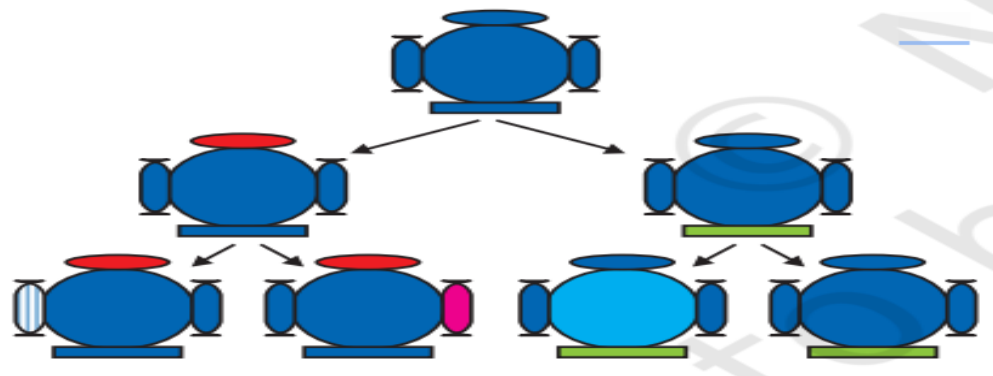


## Heredity



### Heredity and Variation

- **Inheritance:** Offspring inherit a basic body design from their parents, but with subtle variations.
- **Accumulation of Variations:** Each new generation inherits variations from the previous generation and also develops new variations. This leads to increasing diversity over time.



- **Asexual Reproduction:** Produces offspring with minor variations due to small inaccuracies in DNA copying. Example: Bacteria dividing.
- **Sexual Reproduction:** Creates greater diversity among offspring compared to asexual reproduction.
- **Environmental Selection:** Not all variations are equally beneficial. Individuals with variations better suited to their environment are more likely to survive and reproduce. This is a key driver of evolution.

### Key Concepts:

- **Variation:** Differences between individuals within a species.
- **Heredity:** Passing of traits from parents to offspring.
- **DNA:** The molecule carrying genetic information. Inaccuracies in copying DNA lead to variations.
- **Evolution:** The gradual change in the characteristics of a species over many generations.

This is a great summary of heredity and Mendel's contributions!

## Heredity

- **Similar but Different:** Offspring inherit traits from their parents, resulting in similarities, but also have variations that make them unique.
- **Two Copies of Genes:** Each trait is influenced by two copies of a gene (now called alleles), one from each parent.
- **Dominant and Recessive Traits:**
  - Dominant traits are expressed even if only one copy of the dominant allele is present (e.g., tallness in pea plants).
  - Recessive traits are expressed only if two copies of the recessive allele are present (e.g., shortness in pea plants).

## Mendel's Experiments

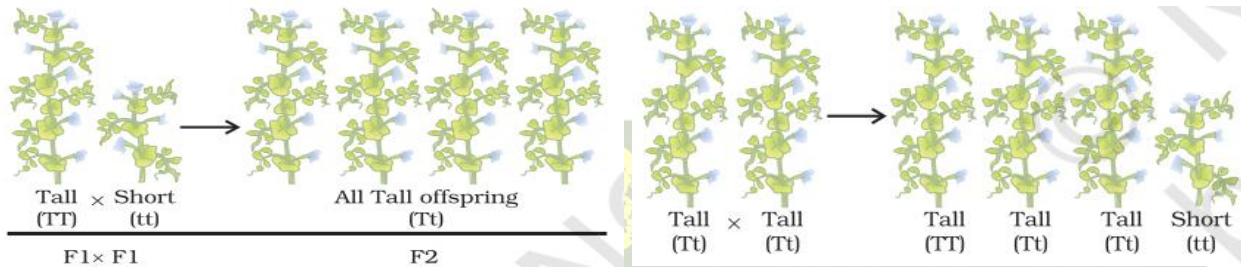
- **Pea Plants:** Mendel studied inheritance in pea plants using traits like height (tall/short), seed shape (round/wrinkled), and flower color (white/violet).
- **No Blending:** When crossing tall and short plants, the first generation (F1) were all tall, showing no blending of traits.
- **Hidden Traits:** The F2 generation (offspring of F1 plants) had a mix of tall and short plants, showing that the shortness trait was hidden in the F1 generation.
- **Independent Inheritance:** Mendel found that different traits (like height and seed shape) are inherited independently of each other.

