

**SWAMI RAMANAND TEERTH MARATHWADA
UNIVERSITY, NANDED**

**B.Sc. GENERAL (SEMESTER PATTERN)
B.Sc. SECOND YEAR
BIOTECHNOLOGY (VOCATIONAL) - CURRICULUM**

With Effect from June - 2010

**B. Sc. BIOTECHNOLOGY (VOCATIONAL) CURRICULUM
(SEMESTER PATTERN)**

Class	Paper No. Code no.	Title of Paper	Periods/ Practicals	Time duration of Examination	Maximum Marks
B.Sc.II Yr Semester-III	Paper -I VBT- 106	Molecular Biology	45	3 Hrs.	40+10*
	Paper -II VBT-107	Biophysics	45	3 Hrs.	40+10*
B.Sc.II Yr Semester-IV	Paper -III VBT-108	Immunology & Animal Cell Culture	45	3 Hrs.	40+10*
	Paper -IV VBT-109	Recombinant DNA Technology	45	3 Hrs.	40+10*
B.Sc.II Yr.	VBP- X (Practical) Annual pattern	Practical Based On Theory Papers Of VBT-106 & VBT-109	17	4 Hrs. for two consecutive days	100
B.Sc.II Yr.	VBP-XI (Practical) Annual pattern	Practical Based On Theory Papers Of VBT-107 & VBT-108	23	4 Hrs. for two consecutive days	100

*** Internal marks**

Workload:

1. **Theory** : Per paper per week three periods
2. **Practical** : Per batch per week two practical (Three periods)

B. Sc. SECOND YEAR BIOTECHNOLOGY (VOCATIONAL)
SEMESTER – III
THEORY PAPER I
VBT- 106 (MOLECULAR BIOLOGY)

Periods : 45

Maximum Marks: 50

Unit-I **(12 Periods)**

Molecular basis of life.
Structure of DNA.
DNA replication both prokaryotes and eukaryotes.
DNA recombination molecular mechanisms prokaryotic and eukaryotic

Unit-II **(12 periods)**

Insertion elements and transposons
Structure of prokaryotic genes
Prokaryotic transcription
Prokaryotic translation
Prokaryotic gene expression (lac,his,trp,catabolic repression)

Unit-III **(10Periods)**

Structure of eukaryotic genes
Eukaryotic transcription
Eukaryotic translation
Eukaryotic gene expression, transcription factors etc.

Unit-IV **(11 Periods)**

Gene expression in yeast
Gene expression in protozoan parasites
Gene organization and expression in mitochondria and chloroplasts
Post translation regulation of gene expression
Development and environmental regulation of gene expression

Text & References:

- 1.Molecular biology of Gene- Watson
2. Molecular Cell Biology - Lodish.
3. Molecular Biology - David Frifielder
- 4.Genomes – T.A.Brown
5. Molecular Biology- Upadhyay.
- 6.Gene VIII- Lewin

**B. Sc. SECOND YEAR BIOTECHNOLOGY (VOCATIONAL)
SEMESTER – III
THEORY PAPER -II
VBT- 107 (BIOPHYSICS)**

Periods : 45

Maximum Marks: 50

Unit-I

(10 Periods)

Bioenergetics of living body :sources of heat limits to temperature.
Heat dissipation and conservation.
Lambert –beer law, spectrophotometry,colorimetry.primary events in photosynthesis.
Strategies of light reception in microbes,plant and animals.

Unit-II

(10 Periods)

Correction of vision faults.
Electrical properties of biological compartment.
Electricity as a potential signal.
Generation and reception of sonic vibrations.hearing aides.

Unit-III

(13 Periods)

Intra and intermolecular interactions in biological system. Spatial and charge compatibility as determinant of such interactions.
Physical methods applied to find out molecular structure.
X-ray crystallography and NMR.
General spectroscopy- UV-vis ,fluorescence,atomic absorption, IR, Raman spectra.

Unit-IV

(12Periods)

Physical methods of imaging intact biological structures:
Ultrasound
Optical filters
X-ray
CAT scan
ECG
EEG
NMR imaging

Text & References:

- 1.Biophysical Chemistry – Nath & Upadhyay
2. Instrumental Methods Of Chemical Analysis – P.K.Sharma
- 3.Practical Biochemistry Principles & Techniques- Wilson Walker
4. Handbook Of Biomedical Instrumentation- R.S. Khandpur.

