HEREDITY

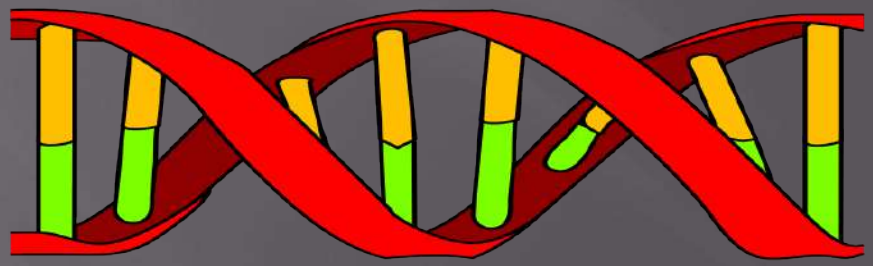
DNA (Deoxyribonucleic acid)

Chemical inside cell that contains hereditary information

Controls how an organism will look & behave

Shaped like a twisted ladder

Rungs hold genetic information that is a pair of bases



Reproduction

Reproduction is the process of producing a new organism.
The purpose is to transfer DNA

Sexual Reproduction

New organisms is produced from the combined DNA of TWO different cells called sex cells.
Male is called sperm & Female is called egg

Fertilization occurs when an egg and sperm unite to form a new organism with half of each parent's DNA

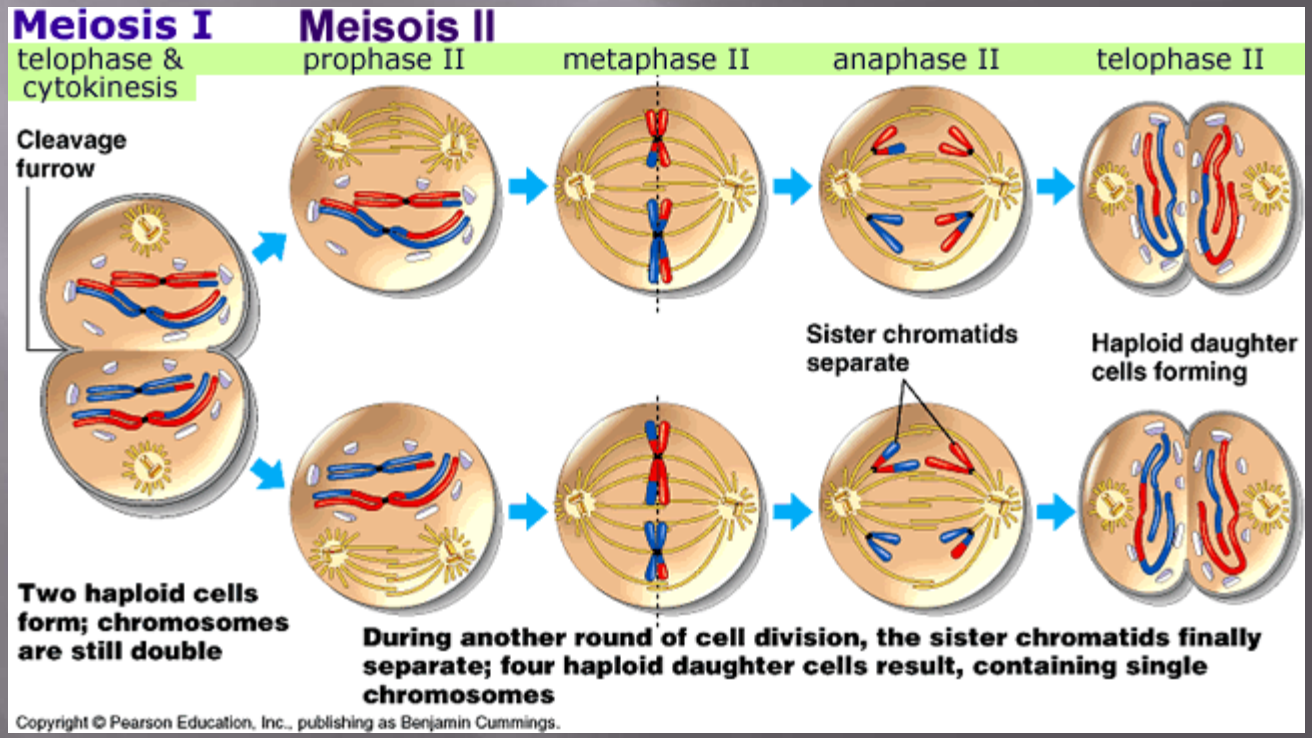
Plants sexually reproduce from male and female parts of a flower

Sex cells are formed by the process of **Meiosis**

Meiosis

Meiosis

During meiosis, the chromosome pairs separate and are distributed to 4 different cells. The resulting sex cells have only half as many chromosomes as the other cells in the organism.



Heredity

The passing of traits from parent to offspring

Traits: physical characteristics of an organism

Example: eye color, hair color, & height

Passing Traits to Offspring

Sex cells have 23 chromosomes and the two sex cells combine to form a zygote with 46 chromosomes

During fertilization the offspring receives half of its genetic information from its mother and the other half from its father.

