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Class 12<sup>th</sup>

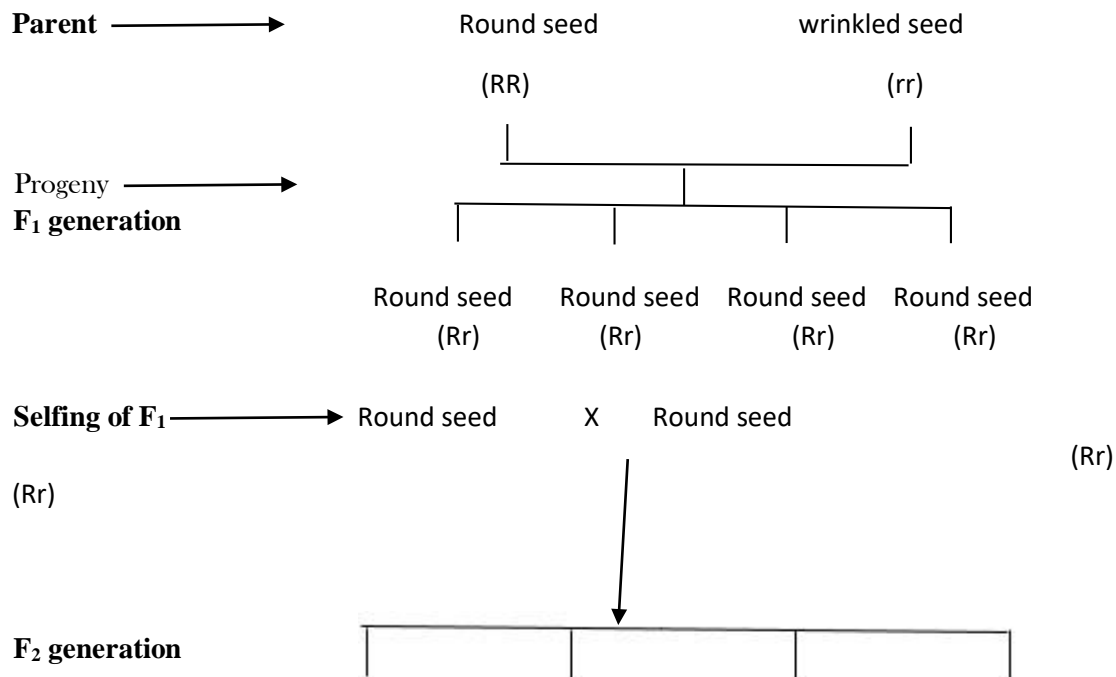
Sub. Biology

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### 1. Explain the Law of Dominance using a monohybrid cross.

The Law of Dominance was proposed by Mendel. It states that a dominant allele expresses itself in a monohybrid cross and suppresses the expression of recessive allele. But the recessive allele for a specific character is not vanished but remains masked or hidden in the progenies of F<sub>1</sub> generation which resurfaces in the subsequent generation.

Example- When a monohybrid cross between two pea plants having round seeds (RR) and wrinkled seeds (rr) was carried out, all the seeds in F<sub>1</sub> generation were observed to be round (Rr). If the round seeds were self-fertilized both the characters – round and wrinkled seeds appeared in F<sub>2</sub> generation in 3:1 ratio. Therefore, in F<sub>1</sub> generation, the character that is dominant i.e., the round seeds surfaced and the recessive character i.e., the wrinkled seeds got suppressed that resurfaced in the F<sub>2</sub> generation.



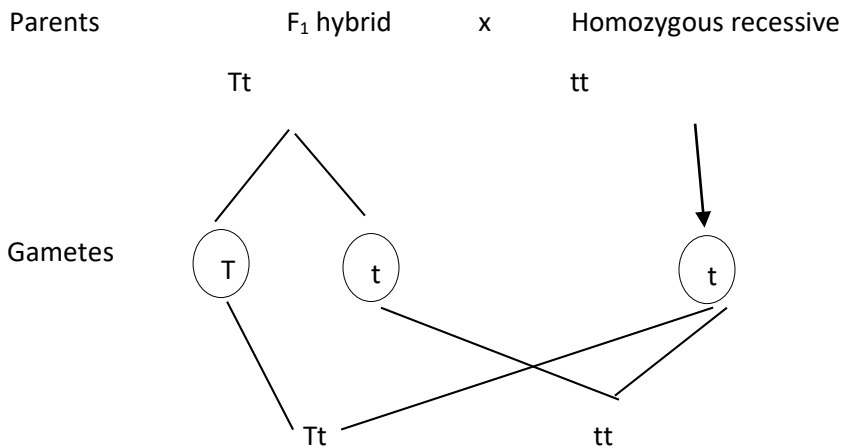
(RR)                      Round seed      Round seed              Round seed              Wrinkled seed  
 (Rr)                      (Rr)                      (rr)  
 3:1      Phenotypic ratio

**2. Define and design a test-cross.**

A test-cross can be defined as a cross of an F<sub>1</sub> individual that has a dominant phenotype with its homozygous recessive parent. This test cross can be used to determine if an individual displaying dominant character is homozygous or heterozygous.

Sample test cross:

- Take a tall plant (TT) and cross it with a dwarf plant(tt)
- The F<sub>1</sub> generation shows tall plant (Tt)
- This tall plant(Tt) is then test crossed with homozygous recessive plant(tt)



As seen above, the test cross between tall heterozygous F<sub>1</sub> hybrid with dwarf homozygous recessive parent producing tall and dwarf in the same equal proportion. This represents that the F<sub>1</sub> hybrid are heterogenous.

**3. Using a Punnett Square, workout the distribution of phenotypic features in the first filial generation after a cross between a homozygous female and a heterozygous male for a single locus.**

In guinea pigs, there is a cross carried out between a heterozygous male with black coat colour (Bb) and a female having white coat colour (bb). The male yields two types of gametes B and b whereas the female yields one type of gamete only, b. Therefore, the ratio of the genotype and phenotype in the progenies of F<sub>1</sub> generation is in the same ratio, i.e., 1:1

