B. Sc. III –Semester V
BIOTECHNOLOGY
BT 501: GENETICS AND MOLECULAR BIOLOGY

UNIT I
Mendels Laws and Inheritance
Mendel experiments, Mendel Laws and deviations: incomplete dominance and Co dominance. Penetration and pleiotropism, Recessive and Dominant epistatic gene interactions. Concept of multiple alleles

UNIT II
Genes and their variations
Structure of gene, gene and environment, gene copies and heterogeneity, Meiotic nondisjunction of chromosomes, chromosome abnormalities in animals and plants. Linkage, recombination, gene maps, interference and coincidence. Sex determination, genetic population studies and Hardy Weinberg Equations.

UNIT III
DNA Replication
Enzymology of replication (detailed treatment of DNA polymerase I, brief treatment of pol II and III, helicases, topoisomerases, single strand binding proteins, DNA melting proteins, primase and RNA primers, distributive and processive properties of DNA polymerase I and III, importance of the β -subunit in polymerase III), proof for semiconservative replication, discontinuous replication and Okazaki fragments, Replication origins, initiation, primosome formation, elongation, and termination. Use of DNA replication mutants in the study of replication.

UNIT IV
Mutations & DNA Repair
Gene mutations: Induced and Spontaneous, Missense, nonsense and frameshift mutations. Mutagens: Physical and chemical mutagens.
Repair: Mismatch repair, light induced repair, SOS repair. Rec gene and its role in DNA repair, post replication repair

UNIT V
Transcription
Enzymatic synthesis of RNA. Basic features of transcription, structure of prokaryotic RNA polymerase (core enzyme and holoenzyme, significance of σ factor), concept of promoter (Pribnow box, -10 and -35 sequences and their significance).
Four steps of transcription (promoter binding and activation, RNA chain initiation and promoter escape, chain elongation, termination and release) and regulation. Reverse transcription.

BT 501: GENETICS AND MOLECULAR BIOLOGY
practicals

1. Effect of UV radiations on the growth of microorganisms.
2. Isolation of plasmid DNA from bacteria
3. Purity analysis of the Nucleic acids
4. Study of different phases of mitosis in onion root tips and meiosis in *Allium cepa* flower buds.
5. Karyotyping in Allium or Drosophila.
6. Problems and assignments in Mendilian genetics.
7. Isolation of auxotrophic mutants (plants or insects).

8. Mutation of bacteria by UV.
9. Chemical induced mutation in bacteria

Note: - Mandatory to perform atleast 6 practical

B. Sc. III – Semester V
BT 502: GENE EXPRESSION & rDNA TECHNOLOGY

UNIT I
Genetic Code

Genetic code: Codon and its characteristics, experimental elucidation of codons, identification of start and stop codons, universality, degeneracy and commaless nature of codons.
The decoding system: aminoacyl synthetases, the adaptor hypothesis, attachment of amino acids to tRNA. Codon-anticodon interaction - the wobble hypothesis.
Selection of initiation codon - Shine and Dalgarno sequence and the 16S rRNA.

UNIT II
Protein synthesis:

Initiation, elongation, termination and post translational modification.
Regulation of translation: phage T4 protein p32 translational regulation. Antibiotics affecting translation.

UNIT III
Gene Expression and regulation

Details of initiation, elongation, and termination (intrinsic and rho factor mediated termination).
Regulation of Transcription in Prokaryotes: Basic idea of lac- and trp-operons. Negative and positive control of lac operon
Eukaryotic Gene Regulation: Gal operon

UNIT IV
rDNA Technology

DNA cloning: Basics of genetic engineering, restriction endonucleases, other enzymes of DNA manipulation. Vectors: Plasmid vectors (pBR322 and pUC 18/19)
Phage vector: Lambda replacement and insertion vectors Cosmids, phagemids, and YAC.
Cutting and joining DNA (cohesive end ligation, methods of blunt end ligation). Transfection and transformation. Selection of transformed cells. Screening methods.

UNIT V

Genomic DNA library and cDNA library – concept and methods of creating these libraries. Advantages and disadvantages of cDNA library over genomic DNA library.
General consideration of Polymerase chain reaction, designing of primers for PCR.
Expression of cloned genes: General features of an expression vector. Expression of a eukaryotic gene in prokaryotes – advantages and problems. Applications of recombinant DNA technology.

