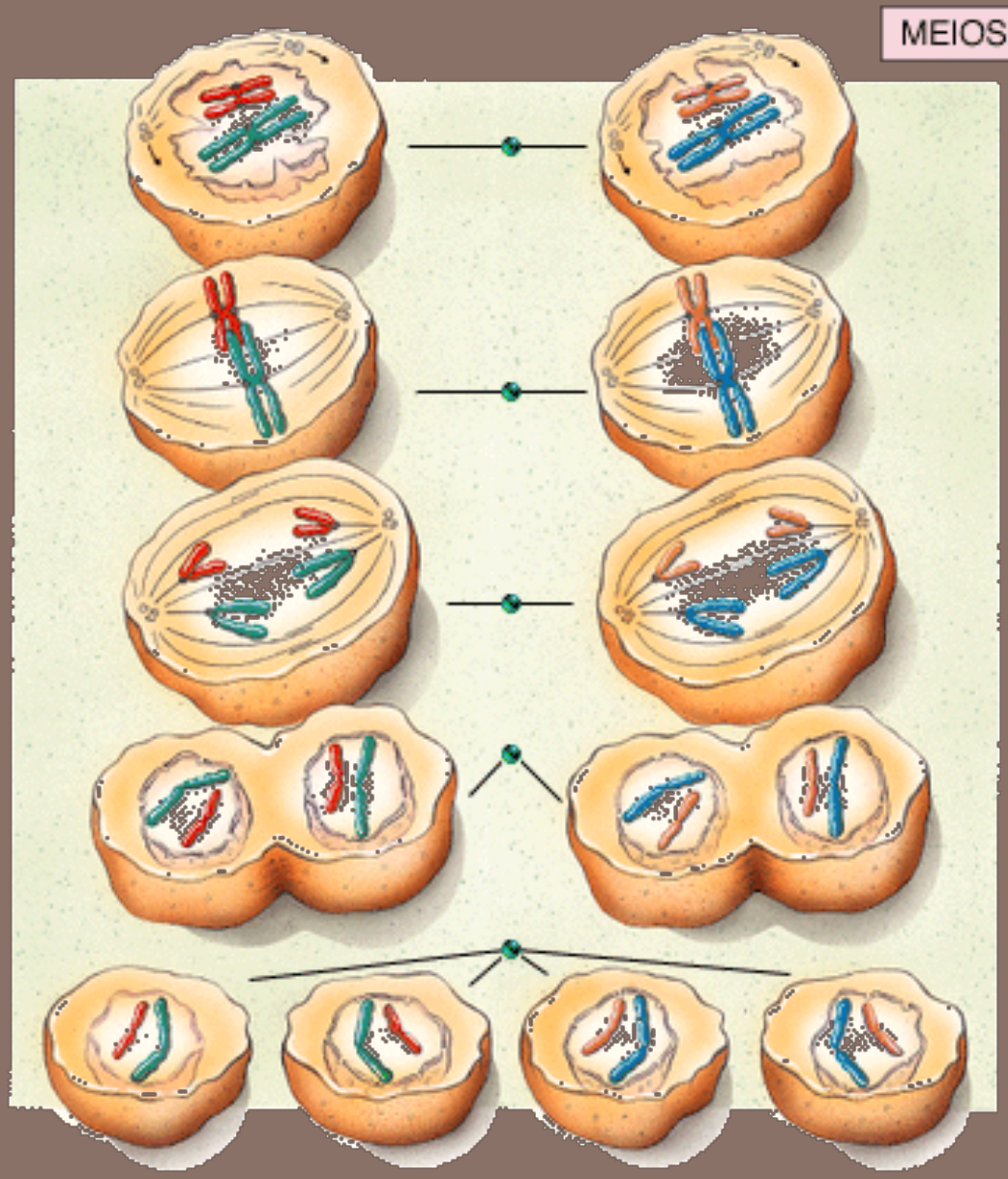
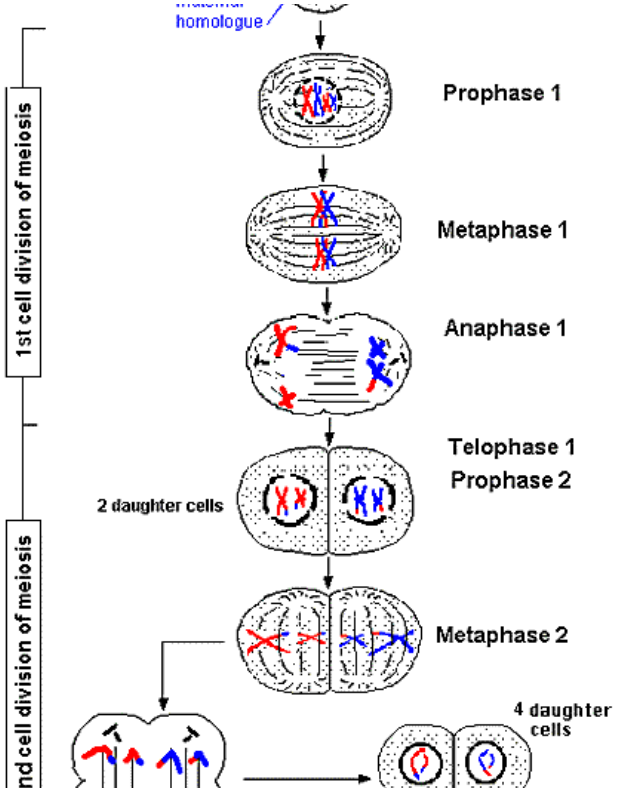
MEIOSIS



