

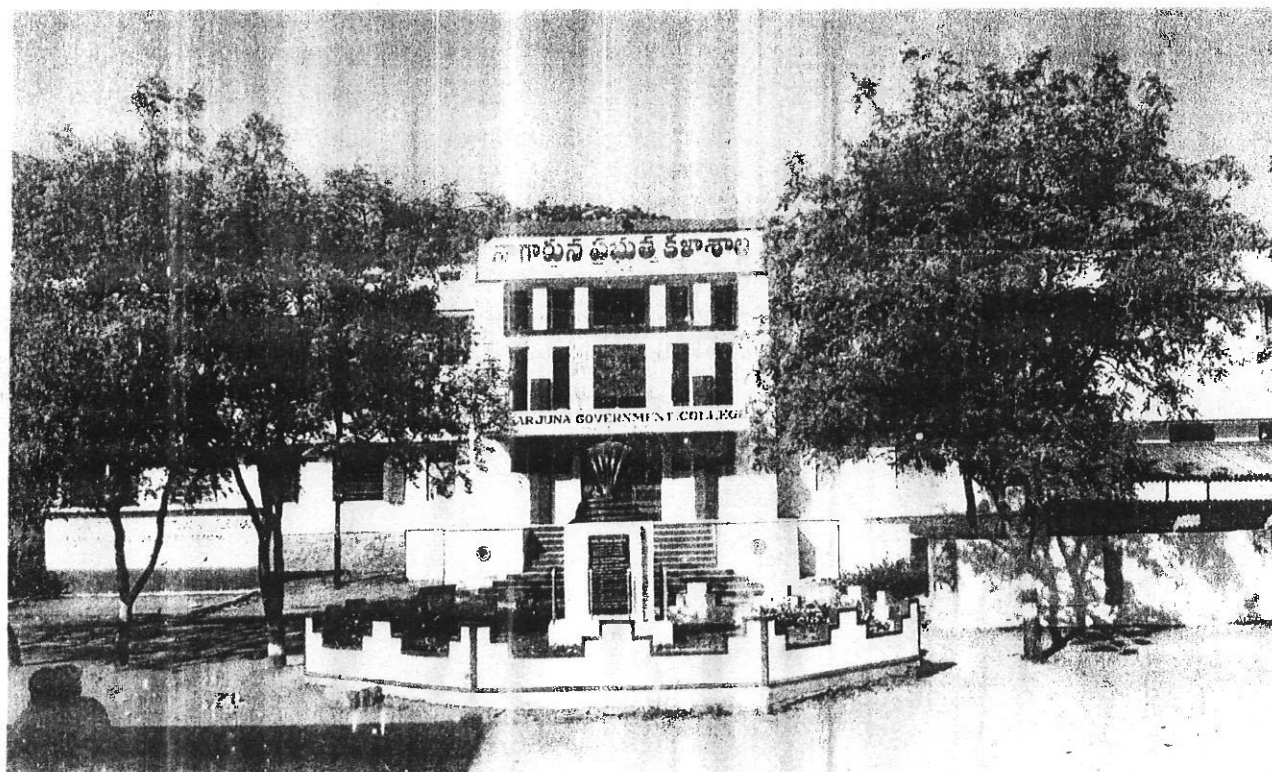
**NAGARJUNA GOVERNMENT COLLEGE, NALGONDA**

(Autonomous) Reaccredited by NAAC with 'A' Grade

(Affiliated to Mahatma Gandhi University)

(www.ngcnalgonda.org)

## **BOARD OF STUDIES 2018-19**



**DEPARTMENT OF BIOTECHNOLOGY**

**NAGARJUNA GOVERNMENT COLLEGE,  
NALGONDA**

NAGARJUNA GOVERNEMENT COLLEGE: NALGONDA  
(AUTONOMOUS)(Re-Accredited with NAAC "A" GRADE)

Date 5/11/2018

To  
The Principal  
N.G.College  
Nalgonda.

Madam,

Sub:- Grant of Autonomous Status – Constitution of BOARD OF STUDIES in Biotechnology Department-  
Request for Approval-Reg.

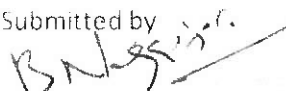
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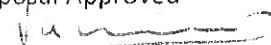
- 1.) No.F.22-1/2007(AC)Dt:3<sup>rd</sup> April 2007
- 2.) OU Lr.mr.69/H/2007/Acad.Dt.12-06-2007
- 3.) GO RT.No.467 HE.(CE-1)Dept.Dt.29-06-2007.
- 4.) MGU Lr.347/MGU/NLG/2017-18,Dt.17-08-2017.

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With Reference to the Subject cited above, I am submitted the list of members of Board of Studies for Academic Years 2018-19 for your Approval.

| S.NO | NAME   | DESIGNATION        |
|------|--|--------------------|
| 1.   | Sri, B.Nagaraju, Asst.Prof<br>In-Charge Dept of Biotechnology<br>N.G. College, Nalgonda. | CHAIRPERSON        |
| 2.   | Sri.Dr. K. Prem Sagar, Asst. Prof,<br>Head Dept of Biotechnology,<br>MGU, Nalgonda       | UNIVERSITY NOMINEE |
| 3.   | 1.Dr. T. Sivaram, Asst. Prof<br>Dept of Biotechnology,<br>MGU, Nalgonda.                 | SUBJECT EXPERT     |
| 4.   | 2. Dr K. Madhuri, Asst. Prof<br>Dept of Biotechnology<br>MGU, Nalgonda.                  | SUBJECT EXPERT     |
| 5.   | G. Anjaiah<br>Guest lecturer in Biotechnology  | FACULTY MEMBER     |

