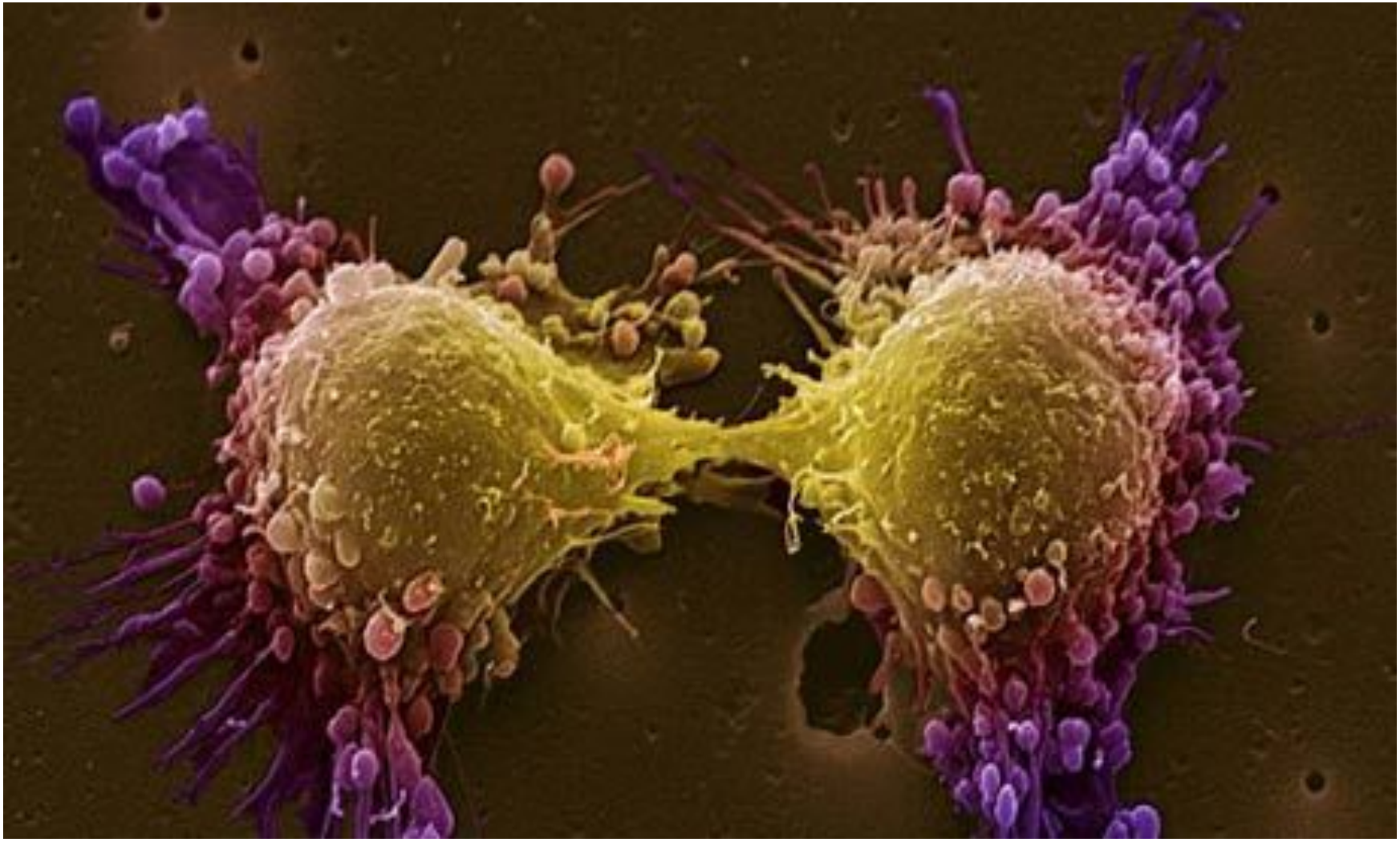
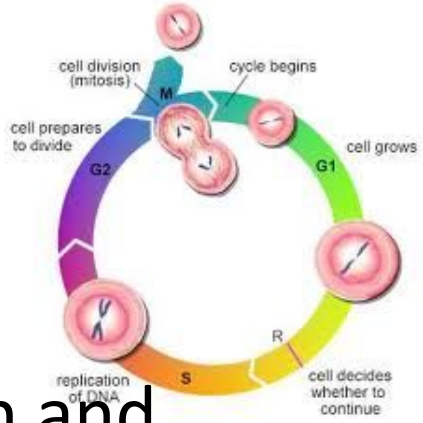
Cell Division



