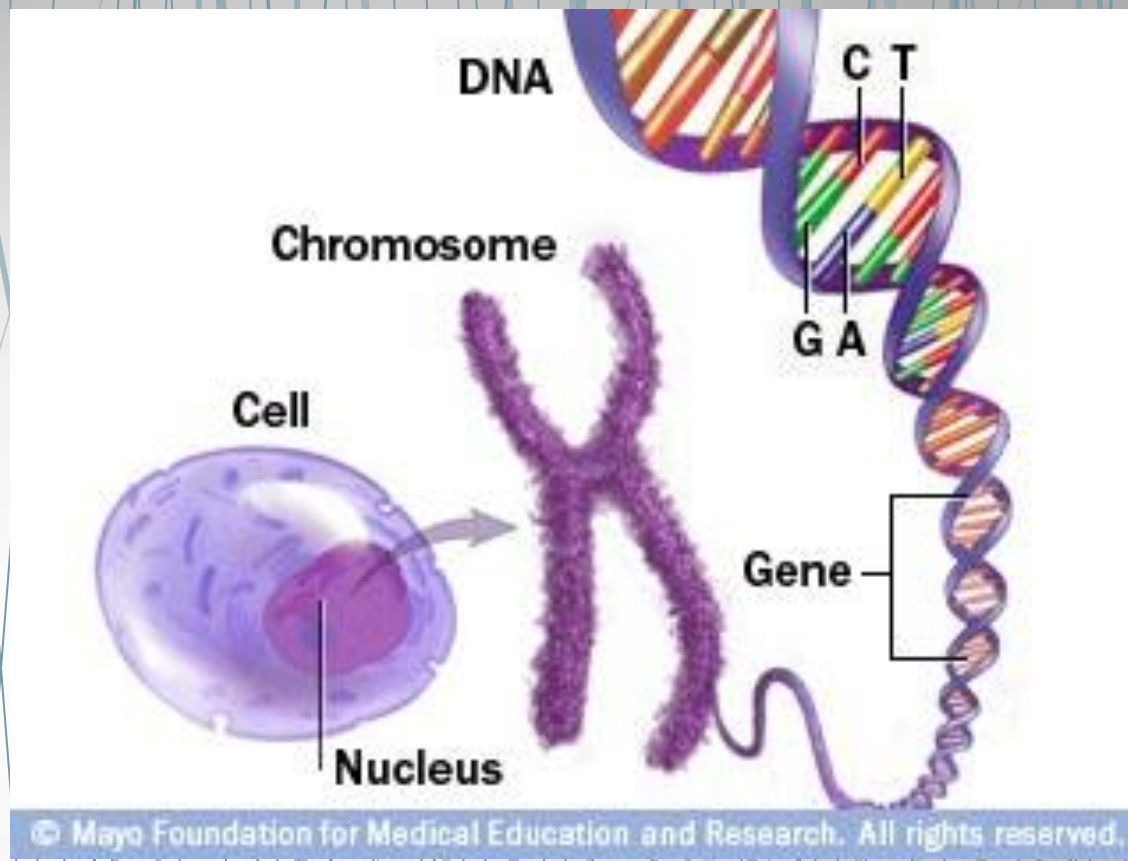


Cell Division

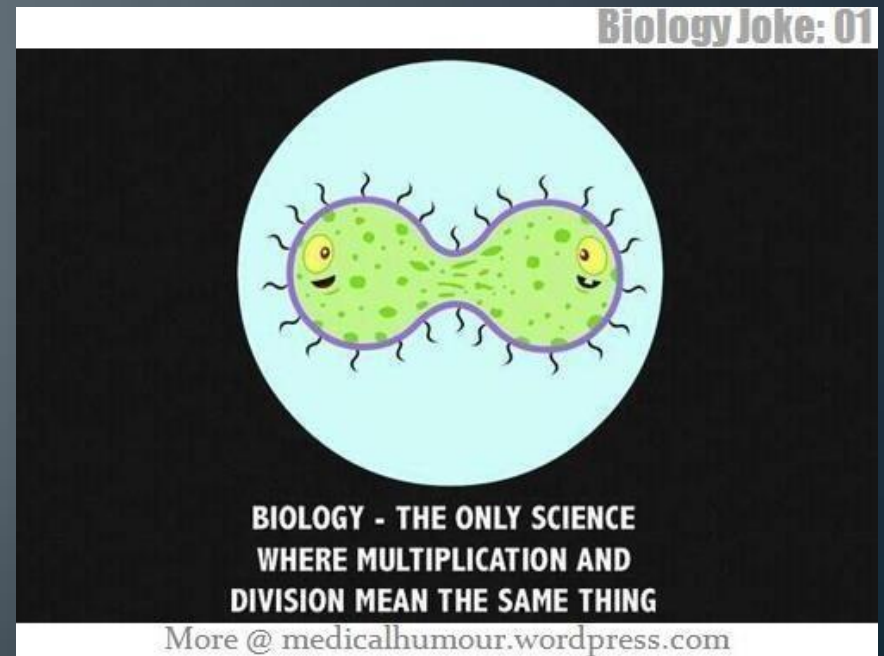


Putting it all together

Cell --> Genome --> DNA --> Gene

Cell Division

- A process essential to the **production of new cells**
- There are 2 types of cell division:
 - **Mitosis**
 - **Meiosis**



Cell Division

Interphase

- Cells are not always dividing. The period when they are not dividing is called the **interphase**.