## How Traits are Expressed

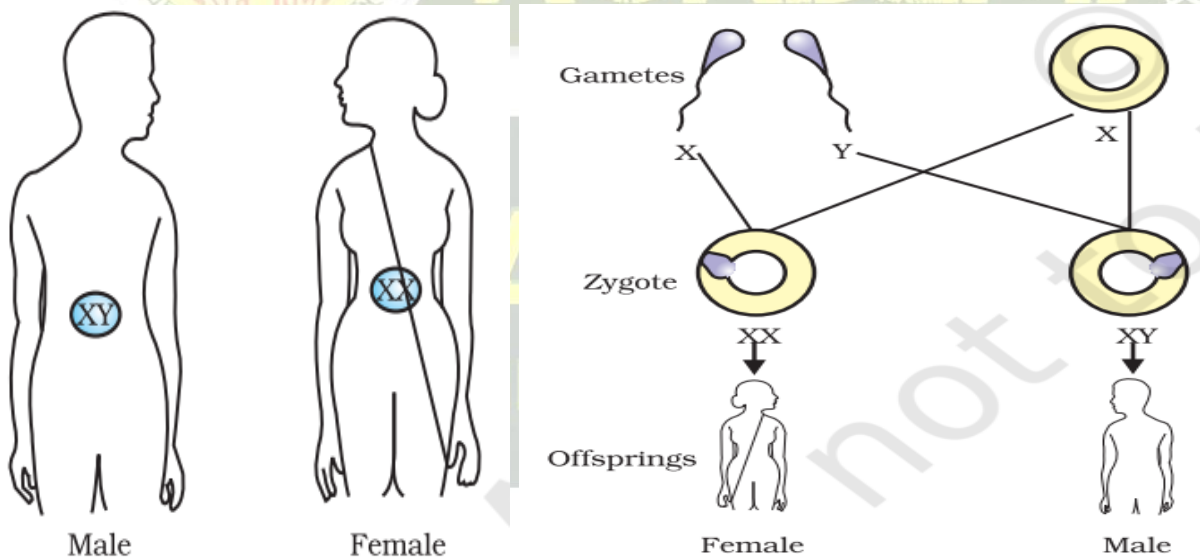
- **Genes and Proteins:** Genes are sections of DNA that provide instructions for making proteins.
- **Proteins and Traits:** Proteins control traits by influencing various processes (e.g., enzymes affecting hormone production that controls plant height).

## Chromosomes and Inheritance

- **Two Sets of Genes:** Each individual has two sets of genes, one from each parent.
- **Chromosomes:** Genes are located on chromosomes. Each cell has two copies of each chromosome.
- **Germ Cells:** Sex cells (sperm and egg) have only one set of chromosomes.
- **Combining Genes:** During sexual reproduction, germ cells combine, restoring the full set of chromosomes in the offspring.



## Sex Determination



### Sex determination in human beings

- **Different Strategies:** Different species have various ways of determining the sex of their offspring.
  - **Environmental Cues:** Some reptiles use temperature to determine sex.
  - **Changeable Sex:** Snails can change their sex based on environmental factors.
  - **Genetic Determination:** In humans, sex is primarily determined by genes.
- **Sex Chromosomes:**
  - Humans have 23 pairs of chromosomes.
  - 22 pairs are autosomes (non-sex chromosomes).
  - 1 pair are sex chromosomes:
    - Females have two X chromosomes (XX).
    - Males have one X and one Y chromosome (XY).
- **Inheritance Pattern:**
  - Mothers always pass an X chromosome to their offspring.
  - Fathers can pass either an X or a Y chromosome:
    - X chromosome from father = female offspring
    - Y chromosome from father = male offspring
- **50/50 Chance:** This inheritance pattern results in approximately a 50% chance of having a male or female child.





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