The Cell Cycle

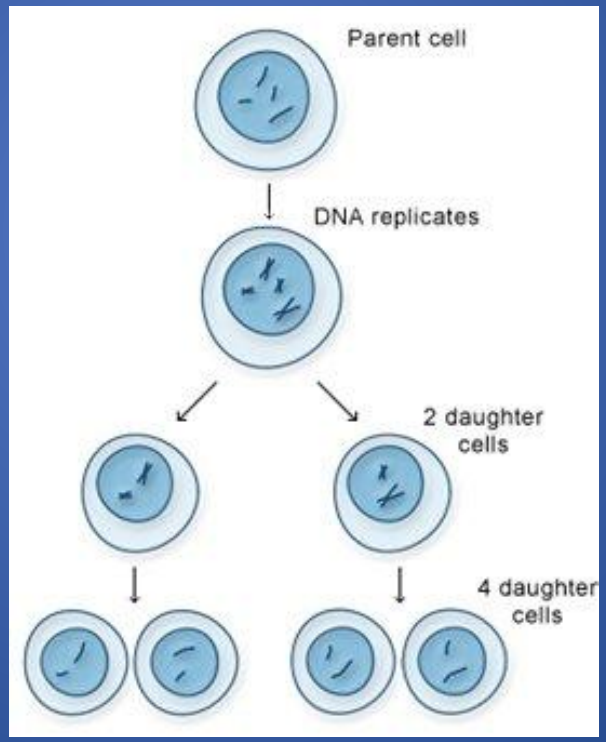


- **<u>Cell cycle</u> –** regular sequence of growth and division that eukaryotic cells undergo.
  - Prokaryotic cells undergo binary fission

- Divided into three main stages:
  - **<u>Interphase</u>** – cell grows into its mature size, makes a copy of its DNA, and prepares for division.
  - **<u>Mitosis</u>** – one copy of the DNA is distributed into each of its daughter cells
  - **<u>Cytokinesis</u>** – the cytoplasm divides and organelles are distributed into the two new cells

Meiosis

Meiosis - the process of cell division that produces haploid gametes (half the number of chromosomes: humans: 23)



