CH 11 Introduction to GENETICS

11-1 The work of Gregor Mendel

11-2 Probability and Punnett squares

11-3 Exploring Mendelian Genetics

11-4 Meiosis

11-5 Linkage and Gene Maps

11-1 The work of Gregor Mendel

- At age 21 Gregor Mendel's knowledge of statistics helped him discover **Heredity-** The transmission of characteristics from parents to offspring
- While in his garden Mendel noticed the two contrasting **Traits** in his pea plants
  - Plant height (long or short stems)
  - Seed color (green or yellow)
  - Flower color (Purple or white)
  - 14 total Traits

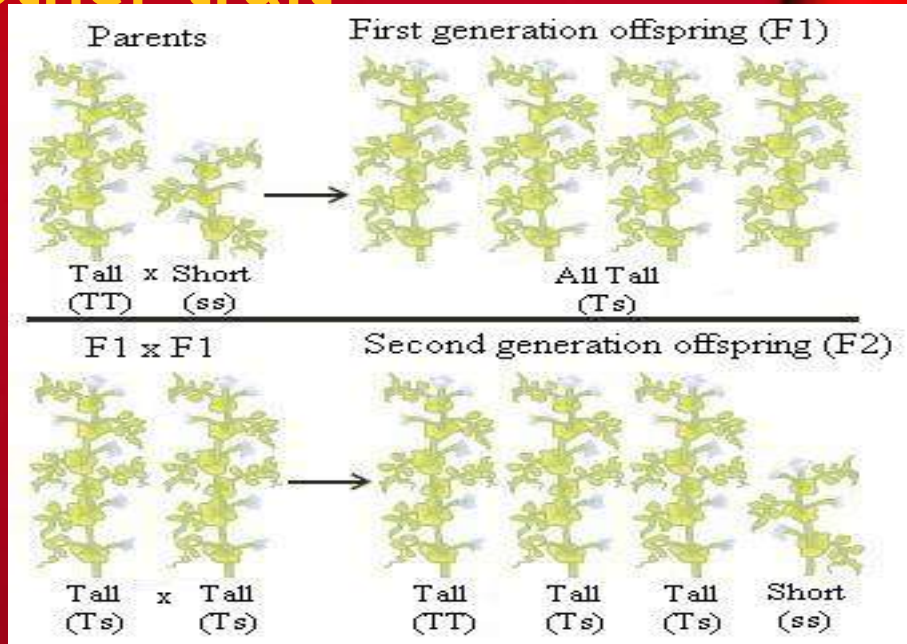
11-1 The work of Gregor Mendel

- Pollination-Pollen grains (Male) go into the flowers stigma (Female)
  - **Fertilization** produces a new cell which develops into a tiny embryo encased in a seed
- Began by **True-Breeding** a plant pure for each of the 14 traits
  - Pure=Always producing the same trait
- Each parent generation is called the

  P_1 Generation,First generation is F_1 generation,and second generation F_2 generation, and so on

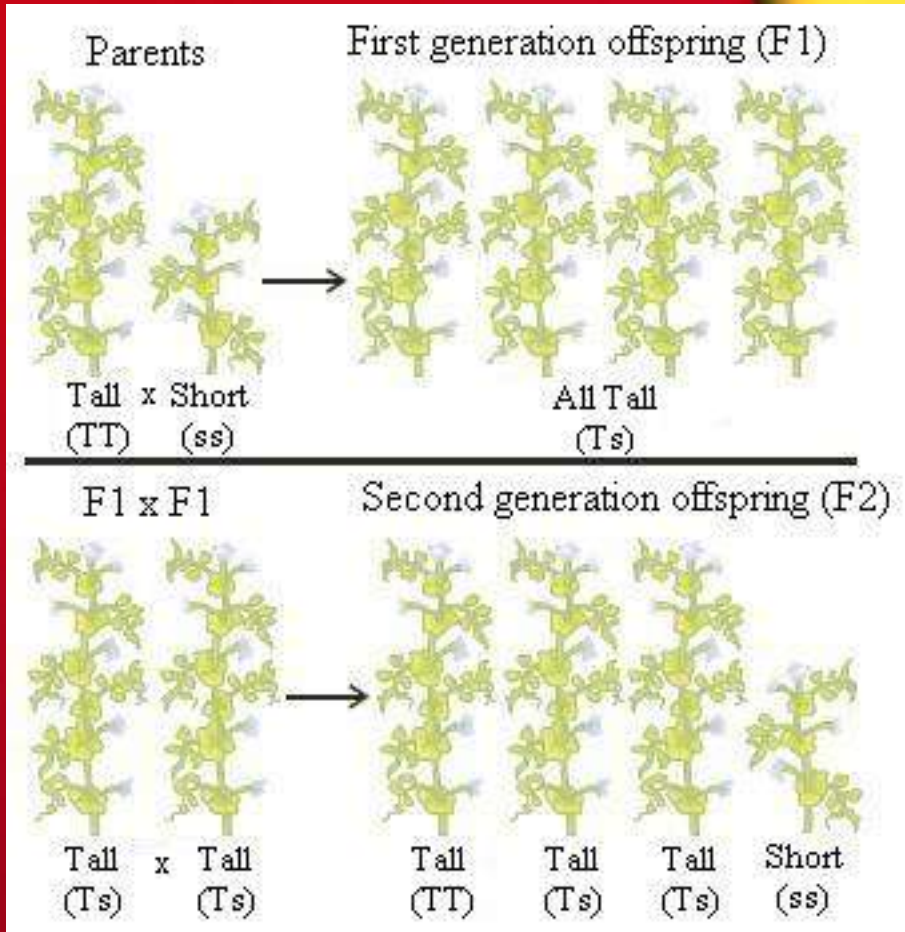
11-1 The work of Gregor Mendel

- Mendel would cross the P_1 traits and one of the traits never appeared in F_1
- When he crossed the F_1 plants the traits would appear in a 3:1 Ratio in F_2
- He concluded that one trait was **Dominant** because it masked **the other trait**