- Meiosis
  - The *process by which the number of chromosomes found in the somatic (body) cells of an organism is reduced by half to form the sex cells, egg & sperm*.
    - *Somatic cells* have *46* chromosomes.
    - *Sex cells* have 23 chromosomes.

Phases of Meiosis

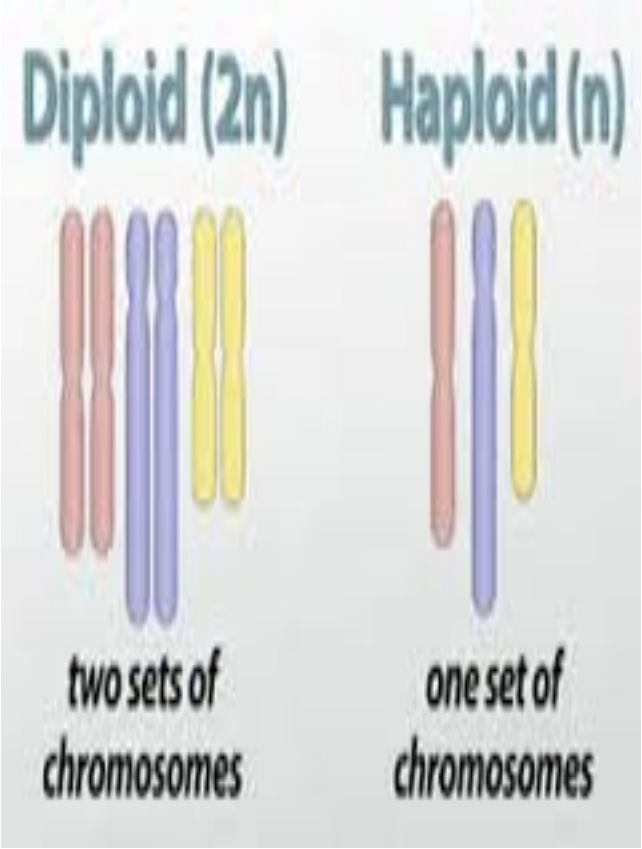
- Meiosis takes place in 5 stages, stages 2 & 4 have 4 phases during each stage.
  - Stage 1: Interphase
  - Stage 2: Meiosis I
  - Stage 3: Cytokinesis I
  - Stage 4: Meiosis II
  - Stage 5: Cytokinesis II



- While the process of Meiosis bears a number of similarities with the cell division process of Mitosis, it differs in two important respects:
  1. The chromosomes in meiosis undergo a recombination or a shuffling of genes that produces a different genetic combination in each gamete or sex cell.
  2. The outcome of Meiosis is four, genetically unique *haploid* cells, compared with the two (genetically identical) *diploid* cells produced from mitosis.