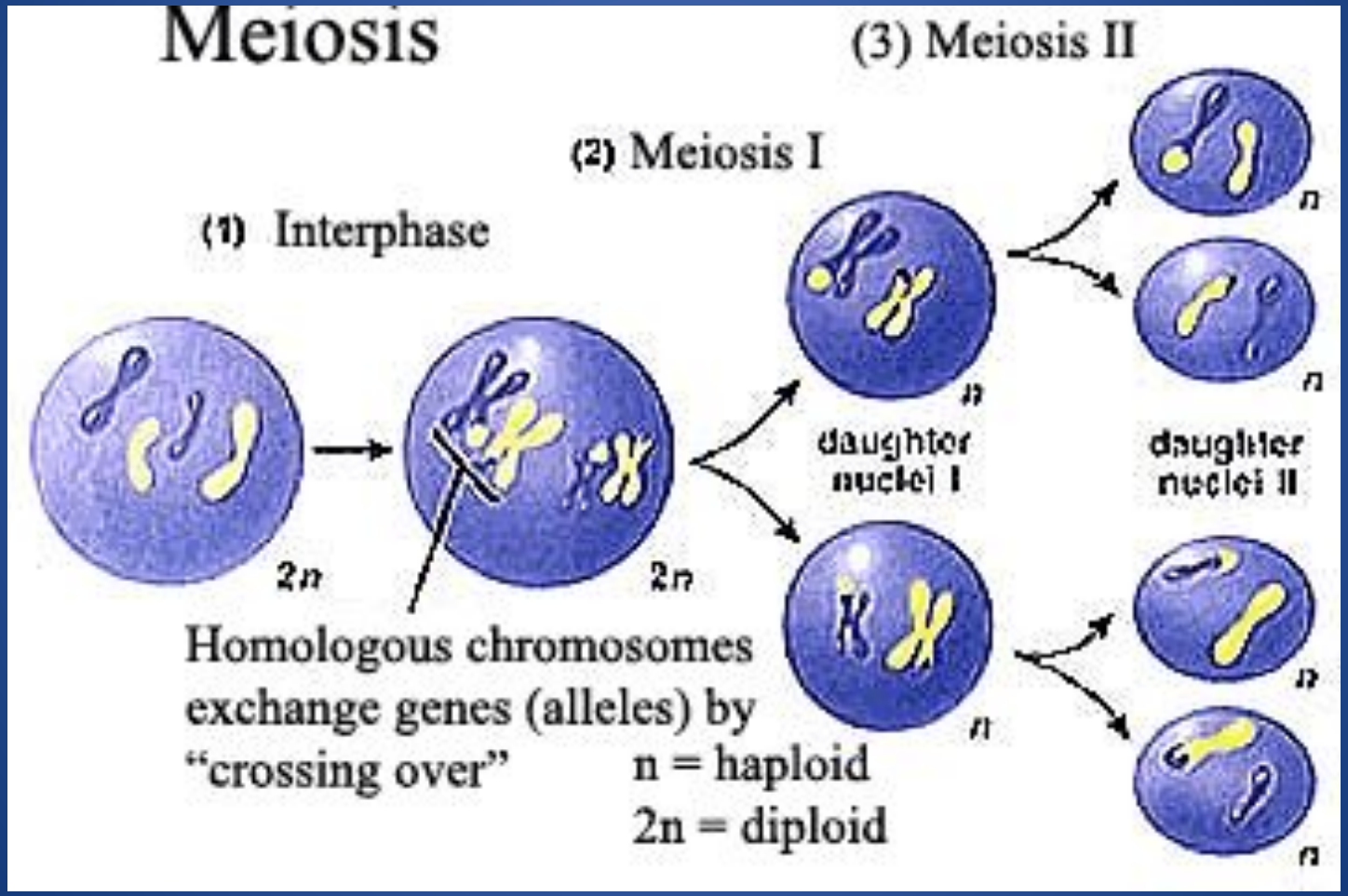
Reduction Division

- Since the sperm and the egg contain only half the number of chromosomes, they cannot be formed from mitosis.

- ***Meiosis*** - the process of cell division that produces gametes with half the number of chromosomes as somatic cells
  - Cell undergoes 2 rounds of cell division:
    - Meiosis 1
    - Meiosis 2

