Principles of Inheritance and Variation

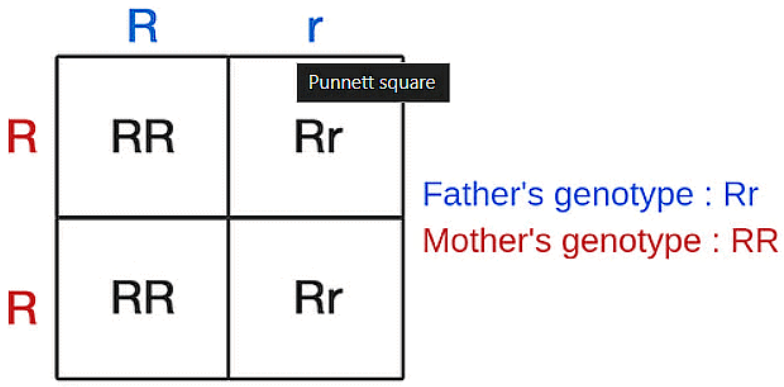
Genetics is indeed the branch of biology that focuses on the inheritance of traits from parents to offspring. This field encompasses the study of genes, genetic variation, and heredity in living organisms. The principles of inheritance were first systematically studied by Gregor Mendel, often referred to as the "father of modern genetics," in the mid-19th century.

To make the understanding of genetics easy there are few diagrams that can help NEET aspirants to have deeper understanding of concepts.

1. Monohybrid Cross

A monohybrid cross involves the genetic inheritance of a single characteristic, such as plant height or pod shape. In this type of cross, Mendel bred two organisms with homozygous traits to produce offspring with a heterozygous trait.

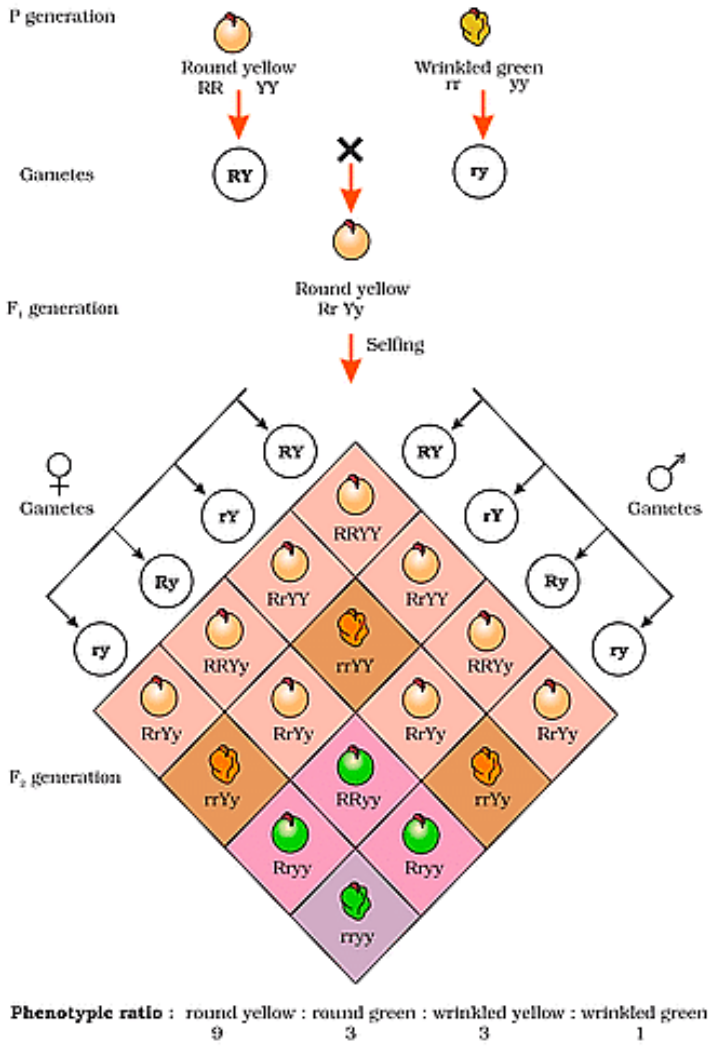
This process demonstrates the inheritance of a single gene, where each gene has two versions known as alleles, which control a particular characteristic.



2. Dihybrid cross

A dihybrid cross involves mating two individuals that are hybrids for two different traits. These traits are observed through a cross between them, with each gene for the traits being located on separate pairs of chromosomes.

