

## Haploid vs. Diploid

- Haploid cells have **one set** of chromosomes. ( $n = 1$  set)
  - > Example: sperm and egg (*gametes*)
- Diploid cells have **two sets** of chromosomes. ( $2n = 2$  sets)
  - > Example: skin cells, muscle cells, all body cells except gametes

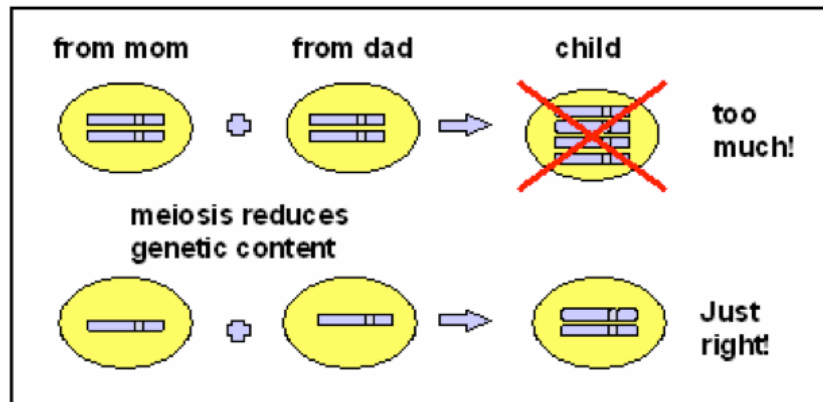
## Meiosis Notes

- Meiosis occurs in sexual reproduction when a *diploid* germ cell produces *4 haploid* daughter cells that can mature to become gametes (sperm or egg).
- **Goal:** reduces genetic material by half

## Why?

$$n \text{ (mom)} + n \text{ (dad)} = 2n \text{ (diploid)}$$

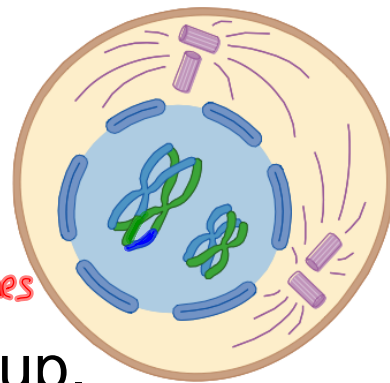
*egg + sperm = zygote*



## Meiosis I

### Prophase I

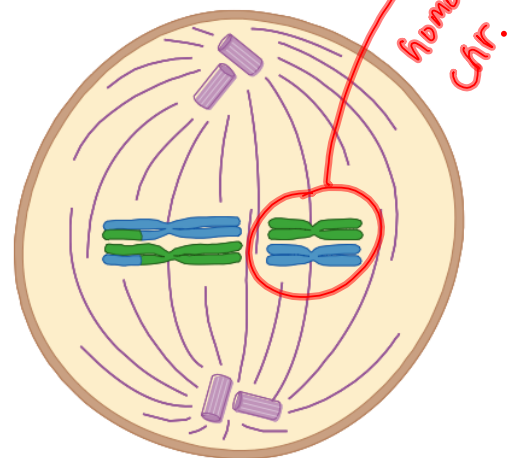
- ~~Chromatids~~ *Chromosomes* condense and pair up.
- Crossing over occurs.  
↳ exchange of genetic material between chromosomes
- Spindle forms.  
↳ microtubules that move chromosomes
- Nuclear membrane fragments.



## Metaphase I

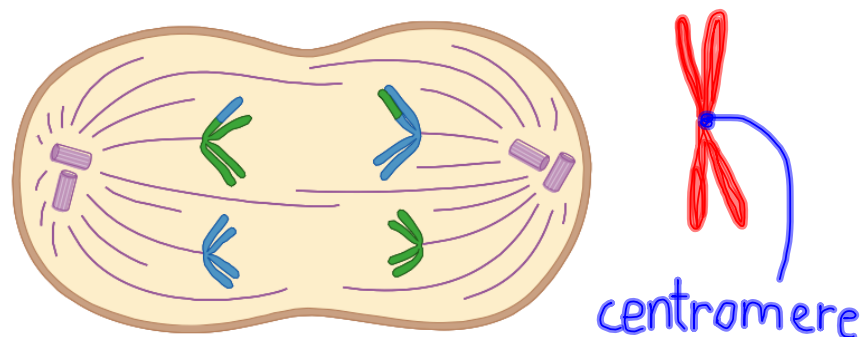
- ~~Chromatid pairs~~ <sup>Homologous chromosomes</sup> line up along the equator of the cell.

