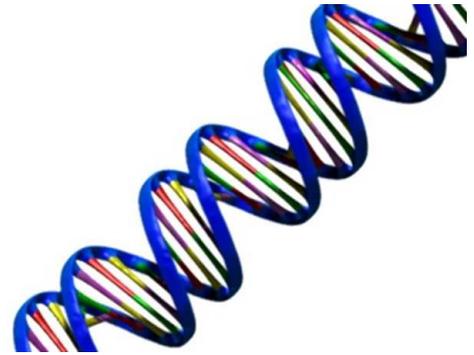


What is DNA?

- Cells use a chemical code called deoxyribonucleic acid or DNA
- DNA carries all of the cell's instructions
- DNA is located in the nucleus
- During cell division it wraps around proteins to form chromosomes
- DNA is passed from parents to offspring

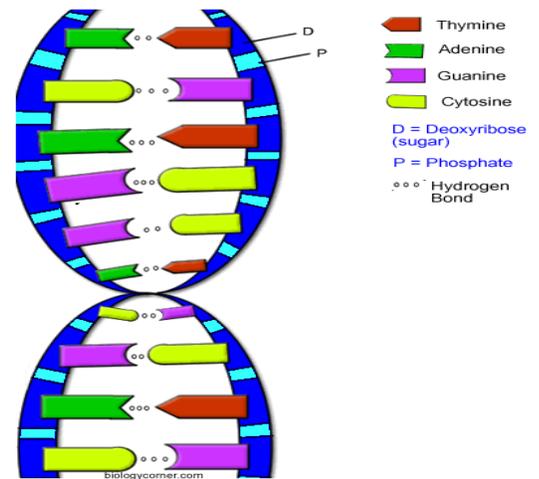


DNA's Discovery

- In 1953, James Watson and Francis Crick discovered the structure of DNA
- The work of Rosalind Franklin led to Watson and Crick's discovery
 - Franklin said DNA is made up of two spirals

The Structure of DNA

- DNA is called a double helix because it looks like a twisted ladder
- The sides of the ladder are made of alternating sugar (deoxyribose) and phosphate molecules
- The steps of the ladder are made up of a pair of nitrogen bases
- There are 4 types of nitrogen bases
 - Adenine (A)
 - Thymine (T)
 - Guanine (G)
 - Cytosine (C)



DNA Pairing

- The nitrogen bases have a specific pairing pattern
 - Adenine (A) pairs with Thymine (T)
 - Guanine (G) pairs with Cytosine (C)

- ▣ This pairing pattern occurs because the amount of adenine equals the amount of thymine; the amount of guanine equals the amount of cytosine
- ▣ The pairs are held together by hydrogen bonds

You Try....

- ▣ Write the matching nitrogen bases next to the strand of DNA

C

C

G

A

T

T

A

Genes

- ▣ Every living thing carries a set of instructions that make it different from others.
- ▣ A chromosome is a structure found inside of the nucleus of the cell.
- ▣ Each chromosome contains DNA.
- ▣ A gene is a part of DNA that contains the instructions that control a trait.
- ▣ You have different genes for each of the different traits that you inherit.

Genes

- ▣ Each cell contains 46 chromosomes except for sex cells (eggs and sperm) which contain 23 chromosomes.
- ▣ Therefore, you receive half of your chromosomes from your mother (23) and half from your father (23) for a total of 46 chromosomes.
- ▣ Remember genes are located on your chromosomes.

Genetics

- ▣ In the 1800s, Gregor Mendel was interested in learning how characteristics are passed from parents to offspring.
- ▣ To study this he bred pea plants because they were easy to study.

Genetics

- ▣ The field of biology that investigates how characteristics are transmitted from parents to offspring is called genetics.
- ▣ Mendel's work with pea plants formed the basis of genetics.

- ▣ His results lead to heredity.
- ▣ Heredity is the transmission of characteristics from parents to offspring.

Pea Plant Characteristics

- ▣ Mendel studied the seven characteristics of pea plants. Each characteristic occurred as one of two traits.

Pea Plant Characteristics	
Plant Height	Tall stem or short stem
Pod Color	Green or Yellow
Pod Appearance	Inflated or Constricted
Seed texture	Smooth or Wrinkled
Seed color	Yellow or Green
Flower position on stem	Axial (along stem) or Terminal (on top of stem)
Flower color	Purple or White

Mendel's Work

- ▣ Mendel collected seeds from pea plants and studied them.
- ▣ He then controlled how the plants reproduced.
- ▣ He eliminated any possibility that birds, insects, or wind would carry the pollen.
- ▣ He then bred plants that were pure for each trait.
- ▣ Pure plants only produced the same trait, for example, tall plants only produced tall plants

Mendel's Crosses

- ▣ Mendel then crossed or bred pure pea plants by transferring pollen from one type of plant to another.

