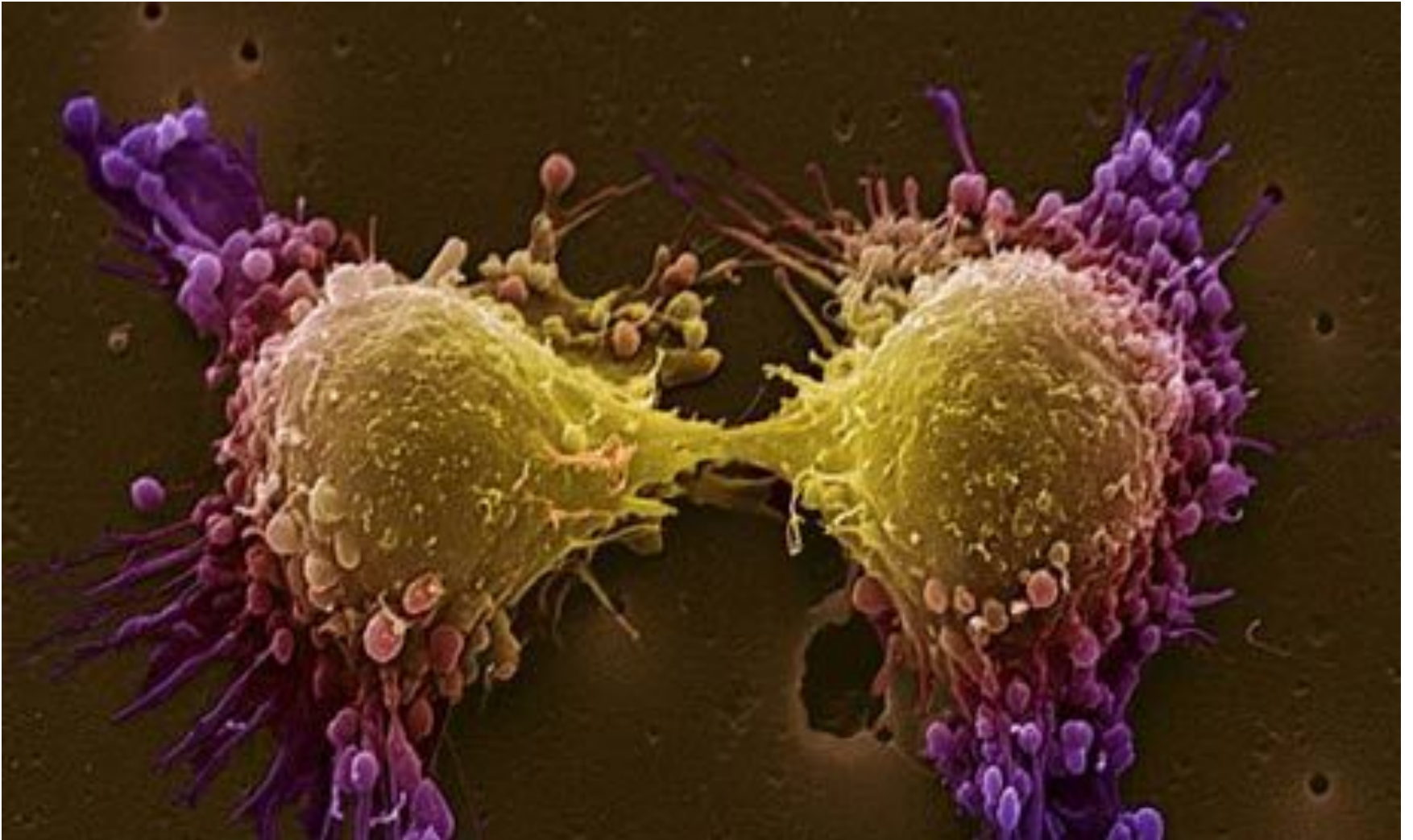
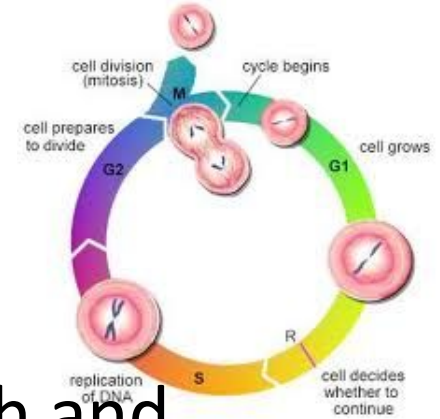


