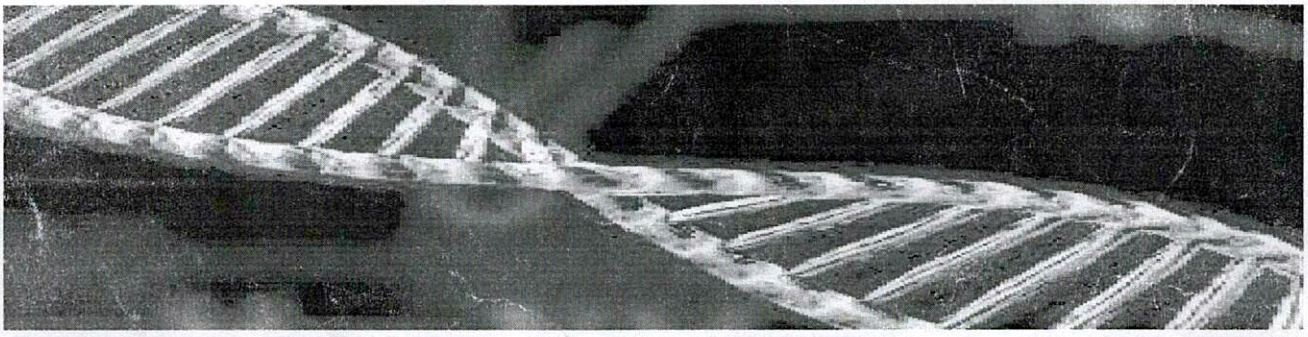
NAGARJUNA GOVERNMENT COLLEGE

(Autonomous), NALGONDA

(Affiliated to Mahatma Gandhi University)

BOARD OF STUDIES 2021-22



DEPARTMENT OF BIOTECHNOLOGY

Date : 13- 09-2021

To
The Principal ,
Nagarjuna Govt. Degree college (A),
Nalgonda.
Sir,

Sub: Grant of Autonomous status –Constitution of the Board of Studies in Biotechnology. Department – request for approval – Reg.

Ref: 1 . No.F. 22-1/2007 (AC) Dt.3 APR 2007
2.OU Lr . NoMR . 69/ H /2007/Acad, Dt : 12-6-07
3.Govt .No.467 HE .(CE-1) Dept. Dt: 29-6-07
4. MGU Lr . No : 704 / NGC / Academic / 2021, Date : 08-07-2021.

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With reference to the subject cited , I am here with submitting the list of committee members for Constitution of the Board of Studies for the academic year 2021-2022 for your approval.

S.No	CATEGORY	NAME & DESIGNATION	CONTACT NUMBER
1	Chairman Board of studies	Sri Md .Ashraf ali Asst prof of Botany Incharge dpt of Biotechnology	9000196247
2	University nominee	**Dr.M .Thirumala** Dept of Applied Biosciences, MGU. Nalgonda.	9490705105
3	Subject Expert-I	**Dr.K.Premsagar** Dept of Applied Biosciences, MGU. Nalgonda.	9866627028
4	Subject expert -II	**Dr.T.Sivaram** Dept of Applied Biosciences, MGU. Nalgonda.	9032694559

Submitted by
In charge/ Chairman BOS
Council.

Head of the Department
Biotechnology
Nagarjuna Government College
NALGONDA.

Proposals approved by
Principal /Chairman Academic

Principal
Nagarjuna Govt. College
(Autonomous) NALGONDA

NAGARJUNA GOVERNMENT COLLEGE(A)

DEPARTMENT OF BIOTECHNOLOGY

COMPOSITION OF BOARD OF STUDIES

Board of Studies in the Department of Biotechnology has been constituted with the following members for the year 2021-22.

SL NO	Category	Name and Designation
1	**Chairman Board of Studies**	**Sri Md . Ashraf ali** Asst prof of Botany Incharge dpt of Biotechnology
2	**University Nominee**	**Dr. M.Thirumala** Dept of Applied Biosciences, MGU. Nalgonda.
3	**Subject expert -1 From outside college**	**Dr.K.Premsagar** Dept of Applied Biosciences, MGU. Nalgonda.
4	**Subject expert -2 From outside college**	**Dr.T.Sivaram** Dept of Applied Biosciences, MGU. Nalgonda.
5	**Faculty member of the deparment.**	**Sri. Ayesha** Lecturer Department of Biotechnology

Head of the Department
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Dr. Korripally Premsagar
Assistant Professor
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Dr. T. SIVA RAM
Asst. Professor
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NAGARJUNA GOVERNMENT COLLEGE(A)

DEPARTMENT OF BIOTECHNOLOGY

Agenda

- To consider and approve the syllabus for I to VI semester during 2021-22
- Continuation of choice Based Credit System(CBCS) for this academic year 2021-22
- To conduct 2 internal assignments 30 marks each in the form of (20 marks for written examination ,5 marks for Assignment and 5 marks for Seminar)I & II,III year.
- To consider and approve the model question paper for 2021-22
- To consider and approve the list of examiners for paper setting , evaluation etc., (3 of each paper) I to VI semester during 2021-22
- The following resolutions were unanimously adopted in the staff meeting held on
- To conduct the meeting of BOS and submit the resolutions to the Academic council for this academic year
- Unitization of Syllabus into IV units in each semester
- To conduct two internal Assignment for 20 marks each in the form of descriptive type and MCQ for I ,II,III year.
- It is compulsory to a student to pass in external exam with minimum of 28 marks in sem end exam and altogerher (semend28 +internal 12) 40 marks and one has to secure 40% marks in each subject / paper.
- To conduct semester and examination for 70 marks
- To pass sem end exam one has to get a minimum of 40% of marks in each subject/ paper
- 3.for odd semester and in December and February respectively for even semester.
- To design the question paper **Pattern in the following lines.**
- SECTION-A,SECTION-B,SECTION-C
- To give 5 questions with no choice and ask the students to answer all questions **5x2=10**
- To give 6 quesitons with inernal choice and ask the students to answer 4 questions **4x5=20**
- To give 8 questions with internal choice and ask the students to answer 4 questions **4x10=40**

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NAGARJUNA GOVERNMENT COLLEGE
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DEPARTMENT OF BIOTECHNOLOGY
BOARD OF STUDIES MEETING

Resolutions.

The Board of studies in the Department of Biotechnology met on Date 13- 09- 2021 under the Chairmanship of the Board of studies and adopted the following Resolutions.

1. Continuation of Choice Based Credit System(CBCS)for I,II& III year for academic year2021-2022
2. Each semester will have 4 units
3. To Conduct 2 (two)internal assignments 30 marks (20 marks for written examination ,5marks for Assignment and 5 marks for Seminar) for I ,II &III year .
4. It is compulsory to a student to pass in internal exam and to pass in internal examination are has to secure 40% marks.
5. To conducts semester end Examination for 70 marks for I, II& III year for year .
6. To pass and examination are has to get a minimum of 40% of marks in each paper.
7. Conducting of I internal in the last week of August and II internal in the first week of October of the academic year.
8. To Design the question paper in the following pattern:
   I ,II& III year in section-A to give 5 Questions and ask the students to answer all Questions(VSA) 5x2=10.
   In section-B to give 6 Questions and ask the students to answer 4 Questions (SA) 4x5=20.
   In section-C to give 4 Questions with internal choice and ask the students to answer 4 Questions 4x10=40.
9. At the Commencement of All Semester to prepare and supply question Banks (Description & Objective type) to the students.
10. Continuous internal assessment method to evaluate the progress of the students
    Approved the panel of examiner for paper setting and evaluation for the year 2021-22.

