Genetics and Heredity – 9th grade

1. Introduction to Genetics

- Review of Basic Concepts: DNA, genes, and heredity.
- Applications of Genetics: Medicine, agriculture, and biotechnology.

2. DNA, Chromosomes, and Gene Expression

- Structure and Function of DNA: Double helix, nucleotides, and complementary base pairing.
- Chromosomes and Karyotypes: How genetic material is organized.

- **Gene Expression: Transcription and translation – how DNA codes for proteins.**

3. Mendelian and Non-Mendelian Inheritance

- **Mendel’s Laws: Law of Segregation & Law of Independent Assortment.**
- **Punnett Squares: Monohybrid and dihybrid crosses.**
- **Beyond Mendel: Incomplete dominance, codominance, multiple alleles (e.g., blood types).**
- **Polygenic Traits: Eye color, skin color – multiple genes affecting a single trait.**

4. Meiosis, Genetic Variation, and Mutations

- **Meiosis vs. Mitosis: How gametes are formed and why meiosis increases genetic diversity.**
- **Crossing Over and Independent Assortment: How new genetic combinations arise.**
- **Mutations: Point mutations, frameshift mutations, and chromosomal abnormalities.**

5. Genetic Disorders and Biotechnology

- **Genetic Disorders: Cystic fibrosis, Tay-Sachs, Huntington’s disease.**

- **Genetic Screening and Counseling: Benefits, risks, and ethical considerations.**
- **Biotechnology and Genetic Engineering: CRISPR, cloning, and GMOs.**

6. Summary and Review

- **Key Concept Recap: DNA, inheritance patterns, meiosis, and biotechnology.**
- **Q&A Session: Addressing misconceptions and clarifying difficult concepts.**
- **Homework: Practice Punnett squares, genetic disorders research, and ethical discussion.**

7. Assessment & Homework

- **In-Class Quiz: Covering Mendelian genetics, meiosis, and mutations.**
- **Homework Assignment: Solve advanced genetics problems, research biotechnology applications, and prepare an argument on genetic ethics.**