Submitted by  
  
Chairman BOS  
Dept.of Biotechnology


Proposal Approved  
  
Principal/Chair Person Acad.Council

**NAGARJUNA GOVERNMENT COLLEGE (A), NALGONDA**

**Annexure - I**

**CBCS Structure from 2018-19 for Undergraduate Courses in Telangana**

| Courses                               | Papers                             | Total Credits | Credits for each Paper/Semester   |    |     |       |    |    | Credits for each Paper/Semester   |    |     |       |    |    |                                    |    |     |    |    |    |
|---------------------------------------|------------------------------------|---------------|-----------------------------------|----|-----|-------|----|----|-----------------------------------|----|-----|-------|----|----|------------------------------------|----|-----|----|----|----|
|                                       |                                    |               | EA                                |    |     | B.Com |    |    | B.Sc                              |    |     | B.Com |    |    | B.Sc                               |    |     |    |    |    |
|                                       |                                    |               | I                                 | II | III | IV    | V  | VI | I                                 | II | III | IV    | V  | VI | I                                  | II | III | IV | V  | VI |
| Core Courses<br>(DSC)                 | Optional-1                         | 4             | 5                                 | 5  | 5   | 5     | 5  | 5  | 5                                 | 5  | 5   | 5     | 5  | 5  | 5                                  | 5  | 5   | 5  | 5  | 5  |
|                                       | Optional-2                         | 4             | 5                                 | 5  | 5   | 5     | 5  | 5  | 5                                 | 5  | 5   | 5     | 5  | 5  | 5                                  | 5  | 5   | 5  | 5  | 5  |
|                                       | Optional-3                         | 4             | 5                                 | 5  | 5   | 5     | 5  | 5  | 5                                 | 5  | 5   | 5     | 5  | 5  | 5                                  | 5  | 5   | 5  | 5  | 5  |
| Elective Courses (DSE)                | Optional-1                         | 2             | -                                 | -  | -   | 5     | 5  | -  | -                                 | 5  | 5   | -     | -  | 5  | 5                                  | -  | -   | 5  | 5  | -  |
|                                       | Optional-2                         | 2             | -                                 | -  | -   | 5     | 5  | -  | -                                 | 5  | 5   | -     | -  | 5  | 5                                  | -  | -   | 5  | 5  | -  |
|                                       | Optional-3                         | 2             | -                                 | -  | -   | 5     | 5  | -  | -                                 | 5  | 5   | -     | -  | 5  | 5                                  | -  | -   | 5  | 5  | -  |
| Language                              | English                            | 6             | 3                                 | 3  | 3   | 3     | 3  | 3  | 3                                 | 3  | 3   | 3     | 3  | 3  | 3                                  | 3  | 3   | 3  | 3  | 3  |
|                                       | MIL (Tel/Hin/Urdu)                 | 6             | 3                                 | 3  | 3   | 3     | 3  | 3  | 3                                 | 3  | 3   | 3     | 3  | 3  | 3                                  | 3  | 3   | 3  | 3  | 3  |
|                                       | Envl Science/Basic CompSkills      | 1             | 2                                 | -  | -   | -     | -  | -  | -                                 | -  | 2   | -     | -  | -  | -                                  | -  | -   | -  | -  | -  |
| Compulsory Course                     | Basic Comp Skills/                 | 1             | 2                                 | -  | -   | -     | -  | -  | -                                 | -  | -   | -     | -  | -  | -                                  | -  | -   | -  | -  | -  |
|                                       | Envl Science                       | 1             | 2                                 | -  | -   | -     | -  | -  | -                                 | -  | -   | -     | -  | -  | -                                  | -  | -   | -  | -  | -  |
|                                       | Adv Comp Skills/Managerial Skills/ | 1             | 2                                 | -  | 2   | -     | -  | -  | -                                 | -  | -   | 2     | -  | -  | -                                  | -  | -   | -  | -  | -  |
| Skill Enhancement Course (SECC)       | SEC 1                              | 1             | 2                                 | -  | -   | -     | 2  | -  | -                                 | -  | 2   | -     | -  | -  | -                                  | -  | -   | -  | -  | -  |
|                                       | SEC 2                              | 1             | 2                                 | -  | -   | -     | -  | -  | -                                 | -  | 2   | -     | -  | -  | -                                  | -  | -   | -  | -  | -  |
|                                       | SEC 3                              | 1             | 2                                 | -  | 2   | -     | -  | -  | -                                 | -  | -   | 2     | -  | -  | -                                  | -  | -   | -  | -  | -  |
|                                       | SEC 4                              | 1             | 2                                 | -  | 2   | -     | -  | -  | -                                 | -  | -   | -     | 2  | -  | -                                  | -  | -   | -  | -  | -  |
| Project                               | Open Stream                        | 1             | -                                 | -  | -   | 4     | -  | -  | -                                 | -  | -   | -     | -  | 4  | -                                  | -  | -   | -  | -  | -  |
|                                       | Optionals                          | 1             | -                                 | -  | -   | -     | 4  | -  | -                                 | -  | -   | -     | -  | -  | 4                                  | -  | -   | -  | -  | -  |
| <b>Total Credits in each Semester</b> |                                    | 25            | 25                                | 25 | 25  | 25    | 25 | 25 | 25                                | 25 | 25  | 25    | 25 | 25 | 25                                 | 25 | 25  | 25 | 25 | 25 |
| <b>Total Credits in UG</b>            |                                    |               | <b>150</b>                        |    |     |       |    |    | <b>150</b>                        |    |     |       |    |    | <b>150</b>                         |    |     |    |    |    |
| Credits under Non-CQPA                | NSS/NCC/Sports/E extra Cur.        |               | Upto 6(2 in each year)            |    |     |       |    |    | Upto 6(2 in each year)            |    |     |       |    |    | Upto 6(2 in each year)             |    |     |    |    |    |
|                                       | Summer Internship                  |               | Upto 4(2 each after I & II years) |    |     |       |    |    | Upto 4(2 each after I & II years) |    |     |       |    |    | Upto 4 (2 each after I & II years) |    |     |    |    |    |


  
**Chairman**  
**S.O.S. Dept. of Biotechnology**  
**Nagarjuna Govt. College (A)**  
**NALGONDA-508 001.**

41

**NAGARJUNA GOVERNMENT COLLEGE(A)**  
**DEPARTMENT OF BIOTECHNOLOGY**

**AGENDA**

- To consider and approve the syllabus for I to VI semester during 2018-19
- Continuation of choice Based Credit System(CBCS) for this academic year 2018-2019
- 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 2018-19
- To consider and approve the list of examiners for paper setting , evaluation etc., (3 of each paper) I to VI semester during 2018-19
- 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 altogether (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
- To conduct I internal in last week of August and II internal in the first week of October 2018 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 questions with internal 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

  
Chairman  
B.C.S. Dept of Biotechnology  
Nagarjuna Govt. College (A)  
NALGONDA-509 001.

# NAGARJUNA GOVERNMENT COLLEGE(A)

5

## DEPARTMENT OF BIOTECHNOLOGY

### BOARD OF STUDIES

Board of Studies in the Department of Biotechnology has been constituted with the following members for the year 2018-19.

| S.No | Category                                    | Name and Designation   |
|------|---|--|
| 1    | Chairman Board of Studies                   | <b>Sri B. Nagaraju</b> , Asst. Prof<br>Incharge Dept. of Biotechnology,<br>N.G. College. Nalgonda.<br><br><i>B. Nagaraju</i><br>B.O.S. Dept. of Biotechnology<br>Nagarjuna Govt. College (A)<br>NALGONDA - 505 001.  |
| 2    | University Nominee                          | <b>Sri Dr. K. Prem Sagar</b> , Asst. Prof,<br>Head Dept of Biotechnology<br>MGU, Nalgonda.<br><br><i>K.P.S.</i><br>5/11/18<br>Dept. of Applied<br>Microbiology,<br>University of Hyderabad,<br>Hyderabad, Telangana, India.                                  |
| 3    | Subject expert- from outside<br>the college | 1. <b>Sri Dr T. Sivaram</b> , Asst. Prof, ,<br>MGU, Nlg.<br><br>2. <b>Smt Dr K. Madhuri</b> , Asst. Prof, ,<br>MGU, Nlg<br><br><i>DR. T. SIVARAM</i><br>Asst. Professor<br>Dept. of Biotechnology<br>NAGARJUNA GOVERNMENT COLLEGE (A)<br>NALGONDA - 505 001. |
| 4    | The Faculty Member of the<br>Department.    | <b>G.Anjaiah</b> ,<br>Guest Faculty in Biotechnology.  |

**NAGARJUNA GOVERNMENT COLLEGE**  
(Autonomous)  
**DEPARTMENT OF BIOTECHNOLOGY**  
**BOARD OF STUDIES MEETING**

The Board of studies in the Department of Biotechnology met on Date 05-11-2018 under the chairmanship of the Board of studies and adopted the following Resolutions.

1. Introduction of Choice Based Credit System(CBCS) for I, II & III year from academic year 2018-2019
2. Each semester will have **4 units**
3. To Conduct 2 (two) internal assignments **30 marks (20 marks for written examination, 5 marks 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. 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
11. Approved the panel of examiner for paper setting and evaluation for the year 2018-19

1. Chairman Board of Studies:

Sri. B. Nagaraju, Asst. Prof  
In-Charge Dept of Biotechnology  
N.G. College, Nalgonda.

*B. Nagaraju*  
**Chairman**  
B.O.S. Dept. of Biotechnology  
Nagarjuna Govt. College (A)  
NALGONDA-508 001.

2. University Nominee

Dr. K. Prem Sagar, Asst. Prof.  
Head Dept of Biotechnology.  
MGU, Nalgonda.