Chairman Board of Studies	**Sri.Md Ashraf ali** ,Asst.Prof Incharge Dept of Biotechnology, N.G College ,Nalgonda.
University Nominee	**Sri.Dr.M.Thirumala**,Asst.Prof UCSI . MGU Nalgonda
Subject Expert from out side college	**1.Sri.Dr.T.Sivaram**,Asst.Prof, Dept of Applied Bioscience University college of science &informaticsMGU Nalgonda.
	2.Smt.Dr. K. Prem Sagar,Asst.Prof, Dept of Biotechnology, MGU,Nalgonda.

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NAGARJUNA GOVT DEGREE COLLEGE NALGONDA (A)
DEPARTMENT OF BIOTECHNOLOGY

FIRST YEAR- SEMESTER I

CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS
BS 101	Environmental Science/Basic Computer Skills	AECC-1	2	2
BS 102	English	CC-1A	4	4
BS 103	Second language	CC-2A	4	4
BS 104	**Optional I- Cell biology and Genetics**	**DSC-1A**	**4T+3P=7**	**4+1=5**
BS 105	Optional II	DSC-2A	---------	4+1=5
BS 106	Optional III	DSC-3A	---------	4+1=5
	TOTAL			**25**

FIRST YEAR- SEMESTER II

BS 201	Gender Sensitization	AECC-2	2	2
BS 202	English	CC-1B	4	4
BS 203	Second language	CC-2B	4	4
BS 204	**Optional I- Biological Chemistry and Microbiology**	**DSC-1B**	**4T+3P=7**	**4+1=5**
BS 205	Optional II	DSC-2B	-----	4+1=5
BS 206	Optional III	DSC-3B	-------	4+1=5
	TOTAL			**25**

SECOND YEAR- SEMESTER III

BS 301	**SEC 1: Industrial Fermentation**	**SEC-1**	**2**	**2**
BS 302	**SEC 2:Immunological techniques**	**SEC-2**	**2**	**2**
BS 303	English	CC-1C	3	3
BS 304	Second language	CC-2C	3	3
BS 305	**Optional I- Molecular Biology and Recombinant DNA Technology**	**DSC-1C**	**4T+3P=7**	**4+1=5**
BS 306	Optional II	DSC-2C	---------	4+1=5
BS 307	Optional III	DSC-3C	----------	4+1=5
	TOTAL			**25**

SECOND YEAR- SEMESTER IV

BS 401	**SEC 3: Molecular markers in plant breeding**	**SEC-3**	**2**	**2**
BS402	**SEC 4: Drug designing**	**SEC-4**	**2**	**2**
BS 403	English	CC-1D	3	3
BS 404	Second language	CC-2D	3	3
BS 405	**Optional I- Bioinformatics and Biostatistics**	**DSC-1D**	**4T+3P=7**	**4+1=5**
BS 406	Optional II	DSC-2D	--------	4+1=5
BS 407	Optional III	DSC-3D	---------	4+1=5
	TOTAL			**25**

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THIRD YEAR- SEMESTER V

CODE	COURSE TITLE	COURSE TYPE	HPW	CREDITS
BS 501	English	CC-1E	3	3
BS 502	Second language	CC-2E	3	3
BS 503	**Basics in Biotechnology**	**GE**	**4**	**4**
BS 504	**Optional I- A/B** **(1A)Plant Biotechnology** **or** **(1B)** MEDICAL BIOTECHNOLOGY	**DSE -1E**	**4T+3P=7**	**4+1=5**
BS 505	Optional- II **A/B**	DSE -2E	------	4+1=5
BS 506	Optional- III **A/B**	DSE -3E	-------	4+1=5
	TOTAL			**25**

THIRD YEAR- SEMESTER VI

BS 601	Project in Biotechnology/ **Optional I: (IPR, Biosafety and Entrepreneurship)**	**Project work/Opt.P**		**4**
BS 602	English	CC-1F	3	3
BS 603	Second language	CC-2F	3	3
BS 604	**Optional II- A/B** **(A) Animal Biotechnology** **(B)** **or** **(C) Environmental Biotechnology** ← BIODIVERSITY	**DSE-1F**	**4T+3P=7**	**4+1=5**
BS 605	Optional- II A/B	DSE -2F	--------	4+1=5
BS 606	Optional- III A/B	DSE -3F	-------	4+1=5
	TOTAL			**25**
	TOTAL Credits			**150**

Total credits= 164-12 (AECC 4 + SEC 8) =15

AECC: Ability Enhancement Compulsory Course
SEC: Skill Enhancement Course
DSC: Discipline Specific Course
DSE: Discipline Specific Elective
GE: Generic Elective

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SEMESTER-I CORE COURSE DCS -1

(1) I

THEORY-I

CELL BIOLOGY AND GENETICS

BSc BiotechnologySyllabusw.e.f 2019 onwards

1. Unit : Cell structure and Functions

1.1. Cell as basic unit of living organisms-bacterial, fungal, plant and animal cells
1.2. Ultrastructure of prokaryotic cell (cell membrane and plasmids, Nucleoid)
1.3. Ultrastructure of eukaryotic cell (cell wall, cell membrane, nucleus,mitochondria, chloroplast, endoplasmic reticulum, Golgi apparatus, vacuoles)
1.4. Fluid mosaic model, Sandwich model, Cell membrane permeability
1.5. Structure of chromosome-morphology, components of chromosomes (histones andnon- histones), specialized chromosomes (Polytene, Lampbrush)
1.6. Chromosomal aberrations- structural and numerical.

2. Unit : Cell Division and Cell cycle

2.1. Bacterial cell division
2.2. Eukaryotic cell cycle –phases
2.3. Mitosis - Stages (spindle assembly)-significance
2.4. Meiosis- Stages (synaptonemal complex)-significance
2.5. Senescence and necrosis
2.6. Apoptosis.

3. Unit : Principles and mechanism of inheritance

3.1. Mendel's experiments- factors contributing to success of Mendel's experiments
3.2. Law of segregation- Monohybrid Ratio; Law of independent assortment- DihybridRatio,Trihybrid Ratio
3.3. Deviation from Mendel's laws- partial or incomplete dominance (eg: Flower Color inMirabilis jalapa), Co-dominance (eg: MN Blood groups), Non allelic interactions-types of epistasis, modification of dihybrid ratios
3.4. Penetrance and Expressivity (eg: Polydactyly, Waardenburg syndrome),pleiotropism, phenocopy- microcephaly, cleft lip
3.5. Multiple alleleism (eg: Coat color in Rabbits, eye color in Drosophila and ABO Bloodgroups)
3.6. X-Y chromosomes - Sex determination in Drosophila, Man, X-linked inheritance–Hemophilia and Color blindness; X-inactivation.

4. Unit : Linkage, Recombination and Extension to Mendel's Laws

4.1. Linkage and recombination- Cytological proof of crossing over, phases of linkage,recombination frequency, gene mapping and map distance
4.2. Non-Mendelian Inheritance – Maternal effect (Shell coilng in snail), variegation in leavesof Mirabilis jalapa
4.3. Cytoplasmic male sterility in Maize.
4.4. Mitochondrial inheritance in human and poky in Neurospora crassa
4.5. Chloroplast inheritance in Chlamydomonas
4.6. Hardy-Weinberg Equilibrium

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CELL BIOLOGY AND GENETICS

SEMESTER-I

CORE-I: PRACTICALS

1. Microscopic observation of cells: bacteria, fungi, plant and animal
2. Preparation of different stages of Mitosis (onion root tips)
3. Preparation of different stages of Meiosis (grasshopper testis)
4. Preparation of Polytene chromosome from Drosophila salivary gland
5. Monohybrid and dihybrid ratio in Drosophila
6. Monohybrid and dihybrid ratio in Maize
7. Problems on co-dominance, epistasis, two point and three point test cross, gene mapping.
8. Statistical applications of Hardy-Weinberg Equilibrium

Spotters:

1. Prokaryotic Cell(Bacteria),
2. Mitochondria,
3. Chlorolplast,
4. Polytene Chromosomes,
5. Test Cross,
6. Blood Grouping,
7. Hemophilia Pedigree,
8. Crossing Over
9. Synaptonemal Complex,
10. Nucleosome Model.