Genetics

The study of how traits are passed from parent to offspring by looking at genes

Genes are small sections of DNA on a chromosomes that has information about a trait

Each chromosome has a gene for the same trait (eye color from mom & eye color from dad)

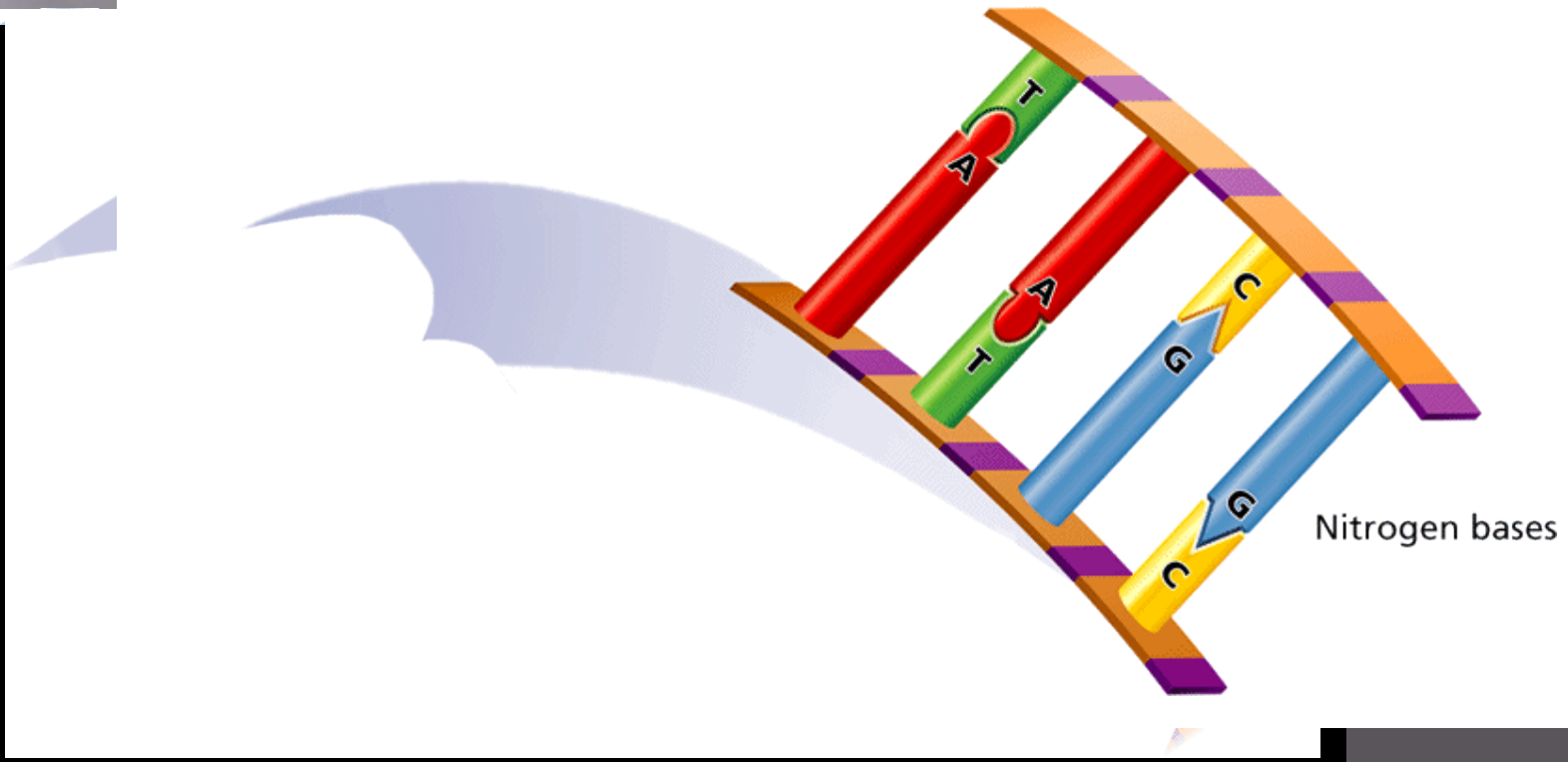
Traits are determined by alleles on the chromosomes