Cell Division



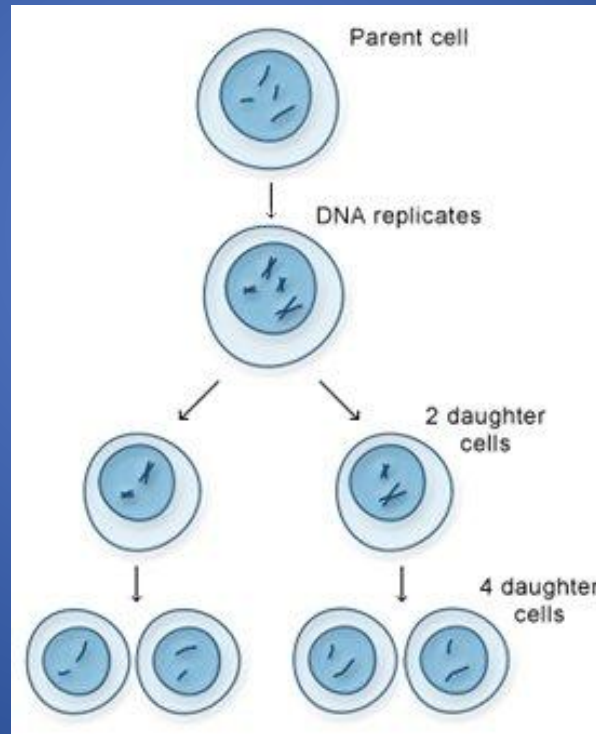
The Cell Cycle



- **Cell cycle** – regular sequence of growth and division that eukaryotic cells undergo.
 - Prokaryotic cells undergo binary fission
- Divided into three main stages:
 - **Interphase** – cell grows into its mature size, makes a copy of its DNA, and prepares for division.
 - **Mitosis** – one copy of the DNA is distributed into each of its daughter cells
 - **Cytokinesis** – the cytoplasm divides and organelles are distributed into the two new cells