REFERENCE BOOKS

1. Cell & Molecular Biology. E.D.D De Robertis & E.M.F De Robertis, Waverly publication
2. An introduction to Genetic Analysis by Anthony, J.F. J.A. Miller, D.T. Suzuki, R.C. Richard Lewontin, W.M-Gilbert, W.H. Freeman publication
3. Principles of Genetics by E.J.Gardner and D.P. Snusted. John Wiley & Sons, New York
4. The science of Genetics, by A.G. Atherly J.R. Girton, J.F. Mcdonald, Saundern College publication
5. Principles of Genetics by R.H. Tamarin McGrawhill
6. Theory & problems in Genetics by Stansfield, Schaum out line series McGrawhill
7. Molecular Cell Biology Lodish, H., Baltimore, D; fesk, A., Zipursky S.L., Matsudaride, P. and Darnel. American Scientific Books. W.H. Freeman, New York
8. The cell: A molecular approach. Geoffrey M Cooper, Robert E Hausman, ASM press
9. Cell and Molecular Biology, Concepts and Experiments – Gerald Karp, John Wiley & Sons, Inc.
10. Cell Biology And Genetics by P.K. GUPTA

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CELL BIOLOGY AND GENETICS

SEMESTER-I

PAPER-I

SECTION-A **Marks:70**

I.ANSWER THE FOLLOWING QUESTIONS 5x2=10M

1.
2.
3.
4.
5.

SECTION -B

II.ANSWER ANY TWO OF THE FOLLOWING QUESTIONS 4x5=20M

6.
7.
8.
9.
10.
11

SECTION-C

III.ANSWER THE FOLLOWING QUESTIONS **4x10=40M**

12 A)

OR

B.)

13.A.)

OR

B.) A.)

OR

B.)

15.A.)

OR

B.)

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DEPARTMENT OF BIOTECHNOLOGY
FINAL PRACTICAL EXAMINATION-
FIRST YEAR –MODEL
SEMESTER -1 I YEAR BATCH: MARKS 50

I.	MAJOR EXPERIMENT. 1	20M
II.	MINOR EXPERIMENT. 2.	10M
III.	SPOTTERS.	5X3=15M
	A). B). C). D). E).	
IV.	RECORD &VIVA.	5M

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NGU

SEMESTER-II CORE COURSEDCS -2

THEORY-II

BIOLOGICAL CHEMISTRY AND MICROBIOLOGY

Unit 1: Biomolecules

1.1. Carbohydrates- importance, classification; structure and functions of monosaccharides (glucose & fructose), disaccharides (sucrose, lactose & maltose) and polysachharides (starch, glycogen & insulin)

1.2. Amino acids- importance, classification, structure, physical and chemical properties of amino acids;peptide bond formation

1.3.Proteins- importance, structure of proteins- primary, secondary, tertiary and quaternary

1.4.Lipids- importance, classification- simple lipids (triacylglycerides & waxes), complex lipids(phospholipids & glycolipids), derived lipids (steroids, terpenes & carotenoids)

1.5. Nucleic acids :structure and chemistry of DNA (Watson and crick) and RNA(TMV) Structure andforms of DNA (A, B and Z)

1.6. Enzymes- importance, classification and nomenclature; Michaelis-Menton Equation, factors influencingthe enzyme reactions; enzyme inhibition (competitive, uncompetitive & mixed), co-enzymes.

Unit 2: Bioenergetics

2.1 Glycolysis, Tricarboxylic Acid (TCA) Cycle,

2.2 Electron Transport, Oxidative Phosphorylation

2.3 Gluconeogenesis and its significance

2.4 Transamination and Oxidative deamination reactions of amino acids

2.5 B-Oxidation of Fatty acids

2.6 Glyoxalate cycle.

Unit 3: Fundamentals of Microbiology

3.1Historical development of microbiology and contributors of microbiology

3.2Microscopy: Bright field microscopy, Dark field microscopy, Phase contrast microscopy, Flourescentmicroscopy, Scanning and Transmission electron microscopy

3.3Outlines of classification of microorganisms

3.4Structure and general characteristics of bacteria and virus

3.5Disease causing pathogens and symptoms (Eg:*Mycobacterium*,*Hepatitis*)

3.6Structure and general characteristics of micro-algae and fungi.

Unit 4: Culture and identification of microorganisms

4.1 Methods of sterilization- physical and chemical methods

4.2 Bacterial nutrition nutritional types of bacteria, essential macro micro nutrients and growth factors.

4.3 Bacterial growth curve-batch and continuous cultures, synchronous cultures measurement of bacterialgrowth-measurement of cell number and cell mass.

4.4 Factors affecting bacterial growth

4.5 Culturing of anaerobic bacteria and viruses

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BIOLOGICAL CHEMISTRY AND MICROBIOLOGY

SEMESTER-II PRACTICALS

BS306: BIOCHEMISTRY AND MICROBIOLOGY

1. Preparation of normal molar, molal solutions.
2. Preparation of buffers (acidic, basic ,neutral)
3. Qualitative tests of sugars, amino acids and lipids
4. Estimation of total sugars by anthrone method
5. Separation of amino acids by paper chromatography
6. Estimation of proteins by biuret method
7. Sterilization methods
8. Preparation of microbiological media (bacterial, algal & fungal)
9. Isolation of bacteria by streak, spread and pour plate methods
10. Isolation of bacteria from soil
11. Simple staining and differential staining (gram's staining)
12. Bacterial growth curve
13. Technique of micrometry(ocular and stage)

Spotters:

1. Osazone
2. Globular protein
3. Lock and key model
4. Completive inhibition
5. RUBISCO
6. ATP synthase
7. Autoclave
8. Laminar air flow
9. Tyndalization
10. Bacterial growth curve
11. Hot air oven
12. Serial dilution technique

REFERENCE BOOKS

1. Lehninger Principles of Biochemistry By: David L. Nelson and Cox
2. Biochemistry By: Rex Montgomery
3. Harper's Biochemistry By: Robert K. Murray
4. Enzymes By: Trevor Palmer
5. Enzyme structure and mechanism By: AlanFersht
6. Principles of Biochemistry By: Donald J. Voet, Judith G.Voet, Charlotte W.Pratt
7. Analytical Biochemistry By: Cooper
8. Principles and techniques of Biochemistry and Molecular Biology Edited By: Keith Wilson and John Walker
9. Experimental Biochemistry: A Student Companion by: Sashidhar Beedu et al.
10. Practical Biochemistry By: Plummer
11. Biology of Microorganisms by: Brock, T.D. and Madigan, M.T.
12. Microbiology by: Prescott, L.M., Harley, J.P. Klein, D.A.

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CELL BIOLOGY AND GENETICS
SEMESTER-II
PAPER-II

SECTION-A **Marks:70**

I.ANSWER THE FOLLOWING QUESTIONS 5x2=10M

1.
2.
3.
4.
5.

SECTION -B

II.ANSWER ANY TWO OF THE FOLLOWING QUESTIONS 4x5=20M

6.
7.
8.
9.
10.
11

SECTION-C

III.ANSWER THE FOLLOWING QUESTIONS **4x10=40M**

12 A)

OR

B.)

13 .A.)

OR

B.)

14) A.)

OR

B.)

15 .A.)

OR

B.)