Replication

- This is the phase when all the DNA is **copied**.
- This results in 2 **identical strands** of DNA.

Cell Division

- There are 3 reasons to divide:
 - To increase cell count – **growth of organisms**
 - To **repair** damaged or broken tissue.
 - To **allow** for sexual reproduction.



Reproductive Cells:

- cells that produce gametes
- male sex cells: sperm
- Female sex cells: ova.
- Sexual reproduction (Meiosis)

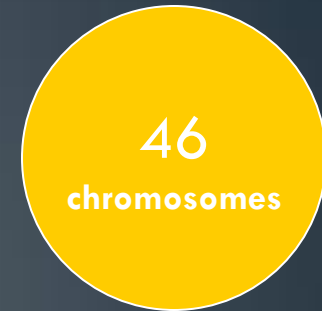
Somatic Cells:

- *all* non-reproductive cells
- Asexual reproduction (Mitosis)



- **Somatic cells** contain 23 pairs of chromosomes for a total of 46 chromosomes.

$$(23 \text{ pairs}) = 23 \times 2 = 46$$



- **Reproductive cells** contain a total of 23 chromosomes. NOT 23 PAIRS!

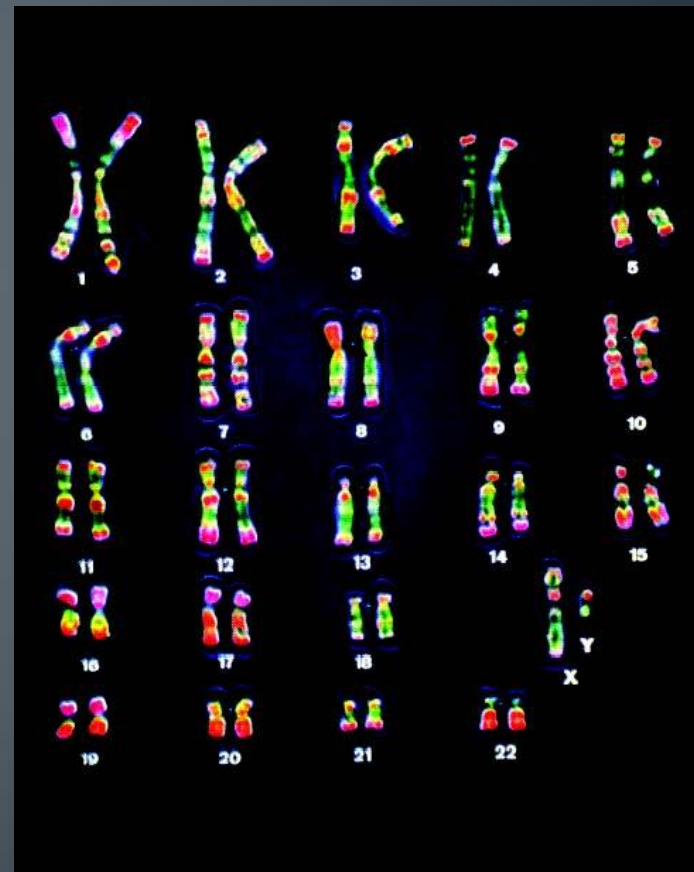


Before moving to mitosis...

Humans

- Humans are **diploid** organisms --> this means at birth we get 23 chromosomes from our **father** and 23 from our **mother**.
- Total: **46** chromosomes
- The sex cells however are haploid- they contain half the number of chromosomes of diploid cells: 23

Karyotype:



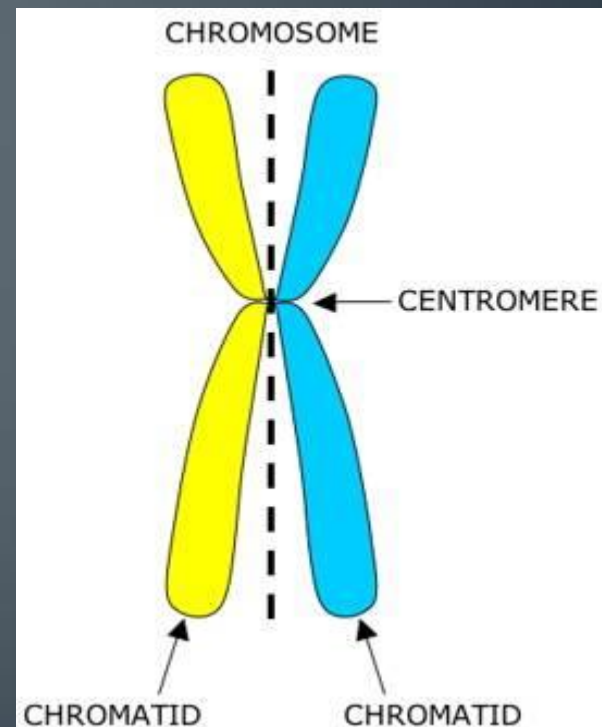
Before moving to mitosis...

Chromosomes

- A chromosome is made of very tightly packed **DNA**.
- Made up of 2 chromatids.

Chromatids

- Half a chromosome.



Fun fact about chromosomes

- It is the 23rd chromosome pair that determines gender.
- Mothers will always give an X chromosome to their offspring (because that's all we have) while men have a 50% chance of giving a Y chromosome, resulting in a baby boy.
 - This means that only 1 chromosome out of 46 is responsible for gender!
- This chromosome pair is called XX for females (because of its shape) and XY for males (again, because of its shape)!

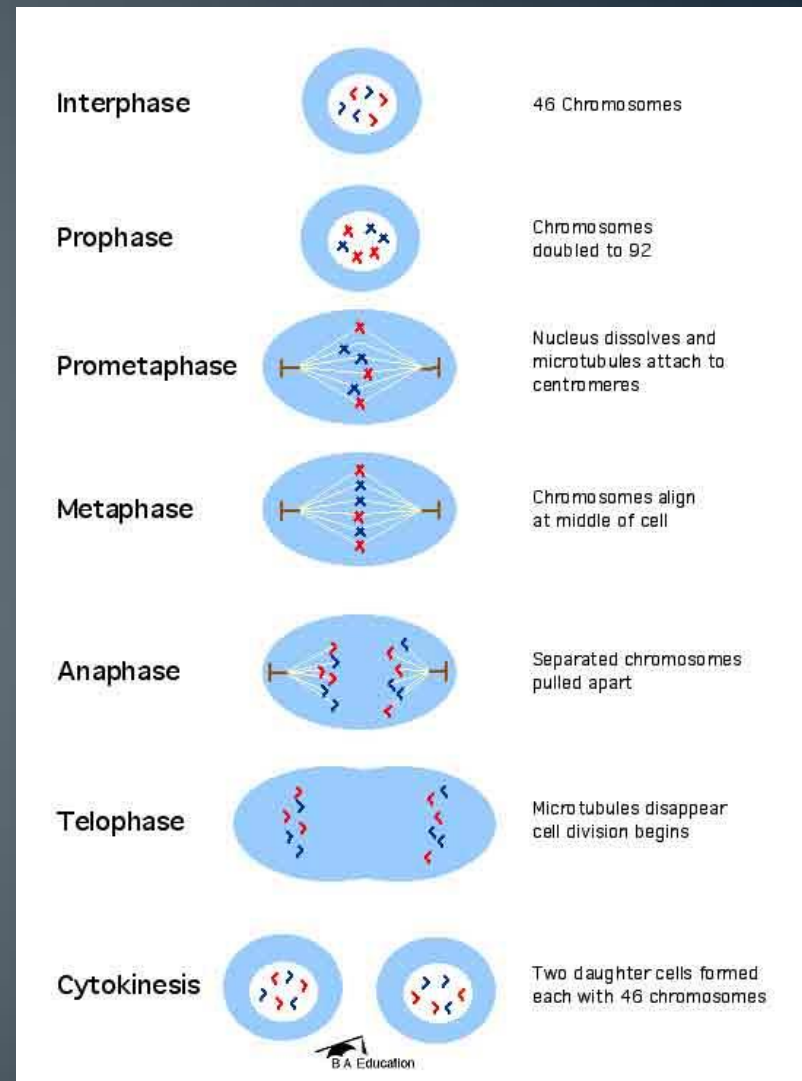
REMEMBER:

Pay attention to the wording! Chromosomes vs Chromosome **pairs!**

Mitosis

Mitosis

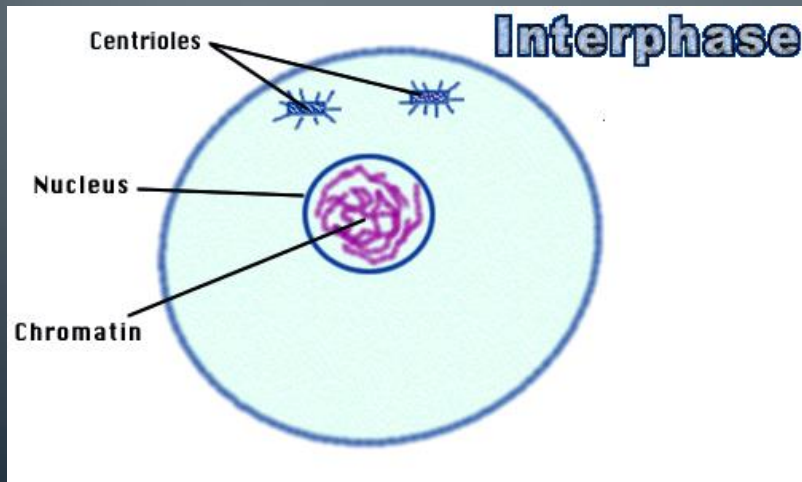
- A process of cell division where cells multiply to...
 - Allow growth
 - &
 - Repair tissue
- End result: 2 diploid daughter cells produced from the parent cell
- Most cells in the body are produced by mitosis: skin cells, nail cells, muscle cells



Mitosis

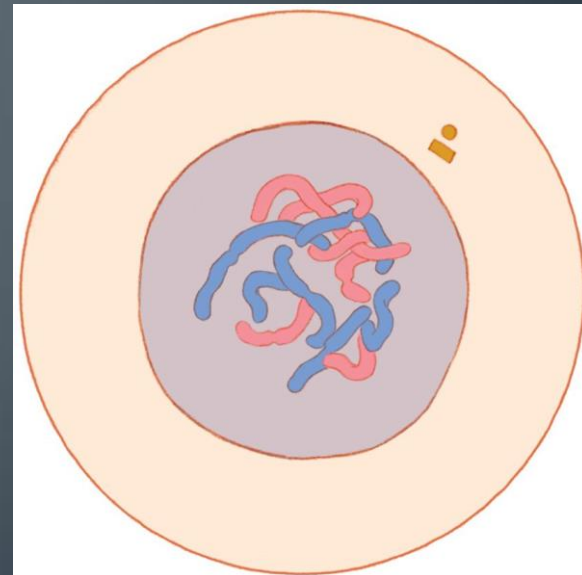
Beginning of Interphase

- DNA appears as threads
 - Hint for drawing: have the DNA all the same color



End of Interphase

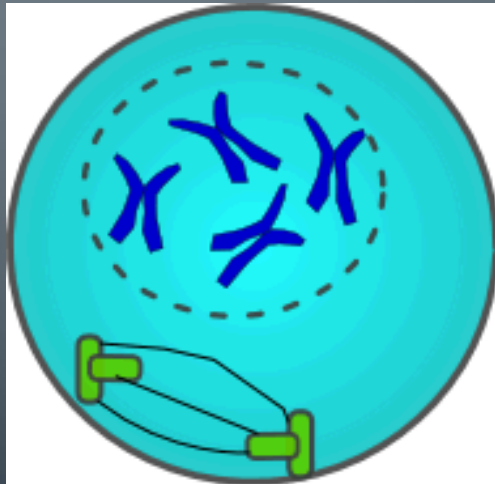
- The **parent** cell has grown & has **2** copies of its DNA.
 - Hint for drawing: have 2 colors for DNA.



Mitosis

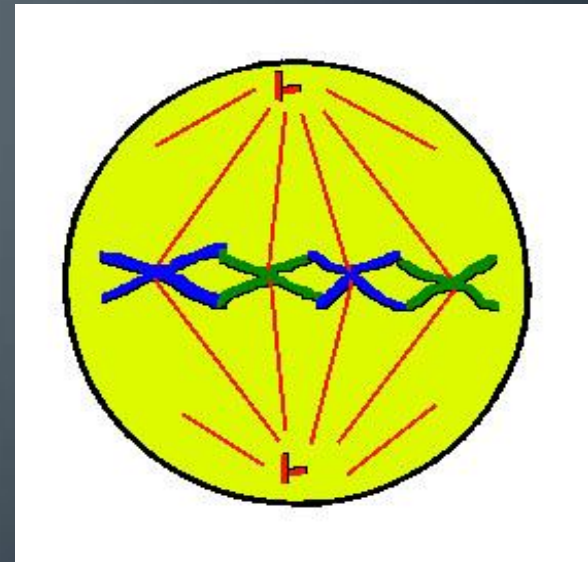
Prophase (phase 1 of mitosis)

- DNA strands coil and form chromosomes.
- The **nuclear membrane** disappears.



