

Meiosis and Sexual Repro

Generation of Variation

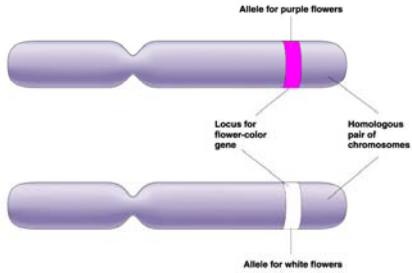
Reproduction of Cells

- Heredity- Passing of traits from one generation to another
- Variation- Inherited Differences among individuals of the same species.
- Genetics- The study of heredity and hereditary variation

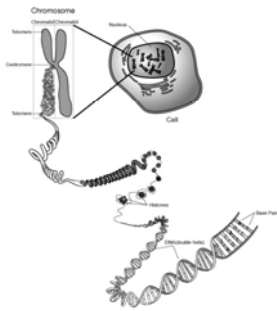
Heredity

- Offspring acquire genes from parents by inheriting chromosomes.
 - ♦ Allele- one specific form of a gene, differing only by a few bases and occupying the same locus.
 - ♦ Genes- The length of DNA that codes for a protein.
 - ♦ Chromosomes- Sections of DNA that contain Genes and other Associated DNA.
 - ♦ Genome- collection of the organism's genes

Chromosome

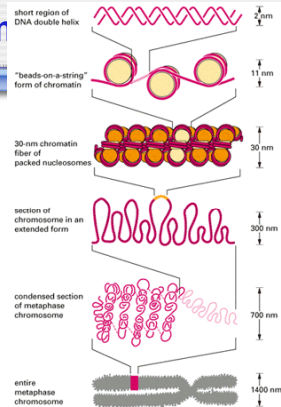


Chromosome

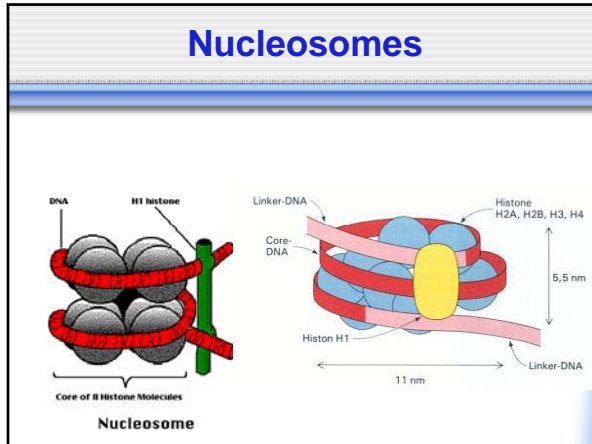


Chrom

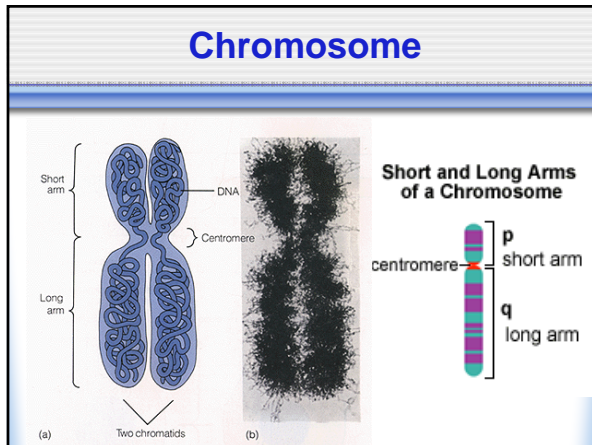
- DNA coils around 8 Histone Proteins and then keeps coiling to condense to be a chromosome
- Nucleosomes are the “beads” made of DNA coiled around Histones.



Nucleosomes



Chromosome



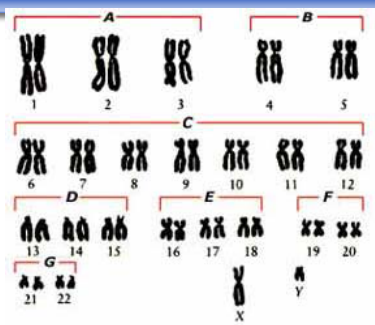
Asexual vs Sexual

- Sexual
 - ♦ Two parents
 - ♦ each gives half
 - ♦ unique combinations
 - ♦ variation!
- Asexual
 - ♦ single parent
 - ♦ all from one
 - ♦ genetically identical (clone)
 - ♦ very rarely generate any differences if so it was from a mutation.