Meiosis

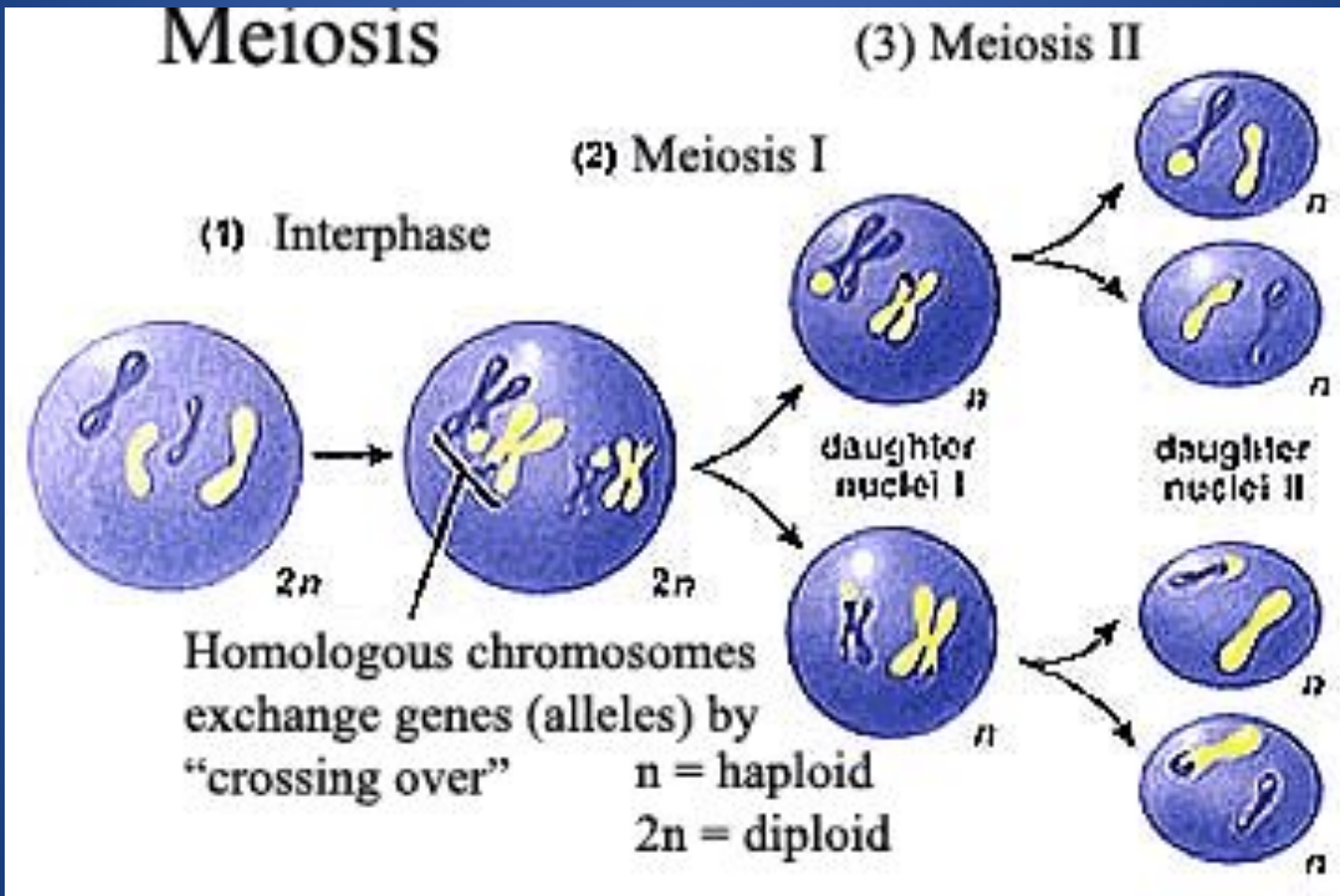
Meiosis - the process of cell division
that produces haploid gametes (half
the number of chromosomes:
humans: 23)