Metaphase (phase 2 of mitosis)

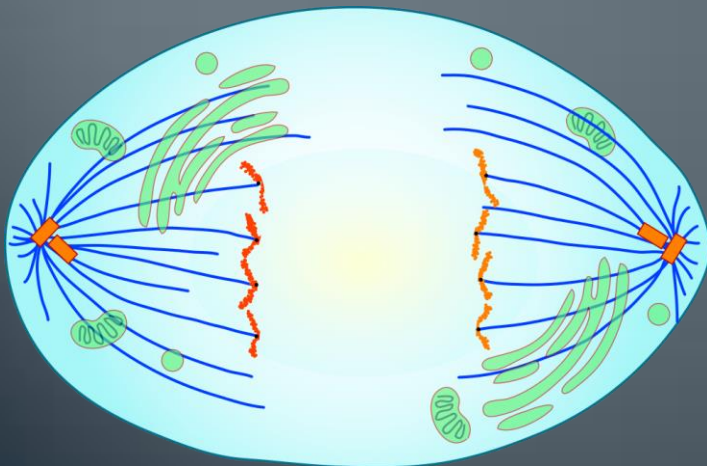
- **Chromosomes** align at the center of cell



Mitosis

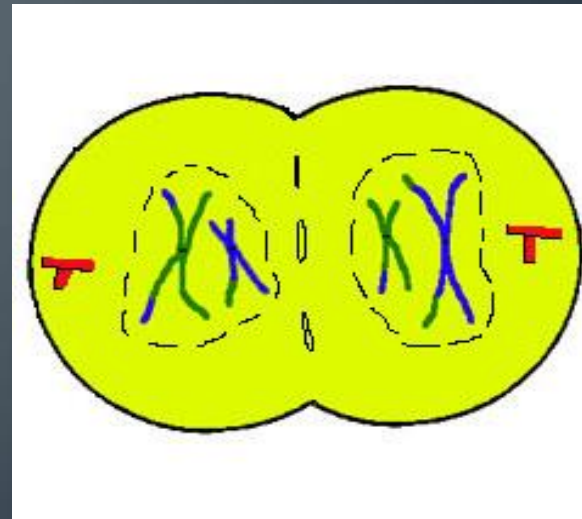
Anaphase (phase 3 of mitosis)

- Chromosomes split at their centers into 2 chromatids.
- Chromatids move away from centre, 1 chromatid goes to each end of the cell.



Telophase (phase 4 of mitosis)

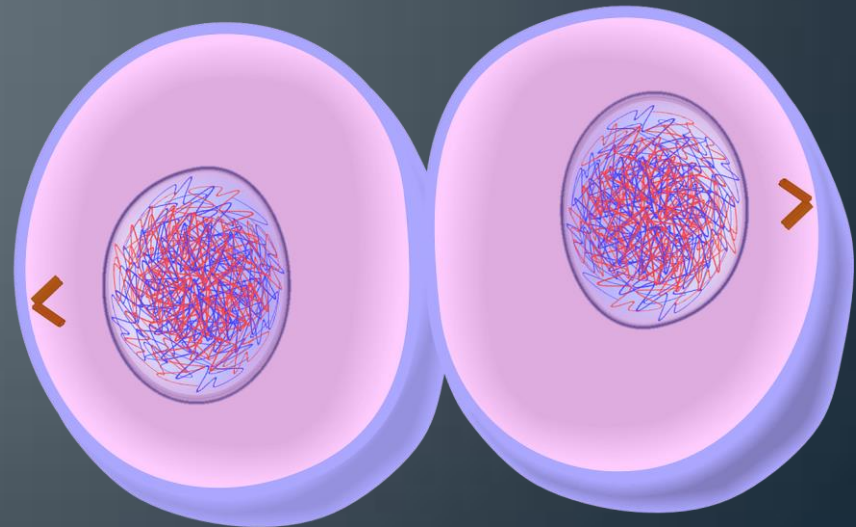
- A new nuclear membrane forms
- DNA uncoils into separate strands.
- Organelles and cytosol are evenly distributed.
- Cell divides into two cells.



