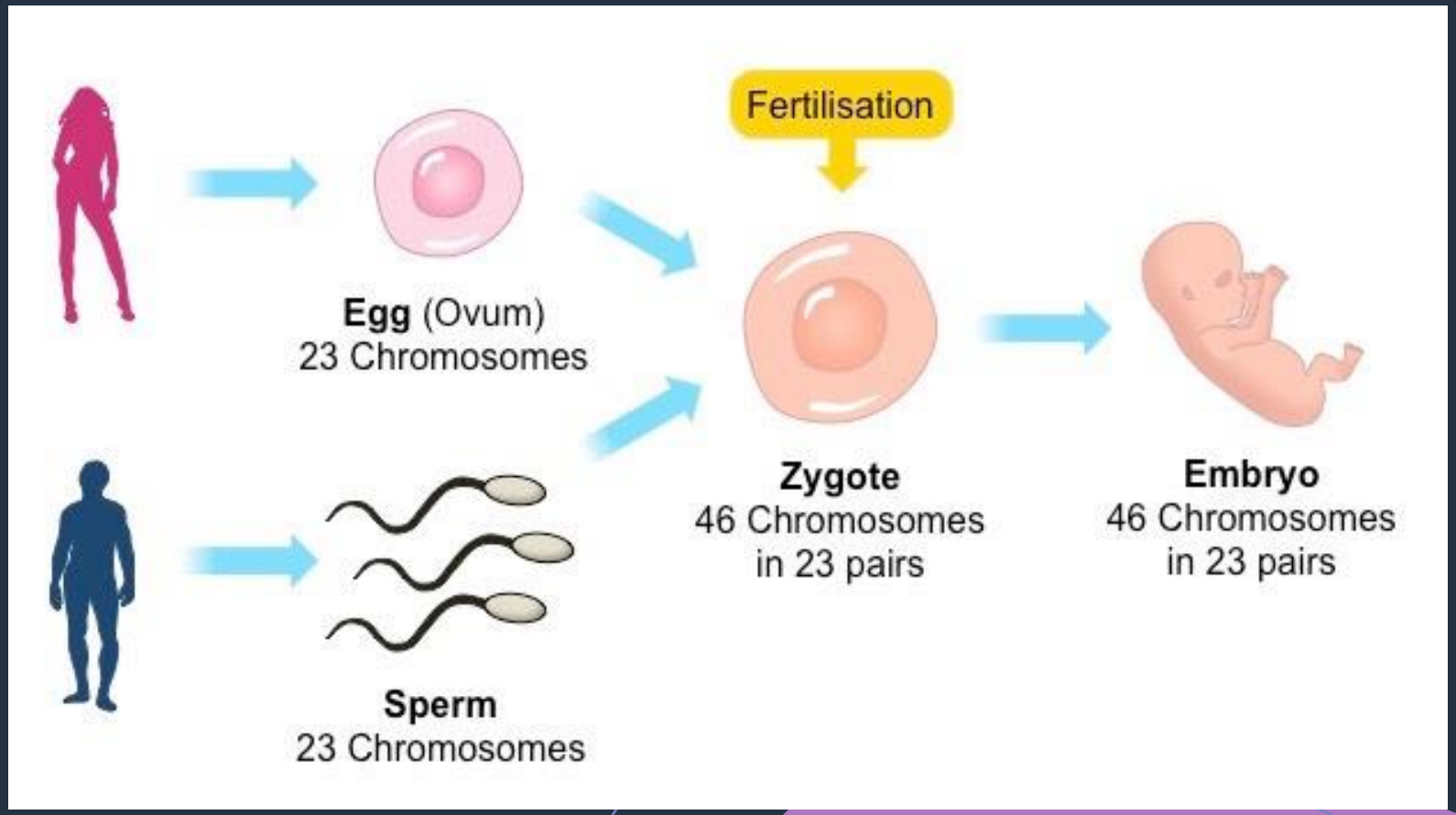
Meiosis

Not You-osis

Meiosis - Purpose

- The purpose of Meiosis is to create new combinations of DNA to create new individual organisms that are **NOT** the same
- This requires giving the new organism a copy of DNA from two parents

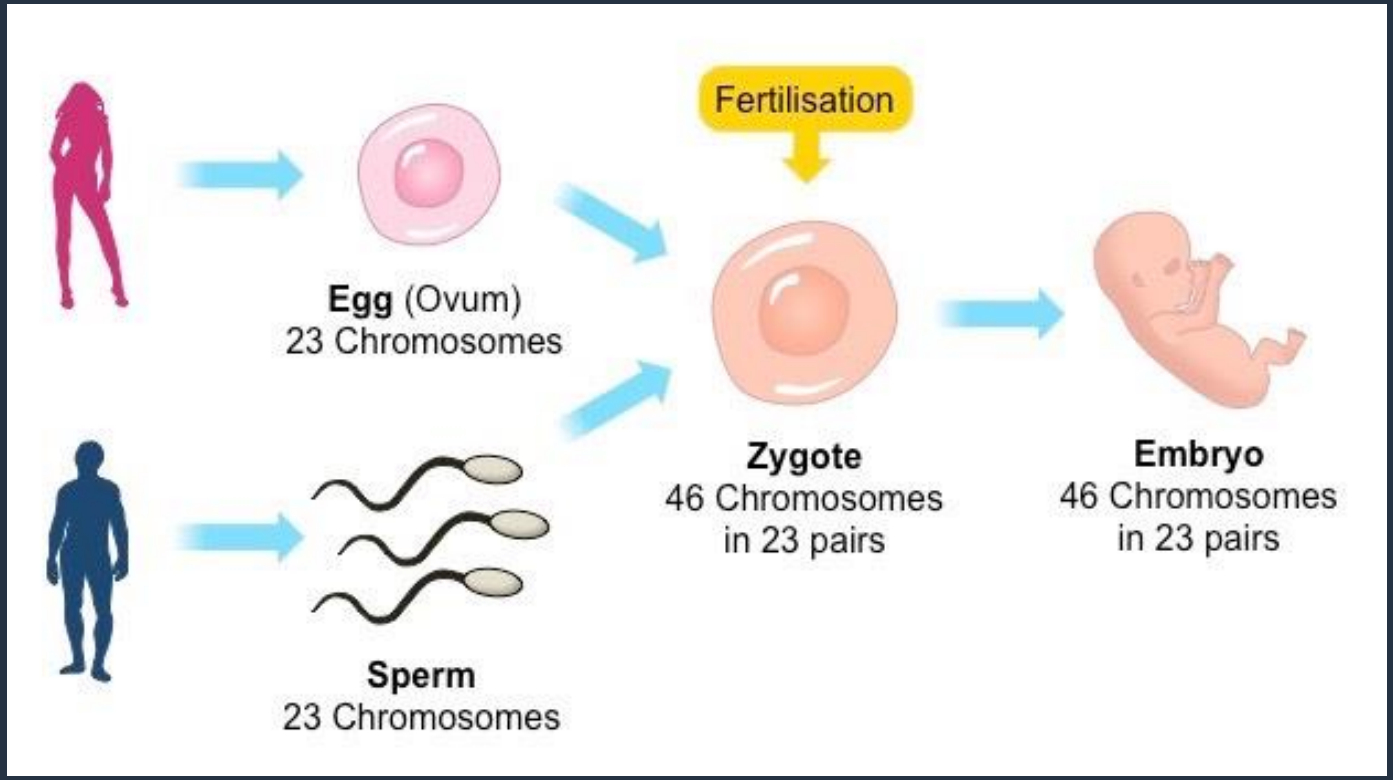


Math Time!

