**Discipline Specific Elective- Theory**

**DSE-Bot-505B - Genetics and Molecular Biology of Genes**

**(Credits- 4, Practicals-1)**

**Unit 1: Post Mendelian Gene interaction 2markes**

1. Epistasis
2. supplementary genes
3. complementary genes
4. Lethal genes
5. Pseudoalleles
6. multiple allele

**Unit II**

1. Explain Complementary gene with suitable example.
2. Explain Supplimentary gene action with suitable example.
3. List the gametes produced by the following individuals
4. AaBbCc b) AABbCcDd
5. Write a short notes on a) reciprocal cross b) back cross
6. Write a short note on Multiple factor inheritance

9.Explain intraction of genes with suitable example

**Unit II**

1. Explain Epistasis with Suitable example
2. Write a short note an a) Epistasis & Hypostasis b) Complementary / Supplementary genes.
3. Solve the following genetic problem
4. Solve the following genetic problem
5. NOTE: In sweet pea (*Lathyrus odoratus*) the purple colour flower is dependent on two non-allelic complementary genes (CP). Gene C produces white coloured flowers and gene P also produces white coloured flower.

PROBLEM: If white colour flowered plant is crossed with another white colour flowered plants, what will be the phenotypic ratio of F1 and F2 generations

**Unit V**

1. Non homologous chromosome
2. Chaisma
3. Chaisma frequency
4. Linkage
5. Linked genes
6. Crossing over
7. Incaylete linkage
8. Synaptonemal complex
9. Terminalization

 Recombination

**Unit V**

1. Write the Significance of crossing over.
2. Explain Sutton and Boveri concept of Coupling and repulsion.
3. Explain coupling and repulsion theory
4. Describe crossing over and its significance

**Unit V**

1. Explain the mechanism of crossing over and add a note on its significance

**Unit V**

1. Mutation
2. Somatic mutation
3. Germ line mutation
4. Name any two physical mutagens
5. Name any two chemical mutagens
6. What are frame shift mutations?
7. Name any two environmental mutagens
8. What are aneuploids?
9. What are euploids?
10. What are autopolyploids
11. Chemical mutation
12. Mutagenes
13. Spontaneous mutation
14. Induced mutation
15. Radiation mutation
16. Temporary mutation
17. Physical mutation

**3) Chromosomal aberrations**

1. Chromosomal aberrations
2. Numerical chromosomal aberrations
3. Structural chromosomal aberration
4. Polyploidy
5. Aneuploidy
6. Euploidy
7. Triploidy
8. Tetraploidy
9. Monoploidy
10. Haploidy
11. Hyperploidy
12. Hypoploidy
13. Trisomy
14. Tetrasomy
15. Nullisomy
16. Monosomy
17. Double monosomy
18. Double trisomy
19. Deletion
20. Duplication
21. Tandom duplication
22. Reverse tandom duplications
23. Inversion
24. Translocation
25. Pericentric inversions
26. Paracentric inversions
27. Polytene
28. Endomitosis
29. Allosome
30. Autosome

**Cell Biology 4) Apoptosis and Cell Senescence**

1. Apoptosis
2. Cell Senescence
3. Cell ageing
4. PCD

**Cell Biology 5) Cell reproduction**

1. Cell reproduction
2. Amitosis
3. Mitosis
4. Meiosis
5. Anaphase checkpoint
6. G1 phase
7. G2 phase
8. S-phase
9. G0 phase
10. Spindle apparatus
11. Interphase
12. M-phase
13. Equational cell division
14. Reductional cell division
15. Chromosomal synapsis
16. Homologous pairing
17. Crossing over
18. Chiasmata
19. Bivalents.
20. Tetrads.
21. Synoptinemal complex
22. Genetic recombination
23. Terminalization
24. Diad
25. Leptotene
26. Zygotene
27. Pachytene
28. Diplotene
29. Diakinesis
30. Metaphase I/II
31. Anaphase I/II
32. Telophase
33. Karyokinesis
34. Cytokinesis
35. Spindle polymerization
36. Spindle depolymerisation
37. B-chromosomes

**Genetics 05 MARKS QUESTIONS**

**Unit V**

1. Write a note on mutagens.
2. Write a note on chemical mutagens.
3. Write a note on physical mutagens.
4. Write a note on spontaneous mutation.
5. Write a note on Induced mutation.
6. Write a note on petite mutants.

**Genetics 10 MARKS QUESTIONS**

1. What is mutation? Mention the types and its significance.
2. Write a detailed note on mutation and mutagens

**Cell Biology 3) Chromosomal aberrations**

1. What is chromosomal aberration? Write a brief note on it
2. What are numerical chromosomal aberrations? Mention different types
3. What are structural chromosomal aberrations? Mention different types
4. Write a note on the role of numerical chromosomal aberrations organismal evolution
5. Write a note on the role of numerical chromosomal aberration on speciation
6. Explain advantages of numerical aberrations in plant breeding programme

**Cell Biology 4) Apoptosis and Cell Senescence**

1. Mention different physiological changes during cell senescence
2. Explain the mechanism of programmed cell death
3. Write a note on significance of apoptosis
4. Explain apoptosis in plant cells

**Cell Biology 5) Cell reproduction**

1. Explain cell cycle with diagramme
2. Mention different changes in the cell during metaphase
3. Mention different changes in the cell during anaphase
4. Mention different changes in the cell during telophase
5. Mention different changes in the cell during G1 phase
6. Mention different changes in the cell during G2 phase
7. Mention different changes in the cell during S- phase
8. Draw neat labelled diagramme of a metaphase chromosome
9. Explain chromosomal synapsis and its significance
10. Explain crossing over and its significance
11. With a neat labelled diagram explain the ultrastructure of Synoptonemal complex
12. Give diagrammatic representation of mitosis
13. Give diagrammatic representation of meiosis
14. Write a note on role of spindle apparatus in cell division
15. Write note on significance of mitosis
16. Write note on significance of meiosis
17. Write note on Interphase and Prophase.

