

**GOVERNMENT AUTONOMOUS COLLEGE
(AUTONOMOUS) RAJAMAHENDRAVARAM**

NAAC “A⁺” GRADE



**DEPARTMENT
OF
MICROBIOLOGY
BOARD OF STUDIES
2023-2024**

**(Single Major & Minor-I & II Semester, II B.Sc
III B.Sc as per BOS Regulations 2021-22)**

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**Proceedings of the Principal, Government College (Autonomous),
Rajahmundry Present: Dr. C. Krishna, M.Sc.Tech, NET.,
Ph.D.**

**Rc. No: Spl./Acad.Cell-GCRJY/BOS/2023-24, Dated: 28 June
2023**

Sub:- Government College (Autonomous), Rajahmundry– **Boards of Studies (BoS) –
2023-24 Nomination of Members - Orders Issued.**

Ref:- 1. UGC Guidelines for Autonomous Colleges - 2018.
2. Proceedings of the Vice-Chancellor, ANUR No. ANUR Government College
(A)Rajahmundry, dated 01-06-2023.
3. UGC, Curriculum and Credit Framework for undergraduate programs
dated 7December 2022.

ORDER:

The Principal, Government College (Autonomous), Rajahmundry is pleased to constitute the **Board of Studies in Microbiology** for framing the syllabi in Microbiology subject for all semesters under **single major system** duly following the norms of the UGC Autonomous guidelines 2018 and curriculum framework issued by UGC for single major system vide Ref.3 above.

S. No	Name	Designation
1	T. Sony	Chairman
2	Dr.T.Sujatha, Lecturer in Microbiology	Member
3	Dr. A. Padmavathi, lecturer in Microbiology, CHSD. St.Theresas Womens college (A), Eluru	Subject Expert
4	Smt. K. Sasikala, ABN&PRR College Kovvuru	Subject Expert
5	Dr. B. Lakshmi P. R. Govt.College Kakinada	University Nominee
6	R.Prasad, QC, Microbiology, MK Marines Duvva West Godavari	Expert from Industry/Corporate Sector
7	K. Ramya Sri III MZC, T. Kanchana III FMZC	Student Nominee

The above members are requested to attend the BOS meetings and share their valuable views, and suggestions on the following functionalities:

- Prepare syllabi for the subject keeping in view the objectives of the college, the interest of the stakeholders and national requirements for consideration and approval of the Academic Council
- Suggest methodologies for innovative teaching and evaluation techniques
- Suggest a panel of names to the Academic Council for the appointment of examiners
- Coordinate research, teaching, extension, and other activities in the department

of the college.

The term of the members will be Two years from the date of issue of this proceeding. The Chairman of the BoS (HoD/lecturer In-Charge of the department) is directed to Coordinate with the Principal of the College and conduct BoS meetings as and when necessary, but at least twice a year.

Note: For further information, please go through the guidelines provided by the Academic Cell of the College.



**C. KRISHNA
PRINCIPAL
GOVERNMENT
COLLEGE [A]
RAJAHMUNDRY**

Copy to:

1. The above individuals
2. File

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
DEPARTMENT OF MICROBIOLOGY
BOARD OF STUDIES

Composition of BOS

The Board of Studies meeting of I, II, and III B.Sc Microbiology for all semesters for the academic year 2022-2023, held in the Department of Microbiology on 30-08-2023 at 2:00 PM with Smt. T. Sony, Lecturer in-Charge, in the chair along with the following members.