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FINAL PRACTICAL EXAMINATION-

FIRST YEAR –MODEL

SEMESTER -I1 I YEAR BATCH: MARKS 50

I.	MAJOR EXPERIMENT. 1	20M
II.	MINOR EXPERIMENT. 2.	10M
III.	SPOTTERS.	5X3=15M
	A).	
	B).	
	C).	
	D).	
	E).	
IV.	RECORD &VIVA.	5M

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CELL BIOLOGY AND GENETICS

SEMESTER-I

PAPER-I

SECTION-A **Marks:70**

I.ANSWER THE FOLLOWING QUESTIONS 5x2=10M

1.
2.
3.
4.
5.

SECTION -B

II.ANSWER ANY TWO OF THE FOLLOWING QUESTIONS 4x5=20M

6.
7.
8.
9.
10.
11

SECTION-C

III.ANSWER THE FOLLOWING QUESTIONS **4x10=40M**

12 A)

OR

B.)

13 .A.)

OR

B.)

14) A.)

OR

B.)

15 .A.)

OR

B.)

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NAGARJUNA GOVERNMENT COLLEGE
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NALGONDA
DEPARTMENT OF BIOTECHNOLOGY
FINAL PRACTICAL EXAMINATION-
FIRST YEAR –MODEL
SEMESTER -1 I YEAR BATCH: MARKS 50

I.	MAJOR EXPERIMENT. 1	20M
II.	MINOR EXPERIMENT. 2.	10M
III.	SPOTTERS.	5X3=15M
	A).	
	B).	
	C).	
	D).	
	E).	
IV.	RECORD &VIVA.	5M

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B.Sc BIOTECHNOLOGY

II YEAR SEMESTER- III

SKILL ENHANCEMENT COURSE-1 (SEC-1) BS 301:
INDUSTRIAL FERMENTATION CREDITS - 2

1. Unit: Production of industrial chemicals, biochemicals, chemotherapeutic products and purification of proteins.

1.1 Propionic acid, butyric acid, 2-3 butanediol, gluconic acid, itaconic acid
1.2 Biofuels: biogas, ethanol, butanol, hydrogen, biodiesel
1.3 Microbial insecticides; microbial flavours and fragrances, newer antibiotics Anti cancer agents, amino acids
1.4 Upstream and downstream processing, solids and liquid handling Centrifugation, filtration of fermentation broth and anaerobic fermentation

2. Unit: Microbial products of pharmacological interest

2.1 Steriod fermentations and transformations
2.2 Metabolic engineering of secondary metabolism for highest productivity
2.3 Enzyme and cell immobilization techniques in industrial processing
2.4 Rate equations for enzyme kinetics- Simple and complex reactions
2.5 Enzymes in organic synthesis, proteolytic enzymes, hydrolytic enzymes, glucose isomerise
2.6 Enzymes in food technology/organic synthesis

REFERENCE BOOKS

1. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.
2. Cassida, L.E. (1968). Industrial Microbilogy, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.
3. Crueger, W. and Crueger, A. (2000). Biotechnology – A Text Book of Industrial Microbiology, Panima Publishing Corporation, New Delhi
4. Reedy, G. (Ed.) (1987). Prescott & Dunn's Industrial Microbiology, 4th Edition, CBS Publishers & Distributors, New Delhi.
5. Reddy, S.R. and Singara Charya, M.A. (2007). A Text Book of Microbiology - Applied Microbiology. Himalaya Publishing House, Mumbai.
6. Singh, R.P. (2007). Applied Microbiology. Kalyani Publishers, New Delhi.
7. Demain, A.L. and Davies, J.E. (1999). Manual of Industrial Microbiology and Biotechnology, ASM Press, Washington, D.C., USA.

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B.Sc BIOTECHNOLOGY II
YEAR SEMESTER- III
SKILL ENHANCEMENT COURSE -2
(SEC- 2) BS 302: IMMUNOLOGICAL TECHNIQUES
CREDITS - 2

1. Unit: Antibody assays - Principle, Methodology and Applications

1.1 Antigen - Antibody reactions: opsonisation, neutralization, precipitation & agglutination Immuno diffusion & radial diffusion
1.2 Immuno electrophoresis-rocket and counter current
1.3ELISA & western blotting
1.4 Radioimmunology assay & immune fluorescent assay Immunohisto chemistry

2. Unit: Cellular Assays - Principle, Methodology and Applications

2.1Total and differential count in human peripheral blood
Separation of mononuclear cells from human peripheral blood
2.2 Cell viability assay using tryphan blue
Lymphocyte transformation assay
2.3 Enumeration of T & B cells from human peripheral blood
2.4 Micro cytotoxicity assay for HLA typing

REFERENCE BOOKS

1. Essential Immunology by I. Roitt, Publ: Blackwell
2. Immunology by G. Reever& I. Todd, Publ: Blackwell
3. Cellular and Molecular Immunology by Abbas AK, Lichtman AH, Pillai S. Saunders publication, Philadelphia
4. Kuby's Immunology by Golds RA, Kindt TJ, Osborne BA. W.H. Freeman and company, New York

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MODEL QUESTION PAPER FOR- SEC

B.Sc BIOTECHNOLOGY

II YEAR SEMESTER-III

SKILL ENHANCEMENT COURSE-1 SEC-1) BS 301::

INDUSTRIAL FERMENTATION - CREDITS-2

MARKS 40

Answer the following All questions **4 x5 = 20**

1)
2)
3)
4)

Answer the following essays **2x10=20**

5) A)

OR

B)

6) A)

OR

B)

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MODEL QUESTION PAPER FOR- SEC

B.Sc BIOTECHNOLOGY

II YEAR SEMESTER-III

SKILL ENHANCEMENT COURSE-1 (SEC-1) BS 302:

(SEC- 2) BS 302: IMMUNOLOGICAL TECHNIQUES CREDITS-2

MARKS 40

Answer the following All questions **4 x5 = 20**

1)
2)
3)
4)

Answer the following essays **2x10=20**

5) A)

OR

B)

6) A)

OR

B)

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NAGARJUNA GOVERNMENT COLLEGE,NALGONDA

SEMESTER III
CORE THEORY III
MOLECULAR BIOLOGY AND RECOMBINANT DNA TECHNOLOGY

Unit 1: Gene expression in prokaryotes and eukaryotes

1.1 Organization of prokaryotic and eukaryotic genes, gene families-homogenous, heterogenous gene families, pseudogenes, split genes
1.2 Transcription in prokaryotes: initiation, elongation, termination
1.3 Transcription in eukaryotes: initiation, elongation, termination
1.4 Processing and maturation of eukaryotic RNA (Splicing)
1.5 Genetic code, properties of genetic code, Wobble concept, aminoacylation
1.6 Translation in prokaryotes and eukaryotes

Unit 2: Regulation of Gene expression in Prokaryotes and Eukaryotes

2.1 Regulation in prokaryotes: general aspects of regulation
2.2 Transcription level regulation-positive, negative and coordinated regulation (inducible–lac operon and repressible operon concept – trp operon
2.3 Regulation in Eukaryotes: genome rearrangement for generation of functional protein sequences (immunoglobulin genes)
2.4 Transcriptional control by cis (enhancers, silencers) and Trans (transcription factors) regulatory elements
2.5 Translational regulation in prokaryotes
2.6 Translational regulation in eukaryotes

Unit 3: Introduction to Recombinant DNA Technology

3.1 Enzymes useful in molecular cloning: Restiction endonuclease, DNA ligases, Polynucleotide kinase, Klenow enzyme, DNA Polymerase I, reverse transcriptase, Alkaline phosphatase, terminal nucleotidyltransferase
3.2 Plasmids as cloning vehicles-pBR322, pUC 18 and pET
3.3 Cloning and expression of foreign genes in E.coli
3.4 Labeling nucleic acids and blotting techniques
3.5 Polymerase Chain Reaction and its applications
3.6 Applications of recombinant DNA technologies