Each gene of a gene pair is called an allele

Inherited traits are determined by the alleles on the chromosome

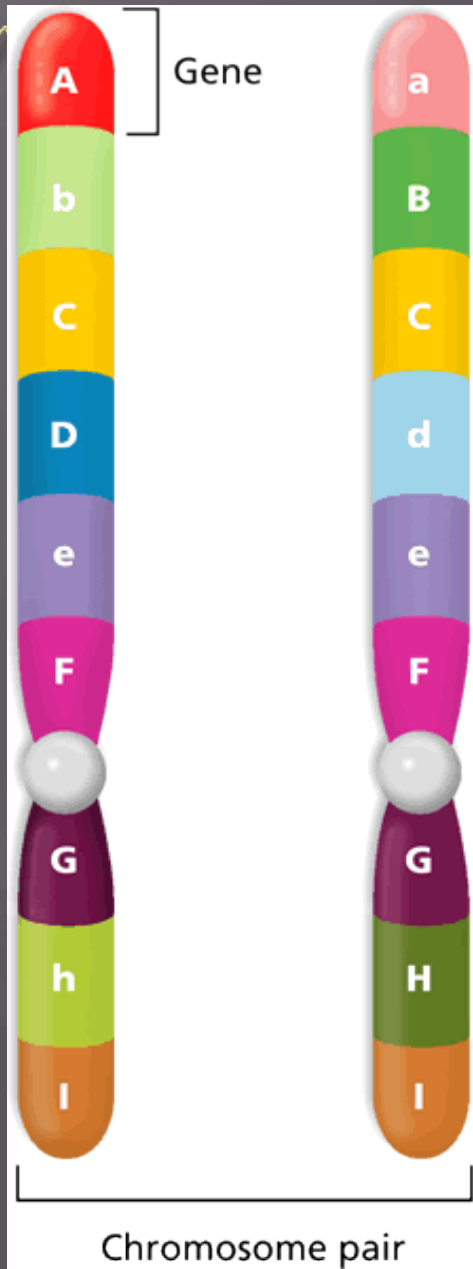
The DNA Code

Chromosomes are made of DNA.
Each chromosome contains thousands of genes.
The sequence of bases in a gene forms a code that tells the cell what protein to produce.



Genes on a Chromosom

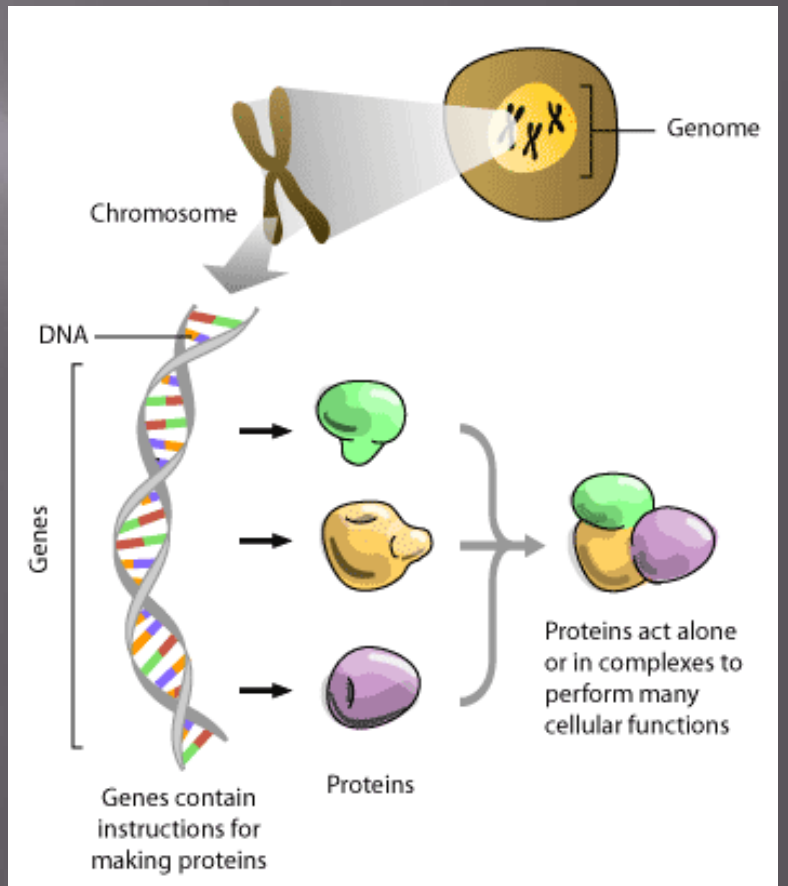
Chromosomes are made up of many genes joined together like beads on a string.
The chromosomes in a pair may have different alleles for some genes and the same allele for others.



Genome

Scientist map a genome to identify all the organisms genes & figure out where they are located