*K.P.S.*  
5/11/18  
**Dr. K. Prem Sagar**  
Head (PG)  
Dept. of Applied Microbiology  
University College of Sciences, Nalgonda  
MG University, Yellareddyguda, Nalgonda

3. Subject expert-from outside college

1. Dr. T. Sivaram, Asst. Prof  
Dept of Biotechnology.  
MGU, Nalgonda.

*T. Sivaram*  
**Dr. T. SIVARAM**  
Asst. Prof  
Dept. of Biotechnology

2. Dr K. Madhuri, Asst. Prof.  
Dept of Biotechnology  
MGU, Nalgonda.

G. Anjanikula  
Guest Faculty in Biotechnology

MG University, Yellareddyguda, Nalgonda

7

**NAGARJUNA GOVERNMENT COLLEGE, NALGONDA**  
**(AUTONOMOUS) ALLOCATION OF CREDITS AT SUBJECT LEVEL**

College: N.G.COLLEGE      Course: B.Sc I YEAR.,      Subject: BIOTECHNOLOGY

| NO                      | Semester      | Module(Paper)                    | Credits | Max.marks |
|-------------------------|---------------|----------------------------------|---------|-----------|
| 1.                      | I(CORE)       | CELL BIOLOGY AND GENETICS        | 04      | 100       |
| 2.                      | Practicals- 1 | CELL BIOLOGY AND GENETICS        | 01      | 50        |
| 3.                      | II (Core)     | NUCLEIC ACIDS AND BIOINFORMATICS | 04      | 100       |
| 4.                      | practical - 2 | NUCLEIC ACIDS AND BIOINFORMATICS | 01      | 50        |
| <b>Total credits=10</b> |               |                                  |         |           |

*B. Srinivas*  
 B.S. Chairperson  
 Dept. of Biotechnology  
 Nagarjuna Govt. College (A)  
 NALGONDA-508001.

*K. Premnagar*  
 5/11/18  
**Dr. K. Premnagar**  
 Head (IC)  
 Dept. of Applied Biosciences  
 University College of Science & Information  
 MG University, Bellareddy, Nalgonda.

*T. Siva Ram*  
**Dr. T. SIVA RAM**  
 Asst. Professor  
 Dept. of Biotechnology  
 Nagarjuna Government College (A)  
 Nalgonda, Nalgonda District, Andhra Pradesh

**NAGARJUNA GOVERNMENT COLLEGE, NALGONDA**  
**(AUTONOMOUS) ALLOCATION OF CREDITS AT SUBJECT LEVEL**

College: N.G.COLLEGE

Course: B.Sc II YEAR., Subject: BIOTECHNOLOGY

| NO                      | Semester                            | Module(Paper)              | Credits | Max.marks |
|-------------------------|-------------------------------------|----------------------------|---------|-----------|
| 1.                      | III (Core)                          | BIOLOGICAL CHEMISTRY       | 04      | 100       |
| 2.                      | Practicals-3                        | BIOLOGICAL CHEMISTRY       | 01      | 50        |
| 3.                      | SEC-1                               | ANALYTICAL CHEMISTRY       | 01      | 50        |
| 4.                      | IV (Core)                           | MICROBIOLOGY AND IMMUNOLGY | 04      | 100       |
| 5.                      | Practicals-4                        | MICROBIOLOGY AND IMMUNOLGY | 01      | 50        |
| 6.                      | SEC-2<br>(SKILL ENHANCEMENT COURSE) | FOOD ADULTERATION          | 01      | 50        |
| <b>Total credits=12</b> |                                     |                            |         |           |

*Balu*  
 Chairman  
 B.O.S. Dept. of Biotechnology  
 Nagarjuna Govt. College (A)  
 NALGONDA-508001.

*K.P.P.*  
 Dr. K. P. Prasad  
 Head (BO)  
 Dept. of Applied Bioscience  
 University College of Science & Information  
 Technology, Yellareddy, Nalgonda

*S. Sivaram*  
 Dr. S. SIVARAM  
 Asst. Prof.  
 Dept. of Biotechnology  
 NALGONDA - 508001



9

**NAGARJUNA GOVERNMENT COLLEGE, NALGONDA**  
**(AUTONOMOUS) ALLOCATION OF CREDITS AT SUBJECT LEVEL**

College: N.G.COLLEGE

Course: B.Sc III YEAR PAPER-V.,

Subject: BIOTECHNOLOGY

| NO                   | Semester                   | Module(Paper)                                | Credits   | Max.marks |
|----------------------|----------------------------|--|-----------|-----------|
| 1.                   | V (Core)                   | MOLECULARBIOLOGY AND RECOMBINANT TECHNOLOGY  | 04        | 100       |
| 2.                   | Practicals-5 (CORE)        | MOLECULAR BIOLOGY AND RECOMBINANT TECHNOLOGY | 01        | 50        |
| 3.                   | V -Elective (A)            | PLANT BIOTECHNOLOGY                          | 04        | 100       |
| 4.                   | V-Elective(A-Practical-6)  | PLANT BIOTECHNOLOGY                          | 01        | 50        |
| 5.                   | V-Elective-(B)             | MEDICAL BIOTECHNOLOGY                        | 04        | 100       |
| 6.                   | V-Elective-(B-Practical-6) | MEDICAL BIOTECHNOLOGY                        | 01        | 50        |
| <b>Total credits</b> |                            |  | <b>10</b> |           |

*B.S.*  
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*K.P.S.*  
**Dr. K. Prensagar**  
 Head (I/C)  
 Dept. of Applied Biosciences  
 University College of Science & Informatics  
 MG University, Warangal, Nalgonda

*S.M.*  
**Dr. T. SIVARAM**  
 Asst. Professor  
 Dept. of Biotechnology  
 Nagarjuna Govt. College (A)  
 NALGONDA-508 001.



**NAGARJUNA GOVERNMENT COLLEGE, NALGONDA  
(AUTONOMOUS)**

**SEMESTER-I  
CORE THEORY-I  
CELL BIOLOGY AND GENETICS**

**Unit 1: 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 and non-histones), specialized chromosomes (Polytene, Lampbrush)
- 1.6. Chromosomal aberrations- structural and numerical

**Unit 2: 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

**Unit 3: 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- dihybrids, trihybrids
- 3.3. Deviation from Mendel's laws- partial or incomplete dominance (eg: Flower Color in *Mirabilis 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 allelism (eg: Coat color in Rabbits, eye color in *Drosophila* and ABO Blood groups)
- 3.6. X-Y chromosomes - Sex determination in *Drosophila*, Birds, Man, *Bonellia*, X-linked inheritance - Hemophilia, Color blindness, X-inactivation, Y-linked inheritance- Holandric genes

**Unit 4: 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 coiling in snail), variegation in leaves of *Mirabilis jalapa*
- 4.3. Cytoplasmic male sterility in Maize and *Paramecium*,
- 4.4. Mitochondrial inheritance in human and poky in *Neurospora crassa*
- 4.5. Chloroplast inheritance in *Chlamydomonas*
- 4.6. Hardy-Weinberg Equilibrium, allelic and genotypic distribution

*B. S. Srinivasan*  
B.S. Dept. of Biotechnology  
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NALGONDA-508 001.

*K.P. Prasad*  
Dr. K. Prasad  
Asst. Prof.

Dept. of Applied Biosciences  
University College of Science & Informatics,  
MG University, Yaddurpet, Nalgonda

*T. Siva Ram*  
Dr. T. SIVA RAM  
Asst. Prof.  
Dept. of Biotechnology

**NAGARJUNA GOVERNMENT COLLEGE(A)**  
**DEPARTMENT OF BIOTECHNOLOGY**

**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. Identification, maintenance and culturing of Drosophila stock
6. Monohybrid and dihybrid ratio in Drosophila
7. Monohybrid and dihybrid ratio in Maize
8. Problems on co-dominance, epistasis, two point and three point test cross, gene mapping, Tetrad analysis
9. Statistical applications of t-test
10. Statistical applications chi square test
11. Statistical applications of Hardy-Weinberg Equilibrium

**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. Medonald, 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

*B. S.*  
**Chairman**  
B.G.S. Dept. of Biotechnology  
Nagarjuna Govt. College (A)  
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*K.P.*  
**Dr. K. P. Prasad**  
Dept. of Biotechnology  
Nagarjuna Govt. College (A)  
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*10*  
**Dr. N. V. S. Rao**  
Asst. Professor  
Dept. of Biotechnology  
Nagarjuna Govt. College (A)  
MALAONDA-508 001, S. INDIA.