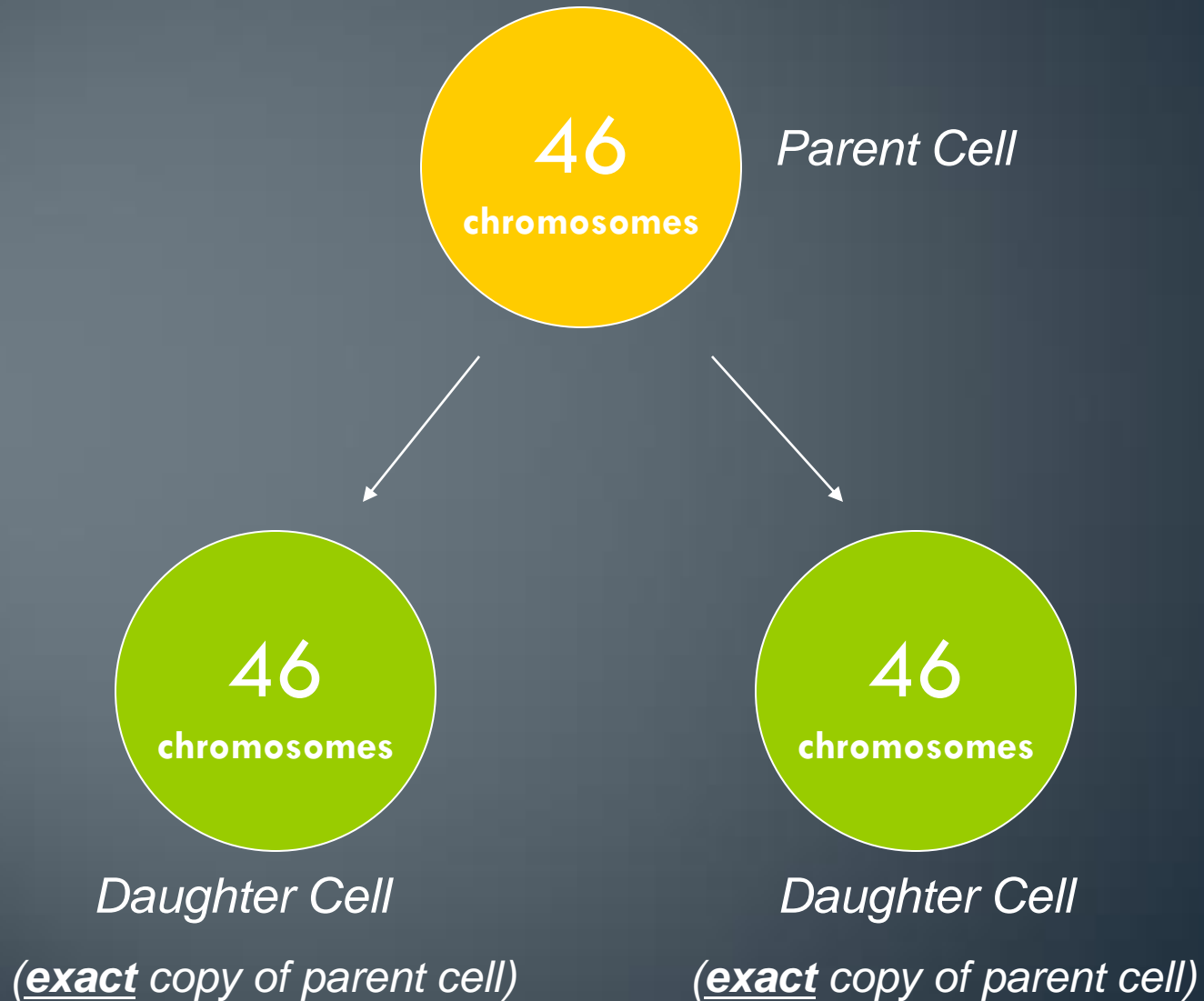
Mitosis

Final Product

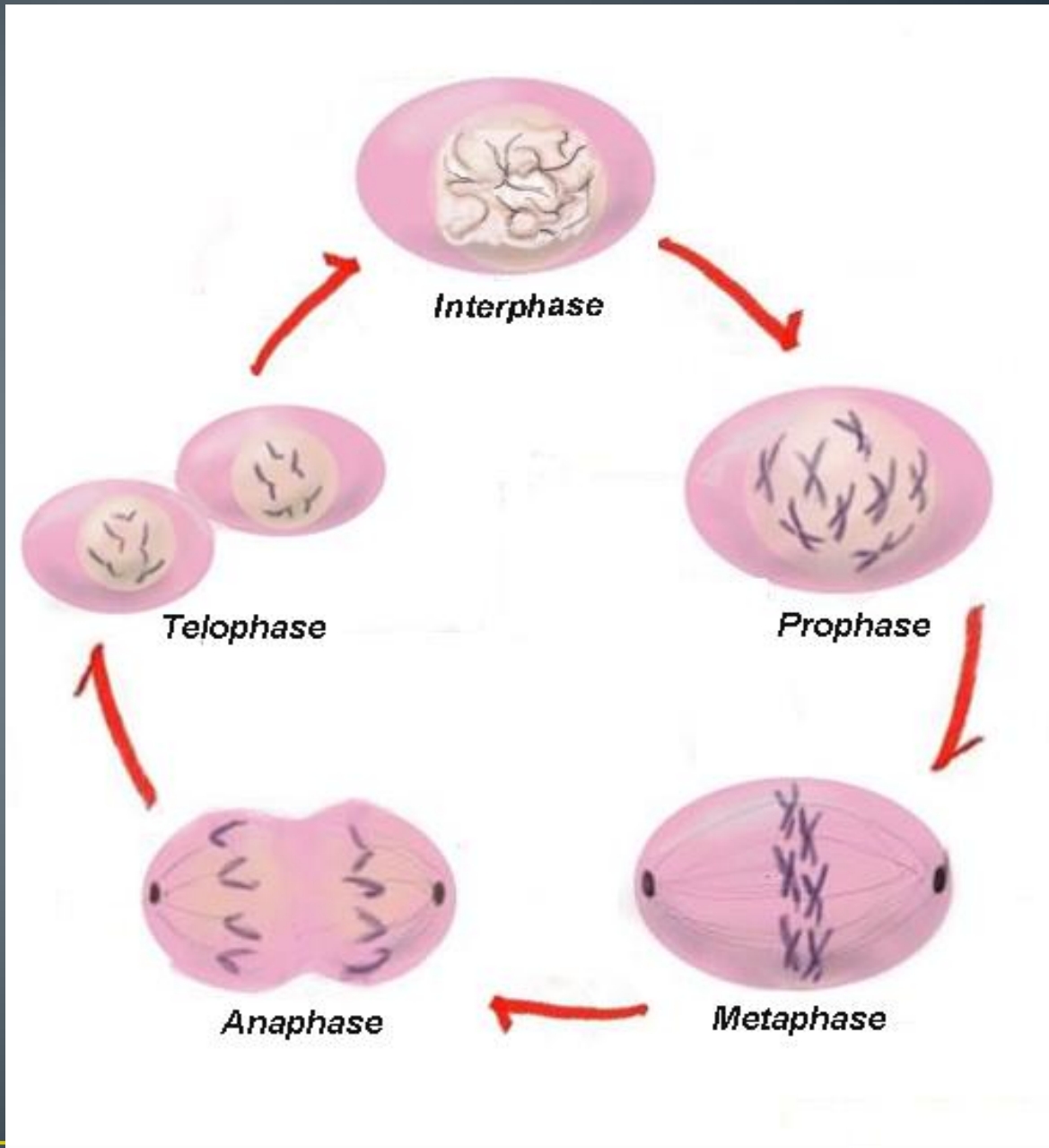
- Separation of the 2 cells is completed.
- **2 identical and complete daughter cells!**