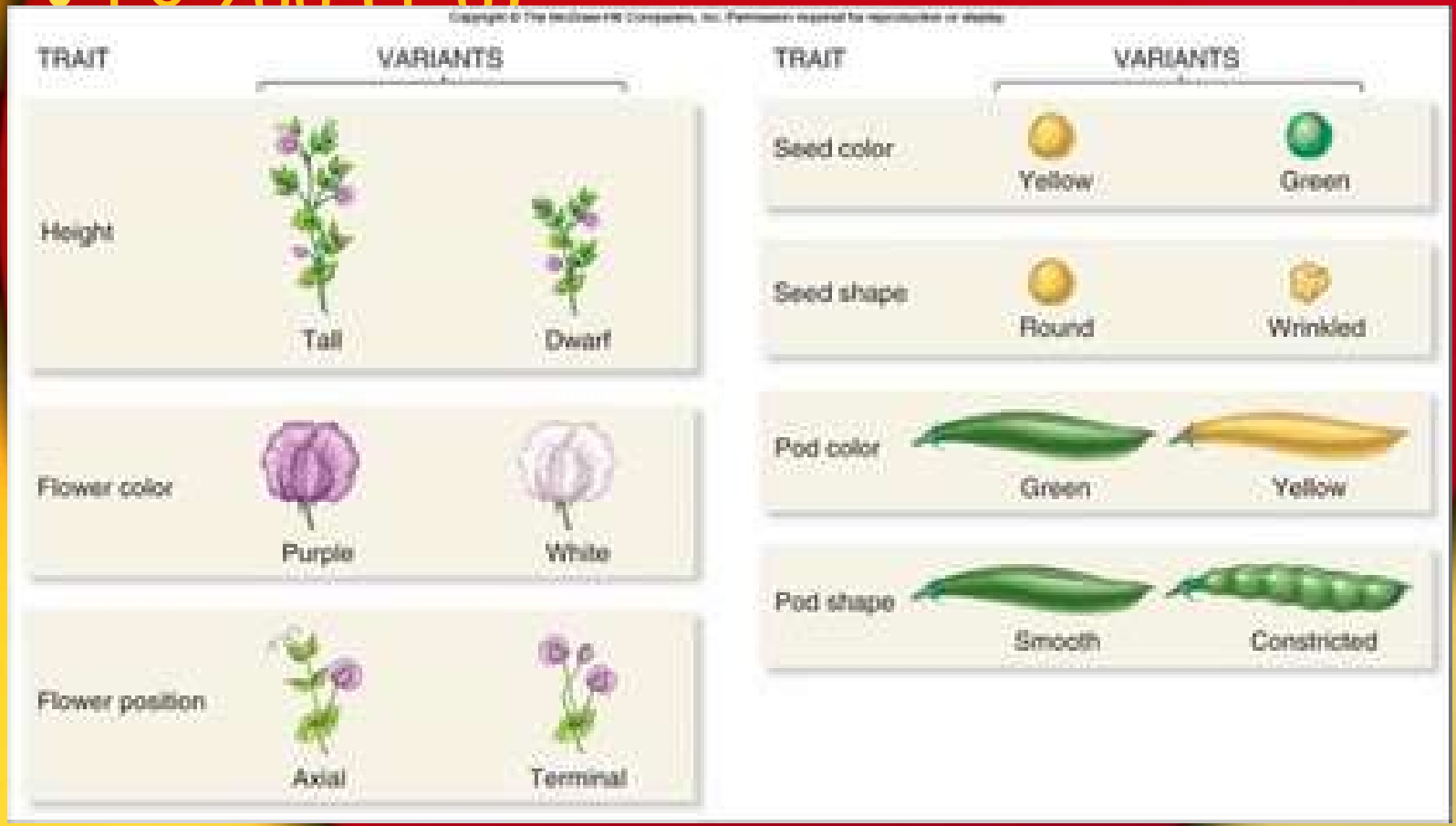
11-1 The work of Gregor Mendel

- **The trait that didn't appear in F_1** but appeared in F_2 was said to be **Recessive**
- Each trait is controlled on a piece of your DNA on a Chromosome which is called an Allele
  - Since chromosomes exist in pairs, your alleles occur in pairs
    - Dominant vs recessive



Questions

- Pg 266 (1-6)



11-2 Probability and Punnett Squares

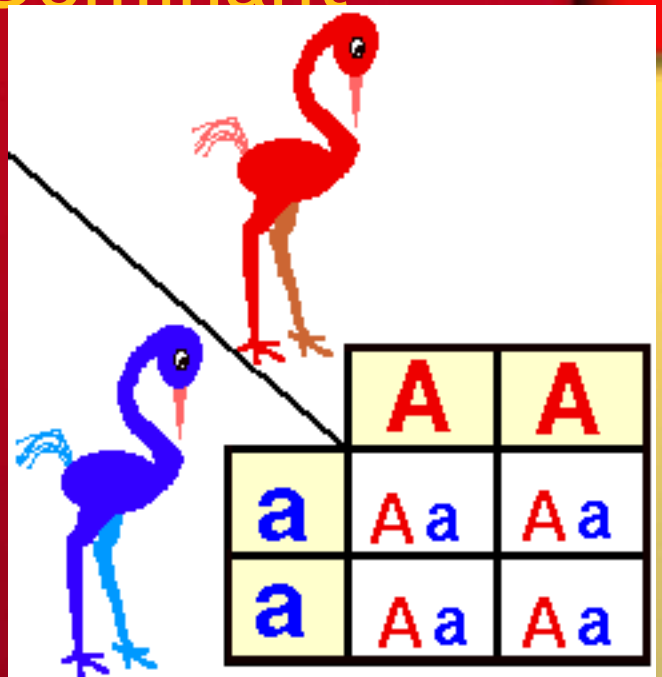
- The likelihood that a particular event will occur is called Probability
- The principles of probabilities can be used to predict the outcomes of genetic crosses
  - **Mendel recorded all of the outcomes he got in every genetic cross to understand**