**NAGARJUNA GOVERNMENT COLLEGE(AUTONOMOUS)**

**CELL BIOLOGY AND GENETICS**

**SEMESTER-I**

**PAPER-I**

**SECTION-A**

**Marks:70**

**ANSWER THE FOLLOWING QUESTIONS**

**5x2=10M**

- 1. Fluid mosaic model?
- 2. Golgi apparatus?
- 3. Hemophilia?
- 4. t-test?
- 5. Hardy-Weinberg Equilibrium?

**SECTION -B**

**ANSWER ANY TWO OF THE FOLLOWING QUESTIONS**

**4x5=20M**

- 6. Explain cell cycle?
- 7. Write in detail about Multiple allelism?
- 8. Describe Structure of chromosome-morphology?
- 9. Draw and explain Ultrastructure of prokaryotic cell?
- 10. Sandwich model?
- 11. Specialized chromosomes?

**SECTION-C**

**ANSWER THE FOLLOWING QUESTIONS**

**4x10=40M**

- 12. A.) Describe Chromosomal aberrations- structural and numerical ?  
OR
- 13. B.) Explain Cell membrane permeability ?
- 14. A.) Details of Bacterial cell division ?  
OR
- 15. B.) Events in Senescence and necrosis of cells?
- 16. A.) Deviation from Mendel's laws Explain?  
OR
- 17. B.) What is Y-linked inheritance- Holandric genes Importance?
- 18. A.) Describe Linkage and recombination ?  
OR
- 19. B.) Mitochondrial inheritance in human?

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14

**NAGARJUNA GOVERNMENT COLLEGE, NALGONDA  
(AUTONOMOUS)**

**SEMESTER II  
CORE THEORY II  
NUCLEIC ACIDS & BIOINFORMATICS**

**Unit 1: Nucleic Acids and Genome organization**

- 1.1 DNA as the genetic material- Griffiths experiments on transformation in *Streptococcus pneumoniae*; Hershey-Chase experiments with radio labeled T2 bacteriophage, Avery, MacLeod and McCarty's experiments
- 1.2 RNA as genetic material- Tobacco Mosaic Virus
- 1.3 Structure and forms of DNA (A, B and Z)
- 1.4 Genome organization in prokaryotes
- 1.5 Genome organization in eukaryotes, C-value and C-value paradox, Reassociation kinetics-cot curve, Denaturation, Reassociation, Tm curve
- 1.6 Kinetic classes of DNA- unique sequences, moderately repeated and highly repeated sequences; tandem repeats (satellite, minisatellite and micro satellites), interspersed repeats (SINES-eg: Alu repeats, LINES); palindromic sequences and transposable genetic elements

**Unit 2: DNA Replication, Recombination and Repair**

- 2.1 DNA replication- enzymes involved, semi conservative DNA replication-Messelson and Stahl experiment, Linear, Circular, Rolling circle, Theta, D loop
- 2.2 Mutation- spontaneous, induced (frame shift, transition, transversion)
- 2.3 Physical and chemical mutagens
- 2.4 DNA damage- intrinsic and extrinsic factors
- 2.5 DNA repair-Direct, Excision and methyl mediated mismatch, recombinational and SOS repair
- 2.6 DNA recombination-homologous, site specific recombination and NHEJ (Non-Homologous End Joining)

**Unit 3: Concepts of Bioinformatics**

- 3.1 Bioinformatics – a historical perspective
- 3.2 Internet and its role in bioinformatics
- 3.3 Bioinformatics Data: Genomes, nucleic acids, proteins, protein structures
- 3.4 Storage of databases in DNA (GenBank, EMBL, DDBJ)
- 3.5 Protein data banks (PDB, SWISS-PROT, UNIPROT, PIR) and their utilization
- 3.6 Data retrieval tools-BLAST, ENTREZ

**Unit 4: Applications of Bioinformatics**

- 4.1 Genome annotation: Gene identification tools
- 4.2 Basics of sequence alignment, Pairwise alignment (global and local)
- 4.3 Multiple sequence alignment and phylogenetic analysis
- 4.4 Structural classification of proteins and homology model building
- 4.5 Applications of Bioinformatics- drug targets, overview of drug designing
- 4.6 Concepts of Pharmacogenomics

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**NAGARJUNA GOVERNMENT COLLEGE(A)  
DEPARTMENT OF BIOTECHNOLOGY**

**CORE-II: PRACTICALS**

1. Isolation of DNA from Plant cells
2. Isolation of DNA from Animal cells
3. Estimation of DNA by Diphenylamine method
4. Estimation of RNA by Orcinol method
5. Exploring data bases: Genbank and Uniprot
6. Exploring the structural data bases: PDB, MMDB
7. Visualization of Protein structures-RASMOL
8. Database searching and downloading bioinformatics data- DNA (Gen bank, DDBJ, ENA)  
Protein (Uniprot)
9. Pairwise sequence alignment (global and local) of DNA and proteins
10. Multiple sequence alignment of DNA & protein sequences using ClustalW
11. Database searching with heuristic algorithms: BLAST

**REFERENCE BOOKS**

1. Genes VII. Benjamin Lewin. Oxford Univ. Press. Oxford
2. Molecular Biology by D. Freifelder Narosa Publishing house New York, Delhi
3. Molecular Cell Biology Lodish, H., Baltimore, D; fesk, A., Zipursky S.L., Matsudaride, P. and Darnel. American Scientific Books, W.H. Freeman, NewYork
4. Molecular Biology by Brown
5. Essentials of Molecular Biology. D. Freifelder, Panima Publishing Corporation.
6. Bioinformatics: Sequence and Genome Analysis by David W. Mount. Cold Spring Harbor Laboratory Press
7. Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids by Richard Durbin, Sean R. Eddy, Anders Krogh, Grnteme Mitchison. Cambridge University Press
8. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, Andreas D. Baxevanis, B. F. Francis Ouellette. Wiley-Interscience
9. Bioinformatics tools and Resources – free online tools, downloadable free tools, software packages, internet.
10. Bioinformatics books and Journals. Bioinformatics web-portals

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16

**NAGARJUNA GOVERNMENT COLLEGE  
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NUCLEIC ACIDS & BIOINFORMATICS  
SEMESTER-II  
PAPER-II**

**SECTION-A**

**Marks:70**

ANSWER THE FOLLOWING QUESTIONS

**5x2=10M**

- Griffiths experiment
- DNA Type A
- C-value
- Denaturation
- Minisatellite

**SECTION -B**

ANSWER ANY TWO OF THE FOLLOWING QUESTIONS

**4x5=20M**

- Hershey-Chase experiment
- RNA as genetic material
- DNA replication
- DNA damage- intrinsic and extrinsic factors
- GenBank
- Drug targets

**SECTION-C**

ANSWER THE FOLLOWING QUESTIONS

**4x10=40M**

- A.) Genome organization in prokaryotes explain?
- OR
- B.) Describe interspersed repeats and transposable genetic elements ?

A.) Write DNA repair mechanisms?

OR

B.) DNA recombination and Mutation ?

A.) Describe the role in bioinformatics

OR

B.) Explain Protein data banks ?

A.) Multiple sequence alignment ?

OR

B.) Concepts of Pharmacogenomics?