1. **Chairman** : Smt.T.Sony, Head of the Department of Microbiology, GC (A), Rajamahendravaram.
2. **Faculty Member** : Dr.T.Sujatha, Lecturer in Microbiology, GC (A), RJY
3. **University Nominee** : Dr. B. Lakshmi P. R. Govt.College Kakinada .
4. **Subject expert** : **Dr.A.Padmavati**, Lecturer in Microbiology, CHSD. St.Therasas Womens college (A), Eluru.
5. **Local Subject expert** : Smt. T. Sasikala, Lecturer, Dept of Microbiology ABN & PRR College, Kovvur
6. **Expert from Industry:** R.Prasad, QC, MicrobiologyMK Marines, Dosapadu Puntha road, Duvva, village Tanuku, Mandal, West Godavari, Andhra Pradesh
7. **Student Nominee** : K. Ramya Sri III MZC, T. Kanchana III FMZC

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

DEPARTMENT OF MICROBIOLOGY

BOARD OF STUDIES

Programme: B.Sc., Honours in MICROBIOLOGY:

MAJOR

w.e.f 2023-24 AY

COURSE STRUCTURE

YEAR	SEMESTER	COURSE	TITLE	Marks (SEE)	Marks in CIA	CRE DITS	HR/ WEEK (L+T+P)
I	I	124401	Introduction to Classical Biology	50	50	4	5
		124402	Introduction to applied biology	50	50	4	5
	II	124403	Introduction to Microbiology	50	50	3	3
		124403 P	Introduction to Microbiology	50	-	1	2
		124404	Bacteriology and Virology	50	50	3	3
		124404 P	Bacteriology and Virology	50	-	1	2

It is resolved to approve the above course structure for admitted batch **2023-2024**.

MICROBIOLOGY: MINOR

w.e.f 2023-24 AY

COURSE STRUCTURE

Year	Semester	Course	Title	Marks (SEE)	Marks in CIA	CRE DITS	HR/ WEEK (L+T+P)
I	II	124403	Introduction to Microbiology	50	50	3	3
		124403 P	Introduction to Microbiology	50	-	1	2

It is resolved to approve the above course structure for admitted batch **2023-2024**.

II & III B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS – w.e.f. 2020-2021

Year	Semester	Paper	Title	Marks	Credits	
II	III	MBT -III	Molecular Biology & Microbial Genetics	100	3	
		MBP - III	Molecular Biology & Microbial Genetics	50	2	
	IV	MBT - IV	Immunology & Medical Microbiology	100	3	
		MBP - IV	Immunology & Medical Microbiology	50	2	
		MBT - V	Microbial Ecology And Industrial Microbiology	100	3	
		MBP - V	Microbial Ecology & Industrial Microbiology	50	2	
		A PAIR				
III	V	MBT-A1	Food, Agriculture & Environmental Microbiology	100	3	
		MBP-A1	Food, Agriculture & Environmental Microbiology	50	2	
			MBT-A2	Management Of Human Microbial Diseases And Diagnosis	100	3
			MBP-A2	Management Of Human Microbial Diseases And Diagnosis	50	2
			B PAIR			
			MBT-B1	Microbial Biotechnology & R-Dna Technology	100	3
			MBP-B1	Microbial Biotechnology& R-Dna Technology	50	2
			BMT B2	Biostatistics And Bioinformatics	100	3
			MBP B2	Biostatistics And Bioinformatics	50	2
			C PAIR			
			MBT-C1	Microbial Quality Control & Instrumentations And Techniques	100	3
			MBP-C1	Microbial Quality Control & Instrumentations And Techniques	50	2
			MBT C2	Drug Designing, Discovery & Intellectual Property Rights	100	3
			MBT-C2	Microbial Quality Control & Instrumentations And Techniques	50	2

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
DEPARTMENT OF MICROBIOLOGY

Minutes of Board of Studies 2023-2024

The Board of Studies meeting for I, II, and III B.Sc Microbiology of all semesters for the academic year 2023-2024, was held at 2:30 PM on 30/08/2023. The Chairperson Smt.T.Sony & other members of the Board of Studies met in the department of Microbiology, Government College Rajahmundry and discussed the following agenda points:

AGENDA

1. Introduction of B.Sc Microbiology- Major and B.Sc Microbiology Minors w.e.f the academic year 2023-24 as per the directions given by APSCHE and Council of Higher education, A.P. For B.Sc. II & III year (MZC & FMZC) regulations will be as per BOS conducted in year 2022-2023.
2. Approval of course framework, syllabus and work load for first year Microbiology Major and Microbiology Minor and II & III year BSc (MZC & FMZC). Assigning and discussion on Programme Outcomes and Course Out comes for the above programmes.
3. Mode of instruction –Blended with offline & online teaching & learning.
4. Model question papers, Assignments question for each course as part of continuous internal assessment & blue prints for each course.
5. Panel of Question Paper Setters & Examiners.
6. SEE: CIA evaluation
7. Proposal for Extension Activities like Community Service / Field Trips/ Study tours/Student Study projects/Industrial Visits/ Extension Lectures / Green Initiatives for the students
8. Enrolling students in SWAYAM / MOOC courses of Microbiology & IPRs
9. Certificate course on “Introduction to Food processing & safety”.
10. Any other proposal with the permission of the chairman

BOARD OF STUDIES MEETING
2023-24 , 30 August-2024

Resolutions:

Agenda point-1:

Introduction of B.Sc Microbiology- Major and B.Sc Microbiology Minors for first year students w.e.f the academic year 2023-24 as per the directions given by APSCHE and Department of Higher education, A.P.

Discussion:

The members of BOS discussed the curriculum under NEP & APSCHE & University Guidelines for UG B.Sc Microbiology for implementation of courses designed by department of Microbiology, Government College Autonomous, Rajahmundry, in tune with decision of introducing UG Minor and Major Government of AP.

Resolution:I.A

It is resolved to approve the introducing Microbiology major and Minor course for B.Sc students by the Department of Microbiology according to our Teaching, Learning and Evaluation pattern which are in force at present.

Resolution: I.B.

It is also resolved to continue the same course structure for II & III B.Sc Microbiology as per BOS 2022-2023.

Agenda point-2:

Approval of course framework, syllabus and work load for Microbiology Major and Microbiology Minor. Assigning and discussion on Programme Outcomes and Course Out comes for the above programmes.

Discussion:

The members of the BOS discussed the Course framework, workload / Hours per week for microbiology major and Minor. The subject experts gave necessary suggestions wherever necessary for the setting up of syllabus for Both Major and Minor. Members of BOS also discussed Programme Outcomes and Course Outcomes for the above programmes.

Resolution:II.A

It is resolved to approve the course framework and work load of each course for microbiology major and minor.

Resolution-II.B.

It is also resolved to approve the syllabus for I semester to VI semester Microbiology major and Microbiology Minor with effect from the academic year 2023-24. (The approved syllabus copy attached with this resolutions).

Resolution-II.C.

It is resolved to approve the Programmes codes and course codes assigned to the new B.Sc Microbiology Major and Microbiology Minor programmes

Agenda point III: - Mode of instruction –Blended with offline & online teaching & learning.

Discussion: The members of BOS discussed about the mode of instruction in both offline & online mode in 80:20. Eighty percent of teaching will be offline. Twenty percent of online instruction includes online test, online quizzes, LMS , Youtube lessons, free links for subject content.

Resolution III: The members resolved to follow the blended mode of teaching & learning in 80:20 ratios as discussed above.

Agenda point IV - Model question papers, Assignments question for each course as part of continuous internal assessment & blue prints for each course.

Discussion: The members of BOS discussed about changes in Model question papers& blue prints, Assignments question for each course as part of continuous internal assessment. Members suggested giving Course Outcomes & level of learning for each course.

Resolution IV A.: The question paper is divided into three parts. The first part comprises of two sections, A and B having essay questions. Each essay question allocated 10 marks. The part 2 has short answer questions and each question has a weightage of 04 marks. The part 3 is of very short answer type questions with 02 marks for each one. The detailed split up of questions and marks allocated in all the three parts are shown in detail in the following table. This blue print will be applicable for all the courses of the single major course in Microbiology for the new regulation taken up from 2023-24 academic years. The members of BOS unaniamously approved the Blue Print, Model Question Papers & Assignment Questions for each course.

