

## LONG QUESTION

### Q1. *Explain Mendel's Laws of Inheritance with examples.*

**Answer:** Gregor Mendel, known as the father of genetics, conducted experiments on pea plants and proposed the **Laws of Inheritance**. His work laid the foundation for modern genetics. The three main laws are:

#### 1. **Law of Dominance:**

- In a cross between two organisms with contrasting traits, only one trait (the dominant one) appears in the offspring.
- **Example:** In a cross between a tall plant (TT) and a short plant (tt), all offspring (Tt) are tall because the tall gene (T) is dominant.

#### 2. **Law of Segregation:**

- Every organism carries two alleles for each trait, which segregate during gamete formation. Each gamete receives only one allele.
- **Example:** A plant with genotype Tt produces two types of gametes: T and t.

#### 3. **Law of Independent Assortment:**

- Genes for different traits are inherited independently of each other, provided they are not linked.
- **Example:** In a dihybrid cross of round yellow (RRYY) and wrinkled green (rryy) seeds, the F<sub>2</sub> generation shows 9:3:3:1 ratio of combinations (round yellow, round green, wrinkled yellow, wrinkled green).

These laws help in understanding how traits are passed from one generation to the next.

## SHORT QUESTIONS

### Q2. *What is the difference between genotype and phenotype?*

**Answer:**

- **Genotype** refers to the genetic makeup (e.g., TT, Tt, or tt), while
- **Phenotype** refers to the physical appearance or trait expressed (e.g., tall or short plant).

### Q3. *Define dominant and recessive traits.*

**Answer:**

- **Dominant trait** is expressed even if only one copy is present (e.g., T in Tt).
- **Recessive trait** is expressed only when both alleles are recessive (e.g., t in tt).

### Q4. *What is a Punnett Square?*

**Answer:**

A **Punnett Square** is a diagram used to predict the genetic outcomes of a cross by showing all possible combinations of parental alleles.

**Q5. What is a homozygous and heterozygous organism?**

**Answer:**

- **Homozygous:** Has two identical alleles (TT or tt).
- **Heterozygous:** Has two different alleles (Tt).

### **ONE-LINE QUESTION ANSWERS**

**Q6.** Who is known as the father of genetics?

**A:** Gregor Mendel.

**Q7.** What are alleles?

**A:** Different forms of the same gene.

**Q8.** What is heredity?

**A:** Transmission of traits from parents to offspring.

**Q9.** What does a dihybrid cross involve?

**A:** Inheritance of two different traits.

**Q10.** What is the phenotypic ratio of a monohybrid cross in F<sub>2</sub> generation?

**A:** 3:1.