SEMESTER V
BT 502: GENE EXPRESSION & rDNA TECHNOLOGY

1. To measure concentration of DNA & RNA by UV spectrophotometry
2. Estimation of proteins by Bradford method
3. Isolation of genomic DNA.
4. Isolation of Plasmid DNA.

5. Restriction digestion of DNA.
6. Demonstration of Replica plating technique
7. Identification of Lac+ bacteria by blue white screening using IPTG
8. Ligation of DNA
9. Chemical mutagenesis and production of microbial mutants.

Note: - Mandatory to perform atleast 6 practical

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MODEL QUESTION PAPER FOR FIFTH SEMESTER END EXAM

GENETICS AND MOLECULAR BIOLOGY

B. Sc Degree Course (CBCS Semester pattern)

B. Sc Biotechnology (Theory)

Duration: 3hrs **Max. marks: 75**

SECTIION –A

Answer any Five questions **5x5 =25marks**

1) Incomplete dominance and co dominance
2) Linkage
3) DNA polymerase and types
4) Missense and Nonsense mutation
5) Concept of Promotor
6) Reverse transcription
7) Hardy weinberg law and equation
8) Penetration and pleiotropism

SECTION-B

Answer the questions **5x10 =50marks**

9) a) Describe Mendel's Laws and deviations

Or

b) Describe Recessive and dominant epistatic gene interaction.

10) a) Describe Chromosome abnormalities in plants and animals

Or

b) Describe recombination process and types

11) a) Describe use of DNA replication mutants in study of replication

12) Or

b) Describe process of replication, proof of semi conservative method of replication

9) a) Describe Physical and chemical mutagens

10) Or

b) Describe SOS repair of DNA

11) a) Describe Enzymes involved in transcription and process of transcription

Or

b) Describe Concept of Promoter.

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS
GENETICS AND MOLECULAR BIOLOGY

B.Sc., V Semester End Practical examination

B.Sc., Biotechnology

TIME: 3 hours Max. Marks: 50

1. Isolation of plasmid DNA from bacteria
(Major experiment).20marks (Principle-5M, Methodology-10M, Results-05)

2. Problems and assignments in Mendilian genetics (Minor experiment). 10 marks

(Principle -2M, Methodology-05M, Results-03)

3. Identify the given spotter and write a brief note on it- A, B, C,D,E, F
(5x2M)10 marks

4. Record 05 marks

5. Viva-voce 05 marks

MODEL QUESTION PAPER FOR FIFTH SEMESTER END EXAM

GENE EXPRESSION & rDNA TECHNOLOGY

B. Sc Degree Course (CBCS Semester pattern)

B. Sc Biotechnology (Theory)

Duration: 3hrs **Max. marks: 75**

SECTIION –A

Answer any Five questions **5x5 =25marks**

1) Characteristics of Codon
2) Antibiotics effecting translation
3) lac operon
4) YAC
5) PCR
6) Vector
7) Shine Dalgarno sequence
8) Ligation

SECTION-B

Answer the questions **5x10 =50marks**

13) a) Describe Codon and its characteristics

Or

b) Describe Codon and anticodon interaction and selection of initiation codon

14) a) Describe post translational modification

Or

b) Describe regulation of translation

15) a) Describe Operon concept and types

16) Or

b) Describe Eukaryotic gene regulation

12) a) Describe different types of Cloning vectors

13) Or

b) Describe bacterial transformation process

14) a) Describe construction of cDNA library and its applications

Or

b) Describe expression of eukaryotic gene in prokaryotes.

MODEL QUESTION PAPER FOR SEMESTER END PRACTICAL EXAMINATIONS

GENE EXPRESSION & rDNA TECHNOLOGY

B.Sc., V Semester End Practical examination

B.Sc., Biotechnology

TIME: 3 hours Max. Marks: 50

1. To measure concentration of DNA & RNA by UV spectrophotometry (Major experiment).20marks (Principle-5M, Methodology-10M, Results-05)

2. Restriction digestion of DNA (Minor experiment). 10 marks

(Principle -2M, Methodology-05M, Results-03)

3. Identify the given spotter and write a brief note on it- A, B, C,D,E, F

(5x2M)10 marks

4. Record 05 marks

5. Viva-voce 05 marks