Homologous chromosomes are similar in size, shape, and the genes they contain.



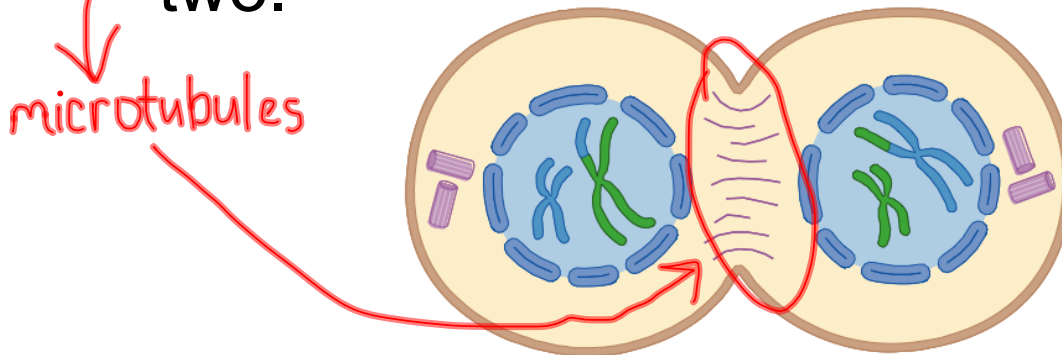
## Anaphase I

- Chromosomes separate and move to opposite poles.
- Sister chromatids remain attached at their centromeres.

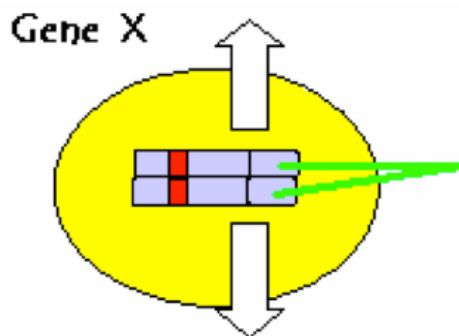


## Telophase I

- Nuclear envelopes reappear.
- Spindle disappears.
- **Contractile ring** divides cell into two.



## Meiosis II

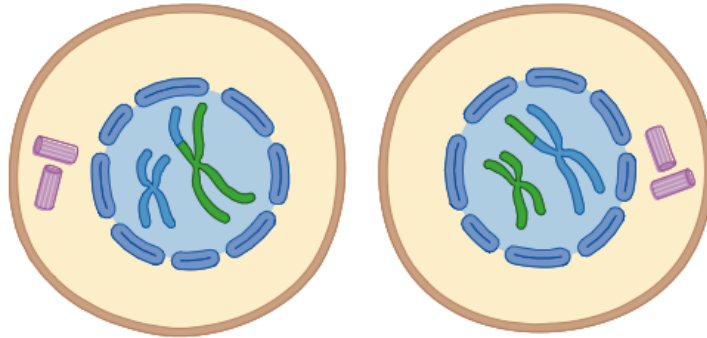


Sister chromatids carry the same genetic information.

Meiosis II produces gametes with one copy of each chromosome and thus one copy of each gene.

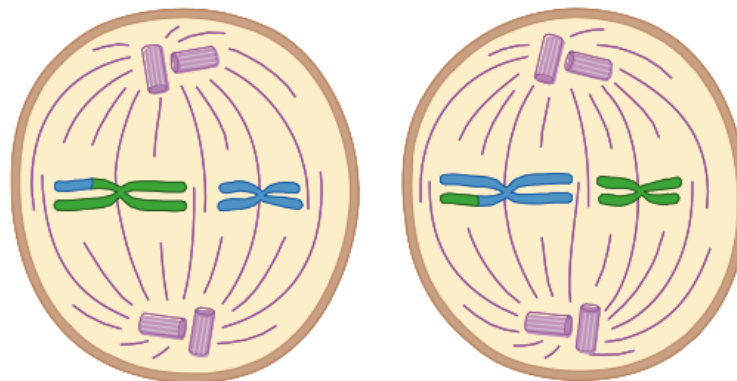
## Prophase II

- Nuclear envelope breaks down.
- Spindle forms.