**Model Blue Print for the Question paper and choice for
B.Sc., (Hons.) – Microbiology – Major/Minor courses (w.e.f. 2023-24 Academic Year)**

S.No.	Type of Questions	No. of questions to be given in the Question paper			No. of questions to be answered by the learner		
		No.	Marks allocated per question	Total marks	No.	Marks allocated per question	Total marks
PART-1							
1	SECTION - A Long Answer Questions (LAQ)	04	10	80	At least 01	10	30
2	SECTION - B Long Answer Questions (LAQ)	04	10		At least 01	10	
PART-2							
3	Short Answer Questions (SAQ)	05	04	20	03	04	12
4	Very Short Answer Questions (VSAQ)	05	02	10	04	02	08
Total questions & Total marks =		16	-	110	08	-	50

$$\text{Percentage of choice given} = \frac{110 - 50}{100} \times 100 = \frac{60}{100} \times 100 = 60\%$$

Resolution IVB. It is resolved to approve the given course outcomes for each course & levels of learning.

Agenda point V: Panel of Question Paper Setters & Examiners

Discussion: The members of BOS discussed Panel of Paper Setters & Examiners and updated the same.

Resolution V: It is resolved to approve the list of Examiners & Paper Setters enclosed for the next academic years.

Agenda point VI: SEE (Semester End Examination): CIA evaluation

Discussion: The members present discussed the SEE: CIA evaluation and ratified the same. CIA would consist of two internal exams of 20 marks. One online test for 10 marks. 5 marks for attendance, 5 marks for seminar, 10 for assignment 1& 2. SEE for 50 marks.

Resolution VI: Resolved to approve 50:50 CIA & SEE evaluation pattern for I, II & III year B.Sc students.

Agenda point VII: Proposal for Extension Activities like Community Service / Field Trips/ Study tours/Student Study projects/Industrial Visits/ Extension Lectures / Green

Initiatives for the students.

Discussion: The members present discussed the need for Co-Curricular activities to enhance learning process & holistic approach to Microbiology subject.

Resolution VII: It is resolved to approve to conduct the above Co-Curricular activities during the course time. It is also approved that the co-curricular activities & additional inputs does not carry any Marks /Credits.


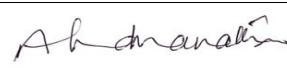

Agenda point VIII: Enrolling students in SWAYAM / MOOCs courses of Microbiology & IPRs.

Resolution VIII: It is resolved to enroll all B.Sc students in Microbiology & related online courses through SWAYAM / MOOCs platforms.

Agenda point VIII: Any other proposal with the permission of the chairman

Resolution VIII : It is resolved to approve the above course structure for admitted batch 2023 – 2024.

Signatures of Members:

S.no	Name	signature
1.	Chairman : Smt.T.Sony Head of the Department of Microbiology, Govt. College (A) – Rajamahendravaram.	
2.	Faculty member : Dr. T.Sujatha Lecturer in Microbiology Govt. College (A) – Rajamahendravaram	
3.	Dr. B. Lakshmi P. R. Govt.College Kakinada UniversityNominee	
4.	Subject expert : Dr.A.Padmavathi Dept of Microbiology, CHSD. St.Theresas Womens college (A), Eluru	
5.	Local nominee / Subject expert : T. Sasikala Dept of Microbiology ABN & PRR College, Kovvur	
6.	Industrial nominee : R.Prasad, Sr.Microbiologist, N K Marine Exports, Dosapadu Puntha road, Duvva Village, Tanuku, Mandal, West Godavari, Andhra Pradesh	
7.	Student member : K. Ramya Sri III MZC, T. Kanchana III FMZC	

Rajahmundry
Date: 30--08-2023

Chairman

Government college Autonomous Rajahmundry NAAC A⁺
BOS Meeting 2023-2024
Microbiology