- All human body (somatic) cells have two copies of each chromosome
  - They are labeled as diploid cells, and are usually noted as **2n**, where n = the number of unique chromosomes
- To reproduce and create different organisms, humans create cells that have half the somatic chromosome number called gametes (sperm and egg cells)
- They are labeled as Haploid cells, and are usually noted as **n**, where n = the number of unique chromosomes

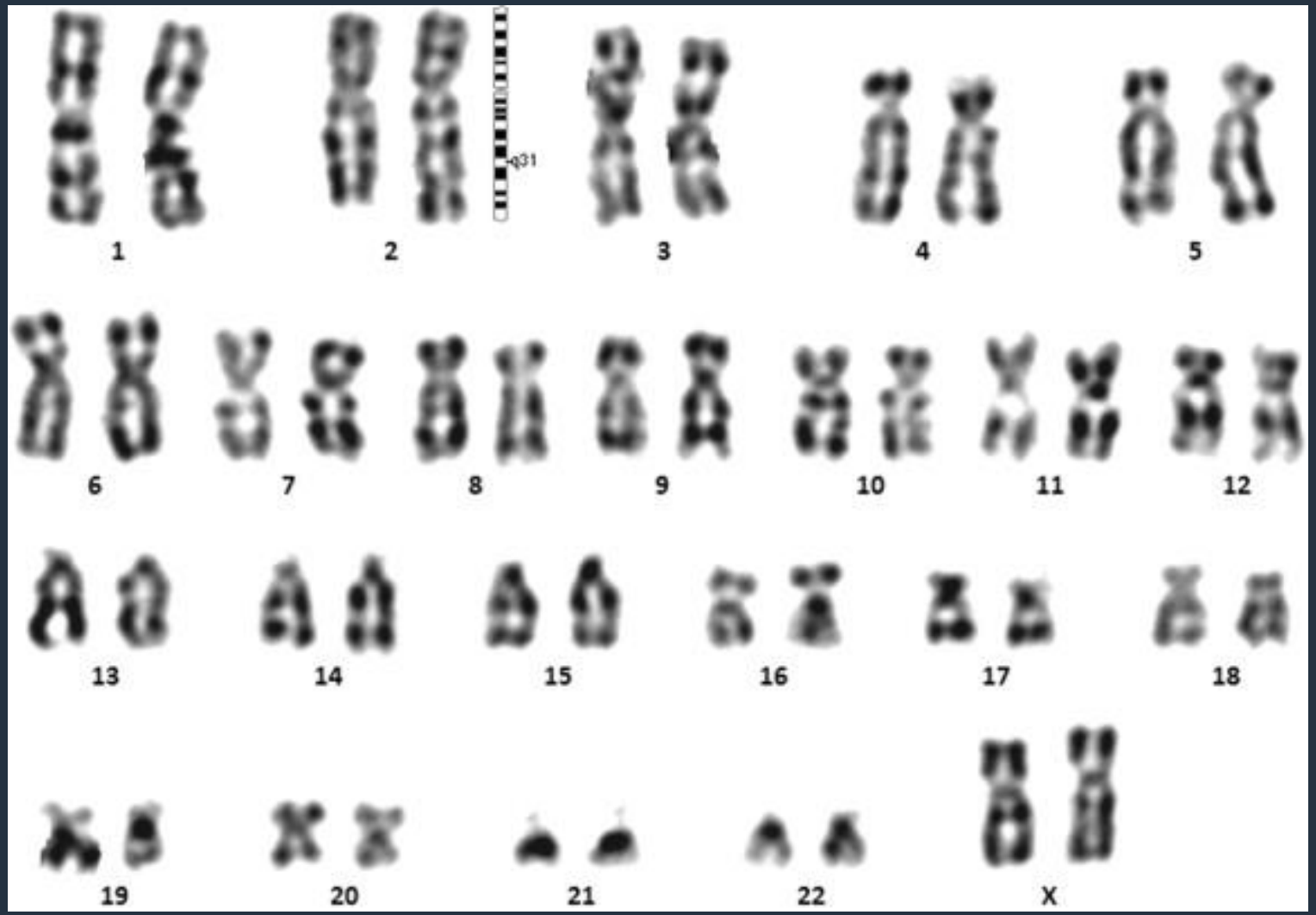
Meiosis - Purpose

- The gamete cells (1 sperm and 1 egg cell) will fuse together during a process called fertilization
- The resulting cell is called a zygote and will be diploid again
- The zygote will then use mitosis to grow into an Embryo (Early stage of development, still unborn)



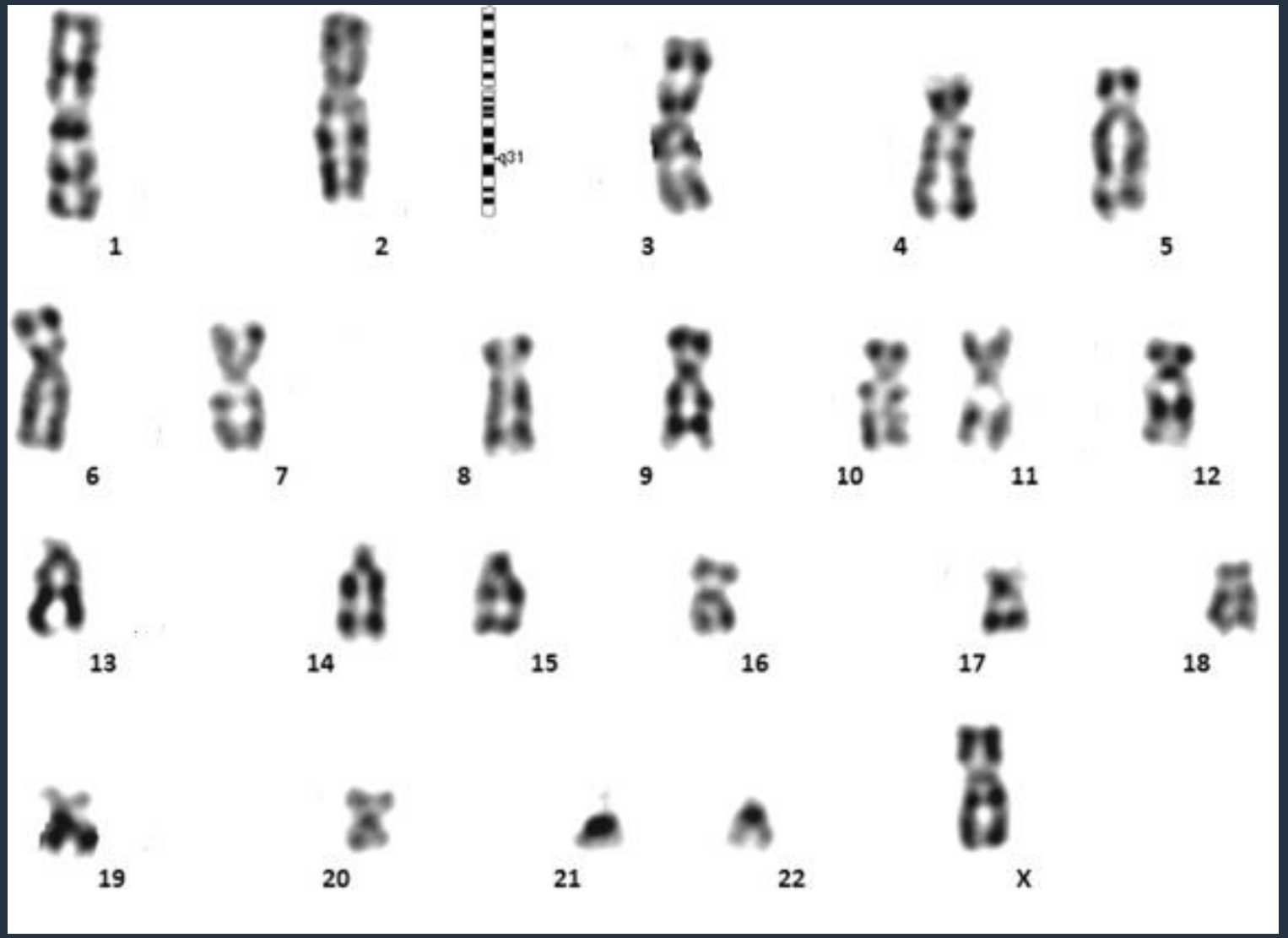
Meiosis

- Meiosis is a two step process
- The DNA is still duplicated in interphase
- Meiosis 1 separates each homologous chromosome randomly