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**NAGARJUNA GOVERNMENT COLLEGE, NALGONDA**  
**SEMESTER III**  
**CORE THEORY III**  
**BIOLOGICAL CHEMISTRY**

**Unit 1: Biomolecules-Carbohydrates and Lipids**

- 1.1 Carbohydrates-Importance, classification, physical and chemical properties of carbohydrates
- 1.2 Structure, configuration and biochemical importance of monosaccharides (Glucose and Fructose) Oxidation, Reduction; Vitamins- classification, sources, functions and applications
- 1.3 Reducing and non-reducing sugars- structure, configuration and biochemical importance of disachharides and glycosidic bond (Sucrose, Lactose, Maltose, Isomaltose)
- 1.4 Structure and functions of polysachharides (Starch, glycogen, chitin)
- 1.5 Lipids, Fatty acids- importance, properties and classification, simple lipids- tag, complex lipids, derived lipids, sterols, fatty acids: saturated and unsaturated fatty acids with examples
- 1.6 Acids, Bases, acid-base interactions, pH, buffers, functional groups

**Unit 2: Biomolecules-Proteins**

- 2.1 Classification, structure, physical and chemical properties of amino acids
- 2.2 Characteristic properties of peptide bond and formation
- 2.3 Structure of proteins, primary, secondary, tertiary and quaternary
- 2.4 Enzymes-classification and nomenclature
- 2.5 Michaelis Menton equation-factors influencing the enzyme reactions and enzyme inhibition (competitive and non-competitive), role of co-enzymes.
- 2.6 Peptide-hormones, mode of action, thyroid gland, pancreatic hormones

**Unit 3: Metabolism and Cell Signaling**

- 3.1 Basic concepts of metabolism, anabolic and catholic pathways with examples.
- 3.2 Glycolysis, TCA Cycle, electron transport, Oxidative phosphorylation
- 3.3 Gluconeogenesis and its significance
- 3.4  $\beta$ -oxidation of fatty acid, transamination and oxidative deamination reactions of amino acids
- 3.5 Basic characteristics of cell signaling- paracrine, endocrine, autocrine
- 3.6 Second messengers and their role in signal transduction

**Unit 4: Bioanalytical techniques**

- 4.1 Colorimetry: Beer and Lambert's laws and UV- Vis spectrophotometry
- 4.2 Principle and applications of Chromatography (Paper, thin layer, ion exchange and gel filtration, HPLC)
- 4.3 Principle and applications of Electrophoresis (Native gels and SDS-PAGE, Agarose)
- 4.4 Principle and applications of centrifugation (Preparative and Analytical)
- 4.5 Principle and applications of X-ray crystallography
- 4.6 Principle and applications of NMR

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NAGARJUNA GOVERNMENT COLLEGE(A)  
DEPARTMENT OF BIOTECHNOLOGY

CORE-III: PRACTICALS

1. Preparation of normal, molar and molal solutions
2. Preparation of buffers (acidic, basic and neutral)
3. Qualitative tests of sugars, amino acids and lipids
4. Estimation of total sugars by Anthron method
5. Reducing sugars by DNS method
6. Separation of amino acids by paper chromatography, TLC
7. Estimation of proteins by Biuret method
8. Enzyme assay- catalase or invertase
9. Determination of acid value of fats
10. Amylase activity assay

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: Alan Fersht
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

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# NAGARJUNA GOVERNMENT COLLEGE

## (AUTONOMOUS) BIOLOGICAL CHEMISTRY SEMESTER-III

### PAPER-III

#### SECTION-A

Marks :70  
5x2=10M

ANSWER THE FOLLOWING QUESTIONS

1. Carbohydrates-Importance
2. Vitamins- sources
3. Secondary Structure of protein
4. Michaelis Menton equation
5. Endocrine

#### SECTION -B

ANSWER ANY TWO OF THE FOLLOWING QUESTIONS

4x5=20M

6. Classification of amino acids ?
7. Gluconeogenesis importance?
8. NMR Principle and its applications?
9. TCA cycle —explain?
10. Enzymes-classification ?
11. Peptide-hormones?

#### SECTION-C

ANSWER THE FOLLOWING QUESTIONS

4x10=40M

12. A.) Structure of proteins, primary, secondary, tertiary and quaternary  
OR  
B.) acid-base interactions, pI, buffers

13. A.)  $\beta$ -oxidation of fatty acid?  
OR  
B.) Second messengers and their role in signal transduction ?

14. A.) Factors influencing the enzyme reactions?  
OR  
B.) Vitamins- classification, sources, functions and applications ?

15. A.) Principle and applications of centrifugation (Preparative and Analytical)?  
OR  
B.) Principle and applications of UV- Vis spectrophotometry ?

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**NAGARJUNA GOVERNMENT COLLEGE, NALGONDA  
(AUTONOMOUS)**

**SEMESTER-IV  
CORE THEORY IV  
MICROBIOLOGY AND IMMUNOLGY**

**Unit 1: Fundamentals of Microbiology**

- 1.1 Historical development of Microbiology and contributors of microbiology
- 1.2 Microscopy: Bright field microscopy, Dark field microscopy, Phase contrast microscopy, Flourescent microscopy, Scanning and Transmission Electron microscopy
- 1.3 Outlines of classification of Microorganisms
- 1.4 Structure and general characteristics of Bacteria
- 1.5 Structure and general characteristics of Virus
- 1.6 Structure and general characteristics of Micro algae and Fungi

**Unit 2: Culture and Identification of Microorganisms**

- 2.1 Bacterial nutrition, Nutritional types of Bacteria, Essential macronutrients, micronutrients and growth factors
- 2.2 Bacterial growth, factors influencing bacterial growth
- 2.3 Typical growth curve-batch and continuous cultures, synchronous cultures
- 2.4 Measurement of bacterial growth- measurement of cell number and cell mass
- 2.5 Culturing of anaerobic bacteria
- 2.6 Culturing of viruses

**Unit 3: Basics of Immunology**

- 3.1 Types of immunity-innate and adaptive immunity
- 3.2 Cells of the immune system: T-cells (helper and cytotoxic cells), B-cells, natural killer cells, macrophages, basophils and dendritic cells
- 3.3 Primary organs of immune system (thymus and bone marrow)
- 3.4 Secondary organs of immune system (Spleen and lymph nodes)
- 3.5 Complement system-functions and components of complement system
- 3.6 Cell mediated immunity and cytokines

**Unit 4: Antigens and Antibodies**

- 4.1 Antigens-Immunogenicity vs Antigenicity, factors affecting antigenicity, epitopes, haptens, adjuvants
- 4.2 Antibody structure, function and diversity, antigen-antibody reactions, complement activation
- 4.3 Antigen antibody interactions, principle and applications of precipitation and agglutination
- 4.4 Monoclonal antibodies, production and applications
- 4.5 Basic concepts of cell mediated immunity, autoimmunity and hypersensitivity
- 4.6 Major Histocompatibility Complex and its role in organ transplantation

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NAGARJUNA GOVERNMENT COLLEGE(A)  
DEPARTMENT OF BIOTECHNOLOGY

CORE-IV: PRACTICALS

1. Sterilization methods
2. Preparation of microbiological media
3. Isolation of bacteria by streak, spread, and pour plate method
4. Isolation of soil bacteria
5. Simple staining and differential staining (Gram's staining)
6. Bacterial growth curve
7. Replica plating
8. Microhaemagglutination (eg. ABO and Rh Blood grouping)
9. Viability tests of cells (Trypan blue test)
10. Differential leukocyte count
11. Single radial Immunodiffusion
12. ELISA

REFERENCE BOOKS

1. Brock, T.D. and Madigan, M.T. Biology of Microorganisms
2. Prescott, L.M., Harley, J.P., Klein, D.A. Microbiology
3. Pelczar, M.J., Chan, E.C.S., Ereig, N.R. Microbiology
4. Benson Microbiological applications
5. Freifelder, D Physical biochemistry: application to biochemistry and molecular biology
6. Wilson & Walker Practical biochemistry
7. Upadhyay and Upadhyay Physical Biochemistry
8. Essential Immunology - By I. Roitt, Publ: Blackwell
9. Immunology - By G. Reeve & I. Todd, Publ: Blackwell
10. Abbas AK, Lichtman AH, Pillai S. Cellular and Molecular Immunology. Saunders Publication, Philadelphia
11. Goldsby RA, Kindt TL, Osborne BA. Kuby's Immunology. W.H. Freeman and Company, New York

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92

**NAGARJUNA GOVERNMENT COLLEGE  
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MICROBIOLOGY AND IMMUNOLGY  
SEMESTER-IV**

**PAPER-IV  
SECTION-A**

**I. ANSWER THE FOLLOWING QUESTIONS**

**Marks :70  
5X2=10M**

1. Dark field microscopy
2. Factors influencing bacterial growth
3. Thymus
4. Major Histocompatibility Complex
5. Hapten

**SECTION -B**

**II. ANSWER ANY TWO OF THE FOLLOWING QUESTIONS**

**4x5=20M**

6. Electron microscopy ?
7. General characteristics of Bacteria ?
8. Nutritional types of Bacteria?
9. Antigens-Immunogenicity ?
10. Monoclonal antibodies?
11. Secondary organs of immune system ?