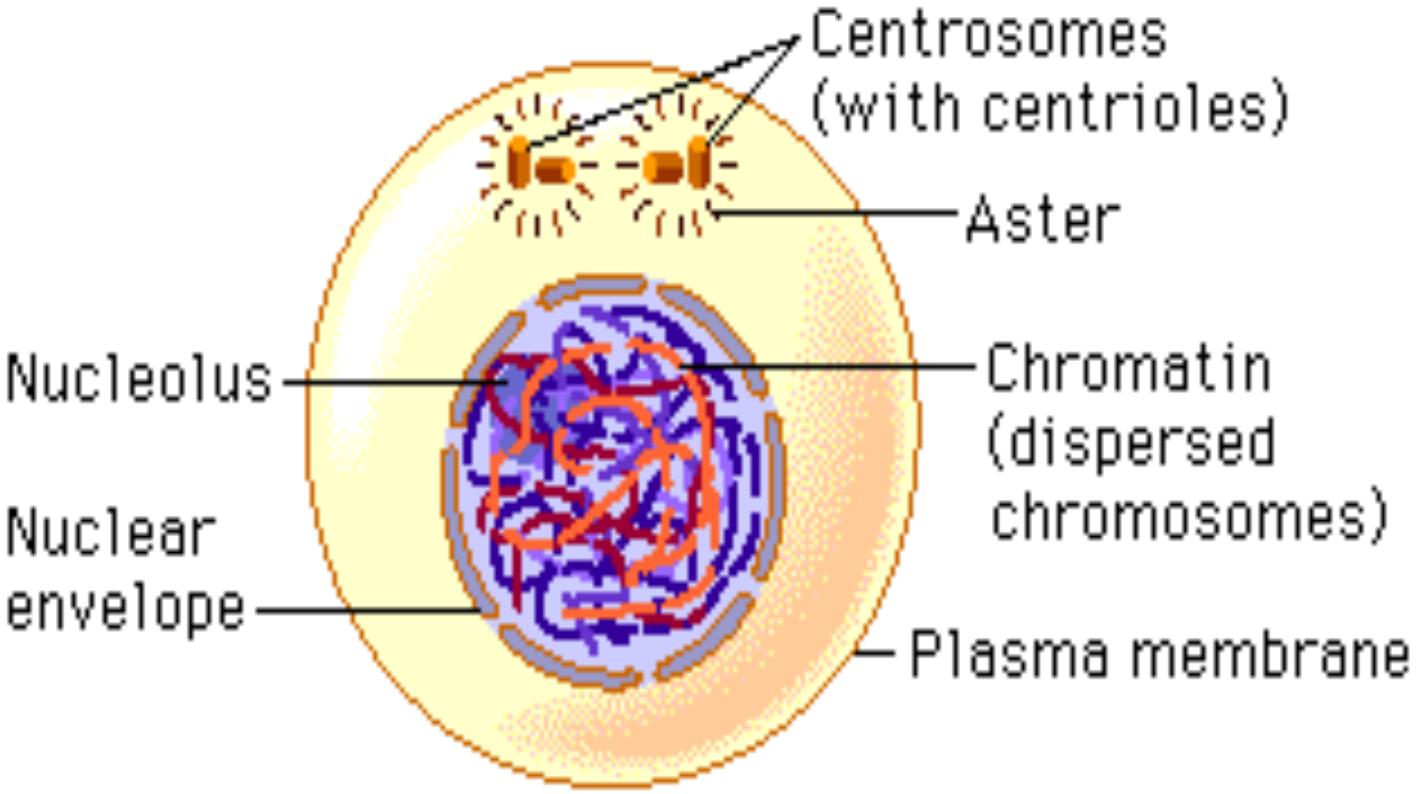
Haploid vs Diploid

- Haploid: (*n*) is the number of chromosomes in a gamete (sex cell) of an individual.
- Diploid: (2*n*) describes cells have two copies of each chromosome, usually one from the mother and one from the father.

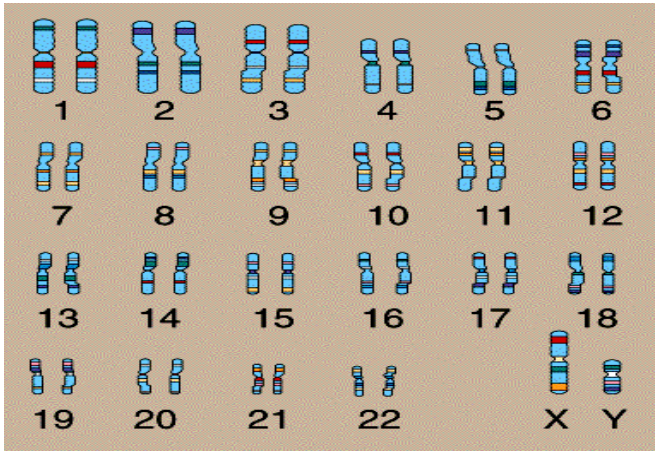


Stage 1: Interphase

- The cell grows to its mature size.
- DNA replication takes place
  - The cell makes a copy of the genetic information contained within the nucleus.
- 2 cylindrical structures called centrioles are formed & copied.