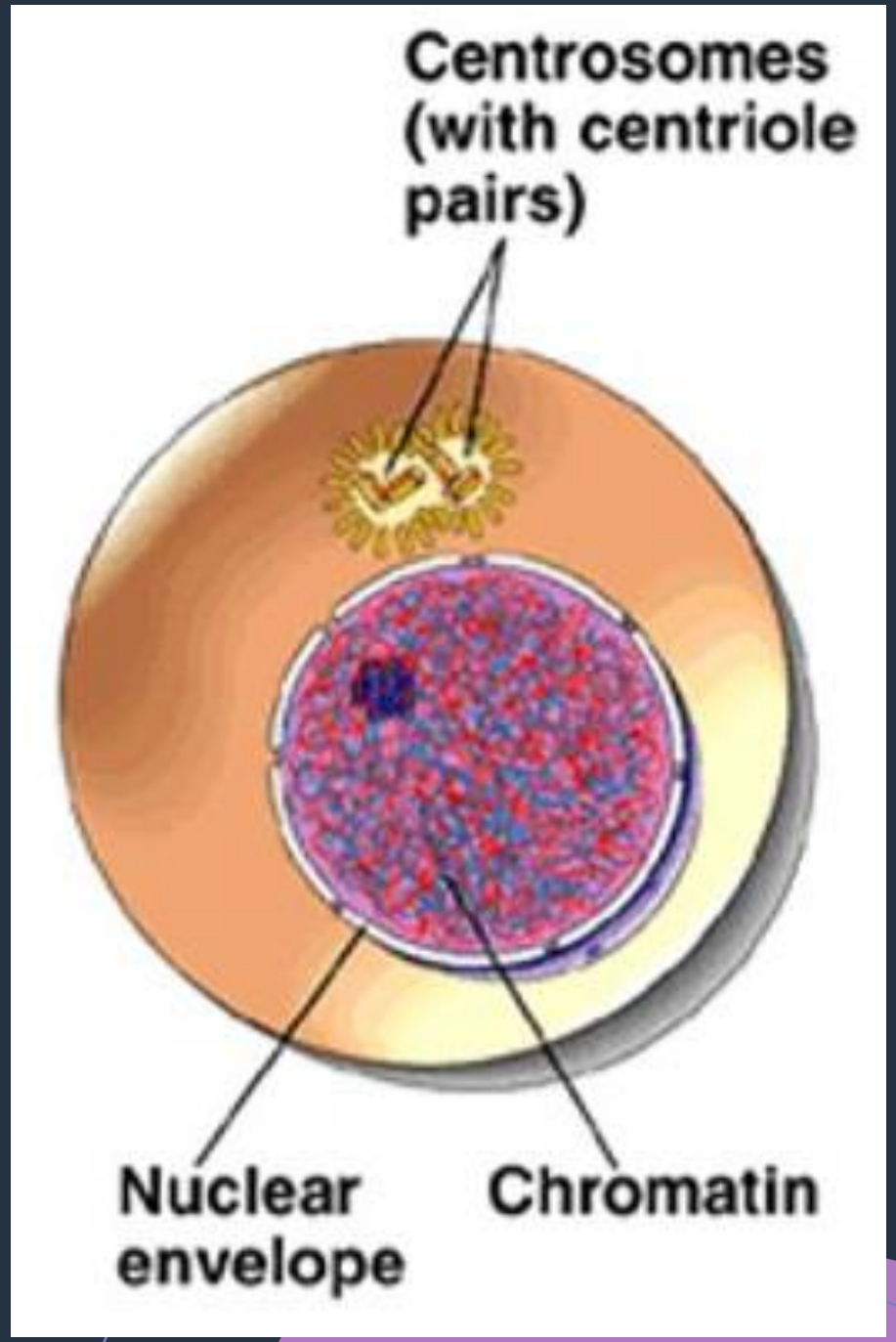
Meiosis

- Meiosis 2 separates the sister chromatids created during duplication in interphase



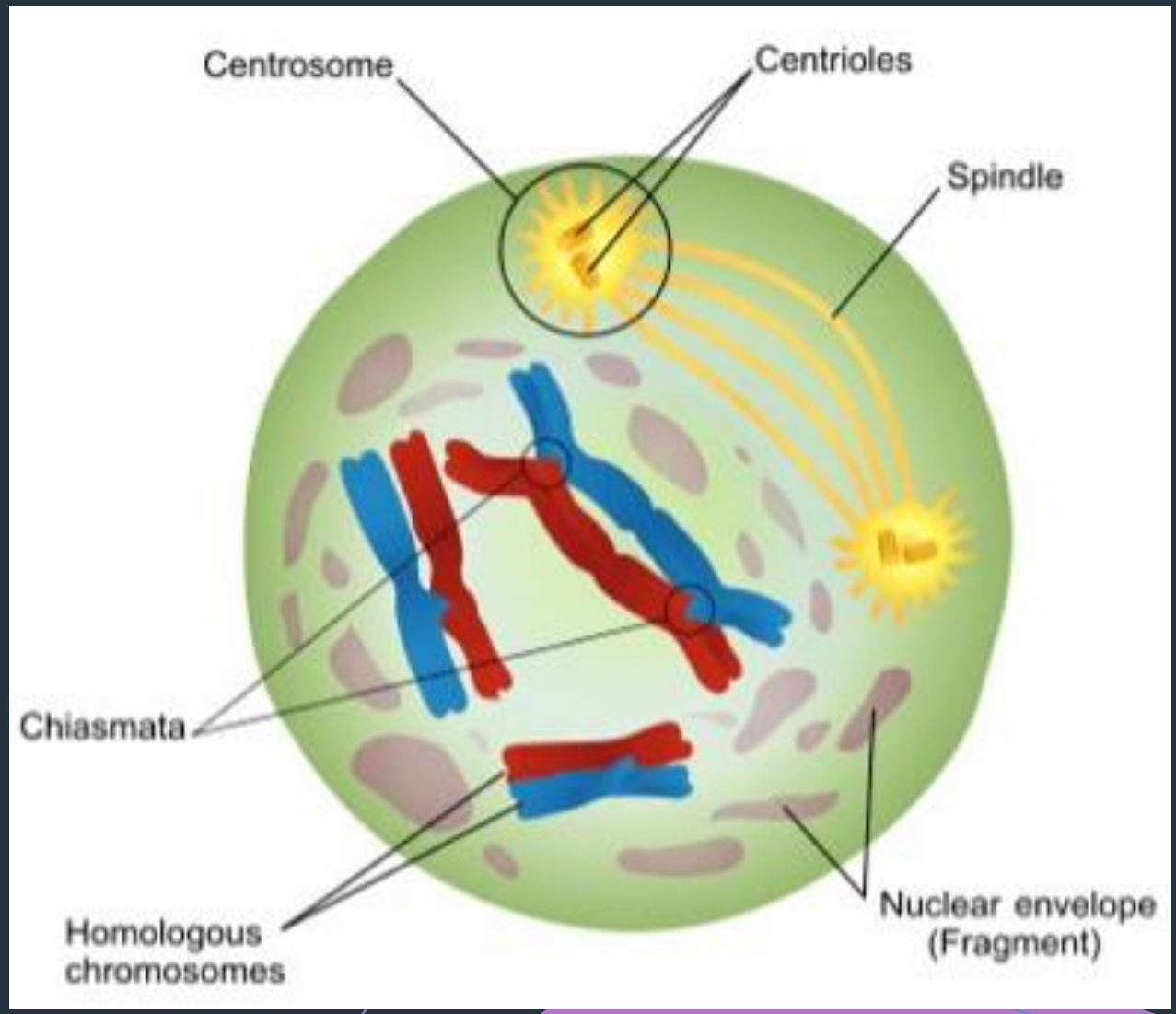
Meiosis 1

- **Interphase**
  - Same as in mitosis, the cell needs to prepare resources to divide and duplicate its DNA
  - Growth 1, DNA synthesis, and Growth 2 phases still occur