Reduction Division

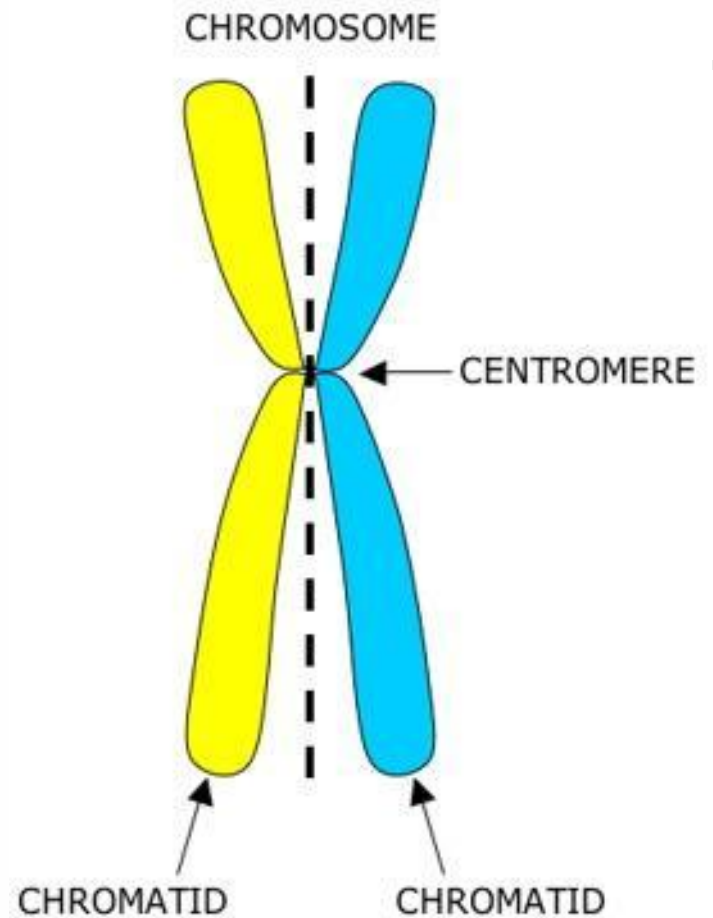
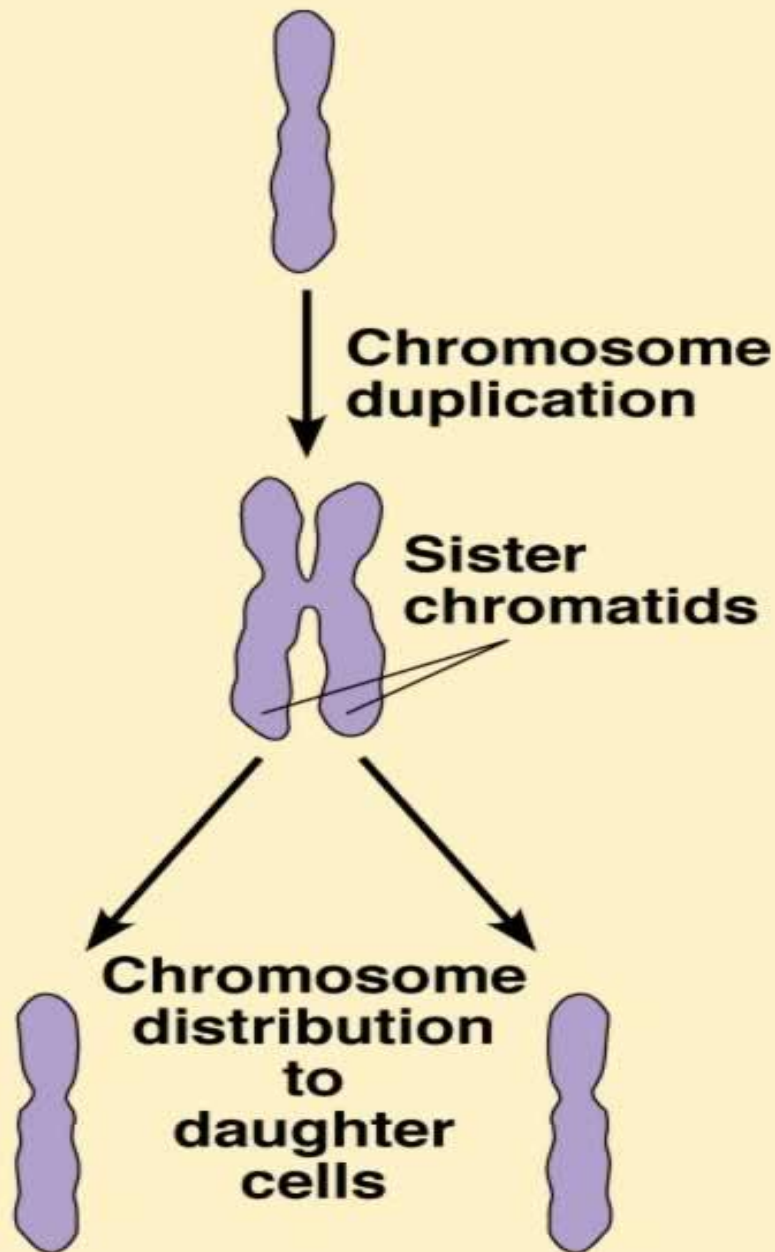
- Since the sperm and the egg contain only half the number of chromosomes, they cannot be formed from mitosis.
- **Meiosis** - the process of cell division that produces gametes with half the number of chromosomes as somatic cells
 - Cell undergoes 2 rounds of cell division:
 - Meiosis 1
 - Meiosis 2
- *Humans have 46 chromosomes in their somatic cells.*