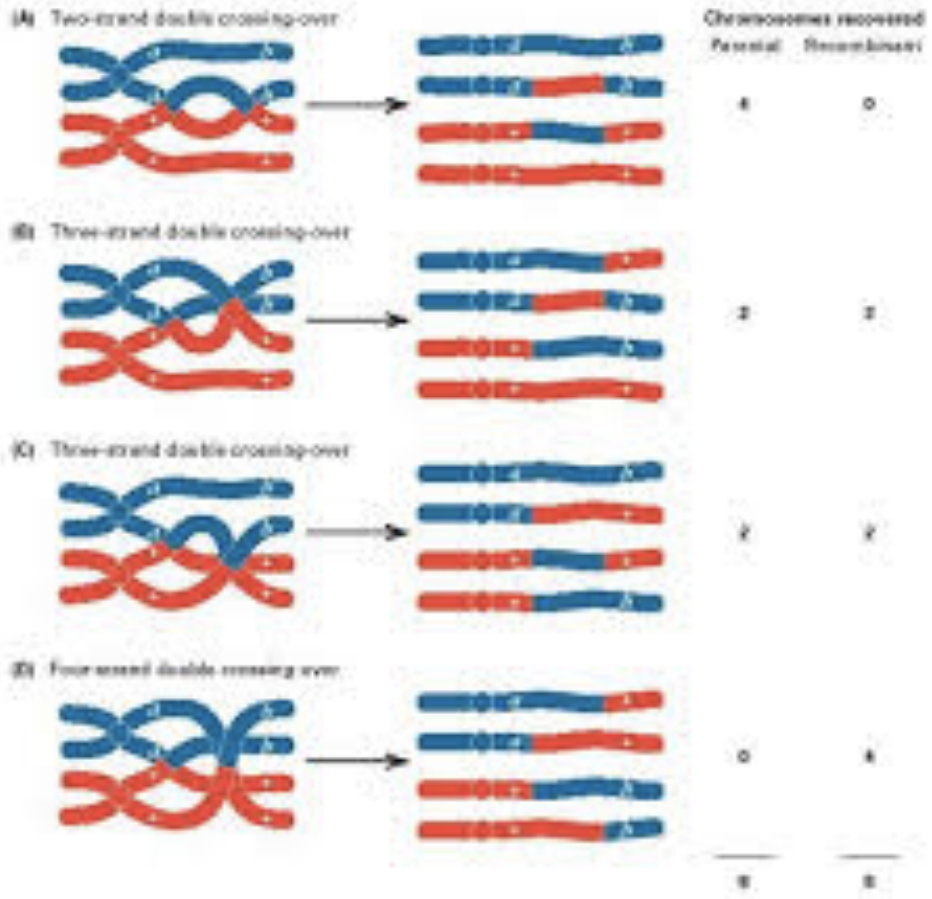


- Stage 2: Meiosis I
  - Prophase I:
    - Chromatin in the nucleus condenses to form 23 chromosome **pairs**.
    - Spindle fibers form a bridge between the ends of the cell.
    - Nuclear envelope breaks down.



