

**PAPER CODE: VBT2301**

**PAPER – I: CELL AND MOLECULAR BIOLOGY AND MICROBIAL GENETICS**

**{Credit – 2: No of lectures: 45}**

<b>Sr. No.</b>	<b>Title and Contents</b>	<b>No. of Lectures</b>
Unit – I	1)Cell structure & functional organization 2) Fractionation of sub-cellular organelles. 3) Membrane structure and membrane transport 4) Cell signaling 5) Cell differentiation , neoplasia & cell death 6) Cell junctions , cell adhesion & ECM	15
Unit – II	1)structure & organization of Pro-& eukaryotic genome 2)Structure & function of chromatin 3) Concept of gene 4) DNA replication in prokaryotes , transcription in prokaryotes & translation in prokaryotes. 5) Post transcriptional modification, Post translational modification & transport of proteins Comparison with eukaryotic replication, transcription and translation. 6) DNA damage & repair	15
Unit – III	Transformation • Discovery of transformation – Griffith’s experiment • Detailed Process of transformation in Gram positive ( <i>S. Pneumonia</i> and <i>B.subtilis</i> ) and Gram negative bacteria ( <i>H. influenzae</i> ) B. Transduction i. Discovery of transduction – Lederberg and Tatum’s experiment ii. Introduction to Generalized and Specialized transduction C. Conjugation i. Discovery of conjugation ii. Types of conjugation (F+ ,F-, Hfr) D. Recombination i. Definition of recombination ii. Types of recombination iii. Homologous recombination (Holliday model) iv. Site specific recombination (Lambda phage) E) Mobile elements (Prokaryotes and Eukaryotes)	15

**Learning Outcome:****The students should acquire the knowledge about:**

- Ultra structure and function of organelles in a eukaryotic cell
- Cell to cell communication, adhesion junction and signaling
- How different genomes are packaged and organized
- Molecular Biology processes like replication, transcription and translation and its regulation
- DNA damage
- How different genomes are packaged and organized
  
- Molecular Biology processes like replication its regulation
  
- DNA transfer methods
  
- Types of recombination

**References:**

Cell and molecular biology by Lodish

2) Cell: a molecular. –Bruce Alberts,

3) Gene VIII- Benjamin Lewin

4) Cell and molecular biology – D Robertis and D. Robertis.

5)Lehninger. A.L Principles of Biochemistry 2nd edition 1993, CBS

**PAPER CODE: VBT2302**

**PAPER – II: Recombinant DNA technology**

**{Credit – 2: No of lectures: 45}**

<b>Sr. No</b>	<b>Title and Contents</b>	<b>No. of Lectures</b>
Unit – I	Introduction to r-DNA technology ,tools in r-DNA technology	(2)
Unit – II	<b>Enzymes used in r-DNA technology:</b> Restriction enzymes ( Definition of nucleases, restriction endonucleases, Classification of restriction endonucleases, Nomenclature of restriction endonucleases, DNA fragments with blunt ends and sticky ends.) DNA Ligases, DNA modifying enzymes.	(7)
Unit – III	<b>Vectors in gene cloning:</b> plasmids (pBR322, pUC 8) , cosmids (pJB8) , phage vectors (Lytic cycle and lysogenic cycle of bacteriophage, Features of $\lambda$ -phage and its types) shuttle vectors (YAC) , BAC ,	(10)
Unit – IV	<b>Transformation</b> (Making host cells competent using $\text{CaCl}_2$ ) & <b>transfection methods</b> for introduction of r-DNA into host cells ( Electroporation, particle gun method)	(4)
Unit – V	<b>Screening &amp; selection of transformants</b> –Nucleic acid hybridization, colony and plaque hybridization probing method,non-radioactive detection procedures, southern blotting, northern blotting, western blotting method.(10)	(8)
Unit – VI	Site – directed mutagenesis (2)	(1)
Unit – VII	<b>Introduction to PCR:</b> ( Steps involved in PCR, applications of PCR, types of PCR )	(3)
Unit - VIII	<b>DNA sequencing methods :</b> Maxam Gilbert method, Sanger's method of DNA sequencing(4)	(4)
Unit – IX	<b>Applications of r- DNA technology:</b> (Recombinant insulin, somatic cell nuclear transfer, Recombinant vaccines, Artificial ripening using anti-sense RNA technology (4)	(4)
Unit - X	Introduction to Genomics & proteomics(6)	(2)
<b>References:</b>  1. Gene cloning and Analysis: TA Brown 2. Principles of gene analysis : Old and Primrose 3. Recombinant DNA : Watson		

**Learning Outcomes:**

- To understand the basics of r - DNA technology.
- To understand the application of r - DNA technology.

**Paper code: VBT2303**

Paper: III Practicals

{Credit: 02: no of practicals =10}

<b>Sr. No.</b>	<b>Topic: Cell and Molecular Biology and r – DNA Technology</b>	<b>Practicals (Total 10 P)</b>
1.	Introduction to microscopy and various staining techniques to stain the various cell parts	(1P)
2.	Fractionation of sub cellular organelles using differential staining method i) Nuclei ii) Mitochondria	(2P)
3.	Isolation of DNA and estimation of DNA	(2P)
4.	Isolation of plasmid DNA	(1P)
5.	Isolation of auxotrophic mutants by replica plate technique.	(1P)
6.	UV survival curve	(1P)
7.	Restriction digestion of DNA	(1P)
8.	Ligation of DNA with the help of DNA ligase	(1P)