11-2 Probability and Punnett Squares

- Genotype- The genetic make-up of an organism
- Phenotype- The appearance of an organism as a result of its genotype
- Homozygous- When both alleles are alike
  - Example- PP (Dominant) or pp (Recessive)
- Heterozygous- When both alleles in the pair are different- Example- Pp
- Punnett square- Diagram to aid biologists in predicting probability that traits will be inherited by an offspring

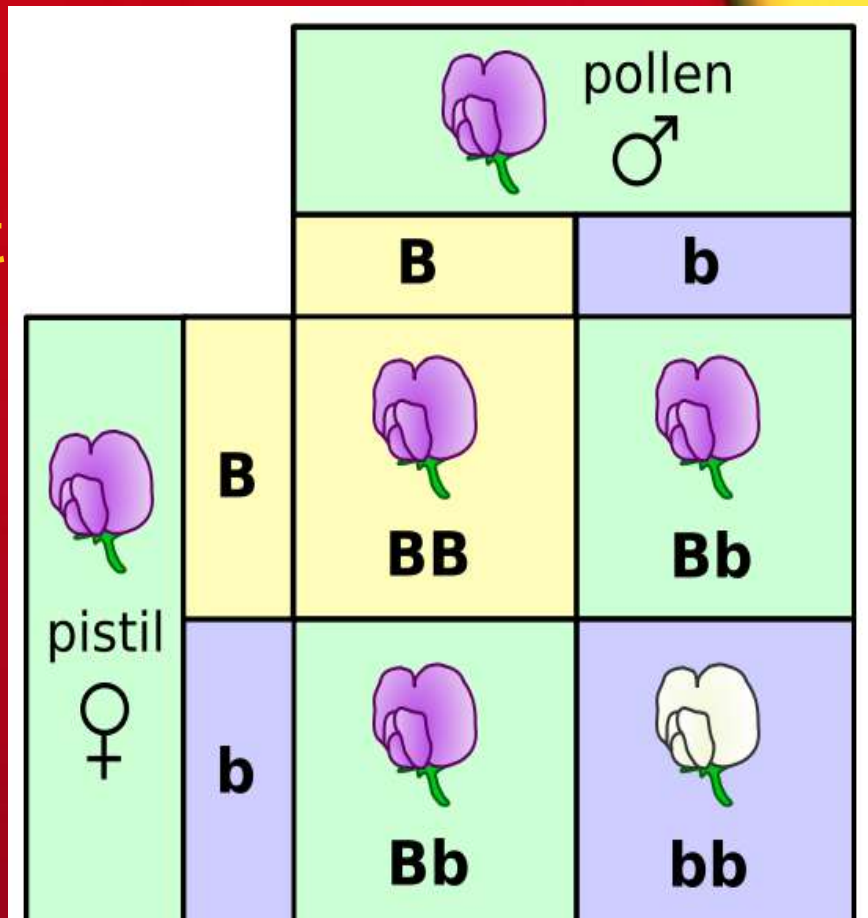
Example 1
Homozygous Dominant
X
Homozygous Recessive

- All Offspring will be Heterozygous
- All Offspring will be Red-Dominant Gene



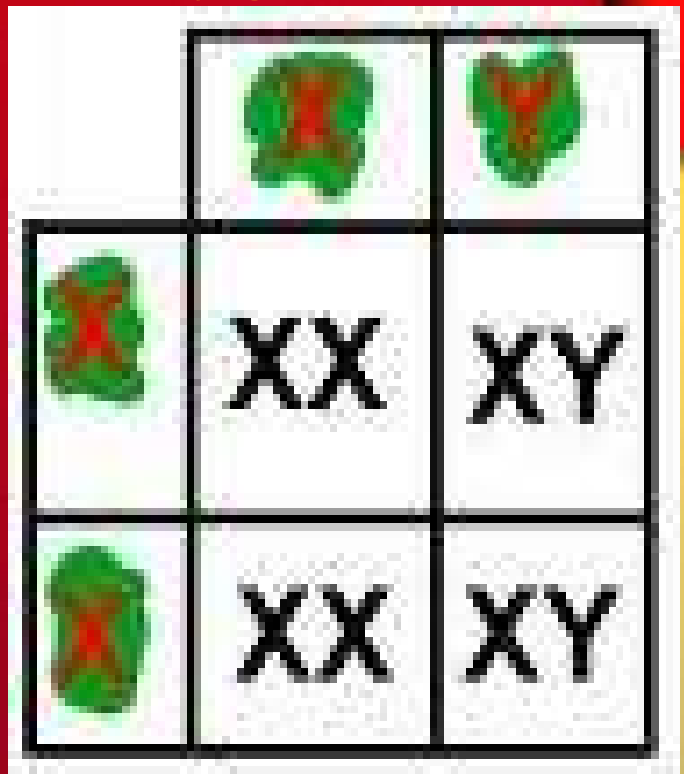
Example 2 Heterozygous X Heterozygous

- Purple flower is dominant
- Offspring will be 3:1
- 1 homozygous dominant
- 2 heterozygous
- 1 homozygous recessive
- 3 Purple-1 White
  - Just like Mendel observed in F_2 generation