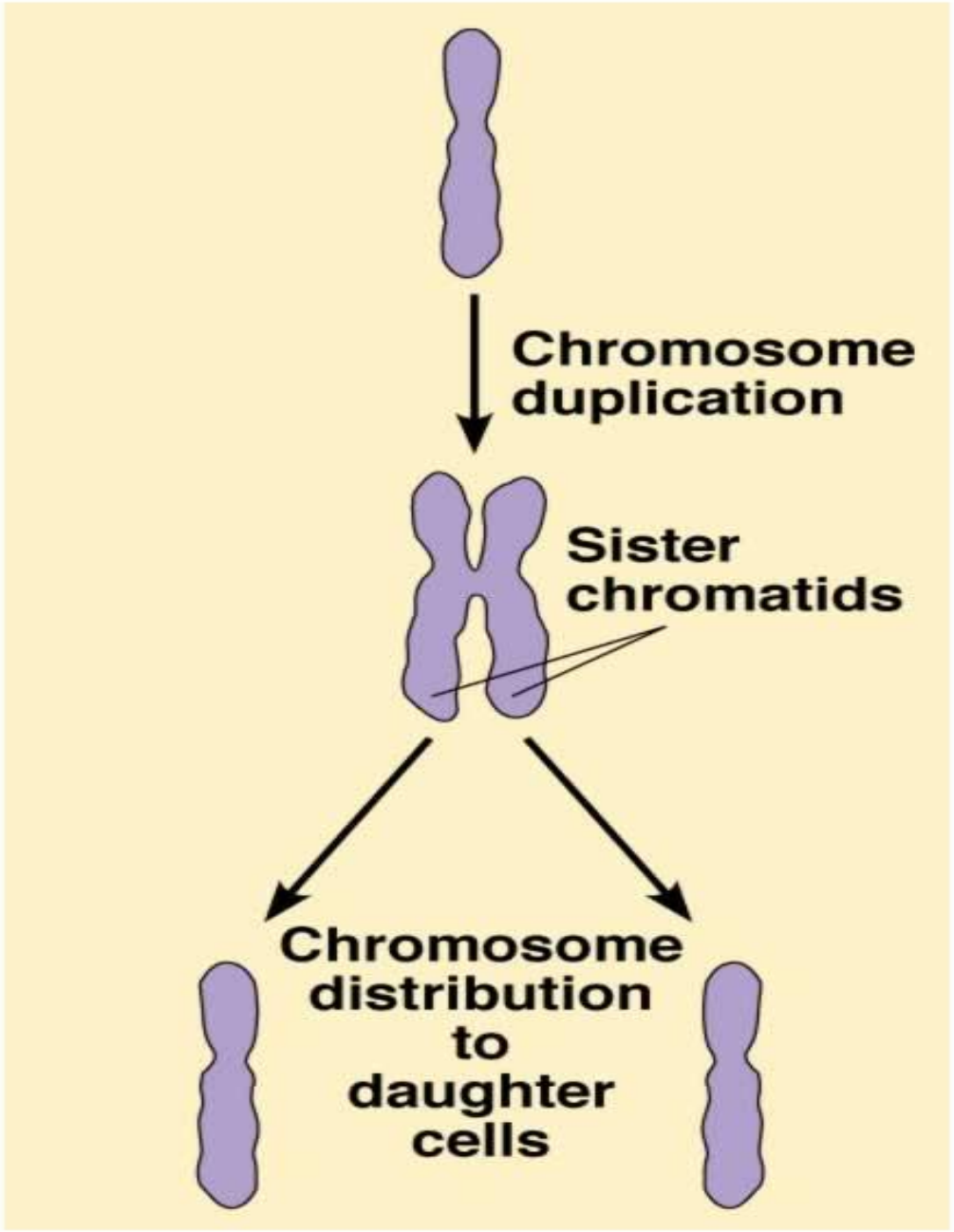
- *Humans have 46 chromosomes in their somatic cells.*