List of paper setters & Examiners

S.No	Name of the lecturer	Papers	College
1	Ms. D. Jayasree, Lecturer in Microbiology	All	Head, Department of Microbiology A.S.D. Govt. College (A), Kakinada 8121000338 jayasreed@gcrjy.ac.in
2	Dr. A. Padmavathi Lecturer in Microbiology	All	Head Department of Microbiology Ch.S.D.St. Theresa's College For Women(A), Eluru, West Godavari (Dist.) 9440581035 Padmaanduri20@gmail.com
3	Dr. Y. Neeraja Lecturer in Microbiology	All	Department of Microbiology Ch.S.D.St. Theresa's College For Women(A), Eluru, West Godavari (Dist.) 9440159390 Neeraja2002@gmail.com
4	Dr. K.Sucharita Lecturer in Microbiology	All	GDC (W) GUNTUR 9963180561 sucharitak@gmail.com
5	Dr. LALITHA Lecturer in Microbiology	All	GDC Dr V S Krishna College (A) VISHAKAPATNAM 9491331865
6	Dr. PALLAVI Lecturer in Microbiology	All	GDC ANANTAPUR 9491233355 pallavi.pavan2003@gmail.com
7	Dr. VIMALA RHODE Lecturer in Microbiology	All	Silver Jubilee college GDC KURNOOL 9030856521

			microbiology@sjgckurnool.edu.in
8	Dr.CH. MADHAVI Lecturer in Microbiology	All	GDC ANATAPUR 9908658952 chavalimadhulatha@gmail.com
9	Dr.K. Aruna Lecturer in Microbiology	All	SRR & CVR Government college Vijayawada 9490040657 kopuriarunadl@gmail.com
10	B.Lakshmi Lecturer in Microbiology	All	P R Government college Autonomous, Kakinada 8106620525
11	DR.CH. Shanti Devi	All	GDC Men Srikakulam 9052177822 <u>Ch.shanthi123@gmail.com</u>
12	Dr. Maqsood	All	SKR Government degree college, Tilak Naga Gudur Nellore 9849530338 <u>mdmaqsood.micro@gmail.com</u>
13	P. Aruna Lecturer in Microbiology	All	GDC Guntur WOMEN <u>patchalaaruna@gmail.com</u>
14	T.Sasikala Lecturer in Microbiology	All	ABN College, Kovvuru 9885861088
15	Dr.K.Usha shree Lecturer in Microbiology	All	Government degree college Piler, Chittoor District
16	Dr.Praveena Lecturer in Microbiology	All	GDC Guntur WOMEN

Members

Chairman

Semester - 1

Course: 1

INTRODUCTION TO CLASSICAL BIOLOGY

Hours/Week: 5
4

Credits:

Learning objectives

The student will be able to learn the diversity and classification of living organisms and understand their chemical, cytological, evolutionary and genetic principles.

Learning Outcomes

1. Learn the principles of classification and preservation of biodiversity
2. Understand the plant anatomical, physiological and reproductive processes.
3. Knowledge on animal classification, physiology, embryonic development and their economic importance.
4. Outline the cell components, cell processes like cell division, heredity and molecular processes.
5. Comprehend the chemical principles in shaping and driving the macromolecules and life processes.

Unit 1: Introduction to systematics, taxonomy and ecology.

- 1.1. Systematics – Definition and concept, Taxonomy – Definition and hierarchy.
- 1.2. Nomenclature – ICBN and ICZN, Binomial and trinomial nomenclature.
- 1.3. Ecology – Concept of ecosystem, Biodiversity and conservation.
- 1.4. Pollution and climate change.

Unit 2: Essentials of Botany.

- 2.1. The classification of plant kingdom.
- 2.2 Plant physiological processes (Photosynthesis, Respiration, Transpiration, phytohormones).
- 2.3 Structure of flower – Micro and macro sporogenesis, pollination, fertilization and structure of mono and dicot embryos.
- 2.4 Mushroom cultivation, floriculture and landscaping.

