

## Genetics Capsule

1. **Codominance** is the condition in which two dominant genes express together. Eg. AB blood group in man, Coat color in Cattle etc. **Incomplete dominance** is the partial expression of two dominant genes to produce a mixture of two characters. Eg. Sickle cell anemia, Pink flower in *Mirabilis*.
2. **Polygenes** (Multiple genes) are groups of genes controlling the same character. Eg. Skin color in man.
3. **Multiple alleles** are alternate forms of a gene expressing the same character. Eg. Blood groups in man, Coat color in Rabbit etc.
4. **Epistatic gene** suppresses the character of a gene (Hypostatic Gene). Eg. Coat color in Dogs, Coat color in Mice.
5. **Pleiotropism** is the condition in which a gene produces multiple effects. Eg. Gene for sickle cell anemia, Eye color in *Drosophila*.
6. **Lethal genes** are harmful genes destroying the possessor. Eg. Thalassemia and Huntington's chorea in man, leaf color in Snapdragon (Homozygous dominant). Some times homozygous recessive genes become lethal. Eg. Congenital Ichthyosis and Amaurotic idiocy in man.
7. **Pedigree analysis** is the method to trace back the ancestral characters by taking one or more characters from an individual. In the Pedigree tree, Squares represents males and Circles females. Shaded squares or circles indicate dominant traits and open squares or circles denote recessive traits.
8. **Giant chromosomes** are found in Dipteran insects. Polytene chromosome (Salivary gland of *Drosophila*) and Lamp brush chromosome (Amphibian Oocytes) are giant chromosomes. **SAT chromosome** possesses a swollen part (Satellite body) at the tip of the chromosome.
9. Somatic genes in the Y chromosomes are called Y linked or **Holandric genes**. Eg. Gene producing Hypertrichosis (hair in the ear pinna) in man.
10. **Sex limited characters** express only in one sex. It will not express in the other sex even if the gene is present. Eg. Feather pattern in Poultry, premature baldness in human males, milk production in cattles.
11. **Sex influenced characters** behave like Dominant in one sex and Recessive in the other sex. Phenotype will be different even though the genotype is same. Eg. Horn in Sheep, baldness in man, Hare lip etc.
12. **Mutation** is a sudden heritable change in organisms leading to variations. Mutation was observed by Hugo de Vries in *Oenothera lamarckiana* (Evening Primrose).
13. **Gene mutations** (Point mutations) affect the genes.
14. **Cladogenic agents** (X-ray, Gamma rays) are chromosome breaking agents.
15. **Cri-du-chat syndrome** is caused due to a deletion in the short arm of 5<sup>th</sup> chromosome.
16. **Philadelphia chromosome** is the small 22<sup>nd</sup> chromosome in man produced due to the translocation between the chromosomes 9 and 22. It is seen in patients with **Chronic myeloid leukemia (CML)**.
17. **Colchicine** is called as Mitotic Poison since it destroys spindle fibers and arrest mitosis. It is used to induce Polyploidy in plants. **Triticale** is the first man made Cereal produced by crossing Wheat and Rye and then inducing polyploidy.
18. **Mutagens** are agents causing mutations. Physical mutagens are X-ray, alpha, beta, gamma rays, UV rays etc. Chemical mutagens include Nitrous acid, Ethyl methane sulphonate (EMS), Acridine orange etc. **Sharbati Sonora** is a variety of Wheat produced by induced mutation.
19. **Cistron** is the smallest unit of DNA that transcribes a messenger RNA.
20. **Recon** is the unit of recombination and **Muton** is the part of DNA that undergoes mutation.

21. **B-DNA** is the usual form of right handed DNA with 10 base pairs in one turn. A-DNA (11 base pairs), C-DNA (9 base pairs) and D-DNA (8 base pairs) are forms of DNA produced in experimental conditions.
22. **Z-DNA** is the left handed DNA discovered by Rich, Nordheim and Wang in 1984. It has 12 base pairs per turn.
23. **Palindrome DNA** has inverted repetition of base sequences.
24. **H-DNA** contains inverted repetition of base sequences to form Triple helix DNA.
25. Watson, Crick, Wilkins and Rosalind Franklin are associated with the Double Helical model of DNA. There are 10 base pairs per turn in the DNA. The base pairs are separated by a distance of 3.4 Angstrom so the total length of the turn is 34 Angstroms.
26. **Hydrogen bonds** in the DNA stabilize the topology and antiparallel nature of DNA.
27. **Phospho diester bonds** maintain the polarity (3'-5' and 5'-3') of the DNA strands.
28. **Helicase** is the enzyme that separate DNA strands during replication.
29. **Topoisomerase** (Relaxing enzyme) reduces tension in the DNA during unwinding. DNA Polymerases I, II and III are DNA synthesizing enzymes. DNA polymerase III is the most active enzyme. Bacterial DNA Polymerases are Pol I and Pol II (DNA repair) and Pol III (Chromosome replication).
30. **Ligase** (Molecular glue) joins DNA segments after synthesis.
31. **Telomerase** is the enzyme containing RNA and protein. It terminates DNA replication.
32. **Reverse Transcriptase** is the bacterial Polymerase that synthesise DNA from RNA.
33. **Primase** (RNA polymerase) is used to synthesize Primer RNA during replication.
34. **RNA Editing** is the modification of the m-RNA before translation.
35. **Recombinant DNA technology** involves manipulation of DNA which involves DNA cloning, DNA profiling etc.
36. **R-DNA** or Recombinant DNA contains a bacterial plasmid and a desired gene sequence of another organism.
37. **Restriction enzymes** are "Molecular Scissors" that cut double stranded DNA at specific sites producing 'Staggered ends'. These enzymes are present in bacteria to destroy foreign DNA such as Viral DNA. The enzyme will not destroy the own DNA of bacteria because it is kept in the methylated form. Most widely used restriction enzymes are Eco R1, Bam 1, Hind III etc.