B. Sc. SECOND YEAR BIOTECHNOLOGY (VOCATIONAL)
SEMESTER – IV
THEORY PAPER I
VBT- 108 (IMMUNOLOGY & ANIMAL CELL CULTURE)

Periods : 45

Maximum Marks: 50

Unit-I

(10 Periods)

The immune system and immunity along with historical perspective
Antigen –antibody and their structure
The organs and the cells of the immune system and their function
Antigen –antibody interactions

Unit-II

(10 Periods)

Humoral and cell mediated immunity (role of MHC and genetic restriction)
Origin of diversity in the immune system
Effector mechanisms
Immunity to infectious diseases, vaccines

Unit-III

(12 Periods)

History of development of cell culture
The natural surroundings of animal cells
Metabolic capabilities of animal cells
Stimulating natural condition for growing animal cells
Importance of growth factors of the serum
Primary cultures .Anchorage dependence of growth .
Non-anchorage dependent cells.

Unit-IV

(13 Periods)

Secondary cultures transformed animal cells, established / continuous cell lines
Commonly used animal cell lines-their origin and characteristics
Growth kinetics of cells in culture
Application of animal cell culture for studies on gene expression
Organ culture
Transfection of animal cells : selectable markers,HAT selection, antibiotic resistance etc
Cell fusion
Transplantation of cultured cells
Differentiation of cells

Text & References:

1. Immunology – Kuby
2. Textbook Of Microbiology – R.Anantnarayan
3. Essentials Of Immunology- Roitt.I.M
4. Immunology – Nagoba
5. Plant Biotechnology-Ramawat
6. Biotechnology –B.D.Singh
7. Animal Tissue Culture- Paul
8. Cell Biology –Rastogi
9. Introduction To Plant Tissue Culture-M.K.Razdan

B. Sc. SECOND YEAR BIOTECHNOLOGY (VOCATIONAL)
SEMESTER – IV
THEORY PAPER II
VBT- 109 (RECOMBINANT DNA TECHNOLOGY)

Periods : 45

Maximum Marks: 50

Unit-I **(10 Periods)**

What is gene cloning and why do we need to clone a gene?
Tools & techniques plasmids and other vehicles genomic DNA, handling of DNA, RNA, cDNA, RT enzymes & other reagents techniques, laboratory requirement.
Safety measures and regulations for Recombinant DNA work
Choice and selection of the tools and the techniques.

Unit-II **(13 Periods)**

Vehicles; Plasmids & bacteriophages, available phagmids, cosmids, viruses
Purification of DNA from bacterial, plant and animal cells.
Manipulation of purified DNA.
Introduction of DNA into living cells.
Cloning vectors for *E. coli*.
Cloning vectors for organisms other than *E. coli* yeast, fungi, plants-Agrobact, plant viruses, animal viruses.

Unit-III **(12 Periods)**

Application of cloning in gene analysis.
How to obtain a clone of a specific gene
Studying gene location and structure
Studying gene expression
Gene cloning and expression of foreign gene in research and biotechnology.

Unit-IV **(10 Periods)**

Production of proteins from cloned genes
Gene cloning in medicines
-pharmaceutical compounds
-Artificial insulin gene
-Recombinant vaccines
-Diagnostic reagents

Text & References:

1. Gene cloning – T.A. Brown
2. Biotechnology – R.C. Duby
3. Biotechnology – P.K. Gupta
4. Biotechnology - Kumarsen
5. Biotechnology - B.D. Singh
6. Molecular biology of the gene – Watson J.D

**B.Sc. SECOND YEAR, BIOTECHNOLOGY (VOCATIONAL)
PRACTICAL PAPER – X (Annual)
BASED ON THEORY PAPERS OF VBT-106 &VBT-109**

Practical : 17

Maximum Marks : 100

MOLECULAR BIOLOGY & RECOMBINANT DNA TECHNOLOGY

Practical 1 : Isolation of DNA from Bacteria.

Practical 2 : Isolation of DNA from Fungi.

Practical 3 : Isolation of DNA from Plant.

Practical 4: Estimation of DNA by DPA method.

Practical 5: U.V Spectroscopic analysis of DNA.

Practical 6: Isolation of RNA from *S.cervisiae*.

Practical 7: Estimation of RNA by Orcinol method.

Practical 8: Estimation of protein by Folin –Lowery method.

Practical 9: Study of permeability changes in erythrocytes.

Practical 10: isolation of streptomycin resistant mutant of *E.coli*.

Practical 11: Separation of Amino acids by TLC.

Practical 12 :Vital staining of Vacuoles, Glycogen & Lipids.

Practical 13: Isolation of Plasmid DNA.

Practical 14: Transformation of *E.coli*.

Practical 15: Restriction enzymes.

Practical 16: Isolation of Ampicillin resistant bacteria.

Practical 17: Isolation & Quantitation of Nucleic acid.