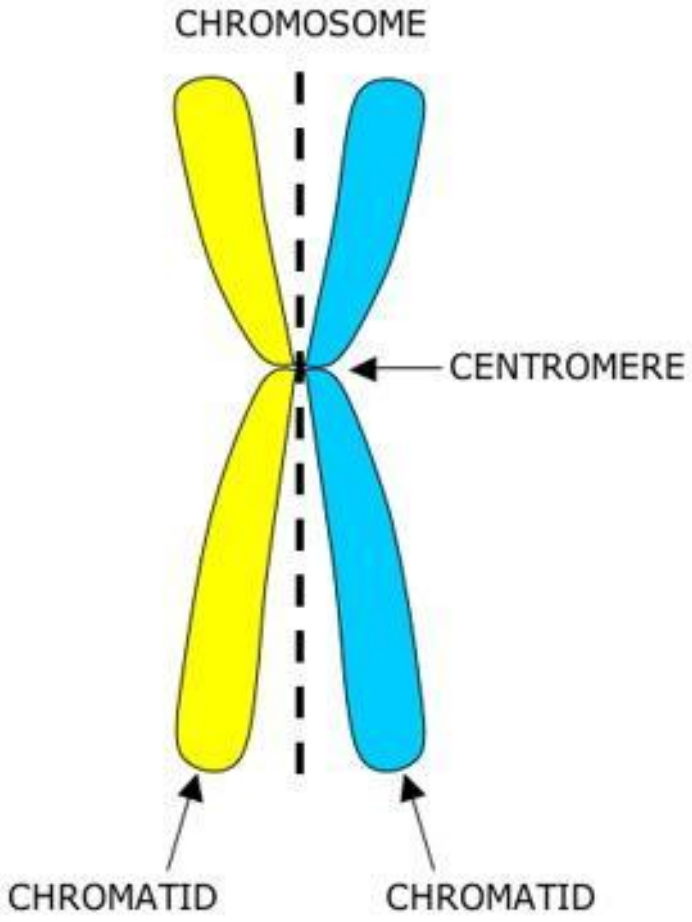
Reduction Division



Meiosis I

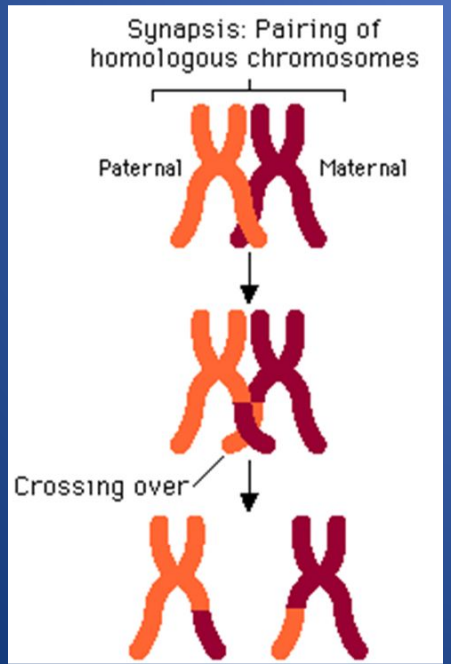
- Preceded by Interphase- chromosomes are replicated to form sister chromatids
- Sister chromatids are genetically identical and joined at centromere





Prophase I

- Individual chromosomes first become visible
  - homologous chromosomes become closely associated in synapsis
  - crossing over occurs
- ***Crossing over*** is a complex series of events in which DNA segments are exchanged between nonsister or sister chromatids.



Metaphase I

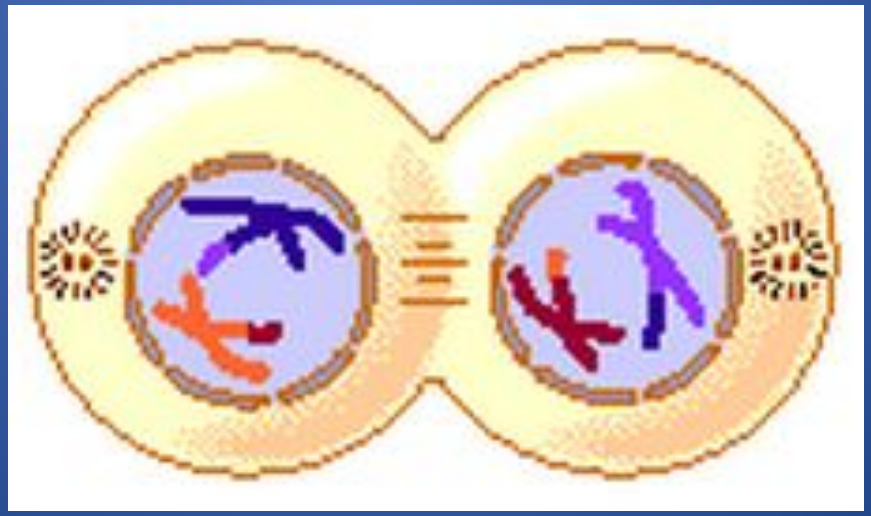
- The homologous chromosomes line up in the center of the cell and are still held together

Anaphase I

- Spindle fibers shorten
- The homologous chromosomes are separated (the sister chromatids are still paired)

Telophase I

- The nuclear membrane reforms around each daughter nucleus
- Each new cell now contains two sister chromatids that are NOT identical due to crossing over

