Chapter 5: Principles of Inheritance and Variation

Mendelian Inheritance:

Gregor Mendel's experiments on pea plants.

Law of Dominance: In a heterozygote, one allele can express itself and mask the expression of the other.

Law of Segregation: Alleles segregate independently during gamete formation.

Law of Independent Assortment: Alleles for di erent traits assort independently of each other.

Incomplete Dominance & Co-dominance:

Incomplete Dominance: Neither allele is completely dominant, resulting in an intermediate phenotype (e.g., Snapdragon flower color).

Co-dominance: Both alleles are fully expressed (e.g., AB blood type in humans).

Sex Determination:

In humans: XX (female), XY (male).

Birds: ZZ (male), ZW (female).

Honeybees: Haplo-diploidy system (unfertilized eggs become males; fertilized eggs become females).

Mutation: Sudden change in genetic material. Can be beneficial, neutral, or harmful .

Point Mutation: Change in a single base pair (e.g., Sickle Cell Anemia).

Chromosomal Disorders:

Down Syndrome: Trisomy of 21st chromosome.

Klinefelter Syndrome: XXY condition in males.

Turner's Syndrome: Only one X chromosome in females (XO).

Genetic Disorders:

Autosomal Dominant: Huntington's Disease.

Autosomal Recessive: Cystic fibrosis, Sickle Cell Anemia.

Sex-linked Recessive: Colour blindness, Hemophilia .

Pedigree Analysis: A chart representing family history of inheritance of a particular

trait.

Molecular Basis of Inheritance:

DNA: Double helix structure (proposed by Watson and Crick). Replication mechanism.

RNA: Types (mRNA, tRNA, rRNA) and their functions in protein synthesis.

Genetic Code: Triplet code (codon) specifying amino acids.

Genome and Human Genome Project:

Genome: Complete set of genes in an organism.

Human Genome Project (HGP): Sequencing the entire human genome. Identified approx. 20,500 genes.