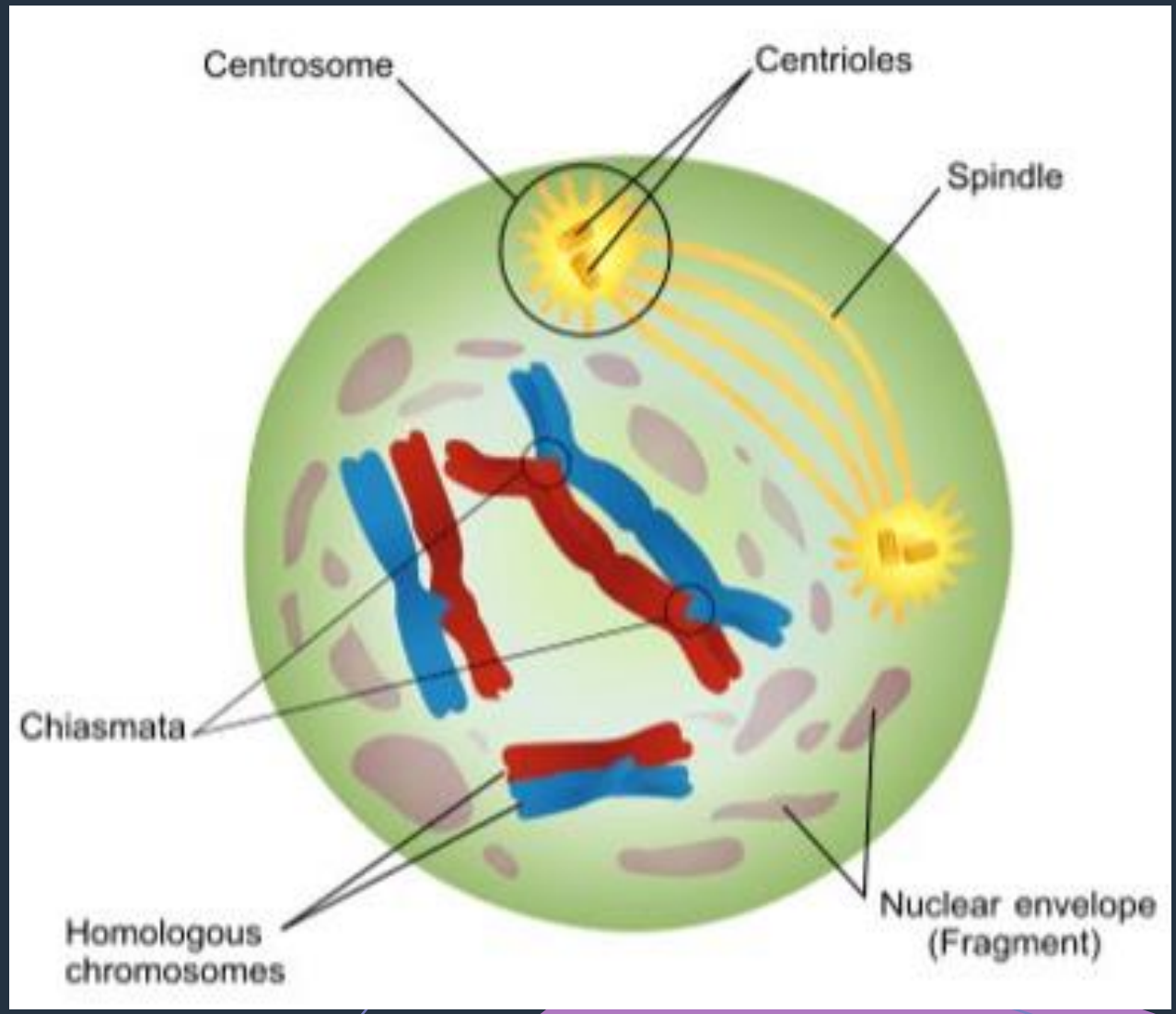
Meiosis 1

- **Prophase 1 - Similarities**
- Nucleus disappears
- This time, the x-shaped chromosomes (made of sister chromatid) pair up with their homologous pairs.
- The centrioles create the spindle fiber that attaches to center of the **pairs** of sister chromatids



Meiosis 1

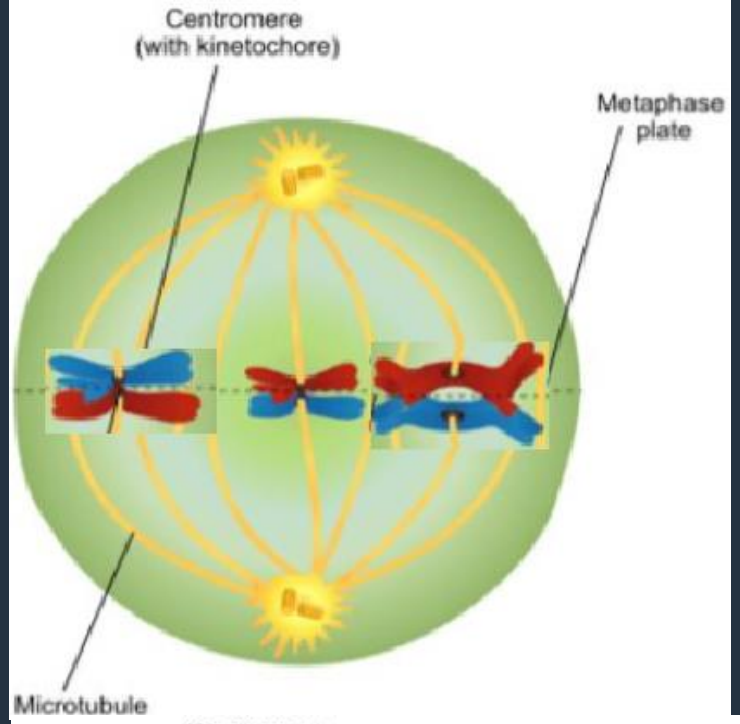
- **NEW!: Crossing over** occurs in Prophase 1 (and somewhat in metaphase)
  - This is where some DNA can be swapped between the homologous chromosomes. This occurs between the sister chromatid near the center.
  - This creates more biodiversity by mixing the DNA for more combinations

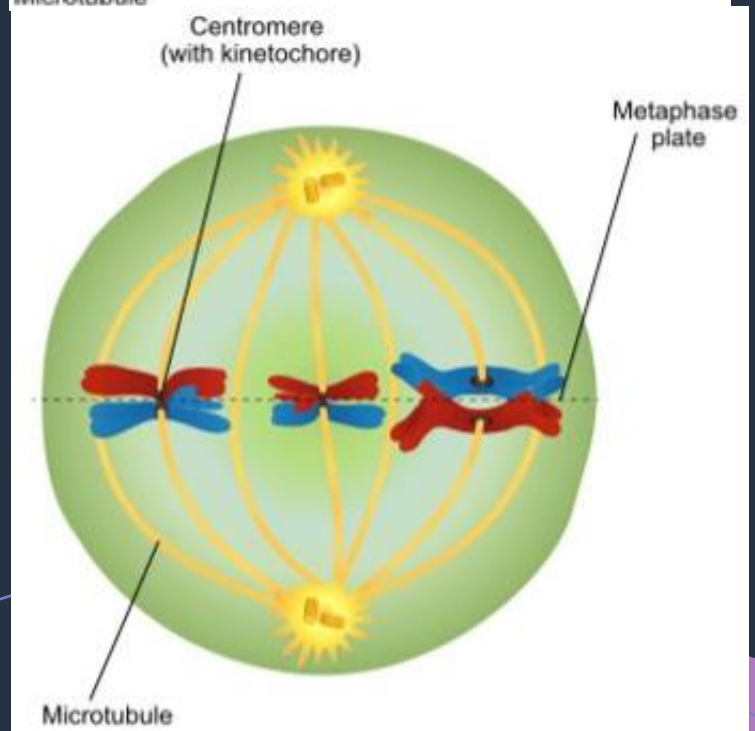


Meiosis 1

<u>Only one combination will be created!!!!!</u>

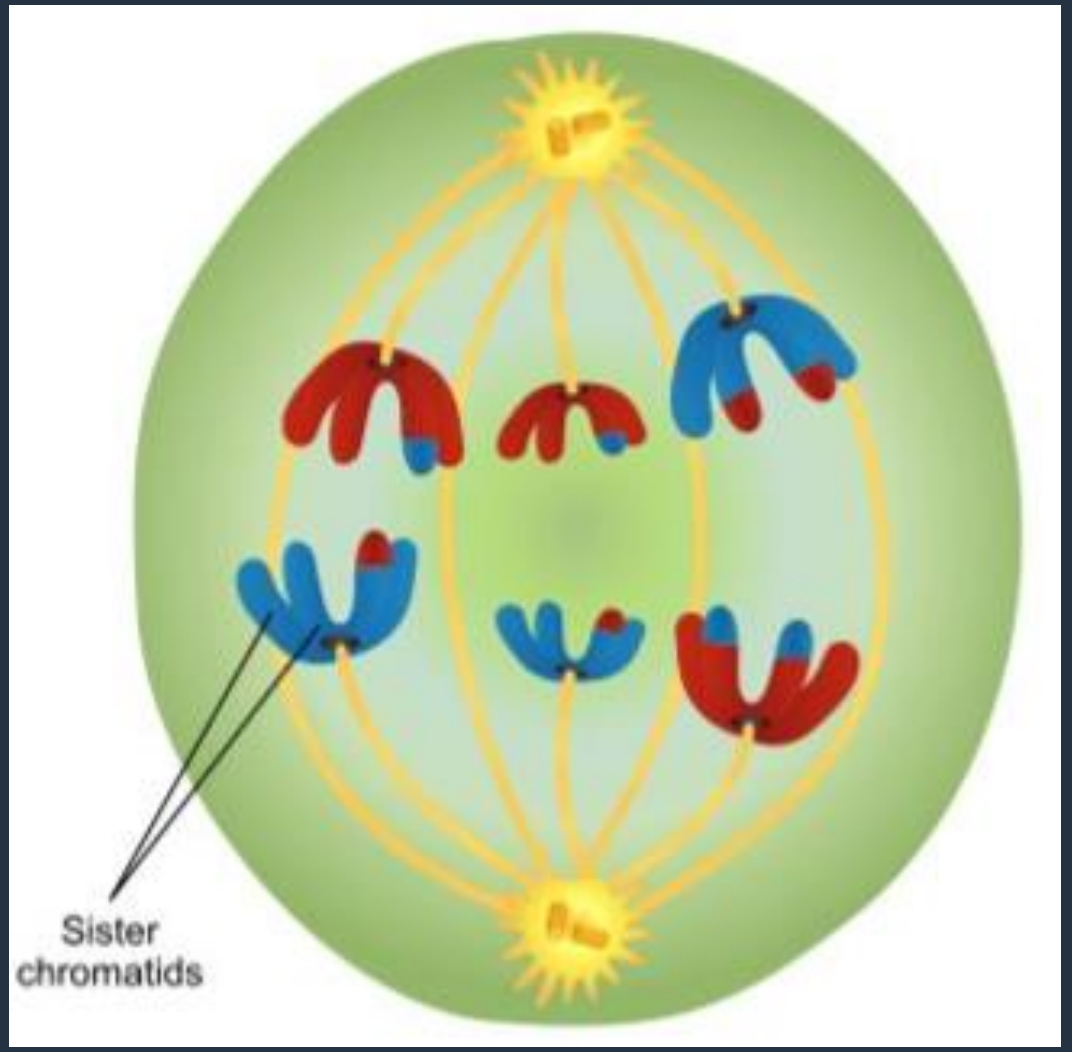
- **Metaphase 1**
- The homologous chromosome pairs are lined up at the center of the cell
- **<u>NEW! Independent assortment</u>**
  - <u>The homologous pairs can orientate themselves in any order.</u> This means that in one pair, the mother's copies will be facing the top, and on another pair, the mother's copies could be facing the bottom.
- **Independent assortment** adds genetic diversity by randomizing genetic material in new cells.