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NAGARJUNA GOVERNMENT COLLEGE(A)
DEPARTMENT OF BIOTECHNOLOGY

SEMESTER III
CORE THEORY III
MOLECULAR BIOLOGY AND RECOMBINANT DNA TECHNOLOGY

CORE-V: PRACTICALS

1. Isolation of DNA from bacterial cells
2. Isolation of plasmid DNA
3. Agarose gel electrophoresis of DNA
4. Quantification of DNA by Spectrophotometer
5. Separation of proteins by SDS-PAGE
6. Bacterial Transformation (Selection of transformants with Blue-white selection)
7. Polymerase Chain Reaction
8. Restriction digestion of DNA

REFERENCE BOOKS

1. Molecular Biology of the cell. Alberts, B; Bray, D, Lews, J., Raff, M., Roberts, K and Watson, J.D. Garland publishers, Oxford
2. Molecular Biology of the Gene - By Watson, Hopkins, Goberts, Steitz and Weiner (Pearson Education)
3. Text Book of Biotechnology - By H.K. Das (Wiley Publications)
4. Gene Structure & Expression - By J.D. Howkins, Publ: Cambridge
5. Test Book of Molecular Biology - By K.S. Sastry, G. Padmanabhan & C. Subramanyan, Publ: Macmillan Indi
6. Principles of Gene Manipulation - By R.W. Old & S.B. Primrose, Publ: Blackwell
7. Genes - By B. Lewin - Oxford Univ. Press
8. Molecular Biology &Biotechnol - By H.D. Kumar, Publ: Vikas
9. Methods for General & Molecular Bacteriology - By P. Gerhardf et al., Publ: ASM
10. Molecular Biotechnology - By G.R. Click and J.J. Pasternak, Publ: Panima
11. Genes and Genomes – By Maxine Singer and Paul Berg
12. Molecular Biology - By D. Freifelder, Publ: Narosa
13. Molecular biology. By;F.Weaver. WCB/McGraw Hill
14. Gene, Genomics and Genetic Engineering - By Irfan Ali Khan and AtiyaKhanum (Ukaaz Publications)

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MODEL QUESTION PAPER FOR

SEMESTER III
CORE THEORY III
MOLECULAR BIOLOGY AND RECOMBINANT DNA TECHNOLOGY

Marks:70

I.ANSWER THE FOLLOWING QUESTIONS 5x2=10M

1.
2.
3.
4.
5.

SECTION -B

II.ANSWER ANY TWO OF THE FOLLOWING QUESTIONS 4x5=20M

6.
7.
8.
9.
10.
11

SECTION-C

III.ANSWER THE FOLLOWING QUESTIONS **4x10=40M**

12 A)

OR

B.)

13 .A.)

OR

B.)

14) A.)

OR

B.)

15 .A.)

OR

B.)

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DEPARTMENT OF BIOTECHNOLOGY
FINAL PRACTICAL EXAMINATION-

MOLECULAR BIOLOGY AND RECOMBINANT DNA TECHNOLOGY

MARKS 50

I.	MAJOR EXPERIMENT. 1	20M
II.	MINOR EXPERIMENT. 2.	10M
III.	SPOTTERS.	5X3=15M
	A).	
	B).	
	C).	
	D).	
	E).	
IV.	RECORD &VIVA.	5M

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B.Sc BIOTECHNOLOGY II YEAR
SEMESTER- IV
SKILL ENHANCEMENT COURSE-3 (SEC-3)
BS 401: MOLECULAR MARKERS IN PLANT BREEDING

1. Unit: Molecular markers in Plant Breeding

1.1 Types of markers - morphological, cytological, biochemical and genetic markers
1.2 Development of molecular markers - scope in plant breeding; criteria for ideal molecular markers
1.3 Types of molecular markers
1.4 Hybridization based molecular markers - RFLP
1.5 PCR based molecular markers - RAPD, SSRs, AFLP
1.6 Sequence based molecular markers - SNPs and DArTs

2. Unit: Applications of Molecular markers in Plant Breeding

2.1Segregating populations - backcross, double haploid, F_2&F_3 families, RILs
2.2 Linkage mapping and QTL mapping
2.3 Marker Assisted Selection (MAS) - procedure and applications
2.4 Map based cloning of genes
2.5Fingerprinting - fingerprinting genotypes; assessment of genetic similarity among genotypes; conservation, evaluation and use genetic resources
Hybrid testing

REFERENCE BOOKS

1. Gupta PK. 2010. Plant Biotechnology. Rastogi Publications.
2. Chawla HS. 2011. Introduction to Plant Biotechnology. Oxford and IBH Publishing Co. Pvt Ltd.
3. Chittaranjan K. 2006-07. Genome Mapping and Molecular Breeding in Plants. Vols. I-VII. Springer.16
4. Newbury HJ. 2003. Plant Molecular Breeding. Blackwell Publ.Weising K, Nybom H, Wolff K & Kahl G. 2005. DNA Fingerprinting in Plants: Principles, Methods and Applications. Taylor & Francis.

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B.Sc BIOTECHNOLOGY II YEAR
SEMESTER- IV
SKILL ENHANCEMENT COURSE-4 (SEC-4)
BS 402: DRUG DESIGNING

1. Unit: Introduction to Drug Discovery

1.1 Drug discovery process - historical perspective and challenges
1.2 Drug targets: proteins- receptors, ion channels and transporters; DNA- gene specific inhibitors of transcription
1.3 Drug target identification and validation: genetic approaches to identify target candidates such as mapping disease loci; role of bioinformatics in the analysis of nucleic acid sequence, proteinsequence and structure.
1.4 Structural bioinformatics: prediction of 3D structure of protein using homology modelling, threading and ab-initio approach.
1.5 Structure-based drug design: active site detection, docking, binding energy calculations
1.6 Ligand-based drug design: computational methods to screen databases for new leads

2. Unit: Strategies of Drug Development

2.1Strategies of drug designing: lead generation through combinatorial chemistry
2.2.Preparation of active compounds: natural products, synthetic compounds, semi synthetic compounds
2.3 Lead identification: High throughput screening and hit generation- small molecule drugs, large molecule drugs.
2.4 Lead optimization: Properties of druggable compounds (Lipinski rule), pharmacokinetics and pharmacodynamics
Screening of lead moleculesfrom the phase I- IVto final drug molecule.
Pharmacogenomics: it's role in drug development and optimization

REFERENCE BOOKS

1. Textbook of Drug Design. Krogsgaard-Larsen, Liljefors and Madsen (Editors), Taylor and Francis, London UK, 2002.
2. Drug Discovery Handbook S.C. Gad (Editor) Wiley-Interscience Hoboken USA, 2005.
3. Advanced Computer- Assisted Techniques in Drug Discovery in Methods and Principles in Medicinal Chemistry by Han van de Waterbeemd (ed.) Volume 3,1994, Publishers, New York, NY (USA).
4. Virtual Screening for Bioactive Molecules by in Methods and Principles inMedicinal Chemistry, Edited by Hans-Joachim Bohm and GisbertSchneider,Volume 10, 2000
5. Burger's Medicinal Chemistry and Drug Discovery, 6th Edition, Vol. 1. Principles and Practice, edited by M. E. Wolff, John Wiley & Sons: New York, 2003.
6. Real world drug discovery: A chemist's guide to biotech and pharmaceutical research by Robert M. Rydzewski, Elsevier Science, 1 edition (2008)
7. Drug discovery and development: Technology in transition by Raymond G Hill,

