

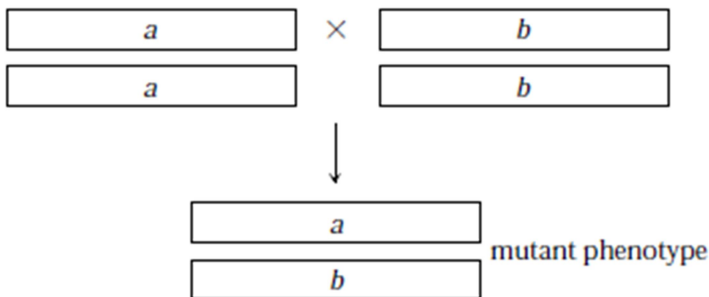
## COMPLEMENTATION TEST IN BACTERIOPHAGE (Benzer's Experiment on rII locus)

### Complementation: Determining Whether Mutations Are at the Same or Different Loci

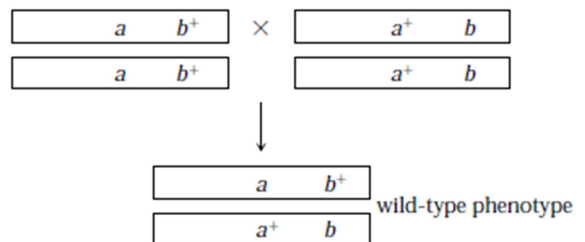
**Q.What do you mean by complementation test? Q.What is the basic principle of a complementation test?**

Complementation test, also called **cis-trans test**, in genetics, test for determining whether two mutations associated with a specific phenotype represent two different forms of the same gene (alleles) or are variations of two different genes.

To carry out a **complementation test**, parents that are homozygous for different mutations are crossed, producing offspring that are heterozygous. If the mutations are allelic (occur at the same locus), then the heterozygous offspring have only mutant alleles (ab) and exhibit a mutant phenotype:



If, on the other hand, the mutations occur at different loci, each of the homozygous parents possesses wild-type genes at the other locus (aa b<sup>+</sup> b<sup>+</sup> and a<sup>+</sup> a<sup>+</sup> bb); so the heterozygous offspring inherit a mutant and a wild-type allele at each locus. In this case, the mutations complement each other and the heterozygous offspring have the wild-type phenotype:



Complementation occurs when an individual possessing two mutant genes has a wild-type phenotype and is an indicator that the mutations are nonallelic genes. When the complementation test is applied to white and apricot mutations, all of the heterozygous offspring have light colored eyes, demonstrating that white and apricot are produced by mutations that occur at the same locus and are allelic.

**Q.State the design adopted by Benzer to carry out complementation test in Bacteriophage.**

[Benzer used the complementation test to distinguish between functional genes (loci).]

- (i)At the time Benzer was conducting his experiments, the relationship between genes and DNA structure was unknown.
- (ii)A gene had been defined as a functional unit of heredity that coded for a phenotype. To test whether different rII mutations belonged to different functional genes, Benzer used the complementation (cistrans) test. Individuals heterozygous for two mutations may have the mutations in trans,

$$\frac{a^+ \quad b^-}{a^- \quad b^+}$$