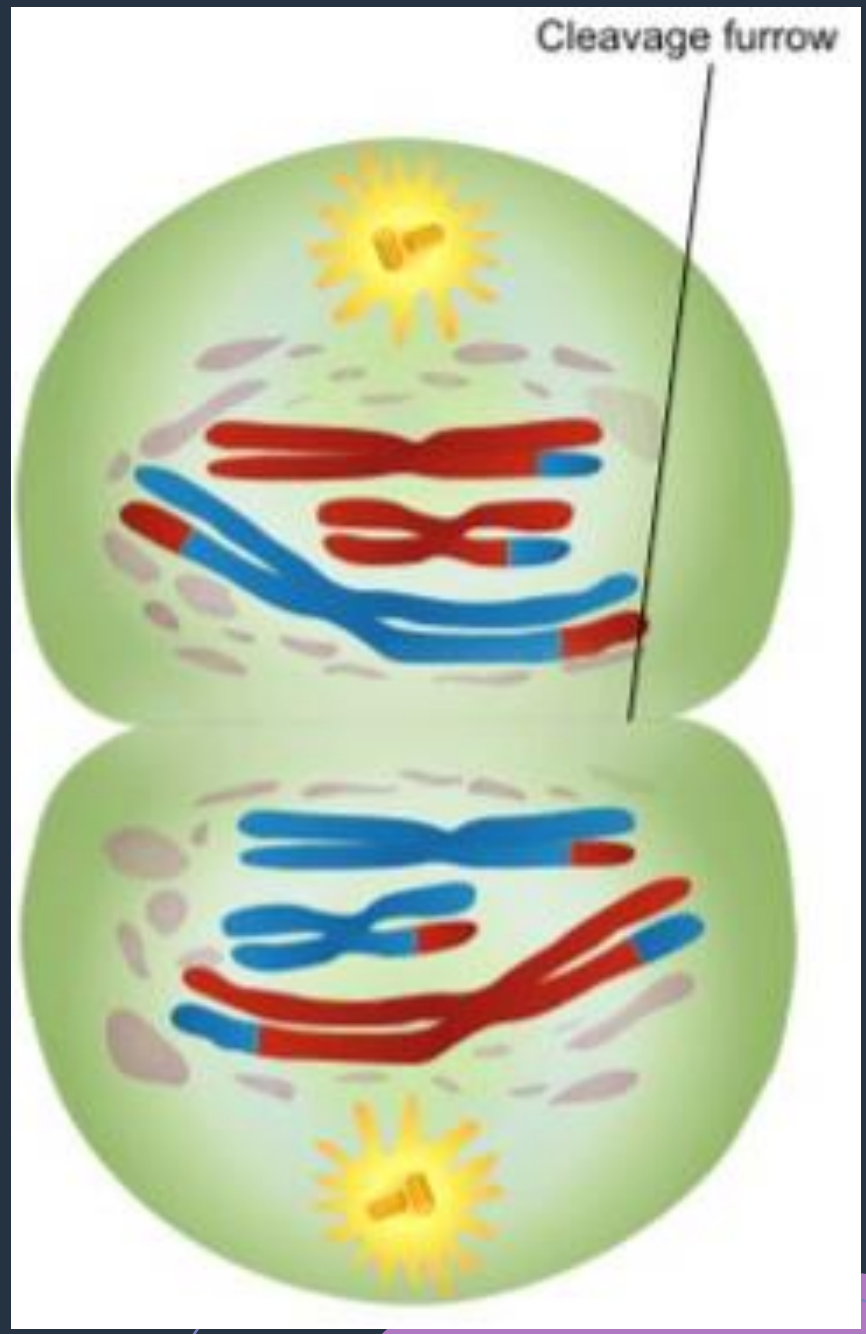
Meiosis 1

- **Anaphase 1**
- The homologous chromosomes get pulled apart.
- This means that from chromosome number 1, the copy from the mother will be on one side of the cell, and the copy from the father will be on the other side of the cell.



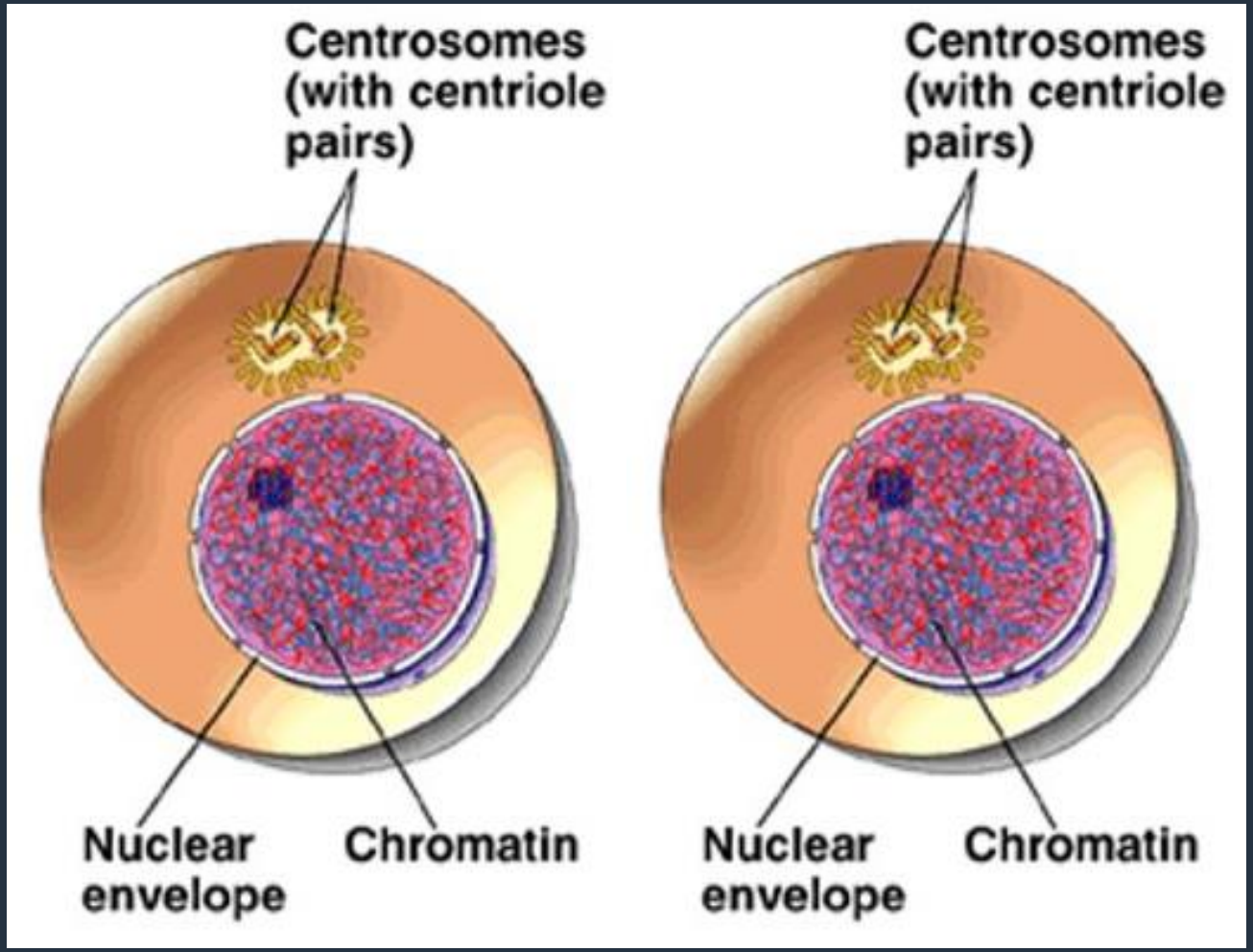
Meiosis 1

- **Telophase 1**
- Two nuclei form around each group of chromosomes.
- The spindle fibers break down
- The cell membrane begins to pinch and create a cleavage furrow (in animal cells)