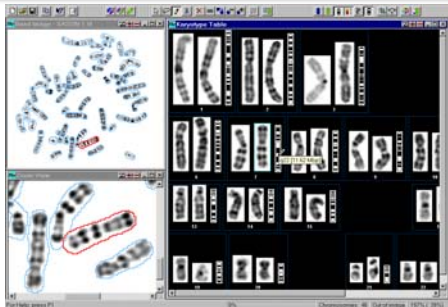
Life Cycles

- Somatic Cells
 - ♦ 46 Chromosomes
 - ♦ By size
 - ♦ Homologous pairs
- Karyotype

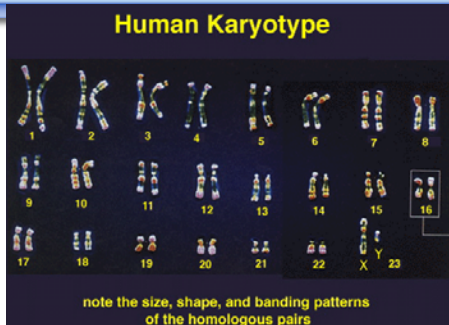
Chromosome



Chromosome

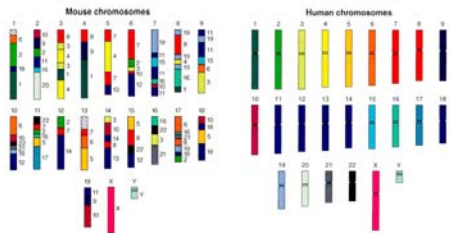


Karyotype



Chromosome

Mouse and Human Genetic Similarities



Life Cycles

- Homologous autosomes
 - ♦ 1-22
 - ♦ Same loci
- Sex Chromosomes
 - ♦ 23rd pair
 - ♦ Not same loci (males)

Life Cycles

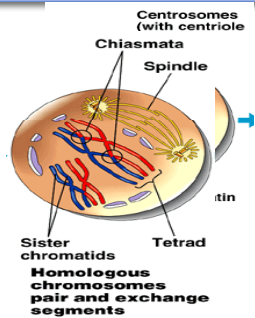
- One homologue is inherited from each parent.
- Our 46 somatic cell chromosomes are actually two sets of 23.
- Diploid (2n)
 - ♦ Two sets of chromosomes
- Haploid (n)
 - ♦ One set
 - ♦ Gamete – haploid reproductive cell.

Life Cycles

- Fertilization
 - ♦ Union of two gametes (n)
 - ♦ Zygote is formed (2n)
- Gametes are produced in gonads (ovaries and testes)
- Meiosis is the process by which the chromosome number is reduced.

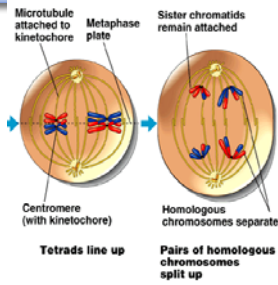
Meiosis

- Interphase one
 - ♦ Replication
- Prophase one (approx 90% of time)
 - ♦ Synapsis occurs
 - ♦ Tetrad forms
 - ♦ Crossing over occurs (Chiasmata)
 - ♦ Centrioles move apart
 - ♦ Nuclear membrane and nucleoli disappear

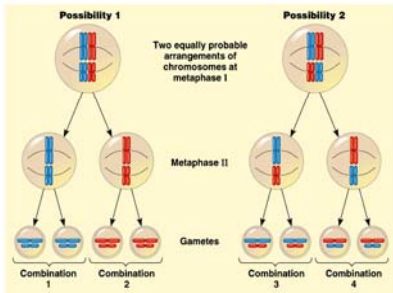


Meiosis

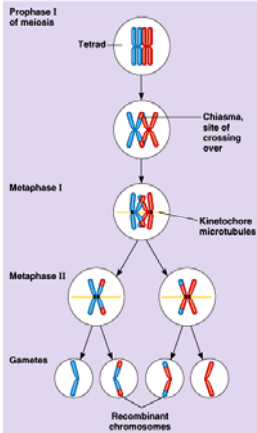
- Metaphase one
 - Chromosomes move to midline
 - Independent assortment happens (Mendel)
 - Segregation happens (Mendel)
 - Homologous chromosomes (2 chromatids) move to opposite sides at the beginning of Anaphase one.



Independent Assortment

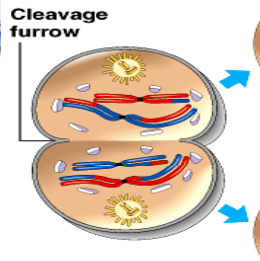


Segregation



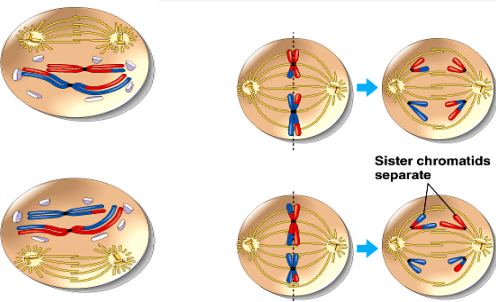
Meiosis

- Telophase one
 - ♦ Cell either pinches or new cell plate forms
- Prophase 2
- Metaphase 2
- Anaphase 2
- Telophase 2
- Daughter cells (Gametes)