During the formation of gametes, these genes assort independently. The resulting phenotypic ratio in a dihybrid cross is typically **9:3:3:1.**

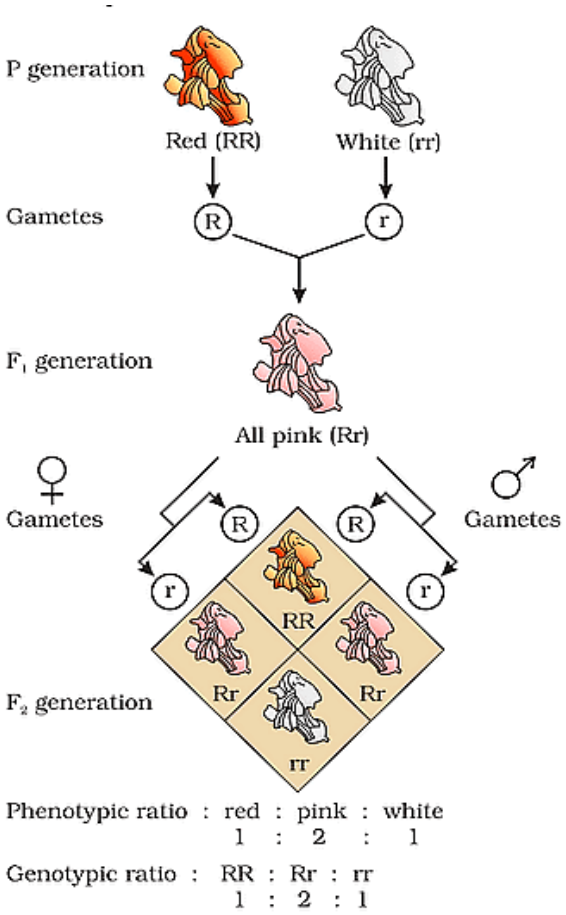


Dihybrid Cross

3. Co- dominance

Co-dominance is when multiple dominant gene features are expressed in an animal's body. It's a straightforward process where the same dominant allele can be present in different combinations, resulting in the display of those dominant traits.

Alternatively, a combination can arise with one recessive allele and one dominant allele.



4. Incomplete dominance

Incomplete dominance arises from a genetic cross where each parent contributes unique genetic material, leading to offspring with an intermediate phenotype. It is also known as semi-dominance or partial dominance. While Mendel described dominance in his experiments, he did not specifically address incomplete dominance.

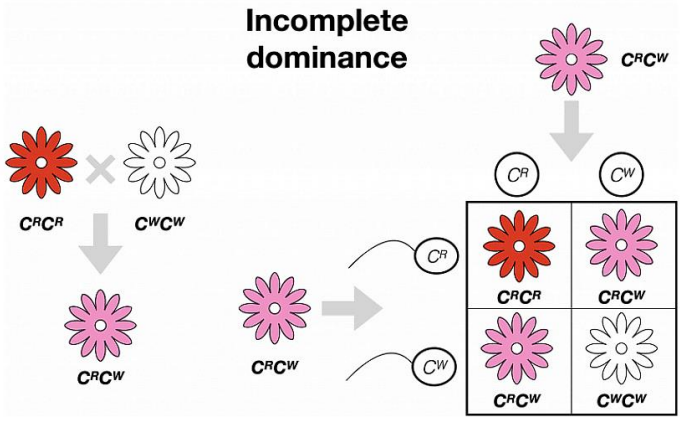
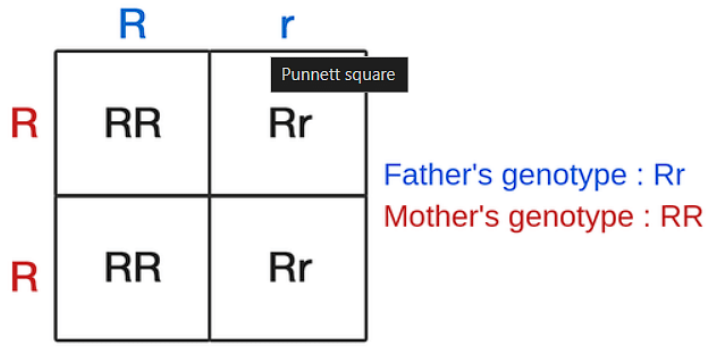


Diagram Based Questions

Q1: The production of gametes by the parents the formation of zygotes, the F_1 and F_2 plants can be understood using
(a) Pie diagram
(b) A pyramid diagram
(c) Punnett square
(d) Wenn diagram

Ans. c



The production of gametes by the parents, the formation of the zygotes, the F_1 and F_2 plants can be understood from a diagram called Punnett Square as shown in Figure given below

Q2. In Antirrhinum (Snapdragon), a red flower was crossed with a white flower and in F_1 generation all pink flowers were obtained. When pink flowers were soiled, the F_2 generation showed white, red and pink flowers. Choose the incorrect statements from the following.
(a) Law of segregation does not apply in this experiment.
(b) This experiment docs not follow the Principle of Dominance.
(c) Pink colour in is due to incomplete dominance.
(d) Ratio of F_2 is $\frac{1}{4}(\text{red}) : \frac{2}{4}(\text{pink}) : \frac{1}{4}(\text{white}).$

Ans. a
Law of segregation applies in this case as when pink (lowers obtained in F_1, are selfed then red and while (lowers are obtained in F_2 which indicates that there is no mixing of gametes.