Example 3 Heterozgous x Homozygous

- Half offspring will be Homozygous
- Half offspring will be Heterozygous

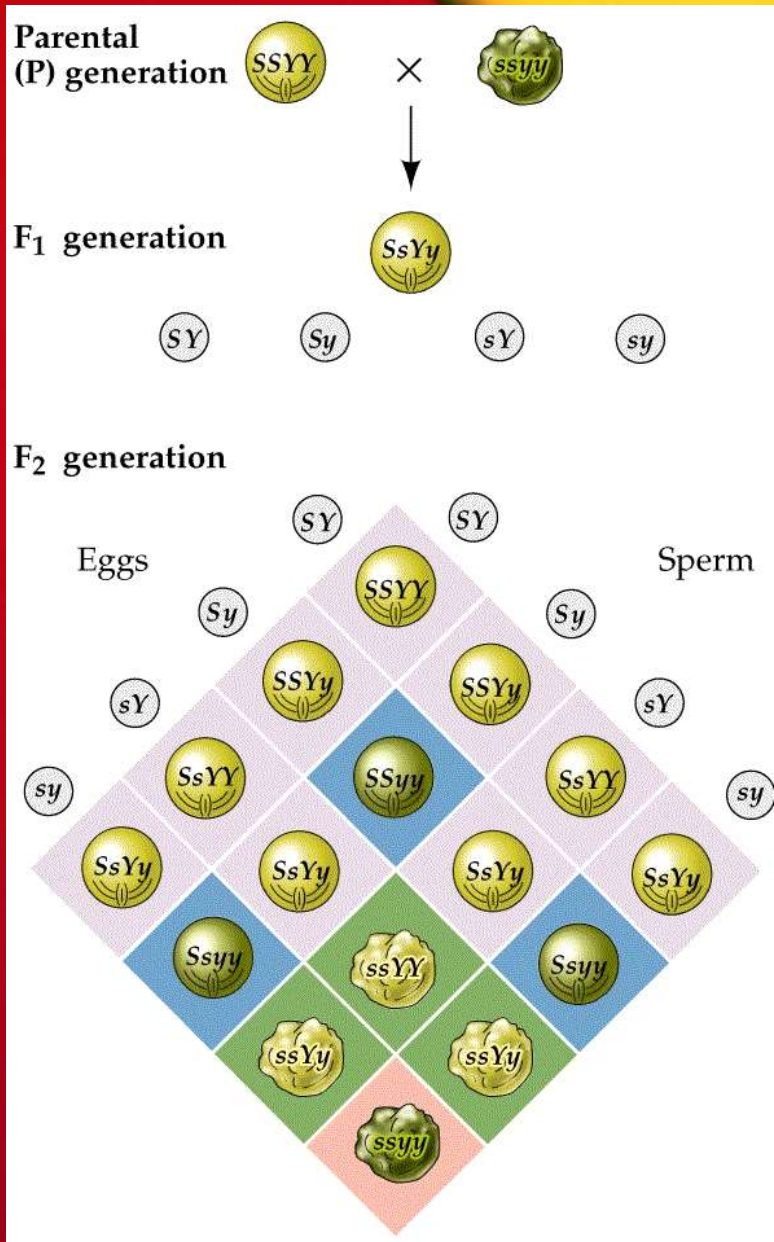


Questions

- Pg 269 (1-5)

