

Extensions of Mendelian Inheritance

Dominance is the relationship between alleles of one gene in which one allele is dominant over another allele, which is recessive.

Therefore, the dominant allele gives the expression over the recessive one, at the same locus.

It is the key concept of Mendelian Inheritance

Incomplete Dominance

- Incomplete dominance is an incomplete allelic relationship where dominance is partial.
- In a heterozygote, the recessive allele is not expressed. The dominant allele cannot express the full phenotype; so there is an **intermediate phenotype** which is intermediate of the phenotypes of both homozygous genotypes.

Co-dominance

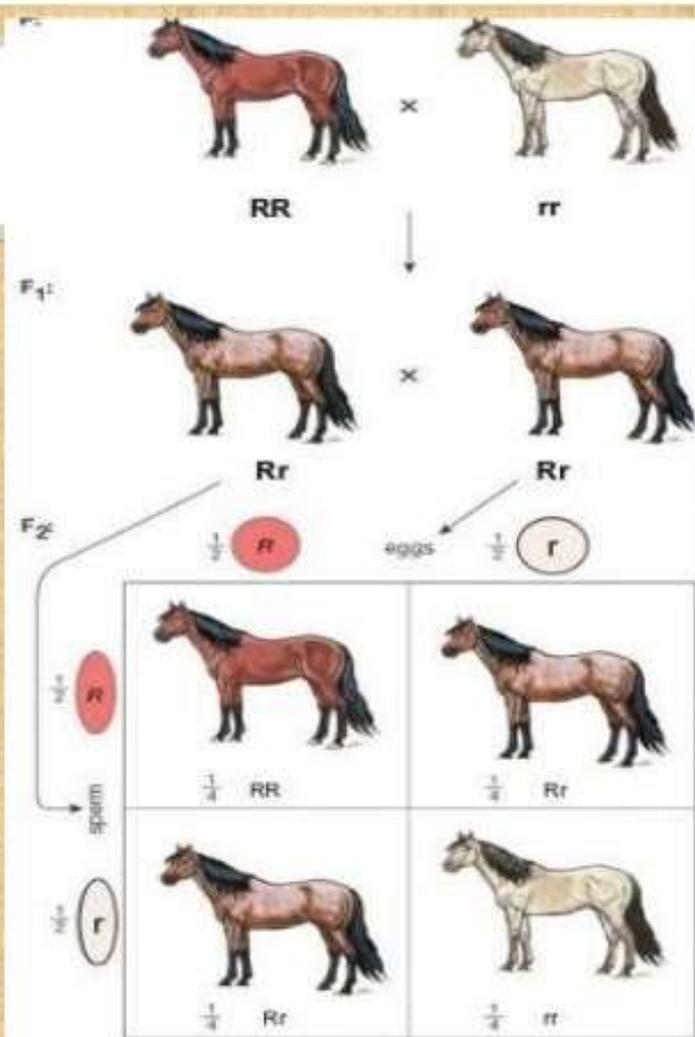
- Both alleles present in a heterozygote are fully expressed.
- Offspring shows a third phenotype that is **completely different** from both the parental phenotypes.

EXAMPLE OF CODOMINANCE

- $C = \text{Color gene}$
- $C^R C^R = \text{Red}$
- $C^W C^W = \text{White}$
- $C^R C^W = \text{Red Roan}$