Unit 3: Essentials of Zoology

- 3.1. The classification of Kingdom Animalia and Chordata.
- 3.2 Animal Physiology – Basics of Organ Systems & their functions, Hormones and Disorders
- 3.3 Developmental Biology – Basic process of development (Gametogenesis, Fertilization,

Cleavage and Organogenesis)

3.3 Economic Zoology – Sericulture, Apiculture, Aquaculture

Unit 4: Cell biology, Genetics and Evolution

- 4.1. Cell theory, Ultrastructure of prokaryotic and eukaryotic cell, cell cycle.
- 4.2. Chromosomes and heredity – Structure of chromosomes, concept of gene.
- 4.3. Central Dogma of Molecular Biology.
- 4.4. Origin of life

Unit 5: Essentials of chemistry

- 5.1. Definition and scope of chemistry, applications of chemistry in daily life.
- 5.2. Branches of chemistry
- 5.3. Chemical bonds – ionic, covalent, noncovalent – Vander Waals, hydrophobic, hydrogen bonds.
- 5.4. Green chemistry

References

1. Sharma O.P., 1993. Plant taxonomy. 2nd Edition. McGraw Hill publishers.
2. Pandey B.P., 2001. The textbook of botany Angiosperms. 4th edition. S. Chandpublishers, New Delhi, India.
3. Jordan E.L., Verma P.S., 2018. Chordate Zoology. S. Chand publishers, New Delhi, India.
4. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.
5. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.
6. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
7. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chandpublishers, New Delhi, India.
8. Karen Timberlake, William Timberlake, 2019. Basic chemistry. 5th Edition. Pearson publishers.
9. Subrata Sen Gupta, 2014. Organic chemistry. 1st Edition. Oxford publishers.

ACTIVITIES:

1. Make a display chart of life cycle of nonflowering plants.
2. Make a display chart of life cycle of flowering plants.
3. Study of stomata
4. Activity to prove that chlorophyll is essential for photosynthesis

5. Study of pollen grains.
6. Observation of pollen germination.
7. Ikebana.
8. Differentiate between edible and poisonous mushrooms.
 9. Visit a nearby mushroom cultivation unit and know the economics of mushroomcultivation.
 10. Draw the Ultrastructure of Prokaryotic and Eukaryotic Cell
 11. Visit to Zoology Lab and observe different types of preservation of specimens
 12. Hands-on experience of various equipment – Microscopes, Centrifuge, pH Meter, Electronic Weighing Balance, Laminar Air Flow
 13. Visit to Zoo / Sericulture / Apiculture / Aquaculture unit
 14. List out different hormonal, genetic and physiological disorders from the society

**Model Blue Print for the Question paper and choice for
B.Sc., (Hons.) – Microbiology – Major/Minor courses (w.e.f. 2023-24 Academic Year)**

S.No.	Type of Questions	No. of questions to be given in the Question paper			No. of questions to be answered by the learner		
		No.	Marks allocated per question	Total marks	No.	Marks allocated per question	Total marks
PART-1							
1	SECTION - A Long Answer Questions (LAQ)	04	10	80	At least 01	10	30
2	SECTION - B Long Answer Questions (LAQ)	04	10		At least 01	10	
PART-2							
3	Short Answer Questions (SAQ)	05	04	20	03	04	12
4	Very Short Answer Questions (VSAQ)	05	02	10	04	02	08
Total questions & Total marks =		16	-	110	08	-	50

$$\text{Percentage of choice given} = \frac{110 - 50}{100} \times 100 = \frac{60}{100} \times 100 = 60\%$$

Major I
INTRODUCTION TO CLASSICAL BIOLOGY

TIME: 2 1/2 HOURS

Maximum Marks: 50

PART -1
Section- A

Answer any THREE attempting at least one from each section
3×10=30 Marks

1. Essay question from unit I.
2. Essay question from unit I
3. Essay question from unit II
4. Essay question from unit II

Section-B

5. Essay question from unit III
6. Essay question from unit III
7. Essay question from unit IV
8. Essay question from unit V

PART -2
SHORT ANSWER QUESTIONS

Answer any THREE questions only **3×4=12 Marks**

9. Short question from unit I
10. Short question from unit II
11. Short question from unit III
12. Short question from unit IV
13. Short question from unit V