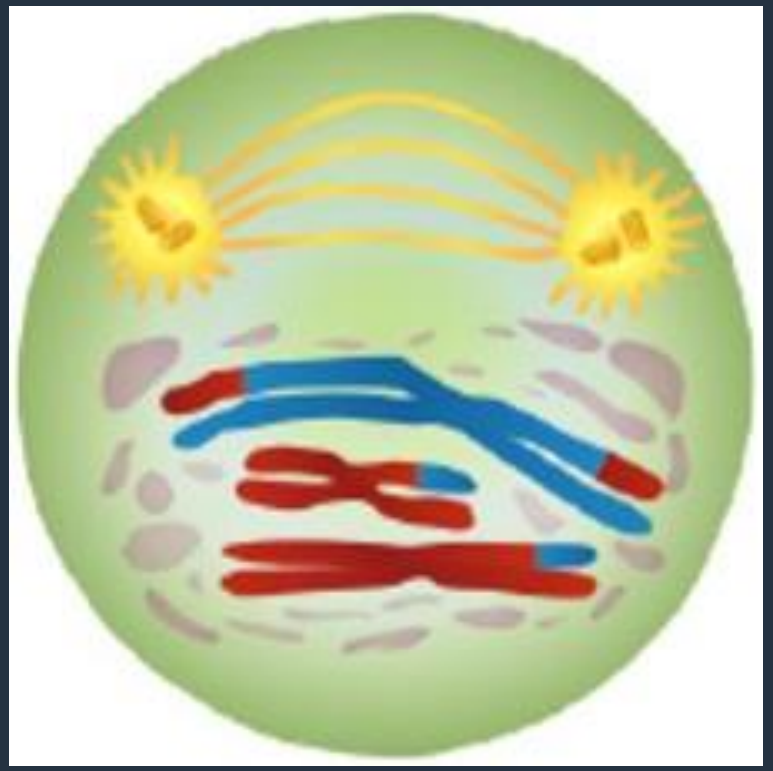
Meiosis 1

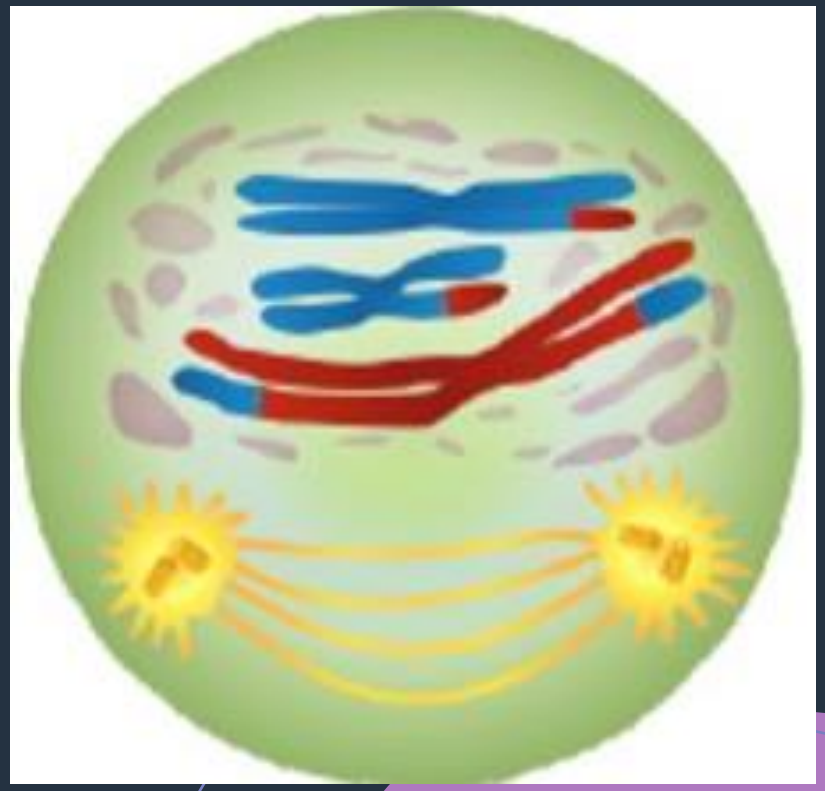
- **Cytokinesis** – The two cells complete their splitting process by (in animals) pinching off along the cleavage furrow.
- **The cells are now haploid**, (in humans, 23 chromosomes), **but** have duplicated copies of the haploid number (**sister chromatid**).



Meiosis 2 – Let's do mitosis again!

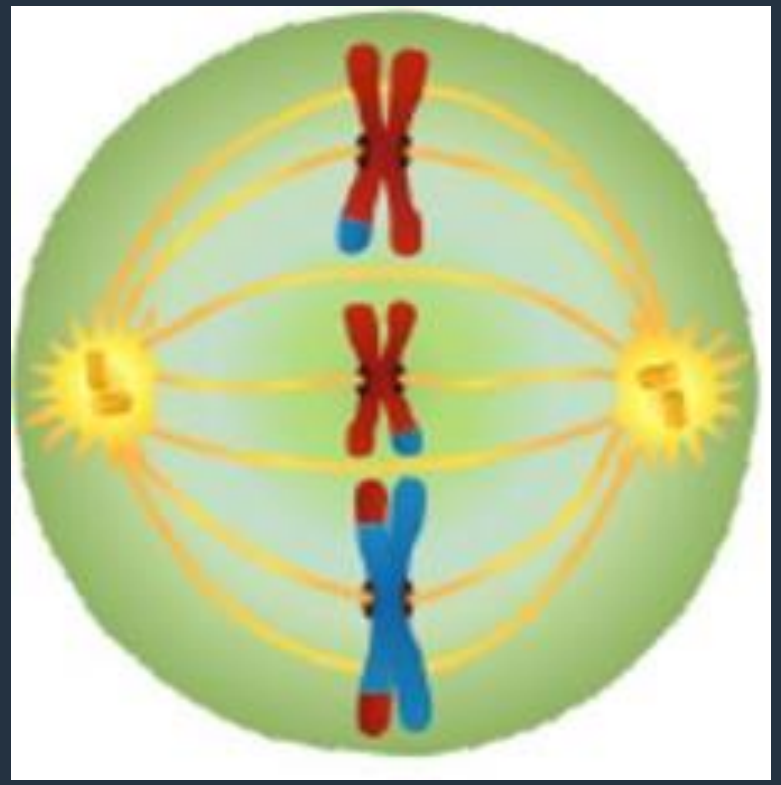
- **Prophase 2 - NO CROSSING OVER**

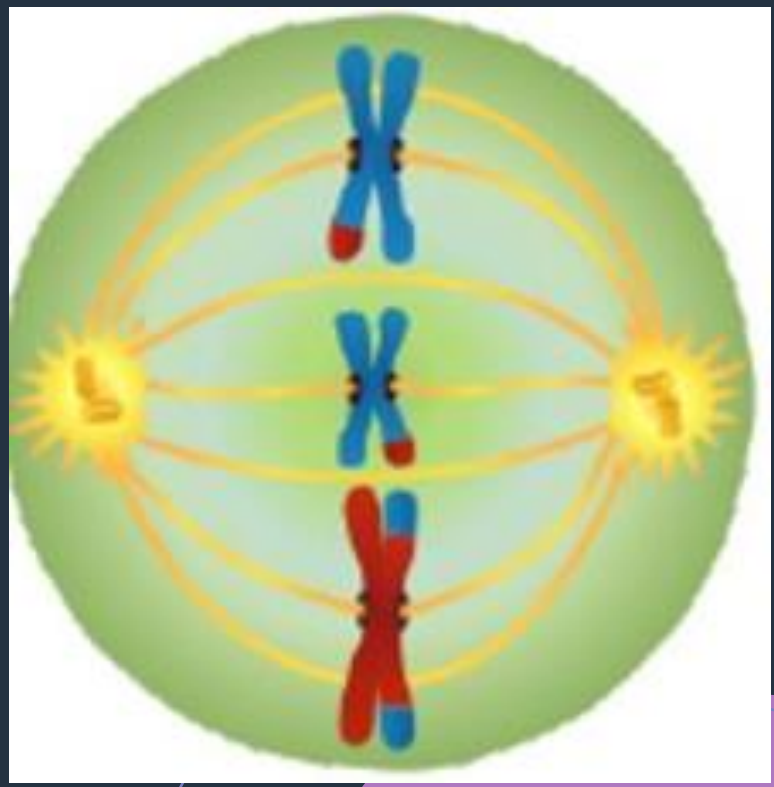




Meiosis 2 – Let's do mitosis again!