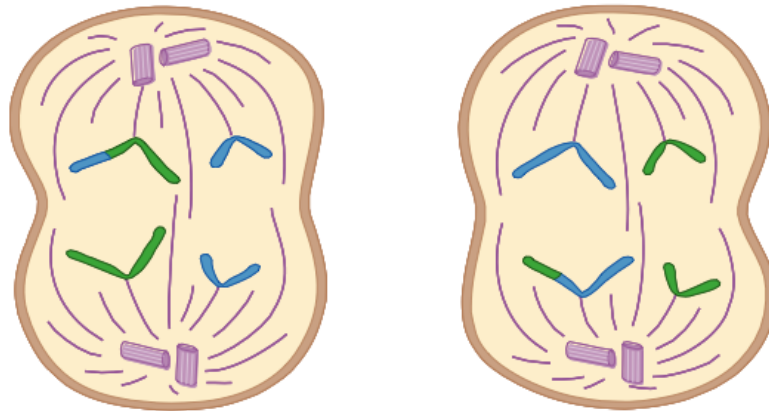
## Metaphase II

- Chromosomes line up along equator of cell.



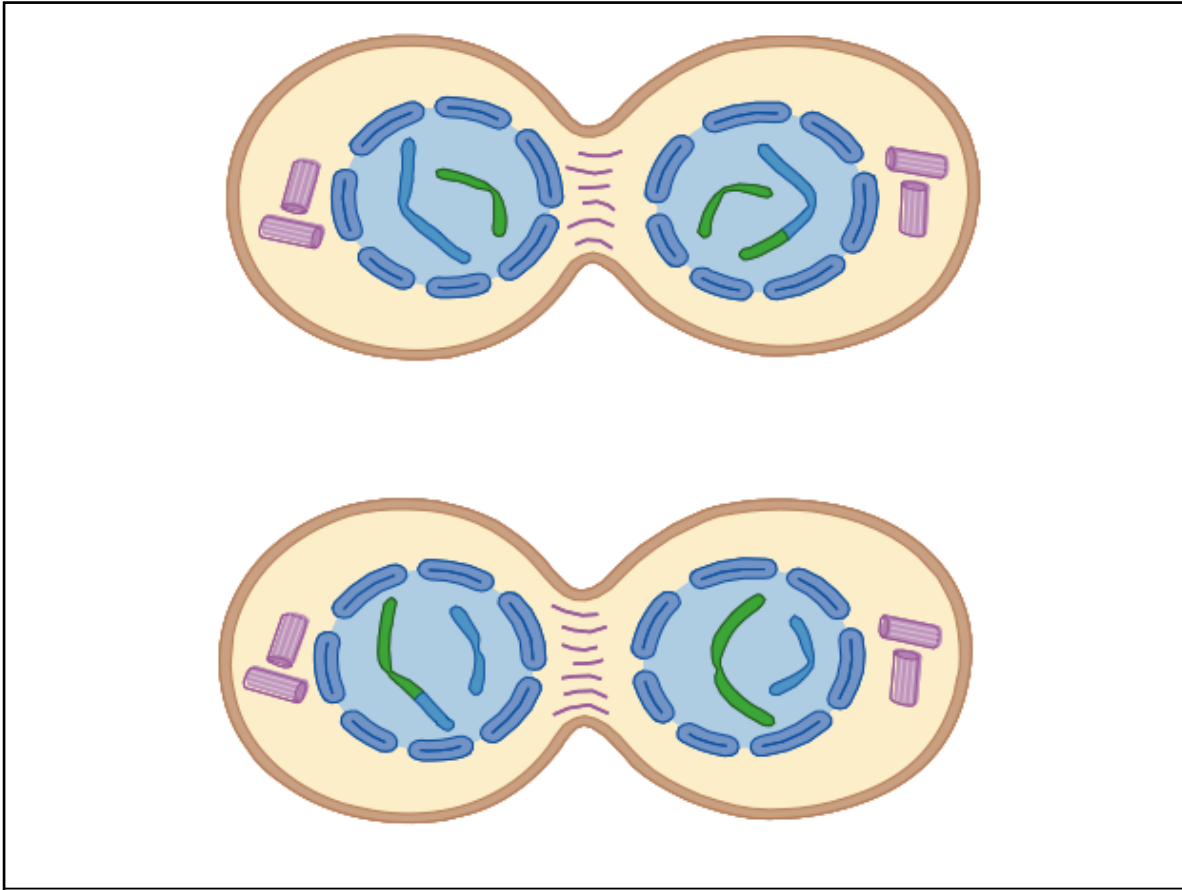
## Anaphase II

- Sister chromatids separate and move to opposite poles.