VERY SHORT ANSWER QUESTIONS

Answer any FOUR questions only **4×2=08 Marks**

14. Very Short question from unit I
15. Very Short question from unit II
16. Very Short question from unit III
17. Very Short question from unit IV
18. Very Short question from unit V

Major I
INTRODUCTION TO CLASSICAL BIOLOGY
Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

PART -1

Section- A

Answer any **THREE** attempting at least one from each section

3×10=30 Marks

1. Write a note on Definition and concept of Taxonomy.
2. Explain the Concept of ecosystem, Biodiversity and conservation.
3. Explain the classification of plant kingdom.
4. Write a note on Mushroom cultivation.

Section-B

5. Write a note on the classification of Kingdom Animalia and Chordata.
6. Explain the economic importance of Sericulture, Apiculture and Aquaculture.
7. Explain the Ultrastructure of prokaryotic and eukaryotic cell.
8. Explain scope of chemistry and applications of chemistry in daily life.

PART -2

SHORT ANSWER QUESTIONS

Answer any **THREE** questions only

3×4=12 Marks

9. Binomial and trinomial nomenclature.
10. Phytohormones
11. Gametogenesis
12. Concept of gene
13. Green chemistry

VERY SHORT ANSWER QUESTIONS

Answer any **FOUR** questions only

4×2=08 Marks

14. Pollution
15. Floriculture
16. Hormones & disorders
17. Origin of life
18. Chemical bonds

Semester – 1

Course: 2

INTRODUCTION TO APPLIED BIOLOGY

Hours/Week: 5

Credits: 4

Learning objectives

The student will be able to learn the foundations and principles of microbiology, immunology, biochemistry, biotechnology, analytical tools, quantitative methods, and bioinformatics.

Learning Outcomes

1. Learn the history, ultrastructure, diversity and importance of microorganisms.
2. Understand the structure and functions of macromolecules.
3. Knowledge on biotechnology principles and its applications in food and medicine.
4. Outline the techniques, tools and their uses in diagnosis and therapy.
5. Demonstrate the bioinformatics and statistical tools in comprehending the complex biological data.

Unit 1: Essentials of Microbiology and Immunology

- 1.1. History and Major Milestones of Microbiology; Contributions of Edward Jenner, Louis Pasteur, Robert Koch and Joseph Lister.
- 1.2. Groups of Microorganisms – Structure and characteristics of Bacteria, Fungi, Archaea and Virus.
- 1.3. Applications of microorganisms in – Food, Agriculture, Environment, and Industry.
- 1.4. Immune system – Immunity, types of immunity, cells and organs of immune system.

Unit 2: Essentials of Biochemistry

- 2.1. Biomolecules I – Carbohydrates, Lipids.
- 2.2. Biomolecules II – Amino acids & Proteins.
- 2.3. Biomolecules III – Nucleic acids -DNA and RNA.
- 2.4. Basics of Metabolism – Anabolism and catabolism.

Unit 3: Essentials of Biotechnology

- 3.1. History, scope, and significance of biotechnology. Applications of biotechnology in Plant, Animal, Industrial and Pharmaceutical sciences.
- 3.2. Environmental Biotechnology – Bioremediation and Biofuels, Biofertilizers and Biopesticides.

- 3.3. Genetic engineering – Gene manipulation using restriction enzymes and cloning vectors; Physical, chemical, and biological methods of gene transfer.
- 3.4. Transgenic plants – Stress tolerant plants (biotic stress – BT cotton, abiotic stress – salt tolerance). Transgenic animals – Animal and disease models.