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B.Sc BIOTECHNOLOGY II YEAR
SEMESTER- IV
OPTIONAL-I (DSC-1D)
BS 405: BIOINFORMATICS AND BIOSTATISTICS

1. Unit: Introduction to bioinformatics and biological databases

1.1 Bioinformatics definition, history, scope and applications
1.2Bioinformatics tools and resources- internet basics, role of internet, free online tools, downloadable free tools
1.3 Bioinformatic web portals – NCBI, EBI, ExPASy
1.4 Biological databases: Classification of databases - primary (Genbank), secondary (PIR) and tertiary or composite (KEGG) databases
1.5 Sequence databases - DNA sequence databases (ENA &DDBJ)
1.6 Protein sequence databases (Swissprot& PROSITE)

2. Unit: Sequence Alignment

2.1 Basics of sequence alignment - match, mismatch, gaps, gap penalties, scoring alignment
2.2 Types of sequence alignment - pairwise and multiple alignment, local and global alignment
2.3 Dot matrix comparison of sequences
2.4 Scoring matrices - PAM and BLOSUM
2.5Pairwise sequence similarity search by BLAST and FASTA
2.6 Concepts of phylogeny- distance based (NJ method) and character based (ML method) tree construction methods

3. Unit: Descriptive Biostatistics and Probability

3.1 Introduction to biostatistics, kinds of data and variables - based on nature (numerical- discrete and continuous; categorical- ordinal and nominal) - based on source (primary and secondary data); sample size, sampling methods and sampling errors.
3.2 Data tabulation and representation methods: graphical methods- stem and leaf plot, line diagram, bar graphs, histogram, frequency polygon, frequency curves; diagrammatic method- pie diagram
3.3 Measures of central tendency – mean, median, mode; merits and demerits
3.4 Measures of dispersion-range, variance, standard deviation, standard error and coefficient of variation; merits and demerits
3.5 Concepts of probability - random experiment, events, probability of an event, probability rules (addition and multiplication), uses of permutations and combinations, random variables (discrete and continuous)
3.6 Probability distributions: Binomial & Poisson distributions for discrete variables, Normal distribution for continuous variables

4. Unit: Applications of Biostatistics

4.1 Hypothesis testing - steps in testing for statistical hypothesis, null and alternative hypothesis, level of significance- type-1 and type-2 errors
4.2 Test of significance for small samples- Student's t-test (one sample and two samples)
4.3 Test of significance for large samples- Z-test for means and proportions
4.4 Chi-square test and its applications- goodness of fit, test of independence
4.5 Analysis of Variance (ANOVA) - one way analysis
4.6 Correlation - definition, simple and linear analysis, Karl Pearson's correlation coefficient

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OPTIONAL I: PRACTICALS
BIOINFORMATICS AND BIOSTATISTICS

1. Exploring web portals - NCBI, EBI &ExPASy
2. Literature search through Pubmed and Pubmed Central
3. Sequence retrieval from Genbank, ENA, Swissprot
4. Pairwise homology search by BLAST and FASTA
5. Calculation of mean, median, mode, standard deviation, variance, standard error and coefficient of variation
6. Construction of bar diagram, pie diagram, line diagram, histogram
7. Problems on hypothesis testing using Z- test, t-test andChi-square test
8. Problems on probability and probability distributions

Spotters

1. Line diagram, bar diagram & pie diagrams
2. Histogram, frequency polygon & frequency curve
3. Normal Probable curve
4. GenBank
5. DDBJ
6. SWISS-PROT
7. PROSITE
8. PIR
9. BLAST
10. Pairwise alignment
11. Multiple sequence alignment
12. PAM and BLOSUM
13. Phylogenetic tree

RECOMMENDED BOOKS

1. Khan &Khanum (2004), Fundamentals of Biostatistics, II Revised Edition, Ukaaz Publication
2. Bailey, N.T.J , Statistical methods in Biology, Cambridge Univ. Press
3. Fundamentals of Biostatistics, P HanmanthRao and K.Janardhan
4. Danial, W. W, Biostatistics, Wiley
5. Introduction to Bioinformatics byAurther M lesk
6. Developing Bioinformatics Computer Skills by: Cynthia Gibas, Per Jambeck
7. Bioinformatics second edition by David M mount
8. Essential Bioinformatics by Jin Xiong
9. Bioinformatics Computing by Bryan Bergeron
10. Bioinformatics: Concepts, Skills & Applications by R.S. Rastogi
11. Queen, J. P., Quinn, G. P., &Keough, M. J. (2002). *Experimental design and data analysis for biologists*.Cambridge University Press
12. Mahajan, B.K. (2002). Methods in biostatistics. Jaypee Brothers Publishers

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DEPARTMENT OF BIOTECHNOLOGY

FINAL PRACTICAL EXAMINATION-

MOLECULAR BIOLOGY AND RECOMBINANT DNA TECHNOLOGY

MARKS 50

I.	MAJOR EXPERIMENT. 1	20M
II.	MINOR EXPERIMENT. 2.	10M
III.	SPOTTERS.	5X3=15M
	A). B). C). D). E).	
IV.	RECORD &VIVA.	5M

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V

B.Sc BIOTECHNOLOGY III YEAR
SEMESTER- V
OPTIONAL- I (A) (DSE- 1E)
BS 504(A): PLANT BIOTECHNOLOGY

Unit 1: Basics to Plant Biotechnology

1.1 Introduction to plant tissue culture, totipotency of plant cells (dedifferentiation, redifferentiation, regeneration of whole plant)

1.2 Nutritional requirements for plant tissue culture: nutrient media – macronutrients and micronutrients, media additives (carbon source, vitamins, amino acids)

1.3 Plant growth regulators (cytokinins, auxins, gibberellins), gelling agents

1.4 Preparation of media, selection and surface sterilization of explants, inoculation, incubation (temperature and light regime), regeneration of plants

1.5 Initiation of callus cultures and cell suspension cultures

1.6 Regeneration of plants (Organogenesis and embryogenesis)

Unit 2: Applications of Plant Tissue Culture

2.1 Meristem culture and production of disease free plants

2.2 Micro propagation of elite ornamental, horticultural plants via organogenesis and somatic embryogenesis Encapsulation and production of synthetics seeds

2.3 Cell suspension cultures (batch and continuous culture) for production of secondary metabolites

2.4 Embryo culture and embryo rescue; Protoplast culture and fusion, Development of somatic hybrids and Cybrids and their applications

2.5 Somaclonal variation and their applications; production of haploids, Isogenic lines, Anther and pollen culture

2.6 Methods of cryopreservation for conservation of plant germplasm

Unit 3: Production of Transgenic Plants

3.1Direct gene transfer techniques - physical methods: microinjection, particle bombardment (gene gun) and electroporation & chemical methods

3.2Molecular mechanism of *Agrobacterium* infection and features of Ti Plasmid *Agrobacterium* mediated gene transfer using binary and co-integrate vectors

3.3 Viral vectors for gene transfer into plants

3.4 Selection of transgenic plants using reporter and selection marker genes

3.5 Genome editing - CRISPR CAS 9 Technology

Unit4 : Applications of Transgenic Plants

4.1Herbicide resistance in transgenic plants - glyphosate tolerance

4.2 Insect resistant transgenic plants: Bt cotton, proteinase inhibitors, lectins Virus, bacterial and fungal resistant transgenic plants

4.3 Abiotic Stress tolerance: drought, heat and salinity stress tolerant plants

4.4Transgenic plants with enhanced nutritional value: vitamin A, oil, amino acids