**SECTION-C**

**III. ANSWER THE FOLLOWING QUESTIONS**

**4x10=40M**

12. A.) Events of contributors of microbiology ?  
OR  
B.) Structure and general characteristics of Virus explain?
13. A.) Culturing of viruses Methods?  
OR  
B.) Describe Cells of the immune system: T-cells ?
14. A.) Details of Cells of the immune system: T-cells?  
OR  
B.) Monoclonal antibodies, production and applications ?
15. A.) B-cells and its role in Immunity ?  
OR  
B.) Explain antigen-antibody reactions?

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**SEMESTER V**  
**CORE THEORY V**  
**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: Restriction 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

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, Lewis, 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. Text Book of Molecular Biology - By K.S. Sastry, G. Padmanabhan & C. Subramanyan, Publ: Macmillan India
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. Gerhardt 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 Atiya Khanum (Ukaaz Publications)

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**NAGARJUNA GOVERNMENT COLLEGE  
(AUTONOMOUS)  
MOLECULAR BIOLOGY AND RECOMBINANT DNA TECHNOLOGY  
SEMESTER-V**

**PAPER-V  
SECTION-A**

ANSWER THE FOLLOWING QUESTIONS

Marks :70

1. Gene families
2. RNA (Splicing)
3. lac operon
4. pUC 18
5. recombinant DNA

5X2=10M

**SECTION -B**

ANSWER ANY TWO OF THE FOLLOWING QUESTIONS

4x5=20M

1. Explain enhancers, silencers?
2. Transcription in prokaryotes?
3. Genetic code, properties -explain?
4. Negative and coordinated regulation - trp operon
5. Polymerase Chain Reaction explain?
6. Restriction endonuclease and its types?

**SECTION-C**

ANSWER THE FOLLOWING QUESTIONS

4x10=40M

12.A.) Translational regulation in eukaryotes ?

OR

B.) Processing and maturation of eukaryotic RNA (Splicing) ?

13.A.) Regulation in Eukaryotes: genome rearrangement ?

OR

B.) Plasmids as cloning vehicles-pBR322?

14.A.) Translational regulation in prokaryotes ?

OR

B.) Transcriptional control by cis and Trans regulatory elements ?

15.A.) Enzymes useful in molecular cloning?

OR

B.) Applications of recombinant DNA technologies ?

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# NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

## SEMESTER V ELECTIVE THEORY (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 synthetic 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: Techniques for production of transgenic plants and applications

- 3.1 Introduction to Agrobacterium tumefaciens, Features of Ti Plasmid, molecular mechanism of T-DNA transfer
- 3.2 Agrobacterium mediated gene transfer method
- 3.3 Direct gene transfer methods – Particle Bombardment (Gene Gun)
- 3.4 Production of transgenic plant for Biotic and Abiotic stresses
- 3.5 Molecular Farming – Production of biopharmaceuticals in transgenic plants
- 3.6 Improvement of nutritional quality of crops (vitamins, amino acids, oil, micronutrients)

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*K. P. S.*  
**Dr. K. P. Srinivasar**  
 Head (BO)  
 Dept. of Applied Biosciences  
 University College of Science & Informatics  
 MGS University, Kallamachyvuota, Nalgonda.

NAGARJUNA GOVERNMENT COLLEGE(A)  
DEPARTMENT OF BIOTECHNOLOGY

Core-V (A): PRACTICALS

1. Preparation of media for tissue culture
2. Surface sterilization methods of explants (seed leaf, inter node and root) and inoculation
3. Seed culture
4. Establishment of callus cultures- from carrot
5. Cell suspension cultures
6. Protoplast isolation and culture
7. Protoplast fusion


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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88

**NAGARJUNA GOVERNMENT COLLEGE**  
**(AUTONOMOUS)**  
**PLANT BIOTECHNOLOGY**  
**SEMESTER-V**  
**ELECTIVE(A)**

**SECTION-A**

**Marks:70**

**5x2=10**

**I. ANSWER THE FOLLOWING QUESTIONS**

1. Totipotency
2. Cybrids
3. cytokinins
4. Plant germplasm
5. Gene Gun

**SECTION -B**

**II. ANSWER ANY TWO OF THE FOLLOWING QUESTIONS**

**4x5=10**

6. synthetics seeds
7. Agrobacterium tumifaciens
8. Cell suspension cultures
9. embryo rescue
10. Protoplast culture
11. Direct gene transfer methods

**SECTION-C**

**III. ANSWER THE FOLLOWING QUESTIONS**

**4x10=40M**

12. A.) Regeneration of plants (Organogenesis and embryogenesis) ?

OR

B.) Nutritional requirements for plant tissue culture?

13. A.) Cell suspension cultures for production of secondary metabolites ?

OR

B.) Methods of cryopreservation for conservation of plant germplasm ?

14. A.) Molecular Farming – Production of biopharmaceuticals?

OR

B.) Improvement of nutritional quality of crops (vitamins, amino acids, oil, micronutrients) ?

15. A.) Development of somatic hybrids and Cybrids and their applications ?

OR

B.) Initiation of callus cultures and cell suspension cultures ?

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*T. Siva Ram*  
**Dr. T. SIVARAM**  
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# NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

## SEMESTER V ELECTIVE THEORY (B) MEDICAL BIOTECHNOLOGY

### Unit 1: Methods for diagnosis of human diseases

- 1.1 Karyotyping of human chromosomes
- 1.2 Chromosome banding - G banding and R-banding technique
- 1.3 Inheritance patterns in Man- Pedigree analysis
- 1.4 Prenatal diagnosis - Invasive techniques- Amniocentesis, Chorionic villi sampling (CVS); Non-invasive techniques- Ultrasonography
- 1.5 Diagnosis using monoclonal antibodies- ELISA
- 1.6 DNA RNA based diagnosis- HBV, HIV

### Unit 2: Inherited disorders

- 2.1 Chromosomal disorders caused due to structural chromosomal abnormalities (Deletions, duplications, Translocations)
- 2.2 Chromosomal disorders caused due to numerical chromosomal abnormalities (autosomal and allosomal)
- 2.3 Monogenic disorders (autosomal and X-linked diseases)
- 2.4 Mitochondrial diseases - LHON, MERRF
- 2.5 Multifactorial conditions - Diabetes and Hypertension; Single Nucleotide Polymorphisms in common diseases: Hypertension (Angiotensin Converting Enzyme gene)
- 2.6 Cancer- types, molecular basis of colon cancer and breast cancer

### Unit 3: Therapeutic approaches for human diseases

- 3.1 Gene therapy - *ex vivo* and *in vivo* gene therapy; somatic and germline gene therapy;
- 3.2 Strategies of gene therapy: gene augmentation - ADA deficiency; Prodrug therapy/ suicide gene - glioma
- 3.3 Stem cells - potency definitions: embryonic and adult stem cells: applications of stem cells - cell based therapies and regenerative medicine
- 3.4 Encapsulation technology and therapeutics-Diabetes
- 3.5 DNA based vaccines, subunit vaccines - Herpes Simplex Virus, Recombinant attenuated vaccines- Cholera
- 3.6 Nutrigenomics and Pharmacogenomics

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**NAGARJUNA GOVERNMENT COLLEGE(A)  
DEPARTMENT OF BIOTECHNOLOGY**

**ELECTIVE (B): PRACTICALS**

- 1. Karyotyping of normal and abnormal human chromosome sets
- 2. Human pedigree analysis
- 3. Estimation of C-reactive protein
- 4. Dot ELISA
- 5. Genotyping of candidate genes for diseases by RFLP
- 6. Detection of DNA damage by comet assay
- 7. Encapsulation of mammalian cells.