Genotypic Ratio = All $C^R C^W$

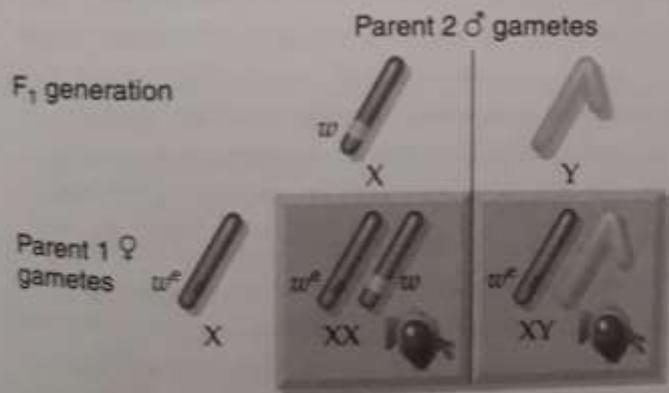
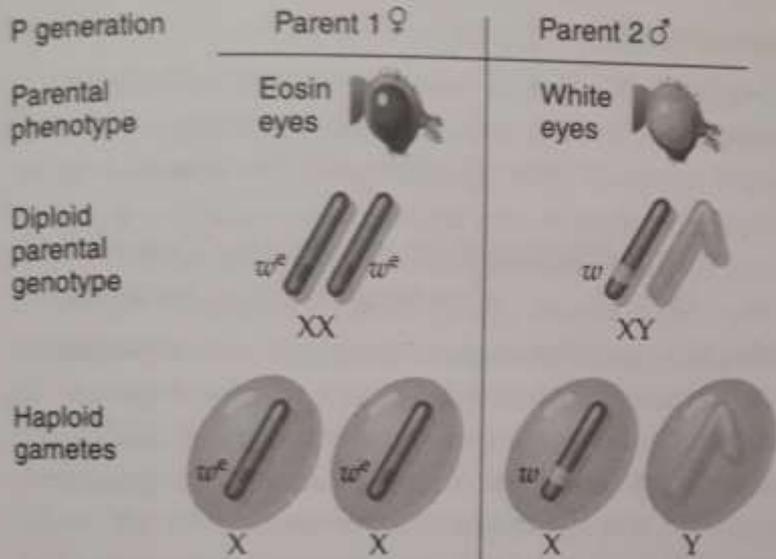
Phenotypic Ratio = All Red Roan



Multiple Alleles

- In a population of individuals, a given gene may have several alleles (often one wild type and other mutant), not just two. Such genes are said to have **multiple alleles**, and the alleles are said to constitute a multiple allelic series. At the molecular level, they represent different forms of the DNA sequence of the gene.
- Although a gene may have multiple alleles, a single diploid individual can have only a maximum of two of these alleles, one on each of the two homologous chromosomes carrying the gene locus.

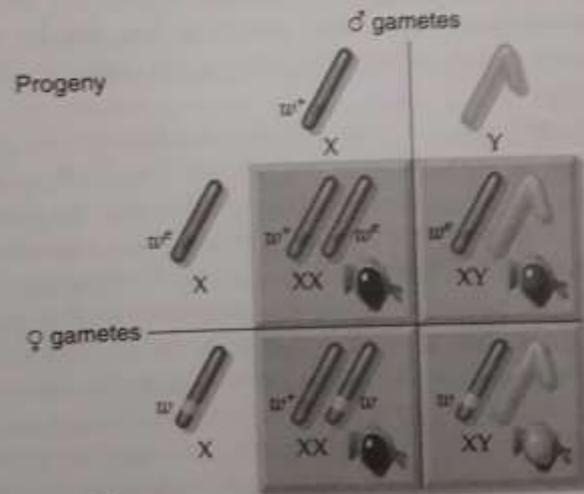
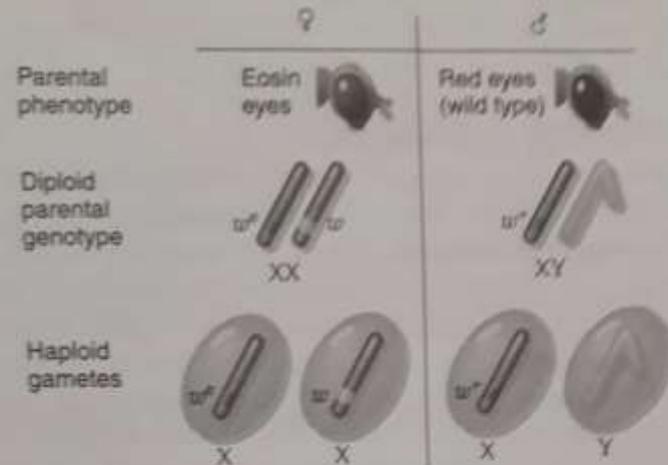
a) White-eosin-eyed female X white-eyed male



F₁ genotypes: $\frac{1}{2} w^e/w$, $\frac{1}{2} w^e/Y$

F₁ phenotypes: All eosin eyes, $\frac{1}{2}$ female, $\frac{1}{2}$ male

b) F₁ female X wild-type male



Progeny genotypes: $\frac{1}{4} w^e/w^+$, $\frac{1}{4} w^e/w$, $\frac{1}{4} w^e/Y$, $\frac{1}{4} w/Y$

Progeny phenotypes: $\frac{1}{2}$ wild-type females, $\frac{1}{4}$ eosin-eyed males, $\frac{1}{4}$ white-eyed males