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OPTIONAL- I (A): PRACTICALS

PLANT BIOTECHNOLOGY

SEMESTER- V

1. Preparation of media for plant tissue culture
2. Sterilization methods of explants (seed, leaf, inter node & root) and inoculation
3. Establishment of callus cultures – from carrot/rice
4. Preparation of synthetic seeds
5. Meristem culture
6. Cell suspension cultures
7. Protoplast isolation and culture
8. *Agrobacterium* mediated transformation

Spotters

1. Callus cultures
2. Sterilization techniques: autoclave and hot air Oven
3. Somatic embryos
4. Synthetic seeds
5. Meristem culture
6. Plant regeneration
7. Cell suspension cultures
8. Isolation of protoplasts
9. Particle bombardment (Gene gun)
10. Binary or co-integrate vectors
11. Gus gene expression in transgenic plant tissue
12. Golden Rice

REFERENCE BOOKS

1. Plant Tissue Culture and its Biotechnological Applications by W. Barz, E. Reinhard, M.H. Zenk
2. Plant Tissue Culture by Akio Fujiwara
3. Frontiers of Plant Tissue Culture by Trevor A. Thorpe
4. In vitro Haploid Production in Higher Plants by S. Mohan Jain, S.K. Sopory, R.E. Veilleux
5. Plant Tissue Culture : Theory and Practice by S.S. Bhojwani and A. Razdan
6. Plant Cell, Tissue and Organ Culture, Applied and Fundamental Aspects by Y.P.S. Bajaj and A. Reinhard

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DEPARTMENT OF BIOTECHNOLOGY

FINAL PRACTICAL EXAMINATION-

LANT BIOTECHNOLOGY
MESTER- V

MARKS 50

I.	MAJOR EXPERIMENT. 1	20M
II.	MINOR EXPERIMENT. 2.	10M
III.	SPOTTERS.	5X3=15M
	A).	
	B).	
	C).	
	D).	
	E).	
IV.	RECORD &VIVA.	5M

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NAGARJUNA GOVERNMENT COLLEGE,NALGONDA

OPTIONAL I-A SEMESTER-V

PLANT BIOTECHNOLOGY 504 A CREDITS = 5

SECTION-A **Marks:70**

I.ANSWER THE FOLLOWING QUESTION **5x2=10M**

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SECTION -B

II.ANSWER ANY FOUR OF THE FOLLOWING QUESTIONS **4x5=20M**

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11.

SECTION-C

III.ANSWER THE FOLLOWING QUESTIONS **`4x10=40M**

12 .A.)

OR

B.)

13 A.)

OR

B.)

14 A.)

OR

B.)

15 A.)

OR

B.)

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V

B.Sc BIOTECHNOLOGY III YEAR
SEMESTER- V
OPTIONAL- I (B) (DSE- 1E)
BS 504(B): MEDICAL BIOTECHNOLOGY

1. Unit: Inheritance of humandiseases and karyotyping

1.1 Inheritance patterns - pedigreeanalysis of autosomal traits
1.2 Inheritance patterns - pedigreeanalysis of allosomal traits
1.3 Factors affecting pedigree pattern- penetrance, expressivity
1.4 Genetic heterogeneity- allele and locus heterogeneity
1.5 Karyotyping of human chromosomes
1.6 Chromosome staining - G, Q, R and C banding techniques

2. Unit: Genetic basis of human disorders

2.1 Chromosomal disorders caused due to structural chromosomal abnormalities (deletions, duplications, translocations and inversions)
2.2 Chromosomal disorders caused due to numerical chromosomal abnormalities (euploidy, aneuploidy, autosomal and allosomal)
2.3 Monogenic disorders (autosomal and X-linked diseases)
2.4 Mitochondrial diseases - LHON,MERRF
2.5 Multifactorial disorders - diabetes and hypertension
2.6 Cancer- types of cancer, genetic basis of cancer (oncogenes, tumour suppressor genes)

3. Unit: Techniques for diagnosis of human diseases

3.1 Prenatal diagnosis - invasive techniques - amniocentesis, chorionic villi sampling (Down's syndrome); non-invasive techniques - ultrasonography (neural tube defects)
3.2 Diagnosis using enzyme markers - Guthrie test (phenylketoneuria)
3.3 Diagnosis using monoclonal antibodies -ELISA (HIV)
3.4 DNA/RNA based diagnosis - HBV
3.5 PCR based genotyping techniques for diagnosis - RFLP (MTHFR C677T mutation)
3.6 Chip based diagnosis and applications - colon cancer

4. Unit: Therapeutic approaches for human diseases

4.1 Recombinant proteins - human growth hormone, insulin
4.2 Gene therapy - *ex vivo* and *in vivo* gene therapy
4.3 Stem cells - potency definitions; embryonic and adult stem cells
4.4 Applications of stem cell based therapies and regenerativemedicine
4.5 DNA based vaccines, subunit vaccines - herpes simplex virus; recombinant attenuated vaccines - cholera vaccine
4.6 Applications of monoclonal antibodies

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OPTIONAL-I (B):
PRACTICALS MEDICAL
BIOTECHNOLOGY

1. Karyotyping of normal human chromosome set
2. Karyotyping of autosomal abnormality (Down's syndrome)
3. Karyotyping of allosomal abnormality (Klinefelter syndrome)
4. Chromosome banding - G banding
5. Human pedigree analysis of autosomal disorder
6. Human pedigree analysis of allosomal disorder
7. Estimation of C-reactive protein
8. DOT ELISA

Spotters

1. Identify the karyotype (Down's syndrome)
2. Identify the karyotype (Klinefelter syndrome)
3. Chromosomal banding technique
4. Identify the inheritance pattern of pedigree (autosomal disorder)
5. Identify the inheritance pattern of pedigree (allosomal disorder)
6. Prenatal diagnosis- invasive technique
7. Prenatal diagnosis- non invasive technique
8. Identify the type of gene therapy- *ex vivo/in vivo*
9. Recombinant vaccine
10. ELISA technique
11. Identify the SNP genotypes of different samples after performing PCR-RFLP
12. Count the viable cells on neubauer chamber (hemocytometer)

REFERENCE BOOKS

1. Medical Biotechnology by Pratibha Nallari, V. Venugopalrao - OxfordPress
2. Introduction to Human Molecular Genetics by J.J Pasternak - John WileyPublishers.
3. Human Molecular Genetics by Tom Strachen and A P Read - Bios ScientificPublishers
4. Human Genetics Molecular Evolution by McConkey
5. Recombinant DNA Technology by AEHEmery
6. Principles and Practice of Medical Genetics - I, II, III Volumes by AEHEmery
7. Molecular Biotechnology by Glick and Pasternak

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B.Sc BIOTECHNOLOGY III
YEAR SEMESTER- VI
OPTIONAL PAPER I
BS 601: IPR, BIOSAFETY AND ENTREPRENEURSHIP 4 Credits

1. Unit: Intellectual Property rights

1.1 Intellectual Property-meaning, nature
Significance and need of protection of intellectual property
1.2 Types of intellectual property rights: patent, trademarks, copyright, design registration, trade secret, geographical indicators, plant variety protection
1.3 Copyright: meaning, nature, historical evolution and significance
1.4 Ownership of copyright - rights of authors and owners, trademarks
1.5 Plant varieties protection and plant breeding rights

2. Unit: Patent laws

2.1 Patents- concept of patent- historical overview of the patent law in India
Kinds of patents- procedure for obtaining patent in India and in other countries
2.2 Patenting microbes and organisms- novelty, International Depository
2.3 Authorities (IDAs), submitting details of the deposit
2.4 Patenting genes - pros and cons, ethics, examples
2.5Patenting markers and variants- examples
2.6 Product vs process patent- product life cycle and process design.