**REFERENCE BOOKS**

- 1. Medical Biotechnology-Pratibha Nallari, V.Venugopal Rao-Oxford Press
- 2. Introduction to Human Molecular Genetics – J.J Pasternak, John Wiley Publishers
- 3. Human Molecular Genetics – Tom Strachen and A P Read, Bios Scientific Publishers
- 4. Human Genetics Molecular Evolution, Mc Conkey
- 5. Recombinant DNA Technology, AEM Emery
- 6. Principles and Practice of Medical Genetics, I, II, III Volumes by AEM Edts. Emery
- 7. Molecular Biotechnology, Glick and Pasternak

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# NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

## SEMESTER-VI CORE THEORY VI MICROBIAL TECHNOLOGY

### Unit 1: Introduction to Microbial technology

- 1.1. Introduction to industrial biotechnology, scope and applications
- 1.2. Principles and exploitation of microorganisms and their products
- 1.3. Isolation and screening of microorganisms for industrial products
- 1.4. Strategies for Strain improvement (mutation, selection, recombination)
- 1.5. Preservation of industrial microorganisms
- 1.6. Good manufacturing practices and Intellectual Property Rights and Patenting issues

### Unit 2: Microbial fermentation

- 2.1 Principles of Fermentation technology
- 2.2 Fermentation concept and Design
- 2.3 Types of Fermentation
- 2.4 Formulation and Design of fermentation Media
- 2.5 Substrates used as Carbon and Nitrogen Inoculum development.
- 2.6 Factors affecting fermentation process

### Unit 3: Microbial technology products and applications

- 3.1 Microbial production of Organic acids (Lactic acid, citric acid)
- 3.2 Microbial production of Amino acids (Glutamic acid, Aspartic acid, Lysine)
- 3.3 Fermentation by microbes for food & Nutives: dairy products (Cheese, Yogurt, Bread, Vinegar, SCP), beverages (Beer, Wine) and antibiotics (Penicillin, Streptomycin, Erythromycin)
- 3.4 Food quality and Control
- 3.5 Therapeutic drugs: Recombinant vaccines, monoclonal antibodies, insulin, vitamins
- 3.6 Biofuel: Hydrogen, Alcohol, Methane

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NAGARJUNA GOVERNMENT COLLEGE(A)  
DEPARTMENT OF BIOTECHNOLOGY

CORE-VI: PRACTICALS

- 1. Screening of Microorganisms (primary selection, secondary selection)
- 2. Production of Citric acid
- 3. Screening of amylase producing microorganisms
- 4. Production of wine using common yeast
- 5. Production of alcohol by fermentation and Estimation of alcohol by colorimetry
- 6. Production of hydrogen or biogas using cow/cattle dung
- 7. Production of Penicillin/Ampicillin

REFERENCE BOOKS

- 1. Text Book of Biotechnology - By H.K. Das (Wiley Publications)
- 2. Biotechnology -By H.J. Rehm and G. Reed, VCH 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. (Pearson Education)
- 10. Biotechnology, IPRs and Biodiversity - By M.B. Rao and Manjula Guru (Pearson Education)
- 11. Bioprocess Engineering - By Shuler (Pearson Education)
- 12. Essentials of Biotechnology - By Irfan Ali Khan and AtiyaKhanum (Ukaaz Publications)
- 13. Gene, Genomics and Genetic Engineering - By Irfan Ali Khan and AtiyaKhanum (Ukaaz Publications)

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NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

53

SEMESTER-VI  
CORE THEORY VI  
MICROBIAL TECHNOLOGY

SECTION-A

Marks:70  
5x2=10M

ANSWER THE FOLLOWING QUESTION

1. Industrial products
2. Intellectual Property Rights
3. Fermentation
4. Biofuel
5. Food quality and Control

SECTION -B

4x5=20M

ANSWER ANY TWO OF THE FOLLOWING QUESTIONS

6. Microbial production of Amino acids?
7. Principles of Fermentation technology ?
8. Fermentation by microbes for food additives: dairy products ?
9. Isolation and screening of microorganisms for industrial products ?
10. Substrates used as Carbon and Nitrogen Inoculum development?
11. Biofuel: Hydrogen, Alcohol, Methane ?

SECTION-C

4x10=40M

ANSWER THE FOLLOWING QUESTIONS

12. A.) Therapeutic drugs: Recombinant vaccines, monoclonal antibodies, insulin, vitamins ?  
OR  
B.) Strain improvement?
13. A.) Fermentation concept and Design ?  
OR  
B.) Factors affecting fermentation process ?
14. A.) Preservation of industrial microorganisms ?  
OR  
B.) Good manufacturing practices and Intellectual Property Rights and Patenting issues?
15. A.) Therapeutic drugs: Recombinant vaccines, monoclonal antibodies, insulin, vitamins ?  
OR  
B.) antibiotics (Penicillin, Streptomycin, Erythromycin) ?

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Dr. K. S. Prasad  
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# NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

## SEMESTER VI ELECTIVE THEORY (A) ANIMAL BIOTECHNOLOGY

### 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, ebv)
- 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
- 3.6 Ethical considerations for transgenic animals

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25


**NAGARJUNA GOVERNMENT COLLEGE(A)**  
**DEPARTMENT OF BIOTECHNOLOGY**


**LECTIVE (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

**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 & Kumar J. Biometrical Methods in Poultry Breeding. Kalyani

  
**T. SIVARAM**  
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# NAGARJUNA GOVERNMENT COLLEGE, NALGONDA

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

### Unit 1: Environmental Pollution

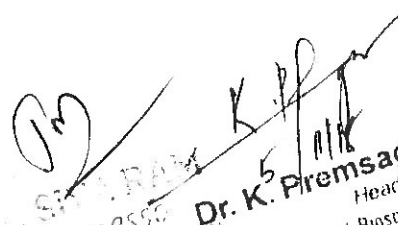
- 1.1 Introduction to environment and pollution.
- 1.2 Types of pollution- air, water and land pollutions
- 1.3 Types of pollutants- inorganic, organic and biotic sources
- 1.4 Sources of pollution – domestic waste, agricultural waste, industrial effluents and municipal waste
- 1.5 Climate change, greenhouse 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
- 2.6 Production of biomethane, biohydrogen

### Unit 3: Bioremediation and Restoration of Environment

- 3.1 Microbial treatment of waste water (sewage of industrial effluent)- aerobic and anaerobic methods
- 3.2 Solid waste and management: Bioremediation- concepts and types (in-situ and ex-situ); Bioremediation of toxic metal ions – biosorption and bioaccumulation
- 3.3 Composting of organic wastes
- 3.4 Microbial bioremediation of pesticides and Xenobiotic compounds
- 3.5 Phytoremediation- concepts and application
- 3.6 Conservation of biodiversity

  
 D. K. P. P. S. R. A. M.  
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**NAGARJUNA GOVERNMENT COLLEGE(A)  
DEPARTMENT OF BIOTECHNOLOGY**

**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

**RECOMMENDED BOOKS**

- 1. Text Book of Biotechnology - By H.K. Das (Wiley Publications)
- 2. Biotechnology -By H.J. Rehm and G. Reed, VCH 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
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- 10. Biotechnology, IPRs and Biodiversity - By M.B. Rao and Manjula Guru (Pearson Education)
- 11. Bioprocess Engineering - By Shuler (Pearson Education)
- 12. Essentials of Biotechnology - By Irfan Ali Khan and Atiya Khanum (Ukaaz Publications)

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

SECTION-A

I. ANSWER THE FOLLOWING QUESTIONS

1. Environment
2. Pollution
3. Bioenergy
4. Phytoremediation
5. Bioaccumulation

SECTION-B

II. ANSWER ANY TWO OF THE FOLLOWING QUESTIONS

6. Land pollutions?
7. Bioethanol?
8. Renewable energy resources?
9. Solid waste and management?
10. Conservation of biodiversity?
11. Impact of pollution on environment and measurement methods?

