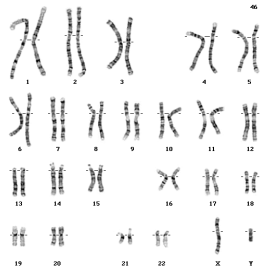


Human Chromosomes



Organization of Human Genome

- Normally, we have 46 chromosomes.
- Our cells are **diploid**, which means our chromosomes are arranged in **homologous pairs**. ($2n = 46$)
- 44 **autosomes** arranged in 22 pairs.
- 2 **sex chromosomes**, one from each parent.
 - XX= female
 - XY= male

Homologous Chromosomes

- **Homologous chromosomes**
 - same length
 - must carry genes for the same **characteristics** but do not have to carry the same **traits**
 - one from each parent.

Characteristic vs Trait

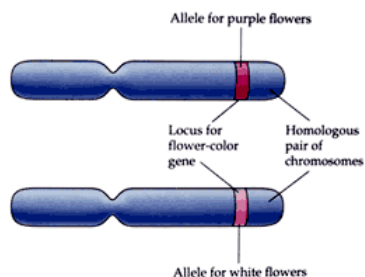
Characteristics

- Height
- Hair color
- Blood type

Traits

- 5'4, 6'3, etc.
- Brown, blonde, red, auburn, etc.
- Type A, Type B, Type O, Type AB

Homologous Chromosomes



Diploid vs Haploid

Diploid Cells

- homologous pairs of chromosomes
- NOT sex cells; all other cells
- $2n$

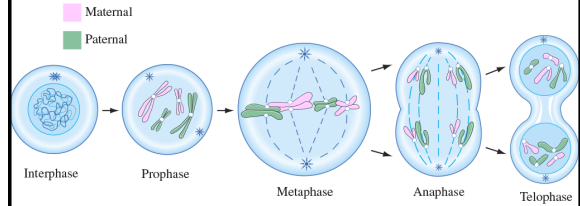
Haploid Cells

- NO homologous pairs
- Only one from each original pair
- sex cells – gametes, sperm and egg
- n

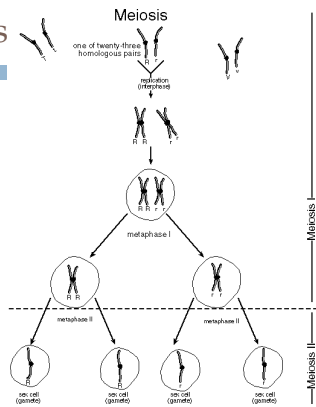
- How do we make sex cells with only $\frac{1}{2}$ of our chromosomes?
- MEIOSIS!!
 - ▣ special cell division that makes sex cells with half of the number of chromosomes.
 - ▣ has two complete divisions \rightarrow makes 4 cells each time

Mitosis review

- Purpose?
- What's happening?



Meiosis

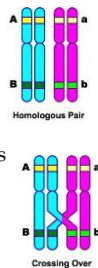


Purpose of Meiosis

1. Reduce the chromosomal number by $\frac{1}{2}$.
2. To make ***haploid*** sex cells (only ONE of each homologous pair) that are GENETICALLY DIFFERENT from each other.

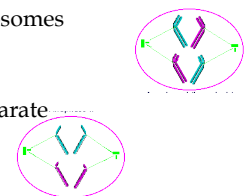
Meiosis (in a nut shell)

1. DNA replication (interphase)
 - ▣ Sister chromatids
2. Homologous chromosomes pair up (synapsis)
 - ▣ Form tetrads - 4 sister chromatids
3. Homologous chromosomes exchange pieces of DNA (crossing over)



Meiosis (in a nut shell)

4. Homologous chromosomes separate
 - ▣ 2 cells formed
5. Sister chromatids separate
 - ▣ 4 cells formed total



Comparison of Meiosis to Mitosis

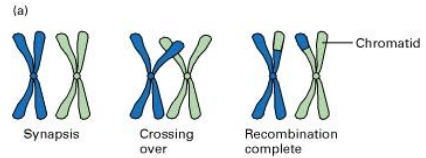
Meiosis

- makes gametes (sperm and egg)
- TWO DIVISIONS → FOUR CELLS
- Reduces chromosomal number by ½ b/c it separates homologous pairs.
- diploid → haploid
- cells are genetically diverse

Mitosis

- all cells EXCEPT gametes.
- ONE DIVISION → TWO CELLS
- Asexual
- makes IDENTICAL COPIES
- diploid → diploid
- haploid → haploid

Events Special to Meiosis

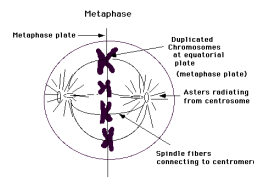


Events Special To Meiosis

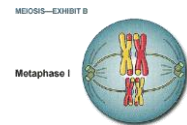
1. **synapsis**- the pair of homologous chromosomes “snap” together (become physically connected).
2. **crossing over**- once synapsis has occurred, touching homologous chromosomes can exchange genes.
3. **independent assortment**- random separation and assortment of chromosomes during meiosis I; results in genetically different sex cells

Synapsis

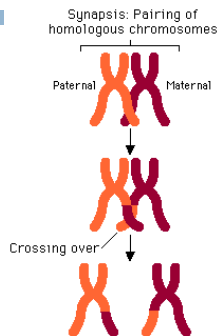
Metaphase of Mitosis-NO SYNAPSIS



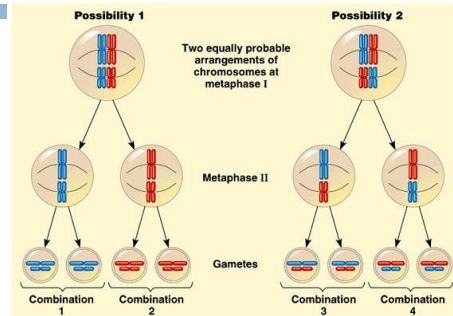
Metaphase I of Meiosis-SYNAPSIS



Crossing Over



Independent Assortment



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