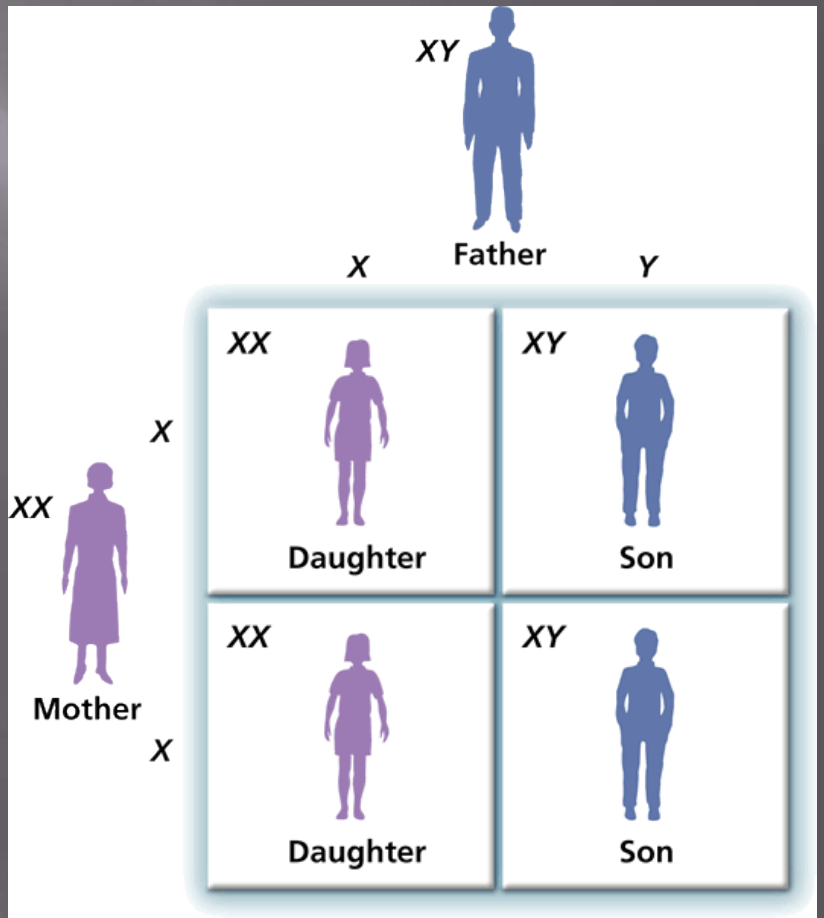
A genome is the complete sequence of an organisms DNA



The Sex Chromosomes

The sex chromosomes carry genes that determine whether a person is male or female.
also carry genes that determine other traits.

XX = female
XY = male



Inheritance of Blood Type

Blood type is determined by a single gene with three alleles.

Alleles of Blood Types	
Blood Type	**Combination of Alleles**
A	$I^A I^A$ or $I^A i$
B	$I^B I^B$ or $I^B i$
AB	$I^A I^B$
O	ii

Group Time

Put the following terms in the correct circle to show the hierarchical structures of DNA

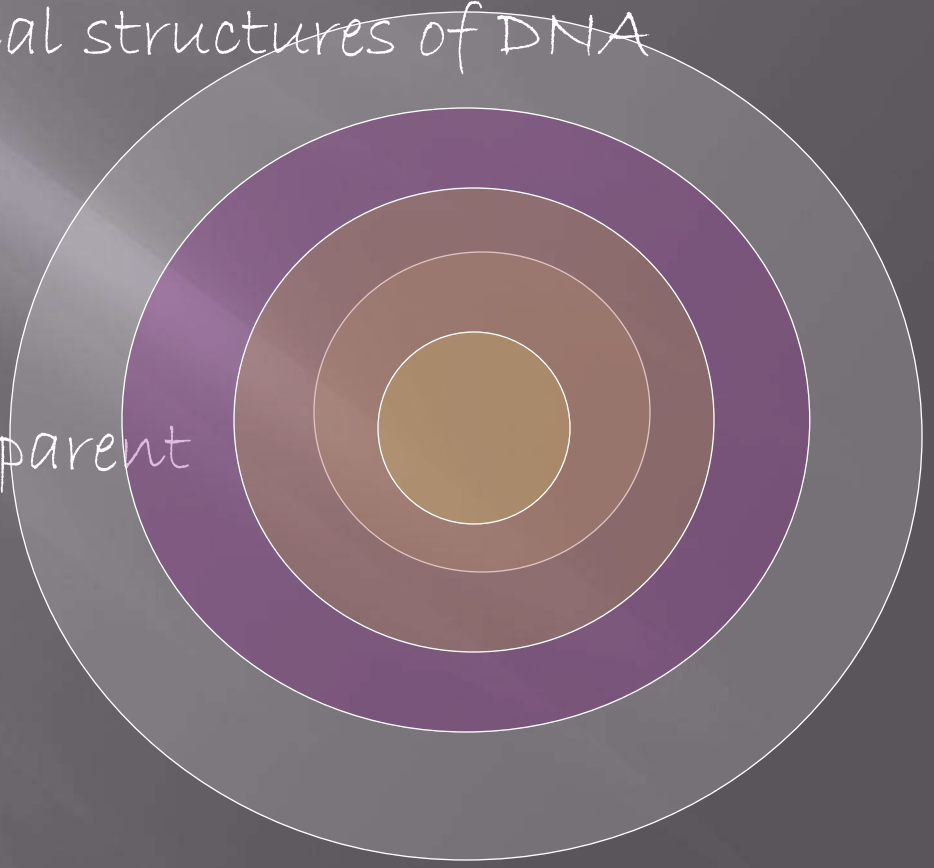
- DNA

Gene

1 Allele from each parent

46 Chromosomes

Nucleus



Types of Alleles

Genetics of Pea Plants

Traits	Seed Shape	Seed Color	Seed Coat Color	Pod Shape	Pod Color	Flower Position	Stem Height
Controlled by Dominant Allele	 Round	 Yellow	 Gray	 Smooth	 Green	 Side	 Tall
Controlled by Recessive Allele	 Wrinkled	 Green	 White	 Pinched	 Yellow	 End	 Short