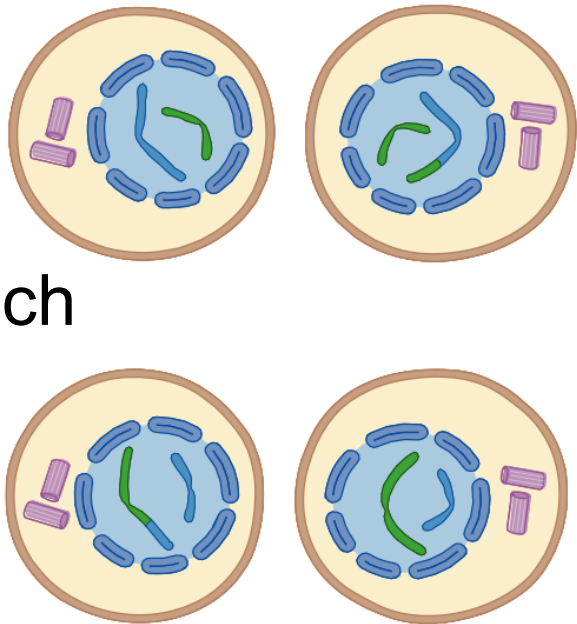
## Telophase II

- Nuclear envelope reappears.
- Chromosomes unwind.
- Spindle disappears.
- Contractile ring divides cell into two.

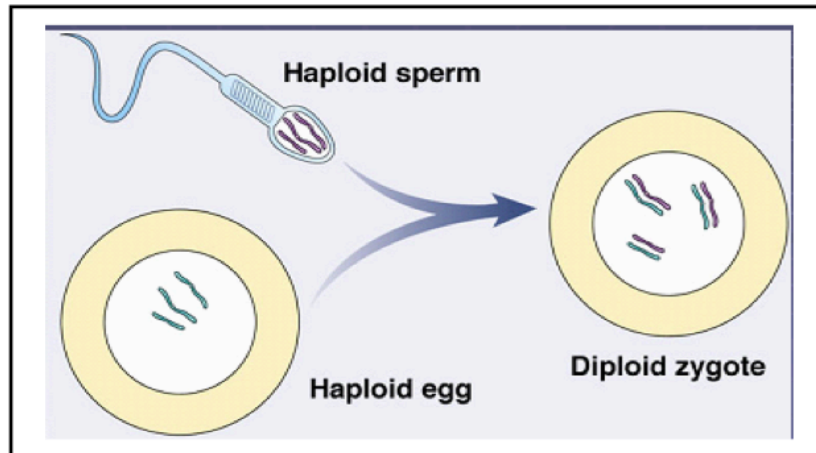


## Results of Meiosis

- Four haploid cells (gametes)
- One copy of each chromosome



- Fertilization allows the creation of diploid individuals through sexual reproduction.



### **Comparison of Mitosis & Meiosis**

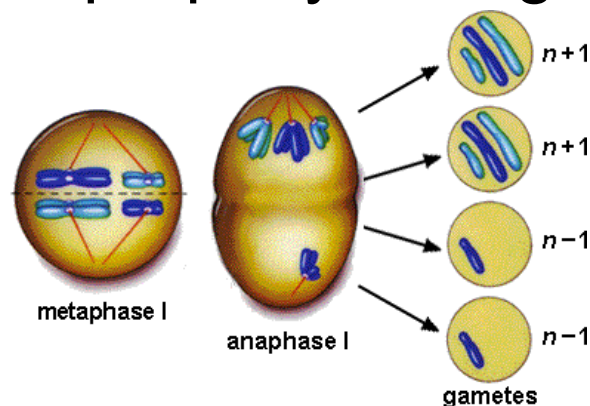
	Mitosis	Meiosis
# of divisions	1	2
# of daughter cells	2	4
Genetically identical?	yes	no
Chromosome #	same	halved
Where?	most body cells	reproductive cells
When?	entire life	reproductive years
Role?	increase cell number	produce gametes



MITOSIS	MEIOSIS
Occurs in somatic (body) cells	Occurs only in germ cells (sex organs: ovaries/testes)
Produces cells for growth, maintenance, healing, asexual reproduction	Only produces gametes (sex cells: egg/sperm)
Results in two diploid (2n) daughter cells	Reduction division results in four haploid (n) cells

## Mistakes in Meiosis

- Nondisjunction: The failure of homologous chromosomes to separate properly during meiosis



- Trisomy: When a gamete with extra chromosomes is fertilized by a normal gamete, the zygote will have an extra chromosome
- Monosomy = When a gamete that is missing a chromosome fuses with a normal gamete during fertilization, the resulting zygote lacks a chromosome.
- Aneuploidy = organisms with more than the usual number of chromosomes sets