3. Unit: Laboratory Management and Safety

3.1 Administration of laboratories, laboratory design, laboratory information management system
3.2 Laboratory safety- good laboratory practice (GLP), biosafety levels
3.3 Basic principles of quality control (QC) and quality assurance (QA)
3.4 Handling of hazardous compounds- chemicals, solvents, poisons, isotopes, explosives and biological strains
3.4 Storage of hazardous material
3.5 Disposal of biological and radioisotope wastes

4. Unit: Entrepreneurship

4.1 Concept, definition, structure and theories of entrepreneurship
4.2 Types of start-ups with examples
4.3 Types of entrepreneurship, environment, process of entrepreneurial development
4.4Entrepreneurial culture, entrepreneurial leadership
4.5 Product planning and development - project management, search for business idea, concept of projects, project identification
4.5 Promoting bio-entrepreneurship

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NAGARJUNA GOVERNMENT COLLEGE,NALGONDA

SEMESTER VI

ELECTIVE THEORY (A)
ANIMAL BIOTECHNOLOGY

Credits = 4

Unit 1: Animal diversity and Cataloguing of germplasm

1.1 Conventional methods of Animal Breeding: Selective and Cross breeding

1.2 Embryo Biotechniques for augmentation of replication efficiency and faster Multiplication of superior germplasm

1.3 Cryopreservation of germplasm

1.4 Artificial insemination: Super ovulation, Oestrus synchronization, embryo collection and transfer

1.5 In vitro maturation of Oocytes, In vitro fertilization, embryo culture, preservation

1.6 Economically important livestock, Conservation of genetic resources

Unit 2: Animal Improvement for desired traits by biotechnology Interventions 2.1 Scope for biotechnological interventions (Buffalo as multipurpose livestock)

2.2 Model organisms and their significance (Cattle, Rodents and Fish)

2.3 DNA Micromanipulation

2.4 Somatic cell nuclear transfer

2.5 Embryo sexing

2.6 Gene mapping and Identification of genes of economic importance in farm Animals

Unit 3: Developments in molecular markers in Livestock and Transgenic Animals

3.1 Developments in livestock genomics (estimated breeding value)

3.2 Molecular markers and applications

3.3 Development of transgenic animals

3.4 Applications of transgenic animals in milk production, meat production and aquaculture

3.5 Transgenic technology for development of animals as bioreactors

Unit 4 : Genetically modified organisms

4.1Animal models and their significance in scientific research

4.2Mouse models for cancer

4.3Generation of transgenic mouse

4.4Generation of gene knock-out mouse

4.5Genetically modified mice as disease models

4.6Applications of genetically modified animals in understanding disease biology and drug development

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SEMESTER VI

ELECTIVE THEORY (A)
ANIMAL BIOTECHNOLOGY

Credits = 4

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SECTION -B

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SECTION-C

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NAGARJUNA GOVERNMENT COLLEGE(A)

DEPARTMENT OF BIOTECHNOLOGY

ELECTIVE THEORY (A)

ANIMAL BIOTECHNOLOGY 4 Credits

ELECTIVE (A): PRACTICALS

1. Preparation of media
2. Isolation of cells from Chicken Liver
3. Isolation of cells from Chick Embryo
4. Preparation of somatic metaphase chromosomes
5. Karyotyping- banding procedures for comparing the chromosomal complement
6. Screening of chromosomal abnormalities
7. Culturing suspension cells
8. Establishment of primary cell culture: Liver/Spleen

RECOMMENDED BOOKS

1. Lasley JF. Genetics of Livestock Improvement
2. Text book of Animal Biotechnology by B Singh. The Energy and Resources Institute (teri)
3. Ross CV. Sheep Production and Management. Prentice Hall
4. Schmidt GM & Van Vleck LD. Principles of Dairy Science. WH Freeman
5. Turner HN & Young SSY. Quantitative Genetics in Sheep Breeding. MacMillan
6. Van Vleck LD, Pollak EJ &Bltenacu EAB. Genetics for Animal Sciences. WH

Freeman

7. Crawford RD. Poultry Breeding and Genetics. Elsevier
8. Singh RP &KumarJ. Biometrical Methods in Poultry Breeding. Kalyani

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SEMESTER-VI
ELECTIVE THEORY (B)
ENVIRONMENTAL BIOTECHNOLOGY AND BIODIVERSITY

Unit 1: Environmental Pollution

1.1 Introduction to environment and pollution
1.2 Types of pollution- air, water and land pollutions
1.3 Types of pollutants– inorganic, organic and biotic sources
1.4 Sources of pollution – domestic waste, agricultural waste, industrial effluents and municipal waste
1.5 Climate change, greenhouse gases and global warming
1.6 Impact of pollution on environment and measurement methods

Unit 2: Bioenergy and Bio-fuels

2.1 Renewable and non- renewable energy resources
2.2 Fossil fuels as energy source and their impact on environment
2.3 Non-conventional source – biomass as source of bioenergy
2.4 Types of biomass – plant, animal and microbial biomass
2.5 Production of biofuels: bioethanol

Unit3:Biofertilizers and Biopesticides

3. 1Chemical fertilizers and their impact on environment (eutrophication)
3.2 Concepts of biofertilizers
3.3 Types of biofertilizers - bacterial, fungal and algal biofertilizers
3.4 Pesticides and their impact on environment
3.5 Concepts of biopesticides; types of biopesticides
3.6 Uses of biofertilizers & biopesticides

Unit4 : Bioremediation and Restoration of Environment

4.1 Microbial treatment of waste water (sewage of industrial effluent)- aerobic and anaerobic methods
4.2 Solid waste and management; Bioremediation– concepts and types (in-situ and ex-situ); Bioremediation of toxic metal ions– biosorption and bioaccumulation
4.3 Composting of organic wastes
4.4 Microbial bioremediation of pesticides and Xenobiotic compounds
4.5 Phytoremediation- concepts and application
4.6 Conservation of biodiversity

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NAGARJUNA GOVERNMENT COLLEGE(A)
DEPARTMENT OF BIOTECHNOLOGY
ELECTIVE THEORY (B)
ENVIRONMENTAL BIOTECHNOLOGY AND BIODIVERSITY

ELECTIVE (B): PRACTICALS

1.Estimation of BOD in water samples
2.Estimation of COD in water samples
3.Estimation of Total dissolved solid in water samples
4.Isolation of microorganisms from soil/industrial effluents
5.Production of hydrogen or biogas using cow/cattle dung
6.Determination of quality of water sample (Coliform test)
7.Isolation of microorganisms from polluted soil/industrial effluents
8.Identification and characterization of bioremediation microorganisms
9.Production of microbial biofertilizer

RECOMMENDED BOOKS

1.Text Book of Biotechnology - By H.K. Das (Wiley Publications)
2.Biotechnology -By H.J. Rehm and G. Reed. VIH Publications, Germany
3.Biogas Technology - By B.T. Nijaguna
4.Biotechnology - By K. Trehan
5.Industrial Microbiology - By L.E. Casida
6.Food Microbiology - By M.R. Adams and M.O. Moss
7.Introduction to Biotechnology - By P.K. Gupta
8.Essentials of Biotechnology for Students - By Satya N. Das
9.Bioethics – Readings and Cases - By B.A. Brody and H. T. Engelhardt. Jr. (PearsonEducation)
10.Biotechnology, IPRs and Biodiversity - By M.B. Rao and Manjula Guru (PearsonEducation)
11.Bioprocess Engineering - By Shuler (Pearson Education)
12.Essentials of Biotechnology - By Irfan Ali Khan and AtiyaKhanum (Ukaaz Publications

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SEMESTER-VI
ELECTIVE THEORY (B)
ENVIRONMENTAL BIOTECHNOLOGY AND BIODIVERSITY

SECTION-A **70 Marks**

I.ANSWER THE FOLLOWING QUESTION **5x2=10M**

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SECTION -B

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