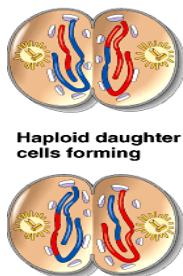


Two haploid cells form; chromosomes are still double

Meiosis II

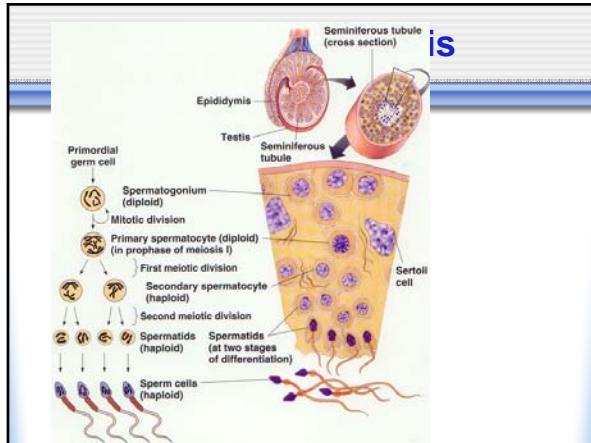


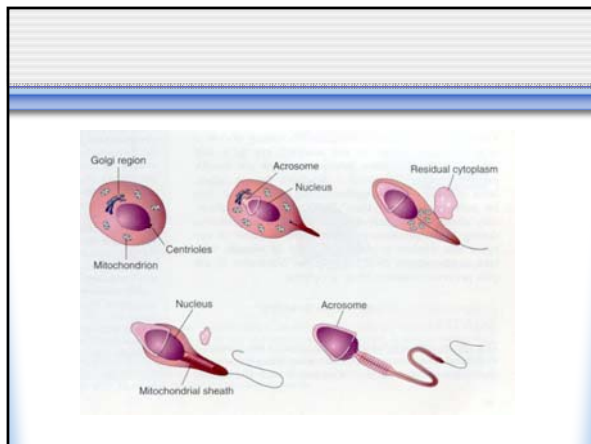
Telophase II



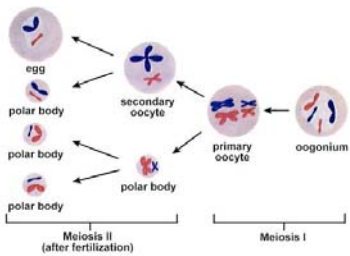
Possible Combinations!

- ♦ A zygote produced by mating of a woman and man has a unique genetic identity.
- ♦ An ovum is one of approximately 8 million possible chromosome combinations (actually 2^{23}).
- ♦ The successful sperm represents one of 8 million different possibilities (actually 2^{23}).
- ♦ The resulting zygote is composed of 1 in 70 trillion ($2^{23} \times 2^{23}$) possible combinations of chromosomes.
- ♦ Crossing over adds even more variation to this.

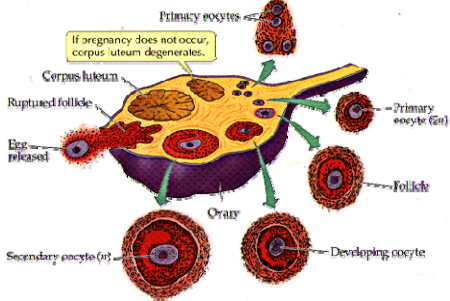




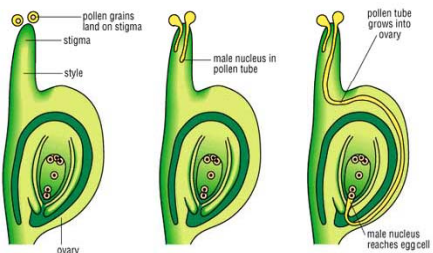
Oogenesis



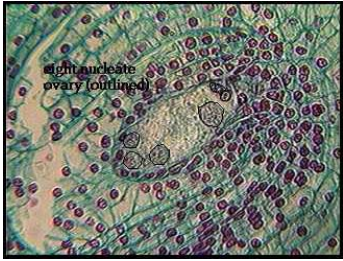
Ovary



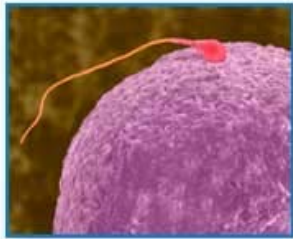
Plant Fertilization



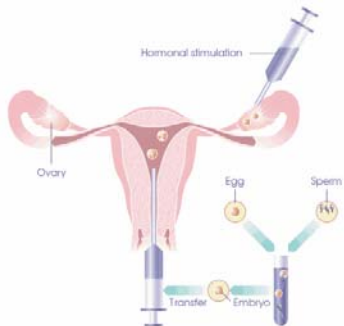
Alternation of Generation



Alternation of Generation



Alternation of Generation



Alternation of Generation

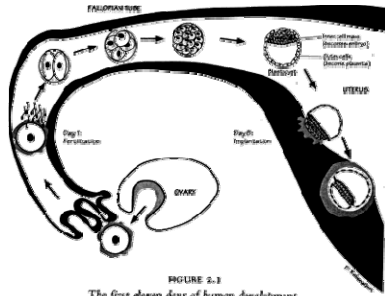


FIGURE 2.1
The first eleven days of human development.

Meiosis in Action