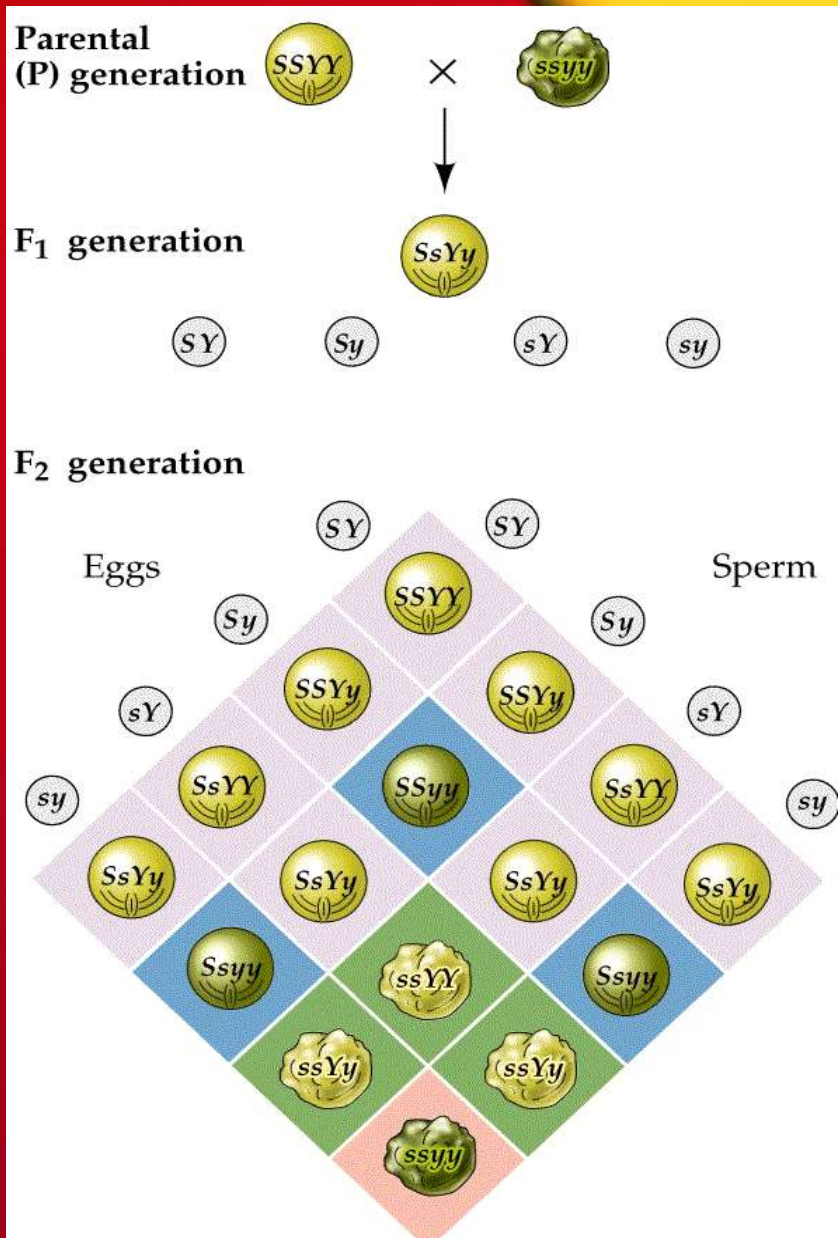
11-3 Exploring Mendelian Genetics

- Does the gene for round/wrinkly affect Yellow/Green
- Two factor cross-F1 does not show that genes are independent
  - Yellow and round stay together



11-3 Exploring Mendelian Genetics

- The factor cross:F2 shows that alleles for seed shape segregate independently of those for seed color
- called Independent Assortment



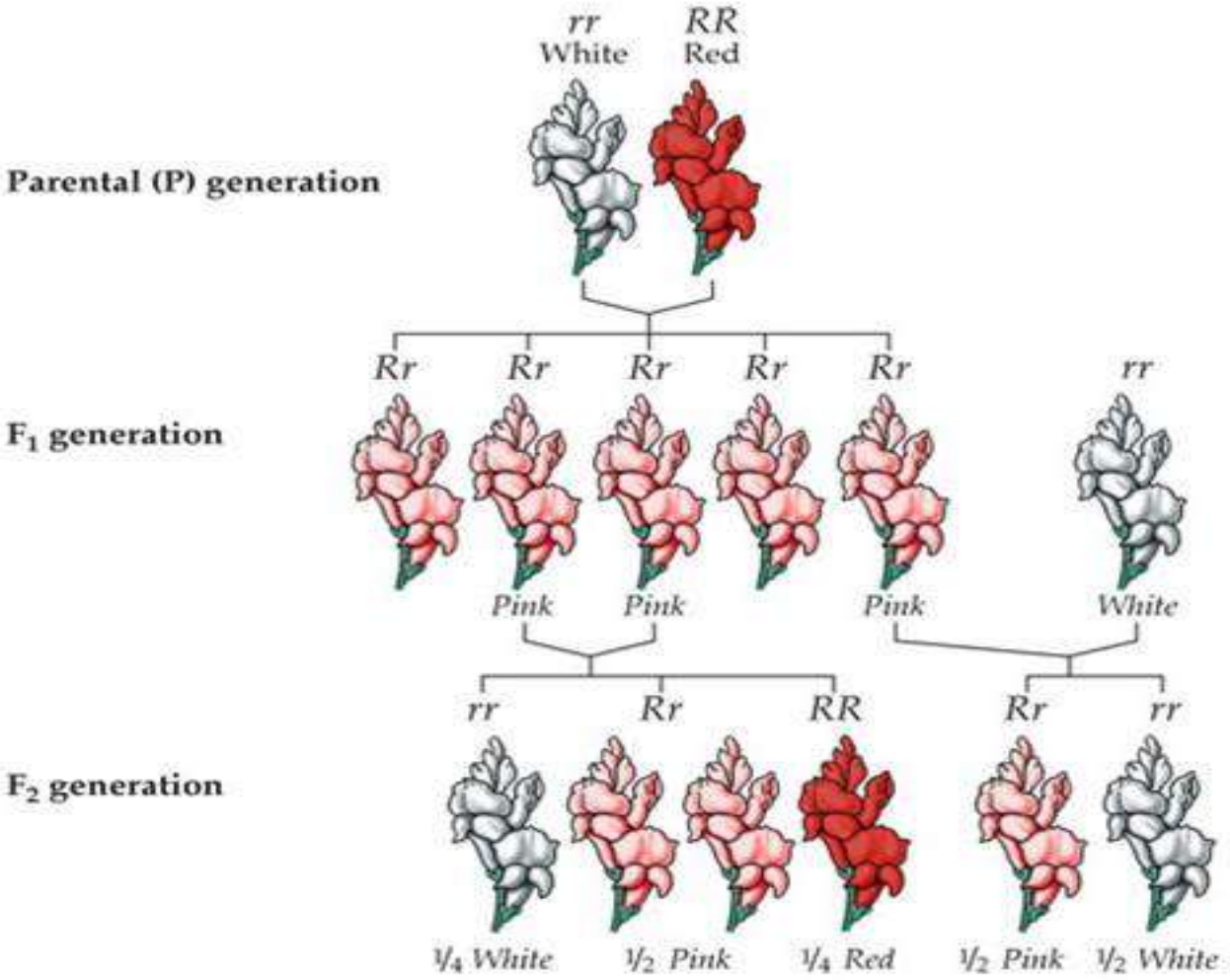
11-3 Exploring Mendelian Genetics

- The principle of independent assortment states that genes for different traits can segregate independantly during the formation of gametes-leading to genetic variation in plants and animals

11-3 Exploring Mendelian Genetics

- Some alleles are neither dominant nor recessive, and may traits are controlled by multiple alleles or genes
- In incomplete dominance the heterozygous phenotype is somewhere between the two homozygous phenotypes