**Cell Biology 3) Chromosomal aberrations**

1. Describe chromosomal aberrations and their genetic significance
2. With a neat labelled diagram explain the structure of giant chromosome
3. Classify numerical chromosomal aberrations and add a note on their role in plant breeding programme

**Cell Biology 4) Apoptosis and Cell Senescence**

1. Write a critical note on Apoptosis and Cell Senescence

**Cell Biology 5) Cell reproduction**

1. With neat labelled diagramme explain mitosis and write its significance
2. With neat labelled diagramme explain meiosis and write its significance
3. Write differences between mitosis and meiosis.

**Unit IV**

1. Extranuclear inheritance
2. Uniparental inheritance
3. Extranuclear genes
4. Plastid inheritance
5. Mitochondrial inheritance
6. *Chlamydomonas reinhardi*
7. Petite characters
8. Neutral petite
9. Plasma genes

Cytogenes

 **Unit IV**

1. Explain the cheeriness of extra nuclear inheritance.
2. Describe Uniparental inheritance in *Chlamydomonas*.
3. Explain maternal inheritance with an example.
4. Explain cytoplasmic inheritance with an example from plant system

 **Unit IV**

1. Write a detailed note on extra chromosomal inheritance.
2. Explain plastid inheritance in *Mirabilis*.
3. Explain petite character inheritance in yeast.
4. Discuss uniparental inheritance in Chlamydomonas

**Molecular Biology : 2) Genes and genetic code**

1. Genetic Code
2. Degeneracy of genetic code
3. Triplet codon
4. Anticodon-NODOC
5. Aminoacyl acceptor site
6. Initiation codon
7. Terminator codon
8. Amber codon
9. Polypeptide
10. Allele
11. hn-RNA
12. Redundancy of Genetic code
13. Coding sequences/DNA template
14. Noncoding sequences
15. Nonsense codon.
16. AUG
17. GUG
18. UGA
19. UAA
20. UAG
21. Wobble hypothesis
22. Transcriptase
23. Reverse transcritase

**Molecular Biology : 3) Geneome functioning**

1. Repetitive DNA
2. Tandem repeats
3. TS elements (Transposable elements)
4. Transposons
5. Transposase
6. Chromosome walking
7. VNTRs
8. Barbara McClintock
9. Genomic Library
10. cDNA libraries

**Molecular Biology : 4) Genome replication**

1. Replicon
2. DNA polymerase
3. Isomerase
4. DNA gyrases
5. Conservative method of DNA replication
6. Semiconservative method of DNA replication
7. dATPs
8. Replication fork
9. Okazaki fragments
10. Leading strand
11. Lagging strand
12. Replication bubble
13. DNA ligases
14. Sigma factors
15. DNA replication initiation
16. DNA elongation
17. Termination
18. Ori c
19. Telocentric
20. RNA primers

**Molecular Biology : 5) Gene expression**

1. Gene
2. Cistron
3. Recon
4. Muton
5. Introns
6. Exons
7. Polycistronic
8. Monocitronic
9. Promoter gene
10. Regulator gene
11. Operator gene
12. Structural gene
13. Lac-ZYA
14. fMet-RNA
15. Polypeptide
16. Lac-Operon
17. Transcription
18. Translation

**Molecular Biology : 1) Nucleic Acids**

1. Define nucleotide
2. Draw a neat labelled diagram of DNA as given by Watson & Crick
3. Draw a neat labelled diagram of tRNA
4. Write a note on chemical composition of DNA
5. Write s note on chemical composition of RNA

**Molecular Biology : 2) Genes and genetic code**

1. Write a note on genes and alleles
2. Write a note on genetic code and its significance
3. What is degeneracy of genetic code? Explain
4. Gene is comma less-explain
5. Explain gene redundancy

**Molecular Biology : 3) Genome functioning**

1. What are transposons? Write a brief note on their role in evolution
2. Write a brief note on chromosome walking

**Molecular Biology : 4) Genome replication**

1. Write a note on Tandem repeats.
2. Write a note on Interspersed repeats.
3. Explain the Class I and Class II transposable elements.
4. Mention the inhibitors of transcription and their role.
5. Explain the semi conservative DNA replication.
6. Mention the enzymes involved in DNA replication and their role.
7. Write the functions of DNA.
8. What are the properties of DNA decides it as a genetic material.
9. What is called central dogma of molecular biology?

**Gene Expression**

1. Explain Cistron, Recon and Muton
2. What is activation and selection of amino acids during transcription?
3. Write a note on Initiation of polypeptide chain in translation.
4. Write a note on Initiation of transcription in prokaryotes.
5. Describe the role of ribosome.

**Molecular Biology : 2) Genes and genetic code**

1. Explain genetic code in detail and its genetic significance
2. Explain different rules proposed by Erwin Chargaff with respect to double standard DNA.
3. Describe the Gene concept.

**Molecular Biology : 3) Geneome functioning**

1. Give an account of repetitive DNA and tandem repeats.
2. Describe transposable elements, chromosomal walking and write their applications.

**Molecular Biology : 4) Genome replication**

1. Describe the mechanism of DNA replication or Genome replication.

**Molecular Biology : 5) Gene expression**

1. Describe the transcription.in both prokaryotes and eukaroyotes.
2. Explain the translation or Gene translation or protein biosynthesis.
3. Explain the Lac-Operon concept / Inducer system with reference to *E. coli.*