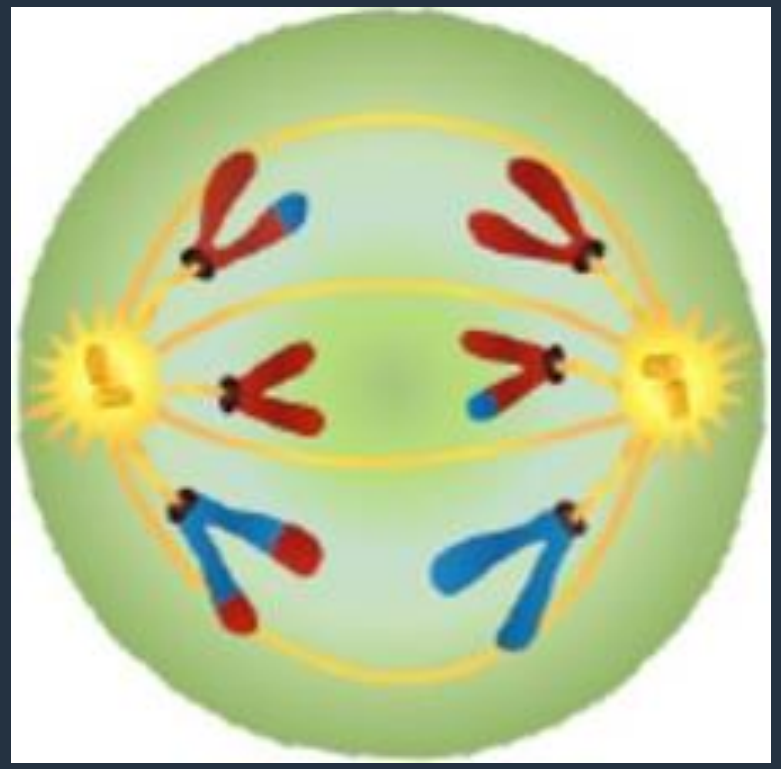
- **Metaphase 2**

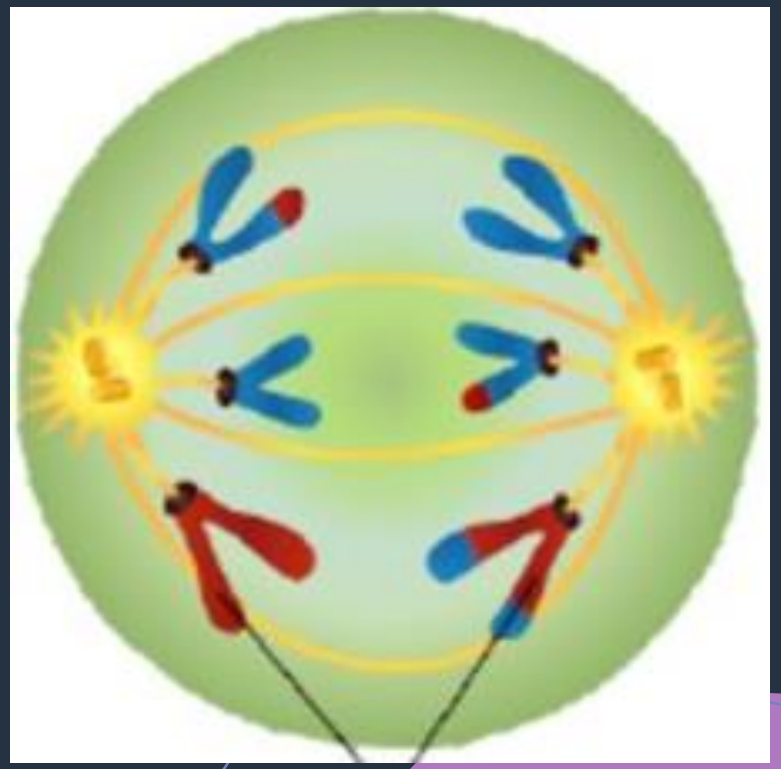




Meiosis 2 – Let's do mitosis again!

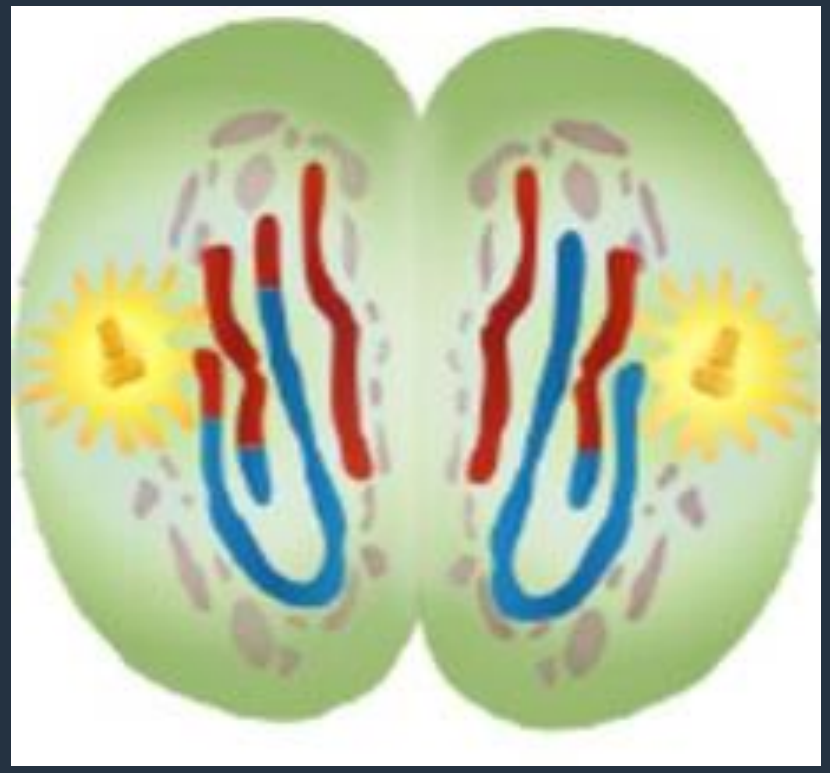
- **Anaphase 2**

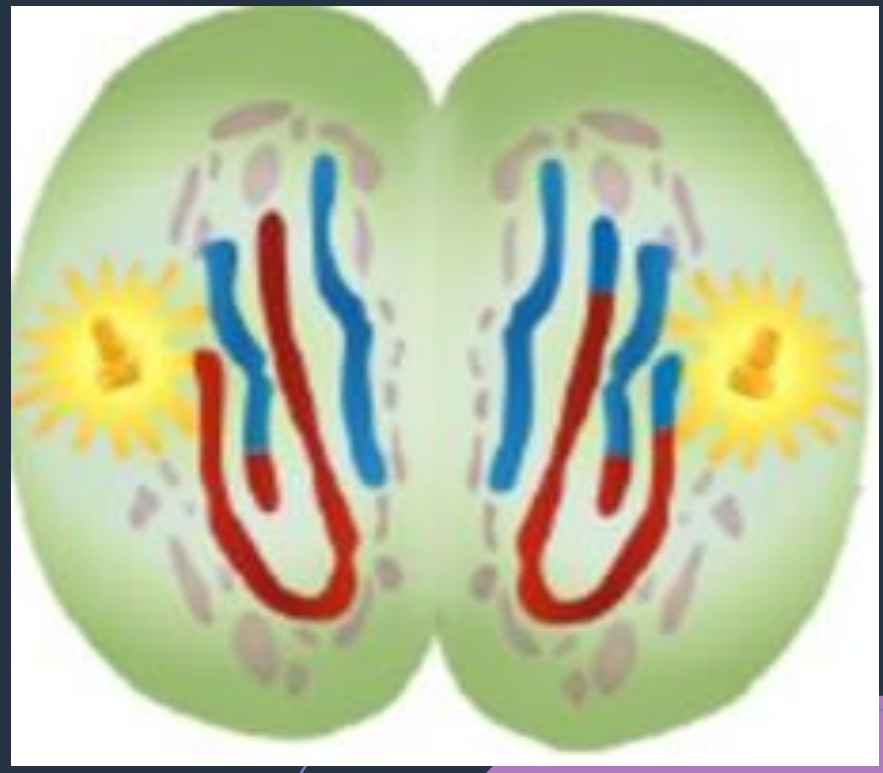




Meiosis 2 – Let's do mitosis again!

