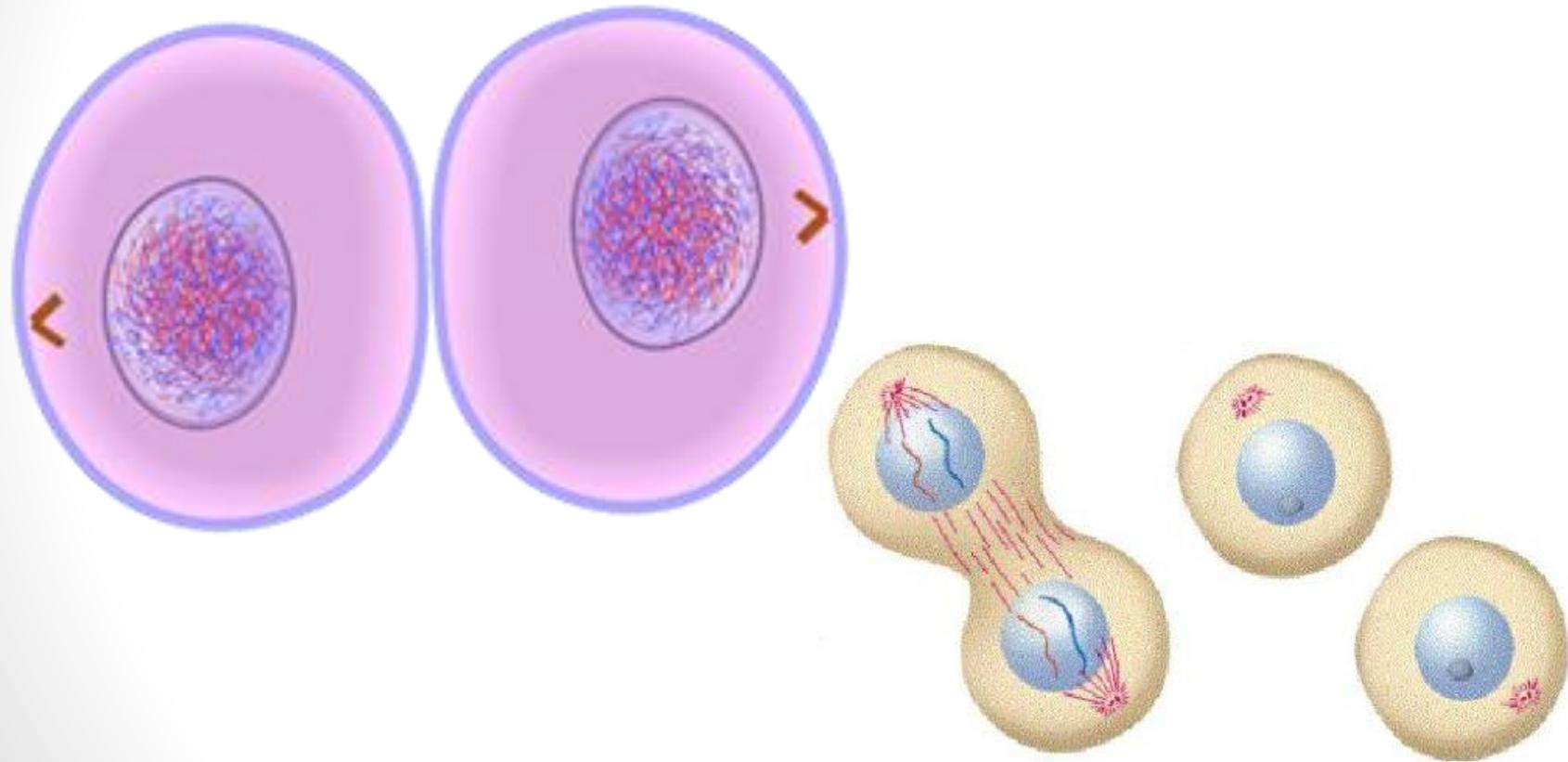
## 4. TELOPHASE:

- 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.



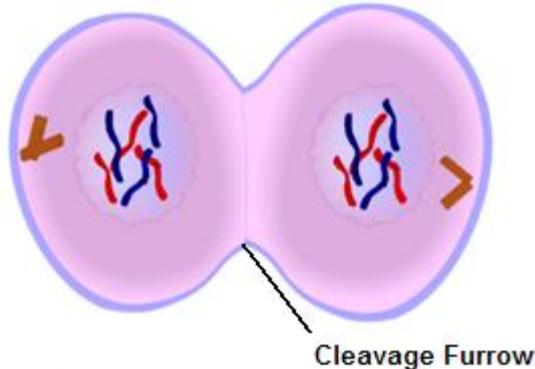
**We-eeeeee are never ever ever  
getting back together**

# Cytokinesis:

Note: Cytokinesis is different in plant and animal cells:

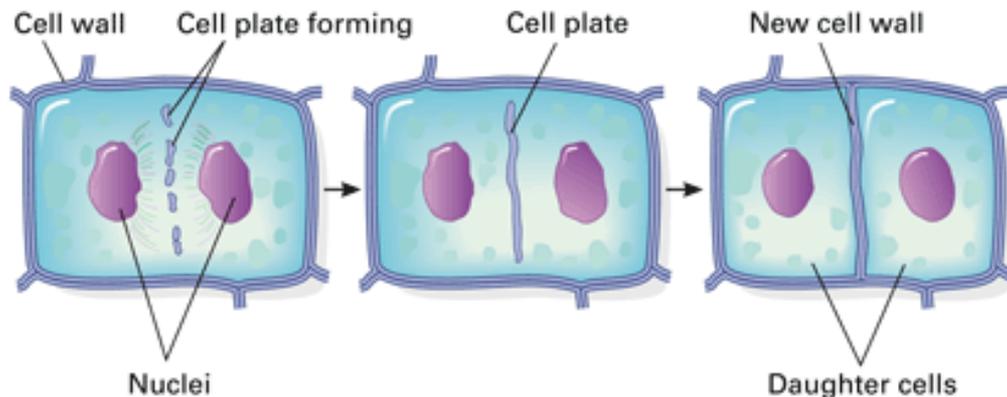
## *In animal cells*

- 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 CONTINUOUS (each phase FLOWS into the next).*

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

Remember:

I→P→M→A→T→I