Mitosis – Somatic cells (Asexual Reproduction)



Phases of Mitosis



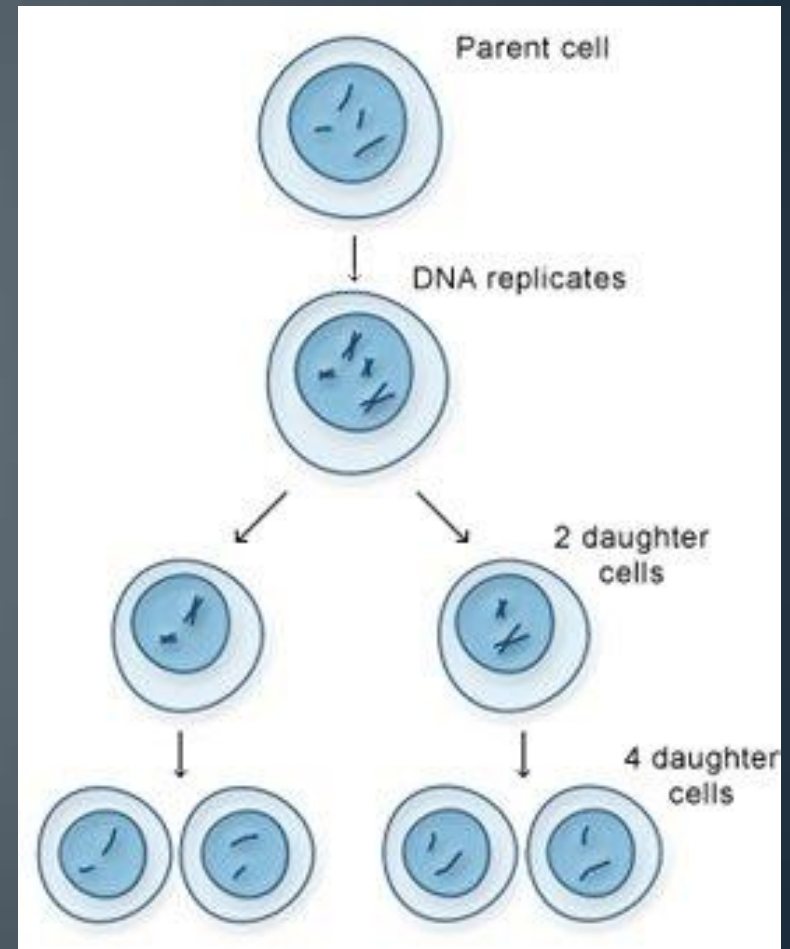
Mitosis Video

<https://www.youtube.com/watch?v=L0k-enzoeOM>

Meiosis

Meiosis

- The process of **cell division** in which male and female **gametes** are produced. This allows for:
 - **Sexual Reproduction**
- End result: **4 haploid** daughter cells.