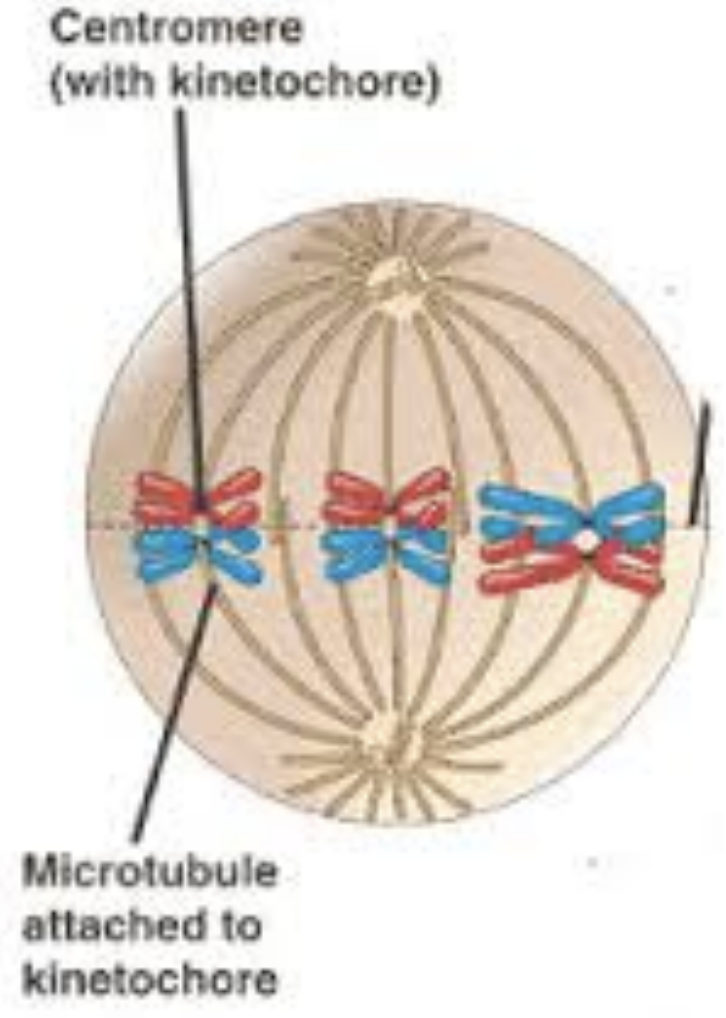
Gene Recombination

- Gene recombination occurs
  - *Genes between mom & dad's chromosomes are exchanged or swopped between the chromosomes* resulting in genes from mom moving to dad's chromosome & vice versa.



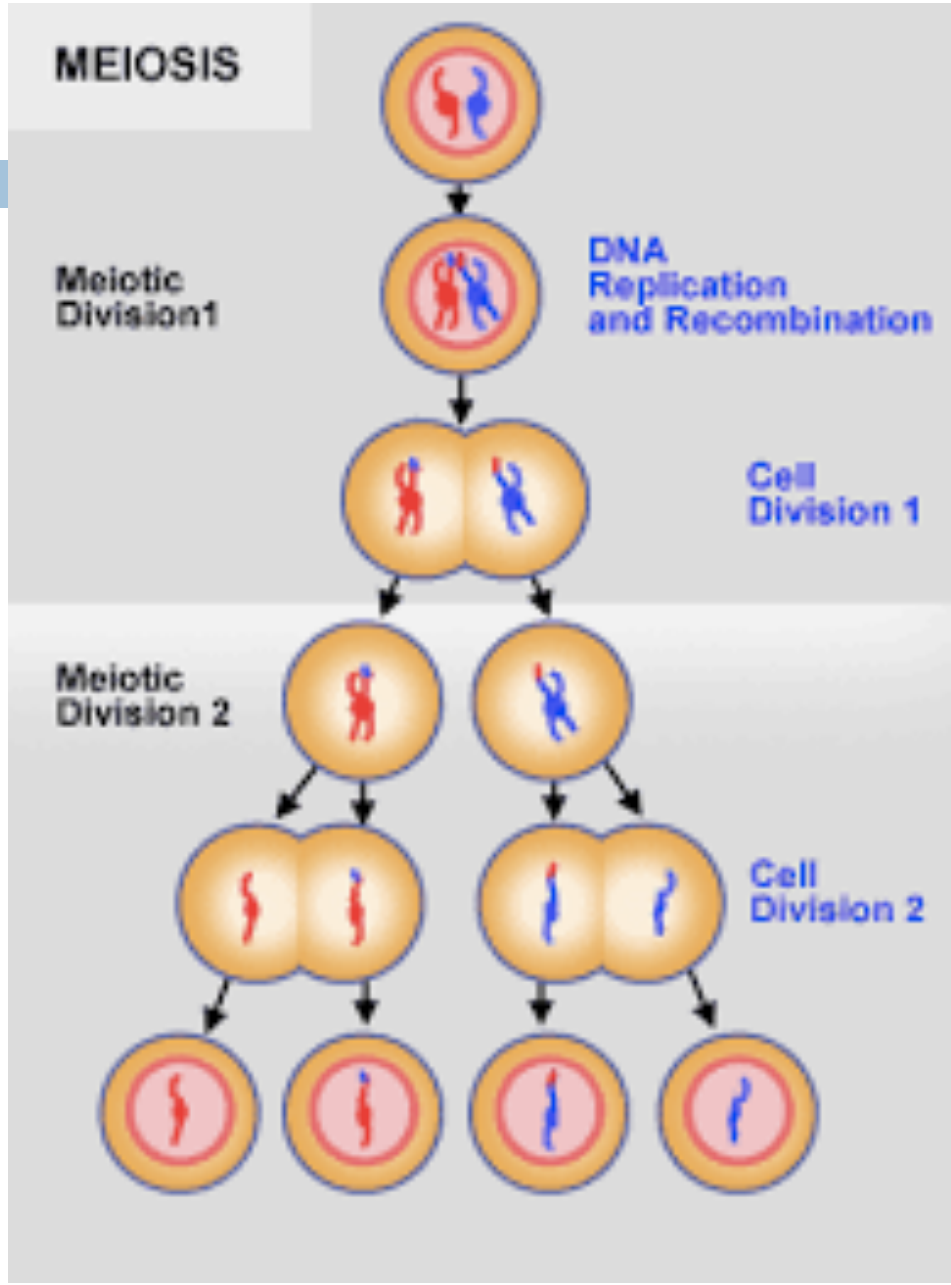
Metaphase I:

- Homologous Chromosome pairs line up across the center of the cell.
- Chromosomes attach to spindle fibers.