**B.Sc. SECOND YEAR, BIOTECHNOLOGY (VOCATIONAL)
PRACTICAL PAPER – XI (Annual)
BASED ON THEORY PAPERS OF VBT-107 & VBT-108**

Practical : 23

Maximum Marks : 100

IMMUNOLOGY, ANIMAL CELL CULTURE & BIOPHYSICS

Practical 1 : Study of Blood Group.

Practical 2 : Determination of Rh factor.

Practical 3 : Total RBC count.

Practical 4 : Total WBC count.

Practical 5 : Differential leucocytes count.

Practical 6 : Determination of Clotting time of Blood.

Practical 7 : Determination of Bleeding time of Blood.

Practical 8 : Estimation of Hemoglobin.

Practical 9 : VDRL Test.

Practical 10 : RA Test.

Practical 11 : WIDAL Test.

Practical 12 : Cell count by Haemocytometer.

Practical 13 : Detection of Hemolysin activity of Bacteria.

Practical 14: Preparation of Animal cell culture media.

Practical 15: Isolation of chick embryo.

Practical 16: U.V Spectroscopic analysis of RNA.

Practical 17: Lambert – Beer;s Law.

Practical 18: Principle & working of X-ray.

Practical 19: Principle & working of Ultrasound / Sonography.

Practical 20: Principle & working of ECG.

Practical 21: Principle & working of EEG.

Practical 22: Principle & working of UV-spectrophotometer.

Practical 23: Principle & working of IR-spectroscopy.

SKELETON OF QUESTION PAPER
B.Sc. SECOND YEAR BIOTECHNOLOGY (VOCATIONAL)
SEMESTER-III
THEORY PAPER – 106 /107
VBT- 106 (MOLECULAR BIOLOGY) /
VBT- 107 (BIOPHYSICS)

Time: Three hours

Maximum Marks: 50

Note: - (i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

VBT- 106 MOLECULAR BIOLOGY

Q.1.	Short answer type (5X1)	05
Q.2.	Long Answer type (5X2)	10
Q.3.	Long Answer type (10X1)	10
Q.4	Multiple Choice Questions	15

VBT- 107 BIOPHYSICS

Q.1.	Short answer type (5X1)	05
Q.2.	Long Answer type (5X2)	10
Q.3.	Long Answer type (10X1)	10
Q.4	Multiple Choice Questions	15

SKELETON OF QUESTION PAPER

**B.Sc. SECOND YEAR BIOTECHNOLOGY (VOCATIONAL)
SEMESTER- IV
THEORY PAPER – 108 /109
VBT- 108 (IMMUNOLOGY & ANIMAL CELL CULTURE) /
VBT- 109 (RECOMBINANT DNA TECHNOLOGY)**

Time: Three hours

Maximum Marks: 50

Note: - (i) Attempt all questions
(ii) All questions carry equal marks
(iii) Draw neat and well labeled diagrams wherever necessary

VBT- 108 IMMUNOLOGY & ANIMAL CELL CULTURE

Q.1.	Short answer type (5X1)	05
Q.2.	Long Answer type (5X2)	10
Q.3.	Long Answer type (10X1)	10
Q.4	Multiple Choice Questions	15

VBT- 109 RECOMBINANT DNA TECHNOLOGY

Q.1.	Short answer type (5X1)	05
Q.2.	Long Answer type (5X2)	10
Q.3.	Long Answer type (10X1)	10
Q.4	Multiple Choice Questions	15

PROFORMA FOR PRACTICAL EXAMINATION

SWAMI RAMANAND TREETH MARATHWADA UNIVERSITY, NANDED

Faculty of Science

B. Sc. Second Year Vocational Biotechnology

Practical Examination

VBP- X (BTT-106 & BTT-109)

Time: 9.00 AM to 1.00 PM (For two consecutive days)

Marks: 100

Q 1) Major Question	(Molecular biology)	25
Q 2) Minor Question	(Molecular biology)	15
Q 3) Major Question	(Recombinant DNA technology)	25
Q 4) Minor Question	(Recombinant DNA technology)	15
Q 5) Viva-Voce		10
Q 6) Record Book		10

PROFORMA FOR PRACTICAL EXAMINATION

SWAMI RAMANAND TREETH MARATHWADA UNIVERSITY, NANDED

Faculty of Science

B. Sc. II year Vocational Biotechnology

Practical Examination

VBP- XI (BTT-107 & BTT-108)

Time: 2.00 PM To 6.00 PM (For two consecutive days)

Marks: 100

Q 1) Major Question	(Biophysics)	25
Q 2) Minor Question	(Biophysics)	15
Q 3) Major Question	(Immunology & Animal cell culture)	25
Q 4) Minor Question	(Immunology & Animal cell culture)	15
Q 5) Viva-Voce		10
Q 6) Record Book		10