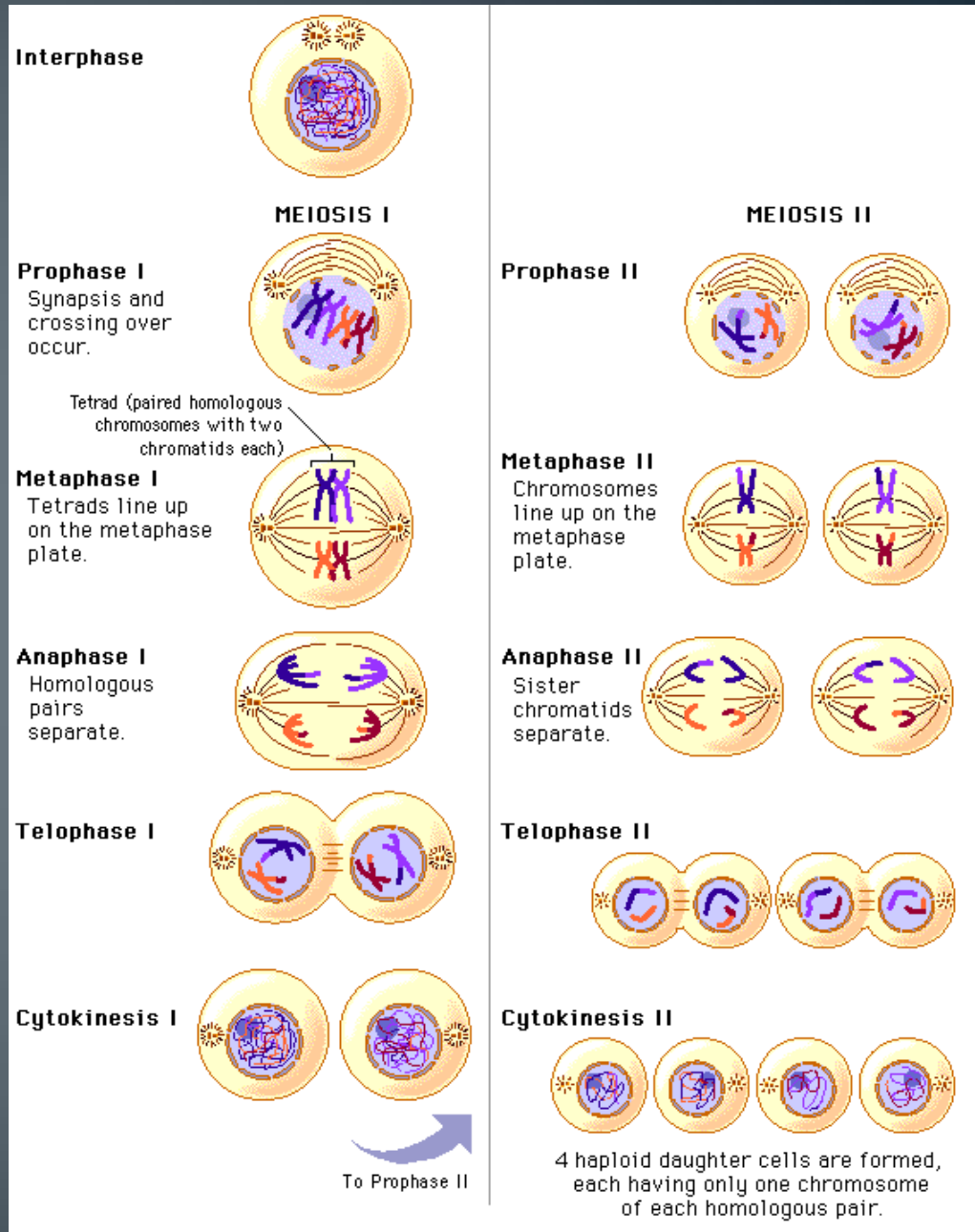
Meiosis

- Male Gamete (or spermatozoa) which contains 23 chromosomes
- Female Gamete (or ova, or egg) which contains 23 chromosomes
- Offspring (baby) will have 23 chromosome **pairs!**

Meiosis

- Very similar to mitosis: the first 4 phases are identical but in meiosis another **division** happens!
- There is just **1 replication** of DNA but 2 divisions, so we end up having 4 cells with **half** the genetic material of the initial cell.

Meiosis



Comparison

Mitosis

VS

Meiosis

- 1 cell division
- Goal: Repair and **growth**
- **Diploid** cells (23 chromosome pairs)
- **2** identical diploid daughter cells

- 2 cell divisions
- Goal: sexual reproduction
- Haploid cells (**23** chromosomes)
- **4** daughter cells containing half of the original diploid cell's genetic material.

Meiosis Video

- www.youtube.com/watch?v=qCLmR9-YY7o&feature=iv&src_vid=L0k-enzoeOM&annotation_id=annotation_279065