Unit 4: Analytical Tools and techniques in biology – Applications

- 4.1. Applications in forensics – PCR and DNA fingerprinting
- 4.2. Immunological techniques – Immunoblotting and ELISA.
- 4.3. Monoclonal antibodies – Applications in diagnosis and therapy.
- 4.4. Eugenics and Gene therapy

Unit 5: Biostatistics and Bioinformatics

- 5.1. Data collection and sampling. Measures of central tendency – Mean, Median, Mode.
- 5.2. Measures of dispersion – range, standard deviation and variance. Probability and tests of significance.
- 5.3. Introduction, Genomics, Proteomics, types of Biological data, biological databases-NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment
- 5.4. Accessing Nucleic Acid and Protein databases, NCBI Genome Workbench

REFERENCES

1. Gerard J., Tortora, Berdell R. Funke, Christine L. Case., 2016. Microbiology: An Introduction. 11th Edition. Pearson publications, London, England.
2. Micale, J. Pelczar Jr., E.C.S. Chan., Noel R. Kraig., 2002. Pelczar Microbiology. 5th Edition. McGraw Education, New York, USA.
3. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
4. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
5. R.C. Dubey, 2014. Advanced Biotechnology. S. Chand Publishers, New Delhi, India.
6. Colin Ratledge, Bjorn, Kristiansen, 2008. Basic Biotechnology. 3rd Edition. Cambridge Publishers.

7. U. Sathyanarayana, 2005. Biotechnology. 1st Edition. Books and Allied Publishers pvt.ltd., Kolkata.
8. Upadhyay, Upadhyay and Nath. 2016. Biophysical Chemistry, Principles and Techniques. Himalaya Publishing House.
9. Arthur M. Lesk. Introduction to Bioinformatics. 5th Edition. Oxford publishers.
10. AP Kulkarni, 2020. Basics of Biostatistics. 2nd Edition. CBS publishers.

ACTIVITIES

1. Identification of given organism as harmful or beneficial.
2. Observation of microorganisms from house dust under microscope.
3. Finding microorganism from pond water.
4. Visit to a microbiology industry or biotech company.
5. Visit to a waste water treatment plant.
6. Retrieving a DNA or protein sequence of a gene'
7. Performing a BLAST analysis for DNA and protein.
8. Problems on biostatistics.
9. Field trip and awareness programs on environmental pollution by different types of wastes and hazardous materials.
10. Demonstration on basic biotechnology lab equipment.
11. Preparation of 3D models of genetic engineering techniques.
12. Preparation of 3D models of transgenic plants and animals.

[**NOTE:** In the colleges where there is availability of faculty for microbiology and biotechnology, those chapters need to be handled by microbiology and biotechnology faculty. In other colleges, the above topics shall be dealt by Botany and Zoology faculty]

**Model Blue Print for the Question paper and choice for
B.Sc., (Hons.) – Microbiology – Major/Minor courses (w.e.f. 2023-24 Academic Year)**

S.No.	Type of Questions	No. of questions to be given in the Question paper			No. of questions to be answered by the learner		
		No.	Marks allocated per question	Total marks	No.	Marks allocated per question	Total marks
PART-1							
1	SECTION - A Long Answer Questions (LAQ)	04	10	80	At least 01	10	30
2	SECTION - B Long Answer Questions (LAQ)	04	10		At least 01	10	
PART-2							
3	Short Answer Questions (SAQ)	05	04	20	03	04	12
4	Very Short Answer Questions (VSAQ)	05	02	10	04	02	08
Total questions & Total marks =		16	-	110	08	-	50

$$\text{Percentage of choice given} = \frac{110 - 50}{100} \times 100 = \frac{60}{100} \times 100 = 60\%$$

Major II
INTRODUCTION TO APPLIED BIOLOGY
TIME: 2 1/2 HOURS **Maximum Marks: 50**

PART -1
Section- A

Answer any THREE attempting at least one from each section **3×10=30**
Marks

1. Write a note on History and Major Milestones of Microbiology.
2. Explain immunity and types of immunity.
3. Describe the structure and function of Carbohydrates.
4. Write a note on Basics of Metabolism.

Section-B

5. Explain History, scope, and significance of biotechnology.
6. Write a note on Genetic engineering.
7. Write a note on Monoclonal antibodies.
8. Explain Probability and tests of significance.

PART -2
SHORT ANSWER QUESTIONS

Answer any THREE questions only **3×4=