

## High Yield Hints- Classical Genetics

1. Germinal variations affect the reproductive cells. These are also called as Fluctuating variations, *Sports or Saltations*. Germinal variations are heritable. *Genome* denotes the haploid set of chromosomes in a cell. *Test cross* is the back cross of F1 generation with the Recessive parent. Alleles are the alternate forms of a gene. *Locus* is the position of a gene.
2. Correns and Tschermak rediscovered Mendelism. Bateson and Punnett discovered Complementary action of genes. Davenport discovered Polygenic inheritance (Skin color) in man. Waldeyer coined the term Chromosome. Balbiani discovered Polytene chromosomes in Drosophila. Muller discovered mutagenic property of X-rays. Hershey and Chase conducted experiments in viral replication. Jacob and Monod proposed the Operon concept. Alec Jeffrey introduced DNA finger printing. Kari Mullis discovered Polymerase chain reaction (PCR).
3. *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*. *Polygenes* (Multiple genes) are groups of genes controlling the same character. Eg. Skin color in man. *Multiple alleles* are alternate forms of a gene expressing the same character. Eg. Blood groups in man, Coat color in Rabbit etc. *Epistatic gene* suppresses the character of a gene (Hypostatic Gene). Eg. Coat color in Dogs, Coat color in Mice. *Pleotropism* is the condition in which a gene produces multiple effects. Eg. Gene for sickle cell anemia, Eye color in Drosophila. *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.
4. *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.
5. Hofmeister first reported Chromosomes in 1849. Sutton and Boveri in 1902 independently proposed the Chromosome theory of Heredity. Chromosomes may be Metacentric (centromere in the middle), Submetacentric (centromere towards one end), Acrocentric (centromere near the end) and Telocentric (centromere at the tip). *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.
6. Somatic genes in the Y chromosomes are called Y linked or *Holandric genes*. Eg. Gene producing Hypertrichosis (hair in the ear pinna) in man. *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. *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.
7. *Mutation* is a sudden heritable change in organisms leading to variations. Mutation was observed by Hugo de Vries in *Oenothera lamarckiana* (Evening Prim rose). *Gene mutations*

(Point mutations) affect the genes. It may be Deletion (removal of bases), Addition or Insertion and Substitution (replacement of one base by another one). Substitution may be Transition (Purine-Purine or Pyrimidine-Pyrimidine change) or Transversion (Purine-Pyrimidine change or vice versa). Transition is caused by Tautomerization (shifting of protons), Deamination (removal of amino group) or through base analogues (5-Bromo Uracil).

8. Gene mutations change the arrangement of genetic code in the DNA. So these are called **Frame shift mutations**. **Mis-sense mutation** changes the amino acid sequence in the protein. **Non sense mutations** results in termination codons. **Silent mutations** do not alter the amino acid sequence in the protein. **Cladogenic agents** (X-ray, Gamma rays) are chromosome breaking agents. **Cri-du-chat syndrome** is caused due to a deletion in the short arm of 5<sup>th</sup> chromosome. **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)**.
9. **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.
10. **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.