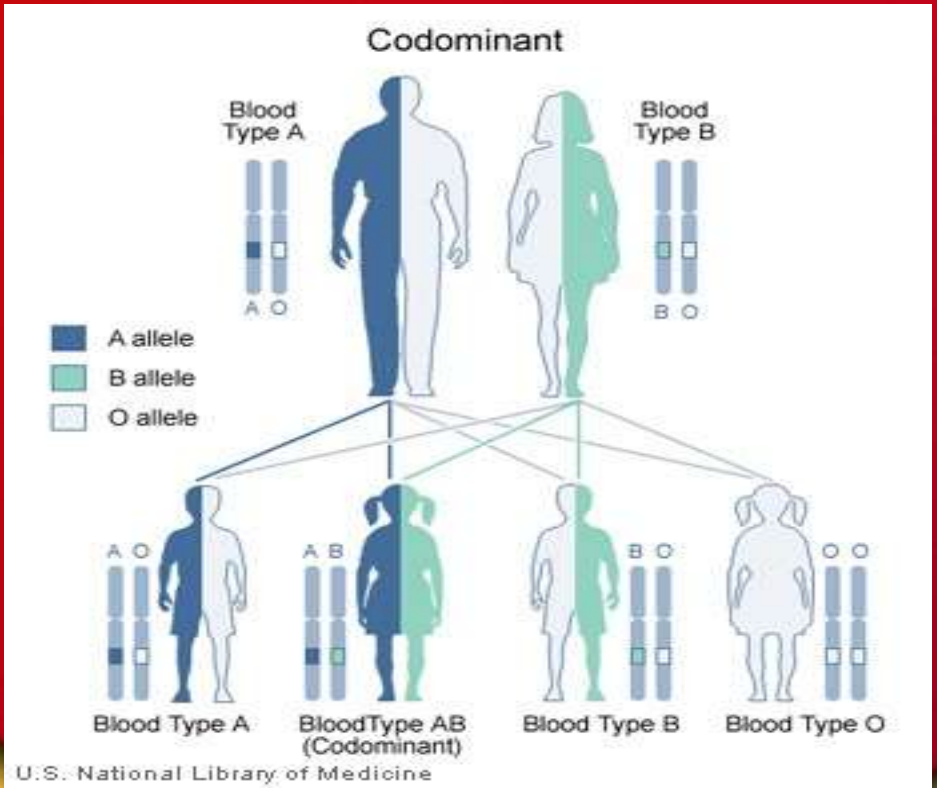
Incomplete dominance



LIFE: THE SCIENCE OF BIOLOGY, Seventh Edition, Figure 10.13 Incomplete Dominance Follows Mendel's Laws

11-3 Exploring Mendelian Genetics

- Codominance is when both alleles contribute to the phenotype



11-3 Exploring Mendelian Genetics

- Many genes have more than 2 varieties of alleles and are said to have Multiple Alleles

Possible genotypes	CC, Cc^{ch}, Cc^{h}, Cc	$c^{ch}c^{ch}$	$c^{ch}c^{h}$, $c^{ch}c$	$c^{h}c^{h}$, $c^{h}c$	cc
Phenotype	Dark gray	Chinchilla	Light gray	Himalayan	Albino

LIFE: THE SCIENCE OF BIOLOGY, Seventh Edition, Figure 10.13 Inheritance of Coat Color in Rabbits

11-3 Exploring Mendelian Genetics

- Traits controlled by two or more genes are said to be Polygenic traits
  - Skin color in humans is controlled by 4 different genes giving up a large variety

11-3 Exploring Mendelian Genetics

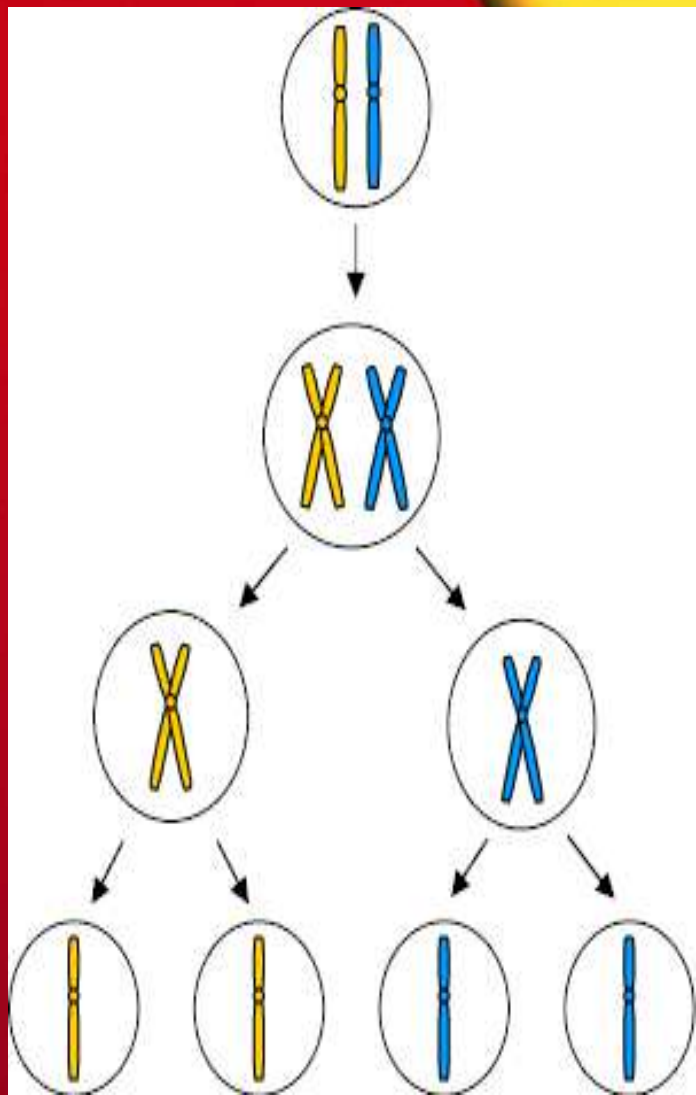
- Genes provide a plan for development, but how that plan unfolds also depends on the environment
- Pg 274 1-5