**PAPER CODE: VBT2401**

**PAPER – I: PLANT TISSUE CULTURE AND ANIMAL TISSUE CULTURE**

{Credit – 2: No of lectures: 45}

Sr. No.	Title and Contents	No. of Lectures
	<b>PLANT TISSUE CULTURE:</b>	
Unit – I	Introduction to plant tissue culture:- History, Lab designing, Instruments, Aseptic techniques, advantages of Plant tissue culture.	(4)
Unit – II	Culture media, Role of growth hormones	(4)
Unit – III	Stages of Micro-propagation (I-VI) i) Selection of plant ii) Ex-plant preparation iii) Surface sterilization iv) Inoculation and incubation v) Sub-culturing vi) Hardening	(6)
Unit – IV	Callus, cell, protoplast culture, Embryo Culture	(4)
Unit – V	Applications of PTC	(4)
	<b>ANIMAL TISSUE CULTURE :</b>	
Unit – I	Introduction to ATC	(1)
Unit – II	Culture medium	(2)
Unit – III	Introduction to stem cells	(2)
Unit – IV	Types of cultures & their applications	(4)
Unit – V	Cell lines & characterization	(5)
Unit – VI	Separation of cell types	(3)
Unit – VII	Organ culture	(2)
Unit – VIII	Organ transplants	(2)
Unit – IX	Cell banks	(2)

**Learning Outcome:**

The student should understand

1. Concept and different types in animal Cell culture
2. Concept and different types in plant Cell culture

**References:**

- 1) Plant tissue culture M.K.Razdan
- 2) Plant tissue culture –H.D.Kumar
- 3) Animal tissue culture –Ian Freshney
- 4) Biotechnology by U.Satyanarayan
- 4) Animal tissue culture- John Paul.

Paper code: VBT2402

**Paper – II: IMMUNOLOGY AND MEDICAL MICROBIOLOGY**

{Credits – 2: No of lectures: 45}

Sr. No	Title and Contents	No of lectures
Unit -I	Introduction to Immunology	(1)
Unit -II	<b>Cell and Organs of immune system:</b> <b>Cells of immune system:</b> Formation of blood cells, leucocytes, NK cells, Macrophage, Dendritic cells. <b>Organs of immune system:</b> Primary lymphoid organs ( Bone marrow, thymus ), Secondary lymphoid organs ( Spleen, lymph node)	(8)
Unit - III	Innate & acquired immunity	(2)
Unit IV	<b>Structure &amp; function of antibody &amp; antigen</b> <b>Structure of antigens:</b> Concept of immunogenicity and antigenicity, Factors affecting immunogenicity, Haptens, Adjuvants. <b>Structure of antibodies:</b> Basic structure of antibody, Types and functions of antibodies	(7)
Unit - V	<b>Immune response :</b> Humoral immune response Cell mediated immune response	(4)
Unit - VI	Primary and secondary immune response	(2)
Unit - VII	<b>Hypersensitivity</b> Gel and Coomb's classification and types of hypersensitivity ( Type I, Type II, Type III, Type IV )	(3)
Unit - VIII	<b>MHC complex and antigen presentation :</b> MHC – I and MHC – II molecules: Structure and function Presentation by exogenous and endogenous pathways	(3)
Unit - IX	<b>Vaccines:</b> Types of vaccines ( Live Attenuated vaccines, killed vaccines, Subunit vaccines, Recombinant vector vaccines)	(2)
Unit - X	<b>Antigen-antibody reactions:</b> Precipitation reactions : ( Immunodiffusion, immunoelectrophoresis) Agglutination reactions: Blood typing ELISA, Widal test, VDRL test, Weil-Felix test	(6)
	<b>MEDICAL MICROBIOLOGY:</b>	

Unit I	<b>Study of etiological agents with respect to characterization, morphology, preventive measures and control :</b> Intestinal diseases : ( Typhoid, Polio) Respiratory disease: ( TB ) CNS : ( Meningitis ) Skin diseases : ( Wound infection by <i>Staphylococcus aureus</i> , Dermatomycosis ) Urinogenital diseases : ( Syphilis ) Viral diseases: ( HIV, Influenza ( H1N1)	(7)

Learning outcomes:

1. To understand pathogenesis of micro-organisms and their role in causing a disease.
2. To understand the immune system and its functions.

Reference books

- 1) Immunology by Janus Kuby
- 2) Essentials of Immunology Roit
- 3) Immunology by pathak and Palan
- 4) Text book of Microbiology by Anantnarayan Medical Microbiology
- 5) Tortora, Funk, and Case: Microbiology an Introduction , sixth edition



**Paper Code: VBT2403**

**Paper III: Practicals in Immunology and Plant tissue culture**

**{Credit: 02: No of Practicals =10}**

<b>Sr. No</b>	<b>Topic</b>	<b>Practicals (Total 10 P)</b>
	<b>Immunology and medical microbiology</b>	
1.	Ouchterlony double diffusion method	(1P)
2.	Determination of blood group	(1P)
3.	ELISA technique	(1P)
4.	Widal test	(1 P)
5.	Radial immunodiffusion	(1P)
6.	Methods of dry and wet sterilization of apparatus and glasswares for plant tissue culture	(1P)
7.	Working and principles of different instruments like autoclave, laminar air flow, pH meter, water distillation unit	(1P)
8.	3)Preparation of nutrient media for plant tissue culture with emphasis on composition and calculation of concentration of ingredients	(1P)
9.	Initiation of callus culture	(1P)
10.	Initiation of Embryo Culture	(1P)