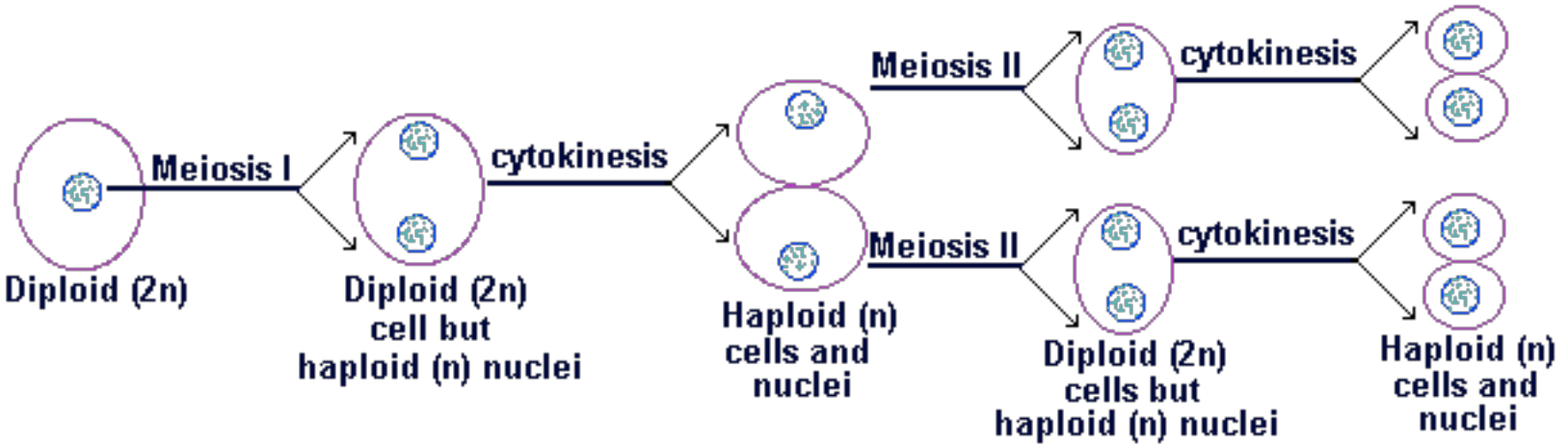


- Anaphase I
  - Centromere's split.
  - The chromosome pairs separate in half.
  - Each chromosome pair is pulled into different halves of the cell.
  - Cell stretches out as the opposite ends are pushed apart.
- Telophase I
  - Cytoplasm divides.
  - Nucleus splits.
  - A new cell membrane forms around the newly created cells.
  - At the end of Telophase I, 2 cells have been created.

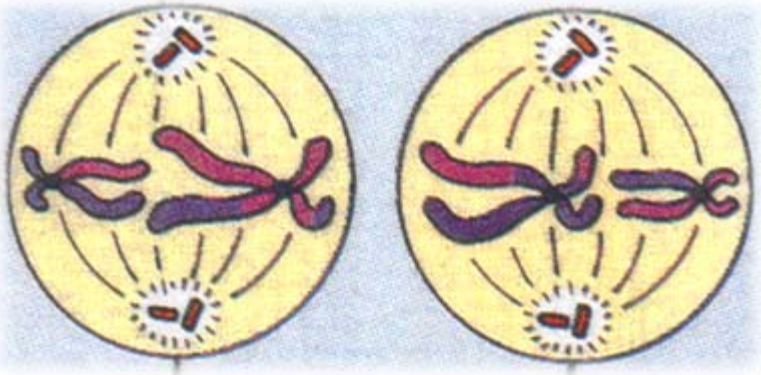
- Stage 3: Cytokinesis I
  - The cell divides into 2 new cells.



- Stage 4: Meiosis II
  - Meiosis II is essentially the process of Mitosis.
  - Prophase II:
    - Centrioles move to opposite sides of the nucleus.
    - Spindle fibers form a bridge between the ends of the cell.