Examining & Studying Traits

Two ways scientist study traits

Phenotype: **Ph**ysical Appearance outside expression of a gene

Blue Eyes

Genotype: Gene Combination the two alleles a person has inherited that can only be seen on the DNA

BB, Bb, or bb

Two categories of genotypes

Homozygous: inherited two identical alleles

BB (pure dominant) or bb (pure recessive)

Heterozygous: inherited two different alleles

Bb (hybrid)

Punnett Squares

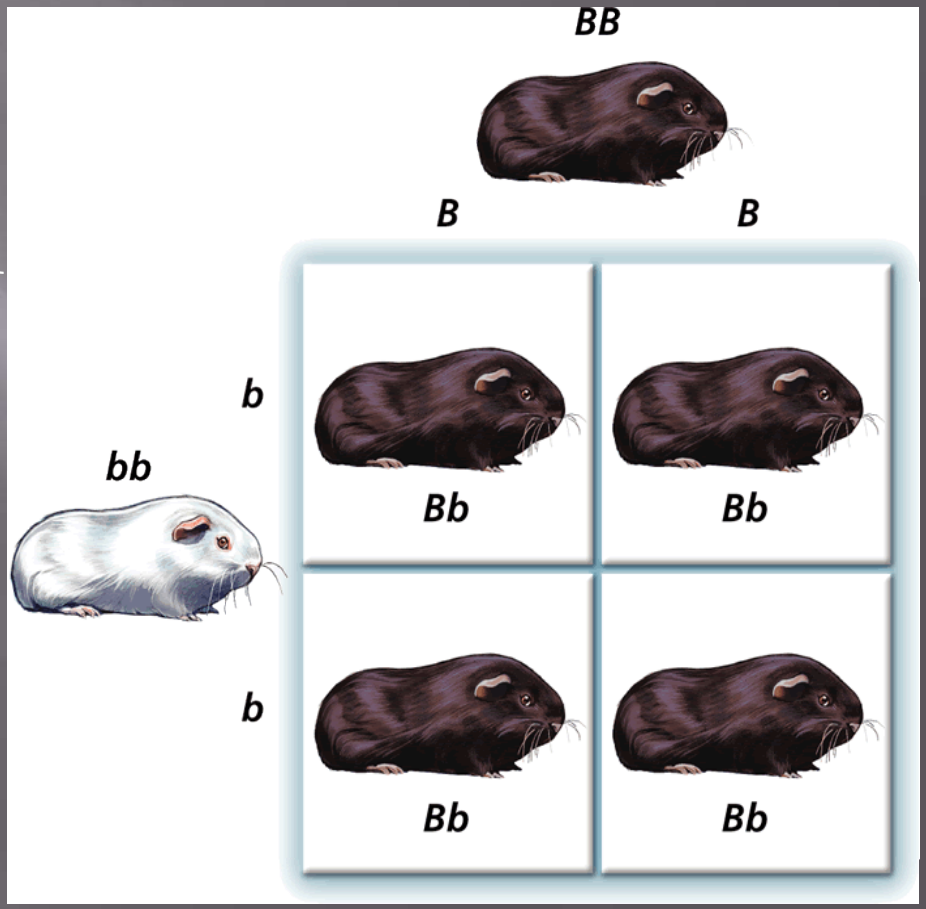
- Shows all possible combinations of alleles that children can inherit from parents
- Mom's genotype for brown eyes (Bb)
- Dad's genotype for brown eyes (Bb)
- Offspring's Phenotype
  - 75% brown, 25% blue
- Offspring's Genotype
  - 25% BB, 50% Bb, 25% bb

Dad

	Mom B	Mom b
B	BB brown	Bb brown
b	Bb brown	bb blue

Punnett Square Practice

What is the genotype and the phenotype for each parent?
What are the possible genotypes and the phenotypes for the offspring?