11-4 Meiosis

- Mendels Principles of genetics require:
- 1) Each organism must inherit a single copy of every gene from each parent
- 2) When that organism produces gametes those two genes separate from each other and each gamete receives one

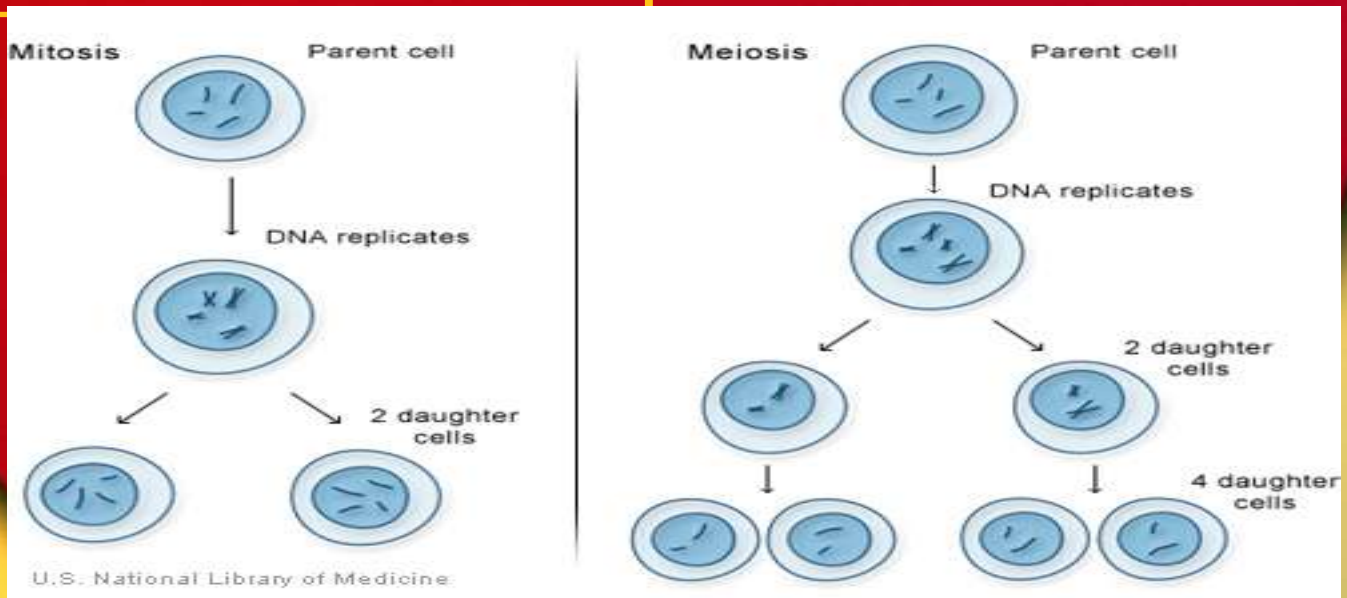
11-4 Meiosis

- Chromosomes come in pairs (one from each parent) that are called Homologous
- Cells that only have one set of chromosomes are called Haploid (1n)



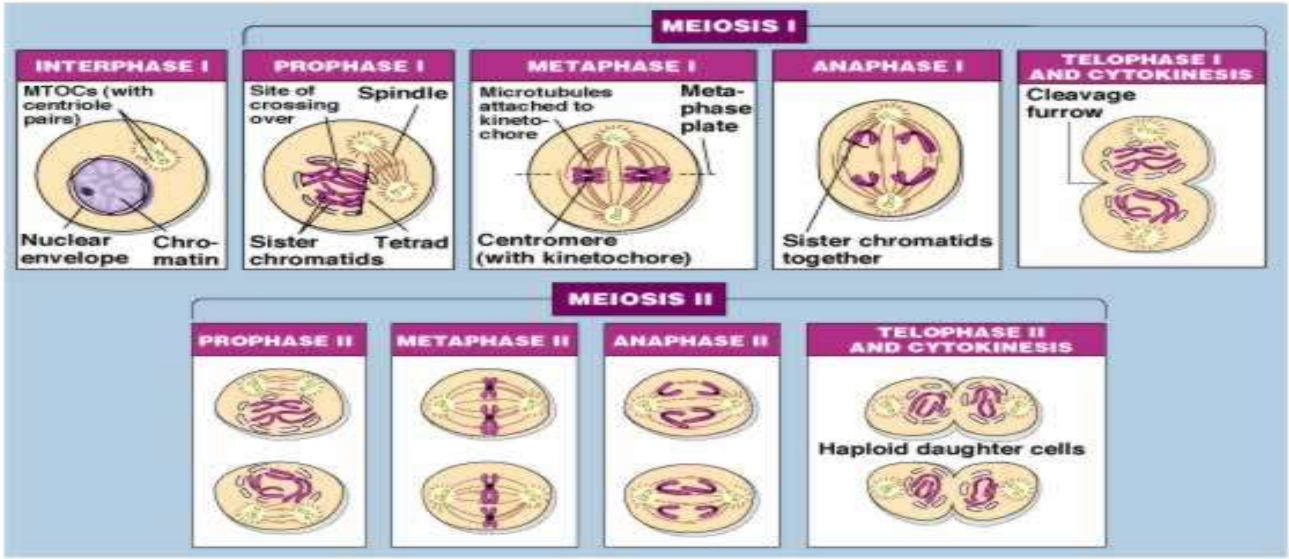
11-4 Meiosis

- Meiosis is a process of reduction division in which the number of chromosomes per cell is cut in half through the separation of homologous chromosomes in a diploid cell