Reduction Division



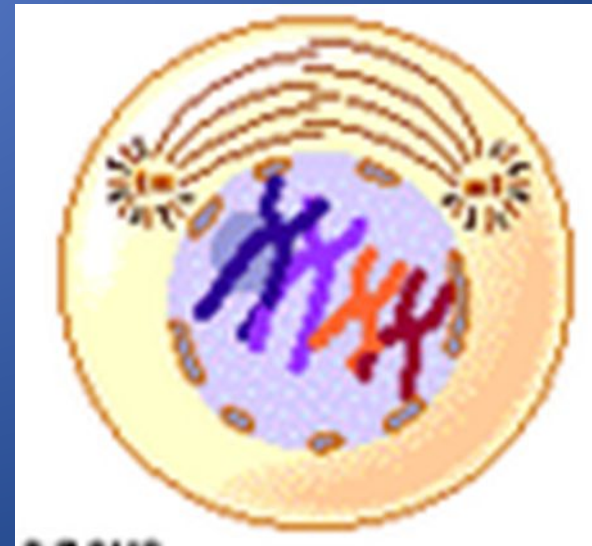
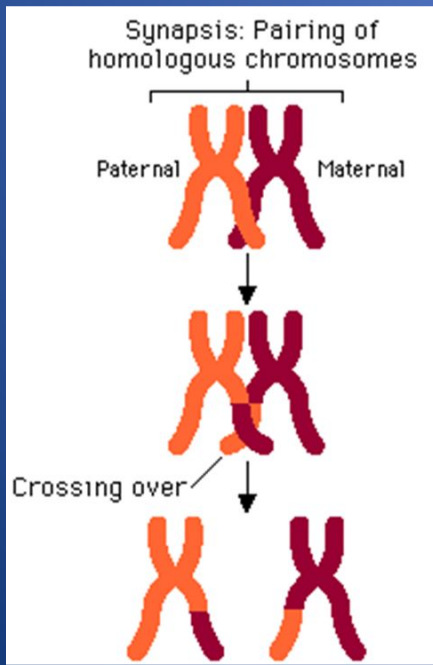
Meiosis I

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



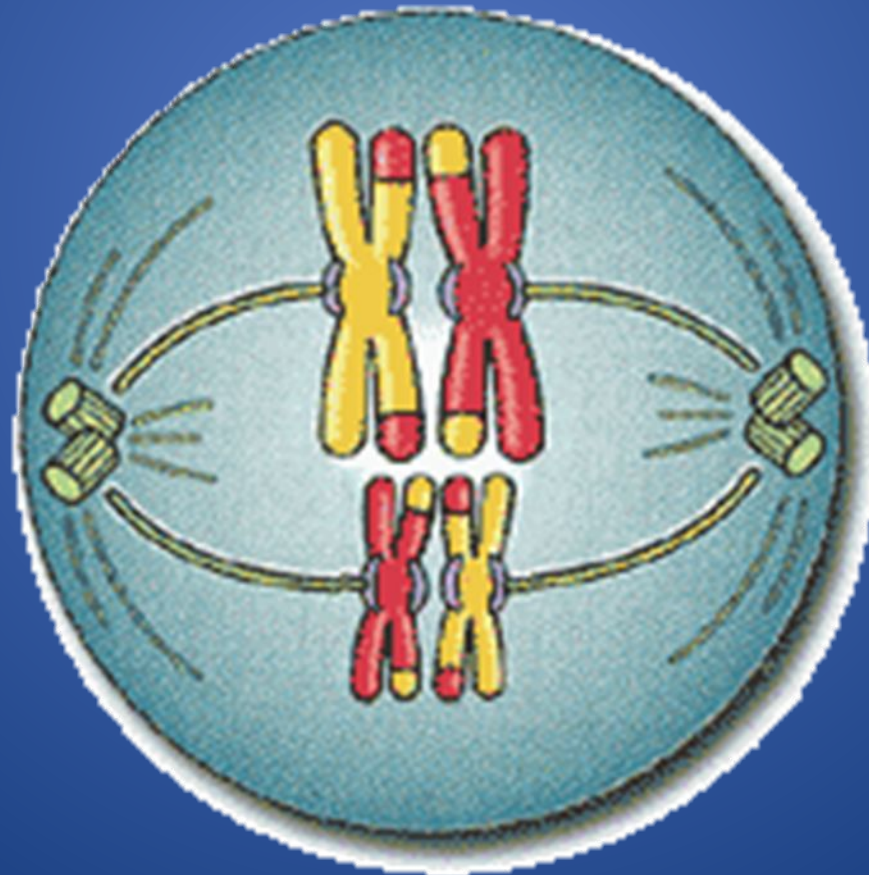
Prophase I

- 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)