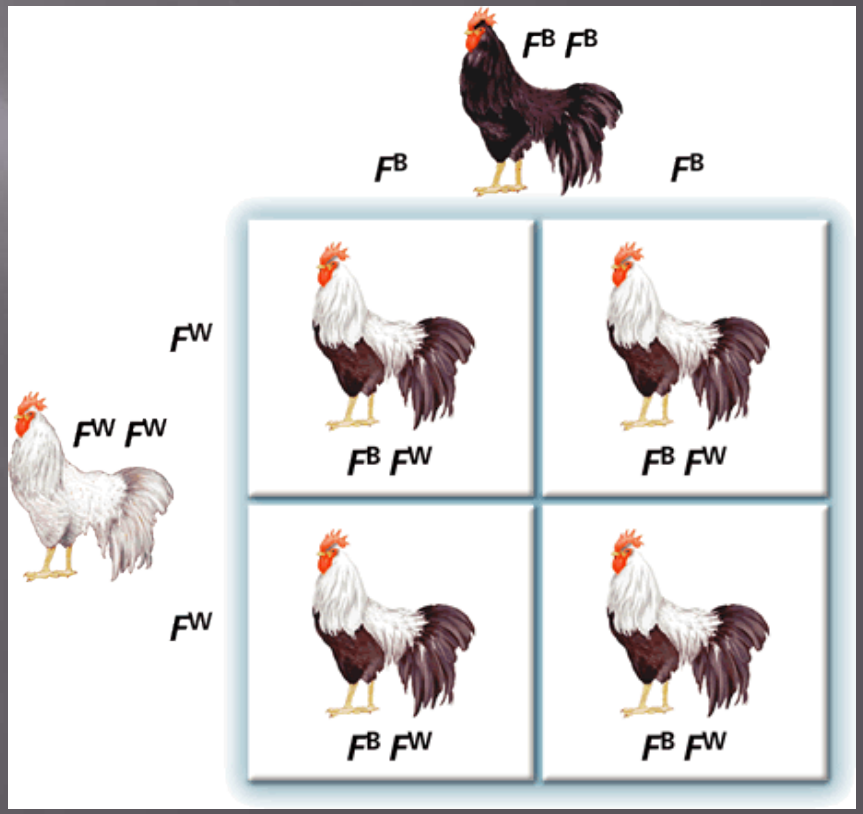
Codominance

In codominance, the alleles are neither dominant nor recessive. As a result, both alleles are expressed in the offspring.

F^W F^B = black & white

F^B F^B = black

F^W F^W = white



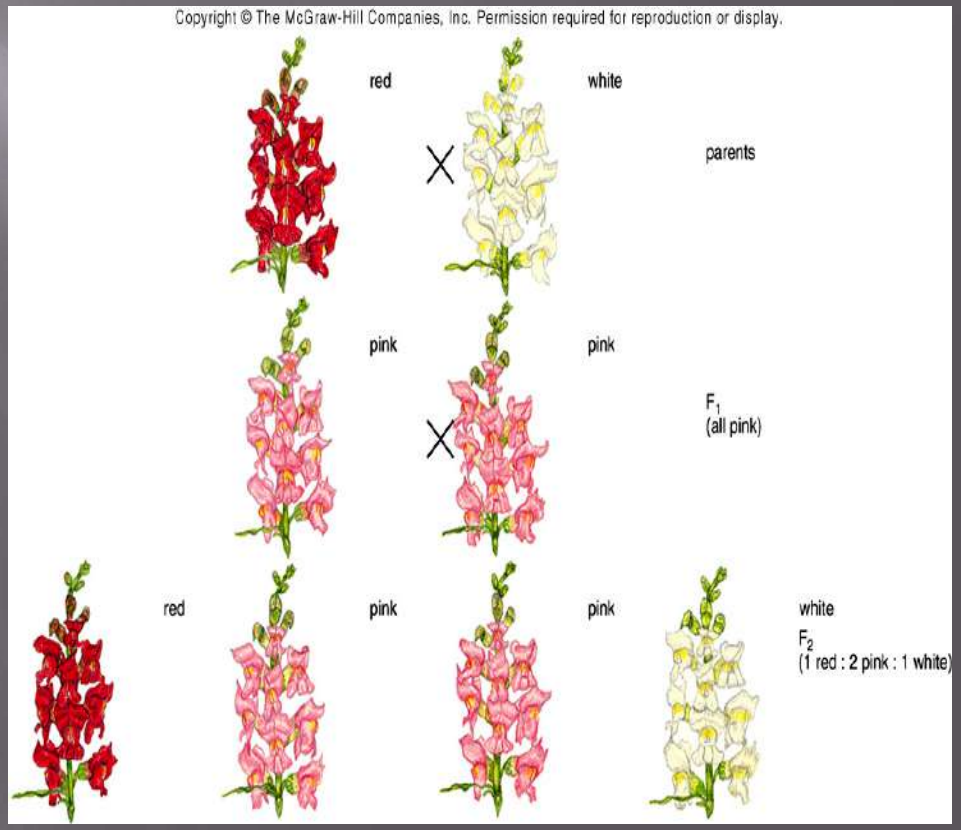
Incomplete Dominance

In incomplete dominance, one allele is not completely dominant over the other allele . As a result, both alleles have a blended expression.

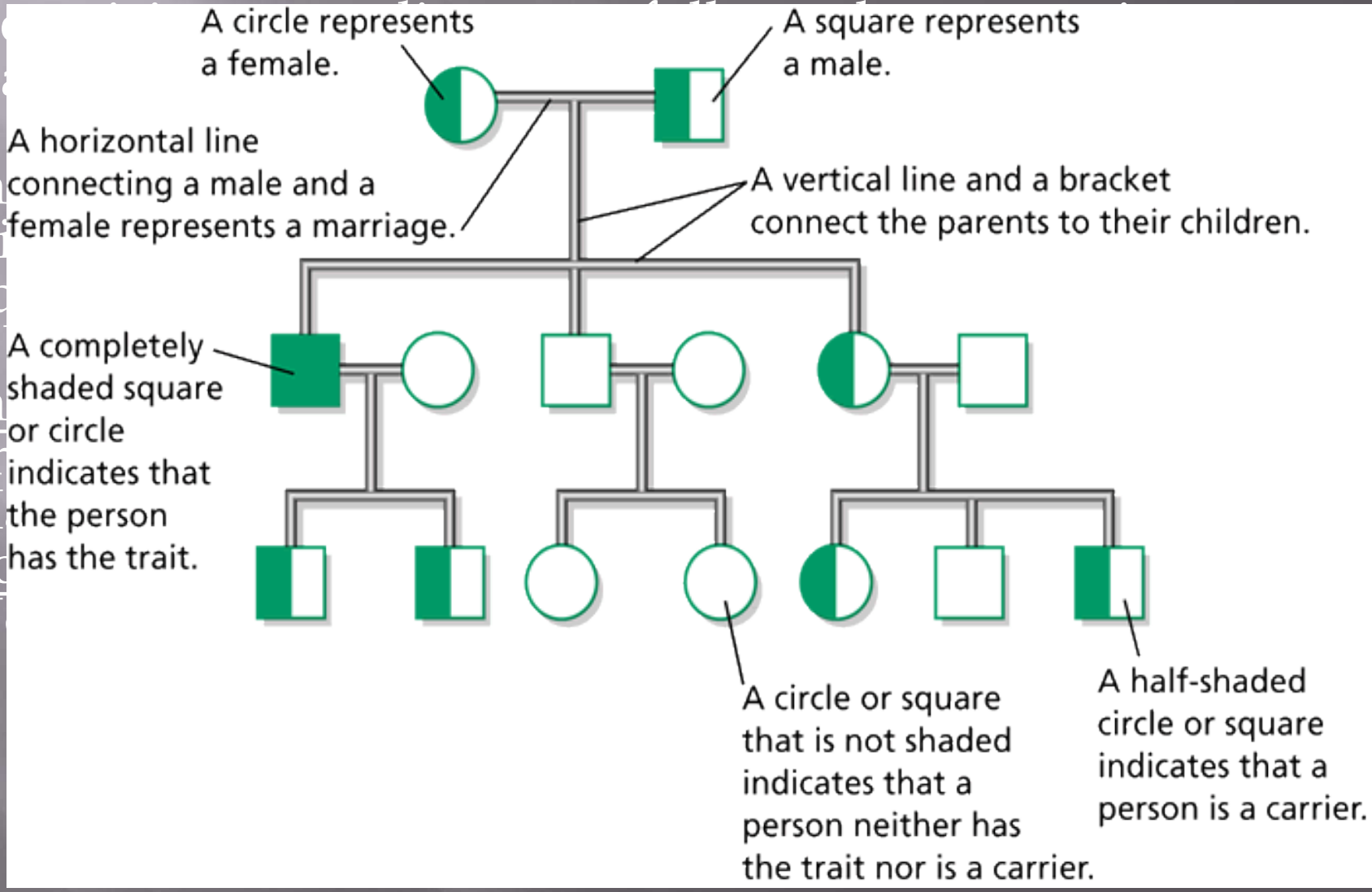
RR = red

WW = white

RW = pink

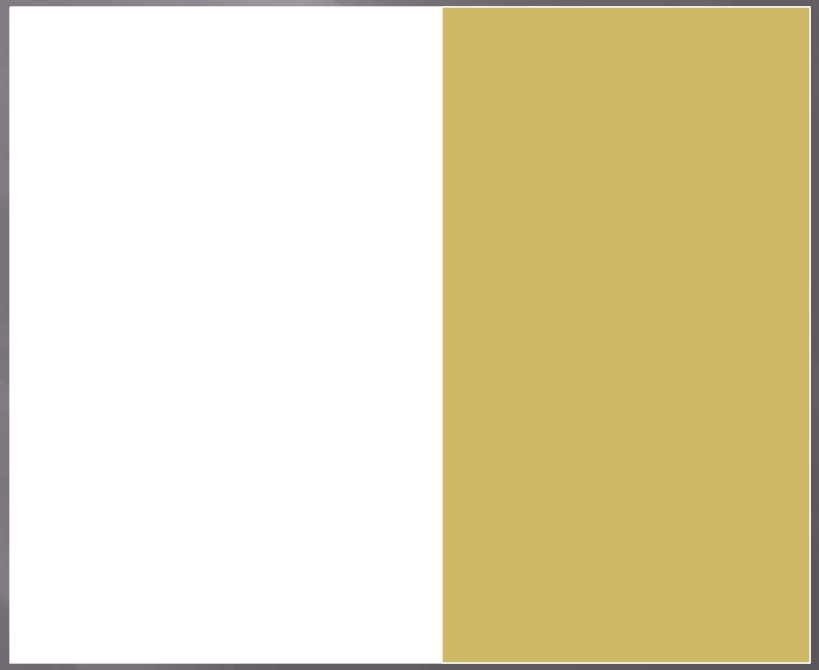


Pedigree


A circle represents a female.
A square represents a male.
A horizontal line connecting a male and a female represents a marriage.
A vertical line and a bracket connect the parents to their children.
A completely shaded square or circle indicates that the person has the trait.
A circle or square that is not shaded indicates that a person neither has the trait nor is a carrier.
A half-shaded circle or square indicates that a person is a carrier.

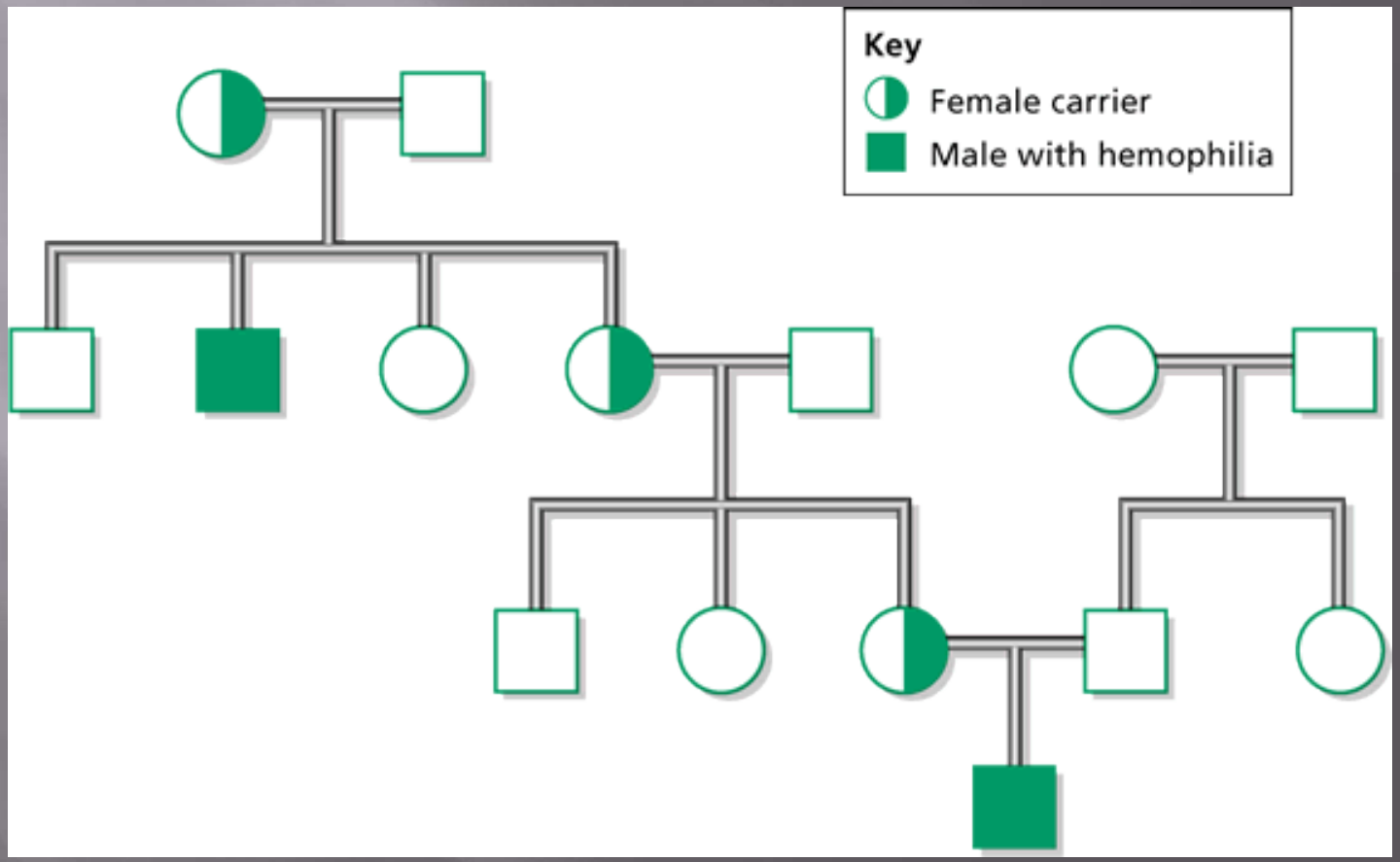
Pedigree Practice

What does this symbol stand for? Male or female
What does the shading of this symbol represent?



A Hemophilia Pedigree

The chart below follows hemophilia in a family. Hemophilia is a genetic disorder that does not allow the blood to clot normally. How many males have hemophilia?



Biotechnology

Biotechnology is the manipulation of living things to make useful products

Causes changes in an organism

Examples of genetic biotechnology

Selective Breeding

Genetic Engineering

Gene Therapy

Selective Breeding

Selective Breeding is an intentional mating of organisms to produce offspring with specific traits

Two types:

Pure bred

Hybrid

Pure breeding

Crossing two individuals that have identical or similar sets of alleles.

Example: breeding only fast horses, breeding only labs

Con – decreases genetic variety therefore makes it harder to adapt, resist diseases, and higher chance of genetic disorders