- Metaphase II:
  - Chromosomes line up across the center of the cell.
  - Each chromosome attaches to a spindle fiber at its centromere.



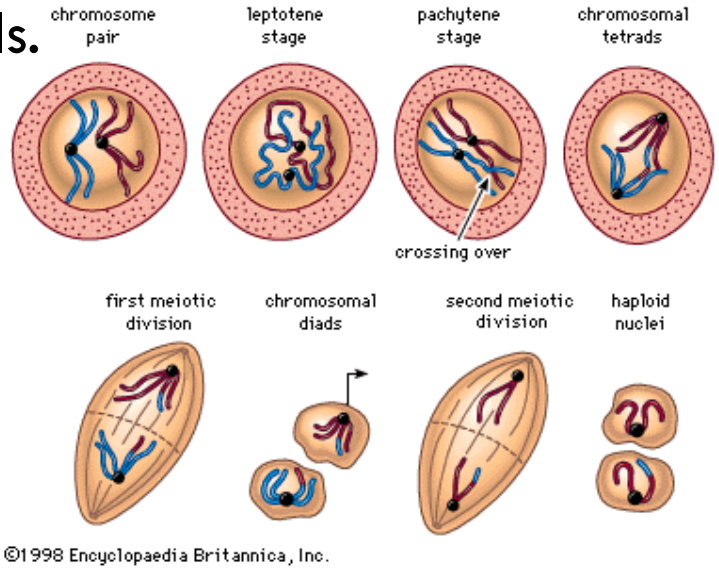
- Anaphase II:
  - The centromere split.
  - The 2 chromatids separate.
    - Chromatid: ½ of a chromosome
  - 1 chromatid is drawn by its spindle fiber to 1 end of the cell.
  - The other chromatid moves to the opposite end.
  - Cell stretches out as the opposite ends are pushed apart.

Chromatides soeurs se séparant

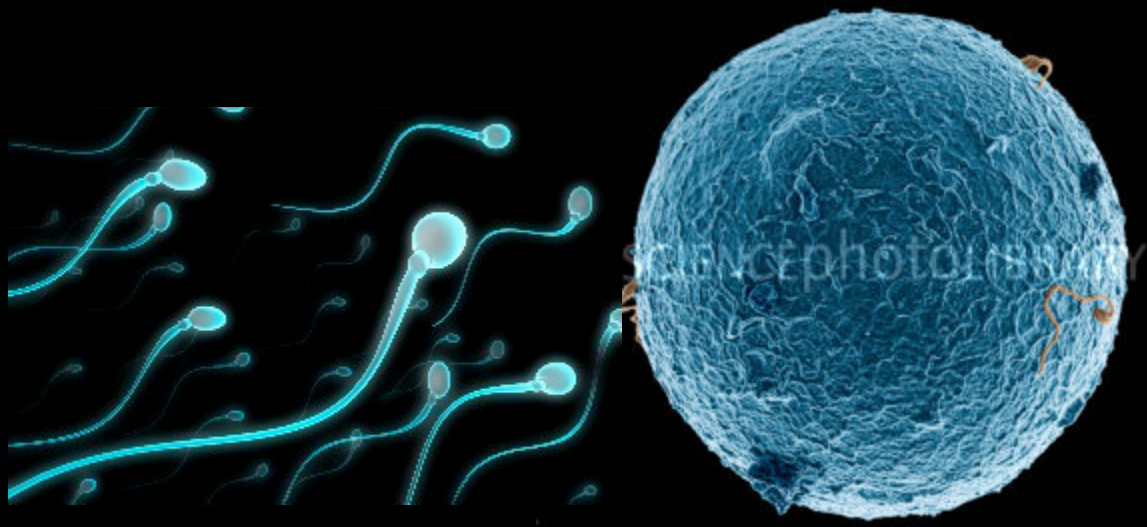
- Telophase II
  - Chromosomes begin to stretch out & lose their rod like appearance.
  - A new nuclear envelope forms around each region of chromosomes.