Mendel's Crosses

Tall stem x short stem

Green pod x yellow pod

Inflated pod x constricted pod

Smooth seed x wrinkled seed

Yellow seed x green seed

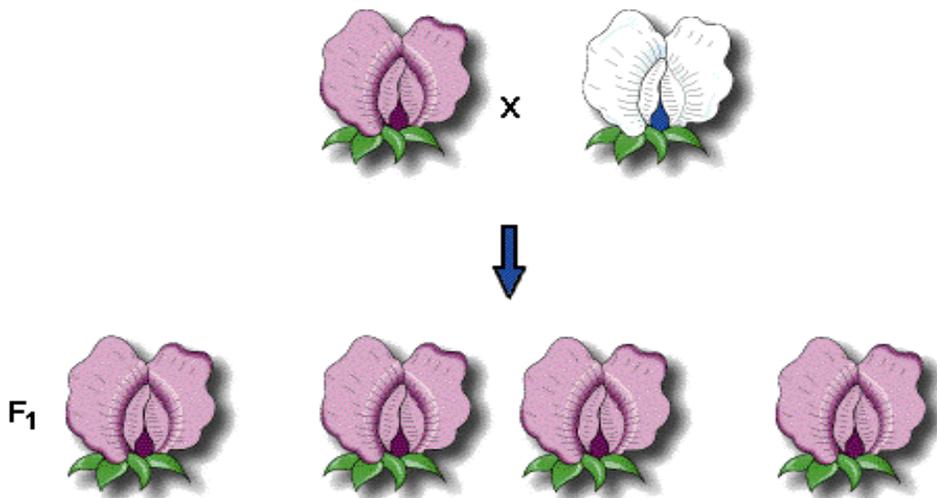
Axial flower x terminal flower

Purple flower x white flower

Mendel's Observations

- All of the plants in the crosses listed are known as parental plants.
- Mendel labeled parental plants P₁ Generation.
- The offspring of the P₁ Generation are known as the F₁ Generation.
- Mendel noticed that all of the plants in the F₁ generation displayed only one of the traits from the P₁ generation.
- A trait is a characteristic, or feature of an organism.

Mendel's Observations



Mendel's Explanation

- Mendel concluded that one trait controls or dominates the other trait.
- For example, Mendel called purple flowers a dominant trait, the characteristic that prevails.
- Mendel called the trait that did not appear in F₁ the recessive trait, or the trait overridden by the dominant trait
 - Think of recessive traits as being hidden by the dominant trait
- In the flower example the white flower would be recessive.

Dominant vs Recessive

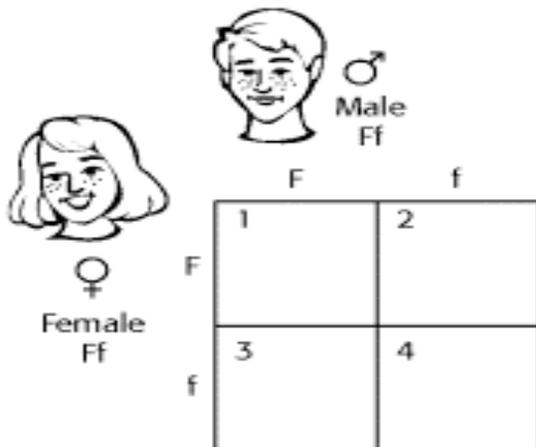
- If one parent has genetic material for a dominant trait and the other parent has material for a recessive trait, the offspring will be dominant.
- An offspring can only be recessive if each parent gives a recessive trait.
- Dominant traits are shown with a capital letter
- Recessive traits are shown with a lower case letter

Dominant or Recessive

- Which trait will the offspring have? Dominant or Recessive?
- T = _____
- t = _____
- TT = _____
- Tt = _____
- tt = _____