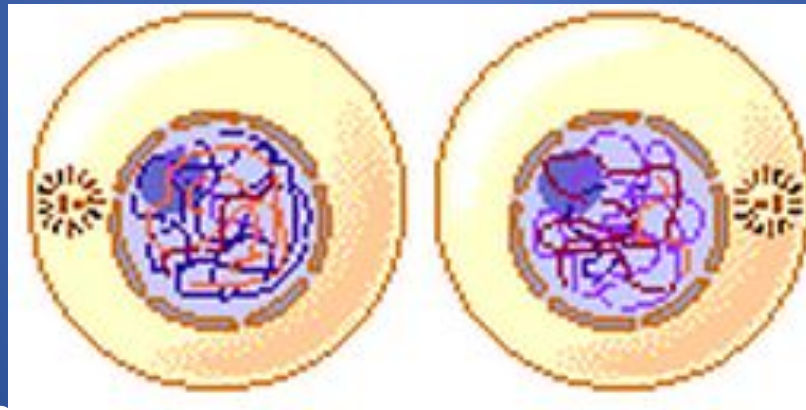
Telophase I

- 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 II
- Meiosis II resembles normal, mitotic division

Prophase II

- Nuclear membrane breaks down again



Metaphase II

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



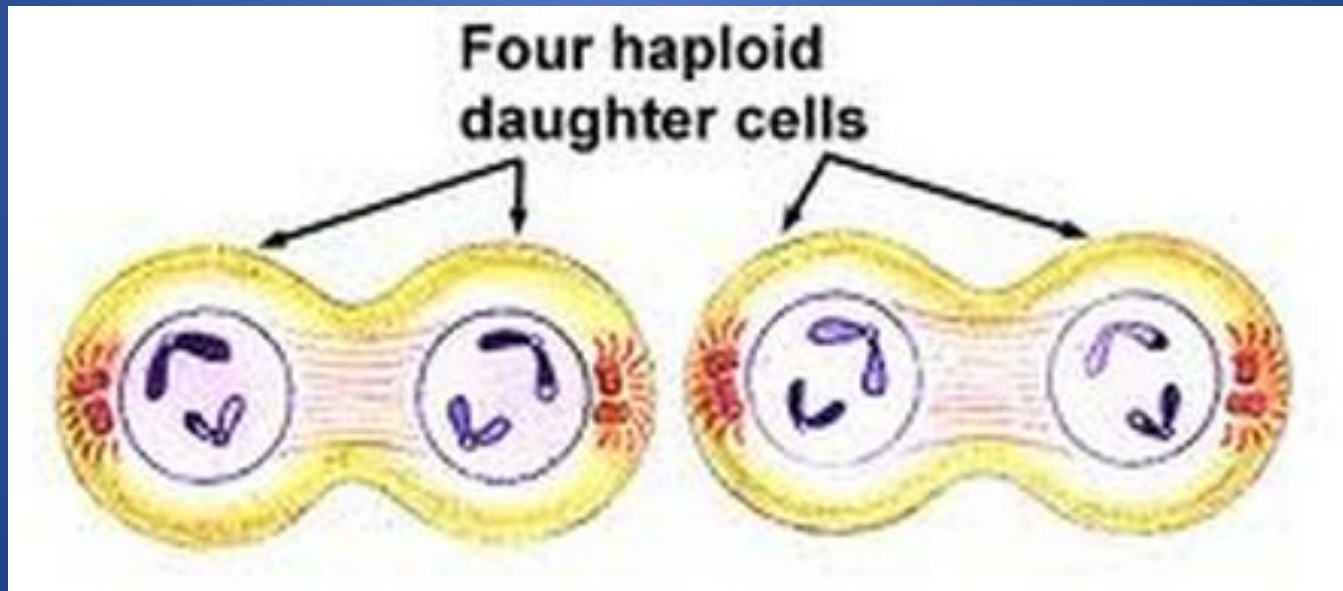
Anaphase II

- 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!