SECTION-C

III. ANSWER THE FOLLOWING QUESTIONS

12. A.) Bioremediation - Phytoremediation?

OR

B.) greenhouse gases and global warming?

13. A.) Non-conventional source - biomass as source of bioenergy?

OR

B.) Xenobiotic compounds?

14. A.) Types of biomass?

OR

B.) Solid waste and management?

15. A.) Phytoremediation- concepts and application?

OR

B.) Climate change, greenhouse gases?

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37

**NAGARJUNA GOVERNMENT COLLEGE(A)**  
**DEPARTMENT OF BIOTECHNOLOGY**  
**PRACTICAL EXAMINATION MODEL PAPER**

**FOR SEMESTER (I II III IV V VI VII VIII)**

**2018-19**

*Time: 2 hrs*

**MAX.MARKS:50**

1.MAJOR EXPERIMENT.?

20 MARKS

2.MINOR EXPERIMENT.?

10 MARKS

3.SPOTTERS.?

5X2=10 MARKS

A.)

B.)

C.)

D.)

E.)

4.RECORD AND VIVA.?

10 MARKS

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**NAGARJUNA GOVERNMENT COLLEGE(A), NALGONDA**  
**PANEL OF EXAMINERS FOR THE ACADEMIC YEAR 2018-19**  
**DEPARTMENT OF BIOTECHNOLOGY**

| S.No | SUBJECT   | S.No | Name Designation, Working address, Mobile No, Email ID | Residential Address                         | Remarks    |
|------|---|------|--|---|------------|
| 1    | <b>FIRST YEAR (PAPER-I) CELL BIOLOGY AND GENETICS</b>         | 1    | Dr. T. Siva Ram Asst. Prof                             | Dept. of Applied Biosciences, MGU, NLG      | 9032694559 |
| 2    |   | 2    | Dr. K. Premeşagar, Asst. Prof                          | Head Dept. of Applied Biosciences, MGU, NLG | 8500275976 |
| 3    |   | 3    | Dr. M. Thirumala, Asst. Prof                           | Dept. of Biochemistry, MGU, Nalgonda        | 9490705105 |
| 4    | <b>FIRST YEAR (PAPER-II) NUCLEIC ACIDS AND BIOINFORMATICS</b> | 1    | Dr. K. Premeşagar, Asst. Prof                          | Head Dept. of Applied Biosciences, MGU, NLG | 8500275976 |
| 5    |   | 2    | Dr. T. Siva Ram, Asst. Prof                            | Dept. of Applied Biosciences, MGU, NLG Dept | 9032694559 |
| 6    |   | 3    | Dr K. Madhuri, Asst. Prof, MGU, Nlg                    | Dept. of Applied Biosciences, MGU, NLG      | 9000595973 |
| 7    | <b>SECOND YEAR (PAPER-III) BIOLOGICAL CHEMISTRY</b>           | 1    | Dr. M. Ramchander, Asst. Prof                          | Dept of Biochemistry (MGU, NLG)             | 9989427725 |
| 8    |   | 2    | Dr. M. Thirumala, Asst. Prof                           | Dept. of Biochemistry, MGU, Nalgonda        | 9490705105 |
| 9    |   | 3    | Dr. T. Siva Ram Asst. Prof                             | Dept. of Applied Biosciences, MGU, NLG      | 9032694559 |

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| S.NO | SUBJECT   | S.NO | Name Designation, Working address/Mobile No/ Email ID | Residential Address                                    | Remarks    |
|------|---|------|---|--|------------|
| 10   | SECOND YEAR<br>(PAPER-IV)<br>MICROBIOLOGY<br>&<br>IMMUNOLOGY  | 1    | K.Devavani,Asst. Prof                                 | Dept of Microbiology,GDC<br>Women,Nlg.                 | 9052528822 |
| 11   |   | 2    | Dr. T. Siva Ram, Asst. Prof                           | Dept. of Applied<br>Biosciences, MGU,NLG               | 9032694559 |
| 12   |   | 3    | Dr K. Madhuri, Asst. Prof, .<br>MGU, Nlg              | Dept. of Applied<br>Biosciences ,MGU,NLG               | 9000595973 |
| 13   | THIRD YEAR<br>(PAPER-V<br>(CORE)<br>MOLECULAR<br>BIOLOGY AND<br>RECOMBINANT<br>TECHNOLOGY                   | 1    | Dr. K. Prensagar ,Asst .Prof                          | Head. Dept. of Applied<br>Biosciences, MGU,NLG         | 9989427725 |
| 14   |   | 2    | Dr K. Madhuri, Asst. Prof, .<br>MGU, Nlg              | Dept. of Applied<br>Biosciences, MGU,NLG               | 9000595973 |
| 15   |   | 3    | Dr. T. Siva Ram, Asst. Prof                           | Head. Dept. of Applied<br>Biosciences, MGU,NLG<br>Dept | 9032694559 |
| 16   | THIRD YEAR<br>(Advanced<br>ELECTIVES)<br>PLANT<br>BIOTECHNOLOG<br>Y OR MEDICAL<br>BIOTECHNOLOG<br>Y         | 1    | Dr .K. Madhuri, Asst. Prof, .<br>MGU, Nlg             | Dept. of Applied<br>Biosciences, MGU,NLG               | 9000595973 |
| 17   |   | 2    | Dr. K. Prensagar, Asst. Prof                          | Head. Dept. of Applied<br>Biosciences, MGU,NLG         | 9989427725 |
| 18   |   | 3    | Dr. T. Siva Ram ,Asst. Prof                           | Head.Dept.of<br>biosciences MGU,NLG<br>Dept            | 9032694559 |
| 19   | THIRD YEAR<br>(PAPER-VI)<br>ANIMAL<br>&PLANT<br>BIOTECHNOLOG<br>Y   | 1    | Dr K. Madhuri, Asst. Prof, .<br>MGU, Nlg              | Dept. of Applied<br>Biosciences, MGU,NLG               | 9000595973 |
| 20   |   | 2    | Dr. K. Prensagar, Asst. Prof                          | Head. Dept. of Applied<br>Biosciences, MGU,NLG         | 9989427725 |
| 21   |   | 3    | Dr. T. Siva Ram ,Asst. Prof                           | Dept. of Applied<br>Biosciences MGU,NLG<br>Dept        | 9032694559 |
| 22   | THIRD<br>YEAR(PAPER-<br>VII Applied<br>electives)<br>ENVIRONMENTAL<br>BIOTECHNOLOG<br>Y AND<br>BIODIVERSITY | 1    | Dr. K. Prensagar, Ass. Prof                           | Head. Dept. of Applied<br>Biosciences, MGU,NLG         | 9989427725 |
| 23   |   | 2    | Dr K. Madhuri, Asst. Prof, .<br>MGU, Nlg              | Dept. of Applied<br>Biosciences, MGU,NLG               | 9000595973 |
|      |   | 3    | Dr. T. Siva Ram, Asst. Prof                           | Dept. of Applied<br>Biosciences, MGU,NLG<br>Dept       | 9032694559 |

  
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