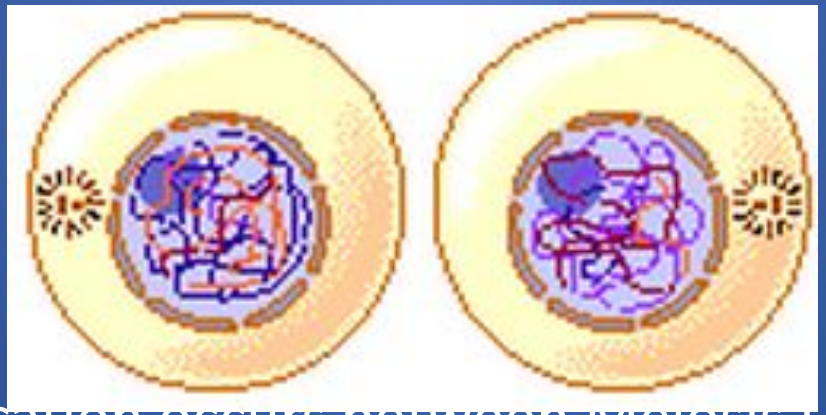


At the end of Meiosis I…

- You have made 2 cells

- Each cell contains a haploid number of chromosomes – 1 copy of each chromosome

  (for humans, each haploid cell has 23 chromosomes)



- No DNA replication occurs between Meiosis I and Meiosis I

- <u>Meiosis II</u> resembles normal, mitotic division

Prophase II

- Nuclear membrane breaks down again

Metaphase II

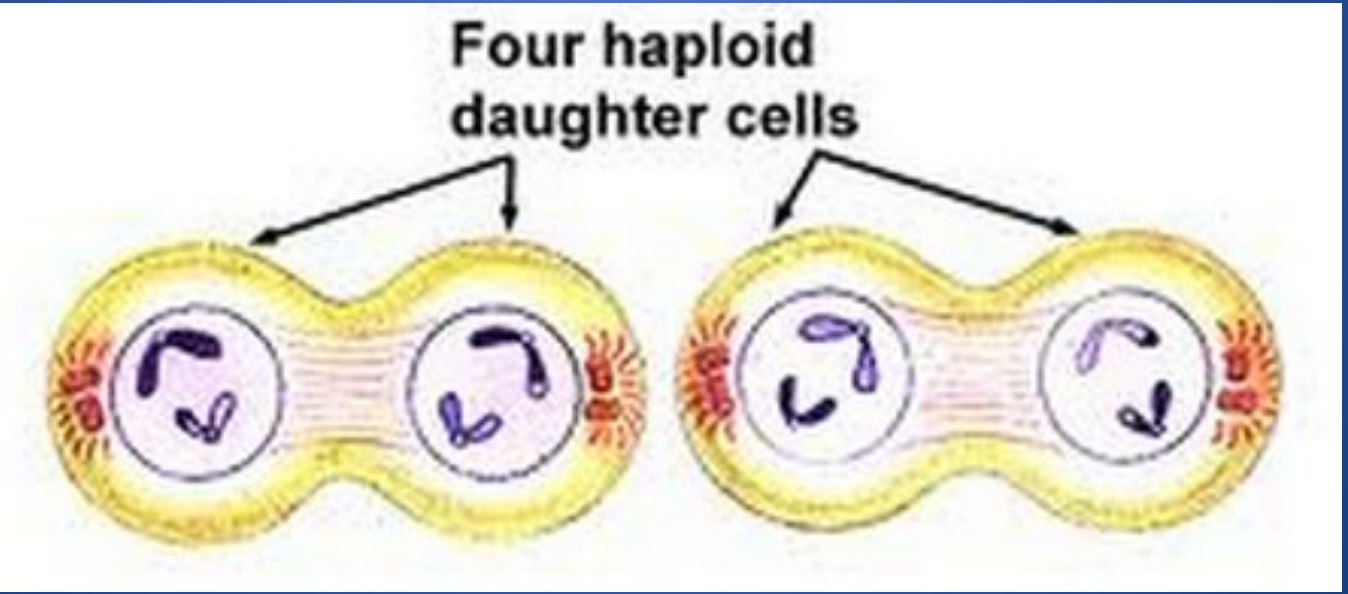
- The chromosomes line up in the middle of the cell.

Anaphase II

- The spindle fibers shorten and the sister chromatids move to opposite poles.

Telophase II

- Nuclear envelope re-forms around the four sets of daughter chromosomes.



At the end of Meiosis II…

- At the end of Meiosis II, there are 4 haploid cells. (only 1 copy of each chromosome)
  - (for humans, each haploid cell has 23 chromosomes)

- No two of these haploid cells are alike due to crossing over.
  - This is why you and your siblings are genetically unique!