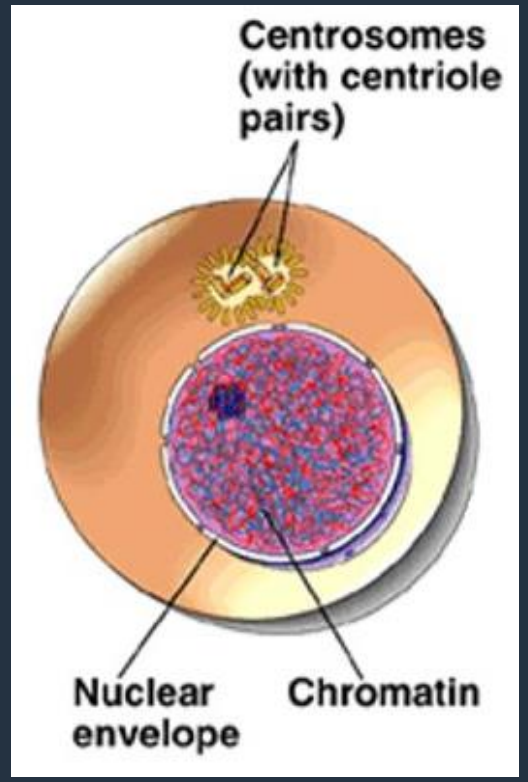
- **Telophase 2**

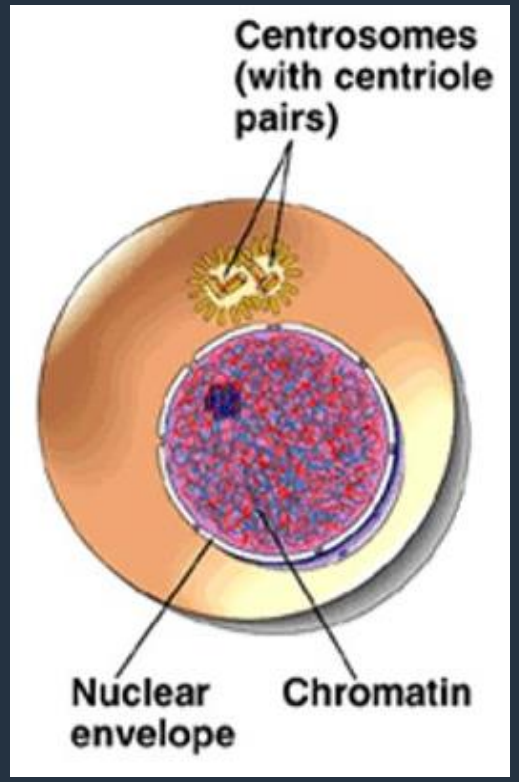


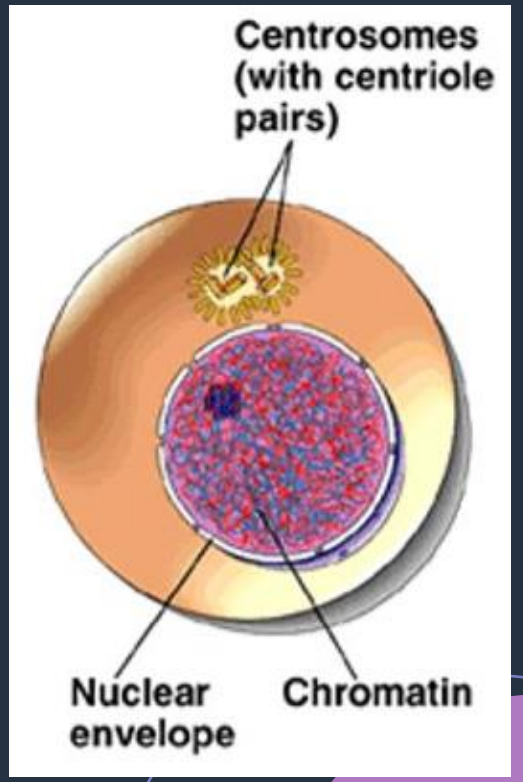


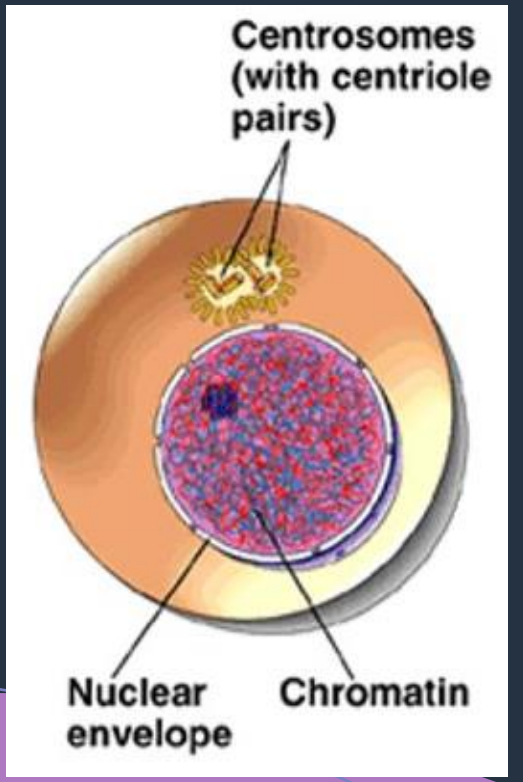
Meiosis 2 – Let's do mitosis again!

- **Cytokinesis**

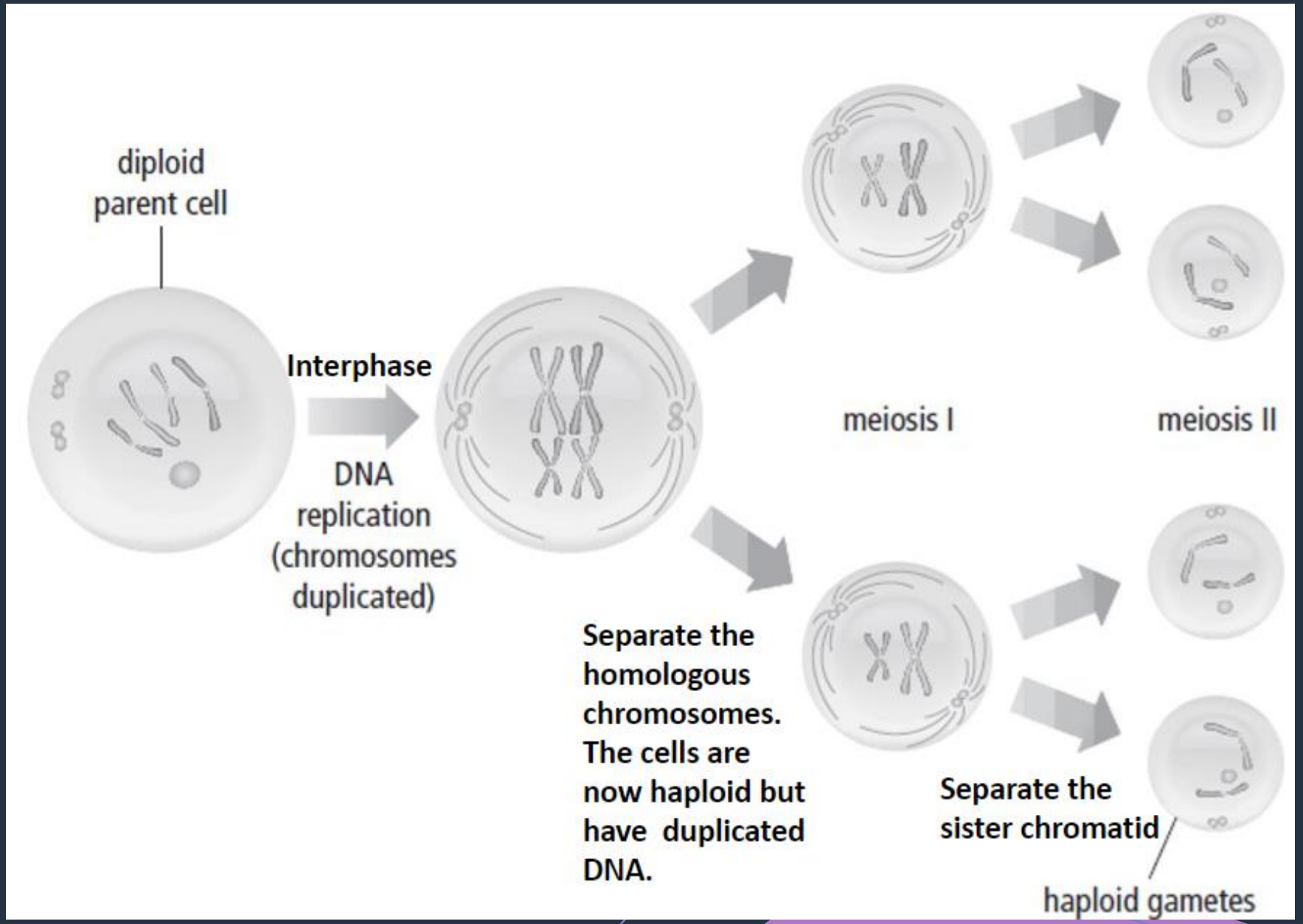








Summary


diploid
parent cell
Interphase
DNA
replication
(chromosomes
duplicated)
meiosis I
meiosis II
Separate the
homologous
chromosomes.
The cells are
now haploid but
have duplicated
DNA.
Separate the
sister chromatid
haploid gametes