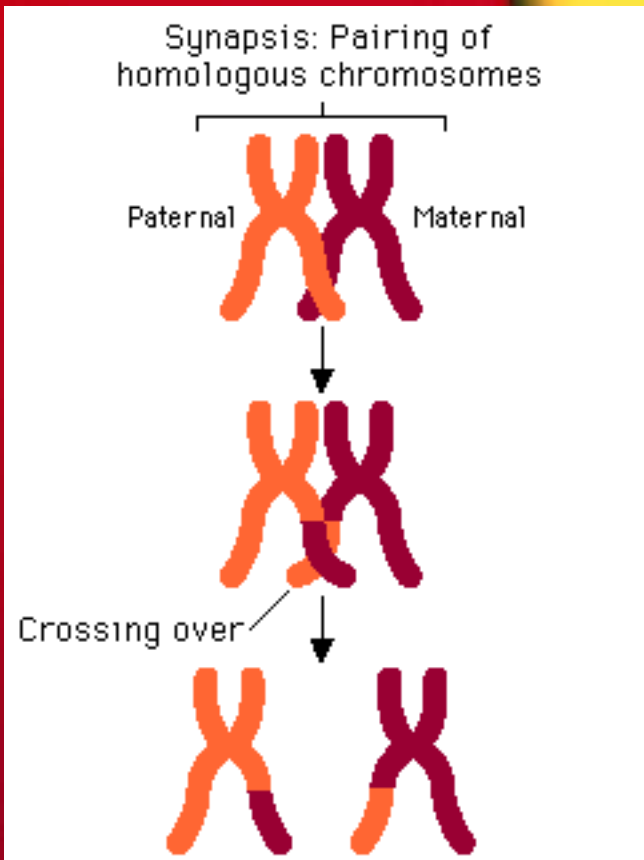
11-4 Meiosis

- Meiosis I-
  - Similar to Mitosis-
    - Prior- DNA replicates
  - During Prophase Homologous Chromosomes pair up creating a Tetrad



11-4 Meiosis

- Meiosis I (cont)
  - As homologous chromosomes pair up and form tetrads they can exchange portions of their chromatids called Crossing over



11-4 Meiosis

- Meiosis II
  - Two cell that were created in Meiosis I now enter a second Meiotic division
  - The two cells created each have 2 chromatids
  - Meiosis II is similar to mitosis without reproducing DNA prior to entering

11-4 Meiosis

- Mitosis results in the production of two genetically identical diploid cells, whereas meiosis produces four genetically different haploid cells
- **Pg 278 (1-5)**
  - **Ch 11 Test Next Thurs!!!☺**
  - **Notebook due friday**
  - **Finish your Punnett Square worksheet**

11.5 Linkage and Gene Maps

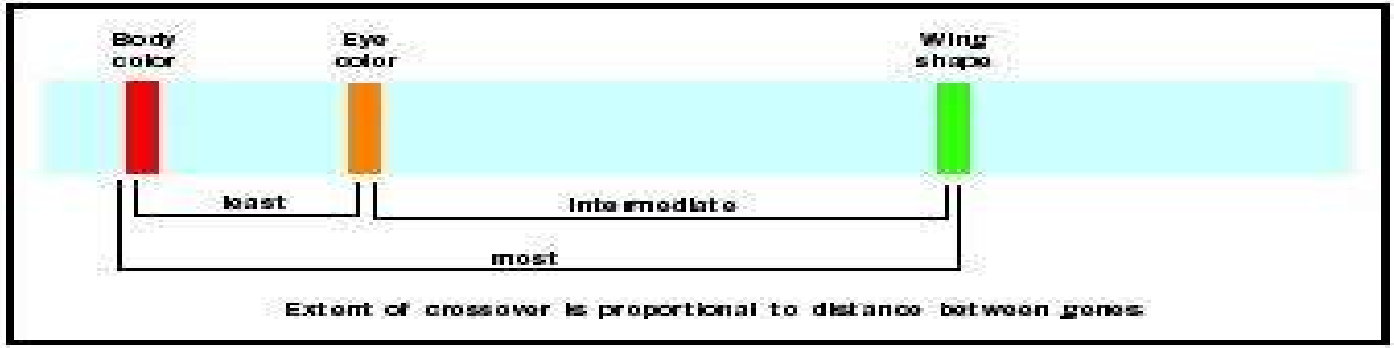
- It is the chromosomes, that sort independently, not the genes
- All of Mendels traits he studied on pea plants were on different chromosomes
- Example- Domesticating Wolves
  - Aggressive genes are on the same chromosomes as Ears
    - Breed this gene out and wolves become calm with floppy ears (DOGS)

11.5 Linkage and Gene Maps

- If genes are on the same chromosome that doesn't mean they are together forever
- Remember during crossing over pieces of chromosomes can be exchanged
- This directly leads to genetic variation throughout nature

11.5 Linkage and Gene Maps

- Where each gene is located on its chromosome is called the Gene Map
- Genes locations are figured out according to crossover frequency
- More frequent genes are separated during crossover, farther genes are apart



- Review Wed
- Ch 11 Quiz Thurs
- Pg 280 (1-4) Due in notebook with complete sentences in 6 weeks