Stage 5: Cytokinesis II

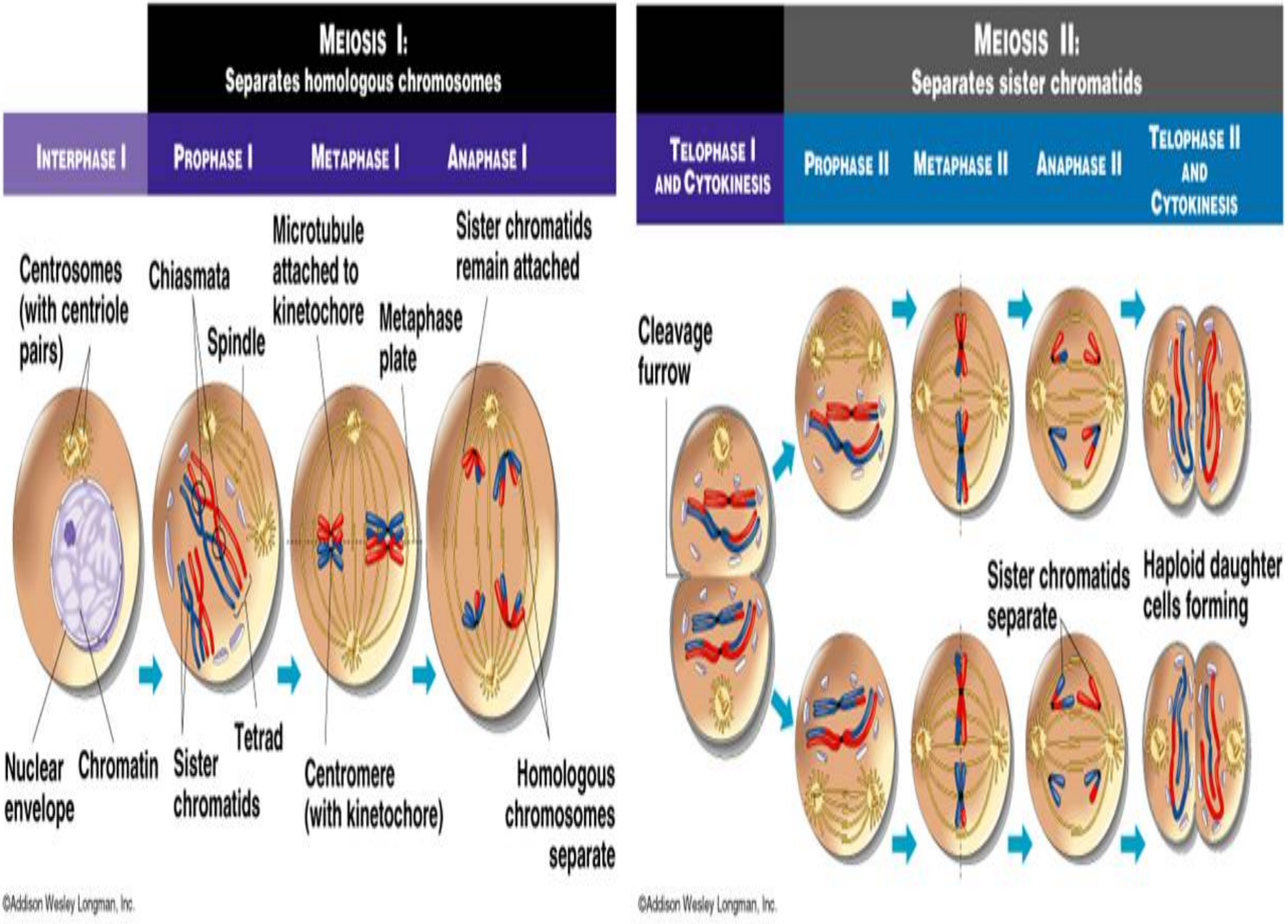
- The cytoplasm divides.
- 4 new cell membranes form around the 4 new cells.
- The new cells have ½ of the chromosomes found in regular body cells.



- Girls go through Meiosis during their development in the womb.
  - The eggs are not mature however.
  - The eggs mature at the onset of puberty.
  - Women stop releasing eggs at the onset of menopause.



- Boys begin the process of Meiosis during puberty.
  - The productions of sperm cells signals the beginning of Meiosis in males.
  - Meiosis continues in boys/men until death once it begins in puberty.


Meiosis I:
Separates homologous chromosomes
Interphase I
Prophase I
Metaphase I
Anaphase I
Centrosomes (with centriole pairs)
Chiasmata
Spindle
Microtubule attached to kinetochore
Metaphase plate
Sister chromatids remain attached
Nuclear envelope
Chromatin
Sister chromatids
Tetrad
Centromere (with kinetochore)
Homologous chromosomes separate
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Meiosis II:
Separates sister chromatids
Telophase I and Cytokinesis
Prophase II
Metaphase II
Anaphase II
Telophase II and Cytokinesis
Cleavage furrow
Sister chromatids separate
Haploid daughter cells forming
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