Punnett Square

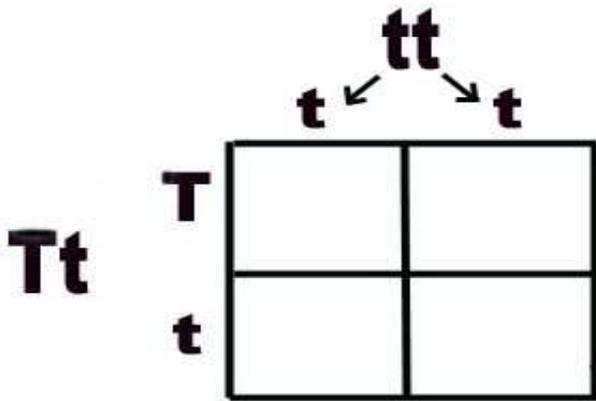
- A Punnett Square is a diagram used to find the possible traits of offspring.
- Example: Presence of freckles
- F = freckles
- f = no freckles



- How many children will have freckles? _____
- How many will not have freckles? _____

Practice...

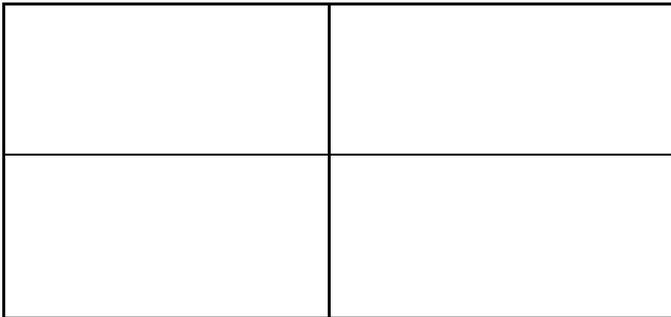
- T = tall
- t = short



- ▣ How many offspring will be tall? _____
- ▣ How many offspring will be short? _____

Practice...

- ▣ A purple flower (PP) is crossed with a white flower (pp), what will be offspring be?



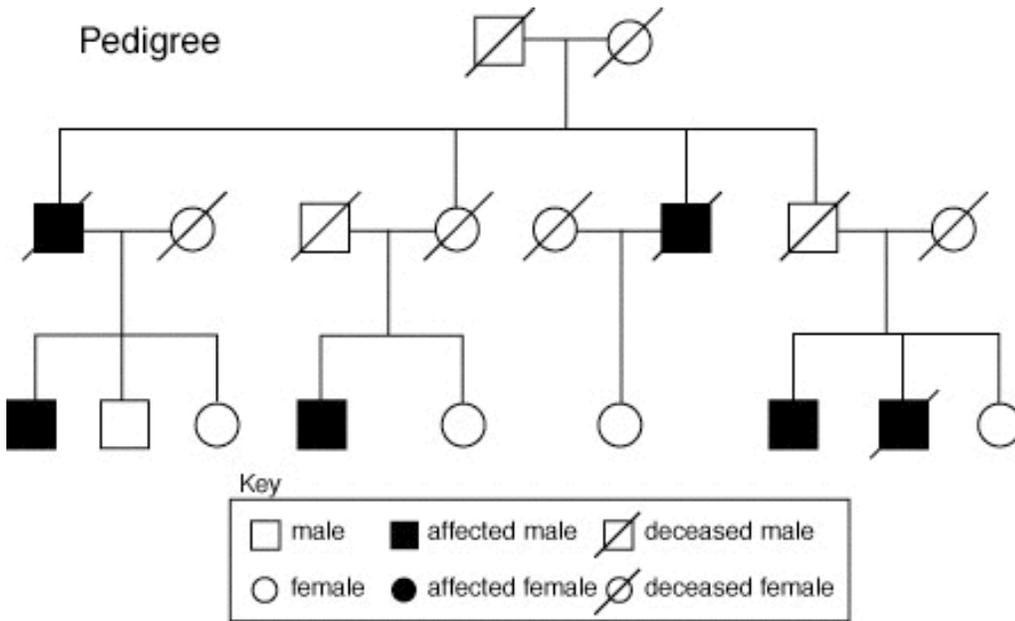
Pedigree Chart

- ▣ A pedigree chart is a diagram that shows which family members have a certain trait.
- ▣ It is like a family tree that shows different generations.

Pedigree Chart

- ▣ Each row in the chart shows a different generation of family members.
- ▣ Squares = males
- ▣ Circles = females
- ▣ A circle and square connected by a straight line show parents
- ▣ A vertical line and bracket connects parents and children.
- ▣ Shaded circle or square means person has trait

Pedigree



Pedigree

- ▣ How many males have trait? _____
- ▣ How many females have trait? _____
- ▣ How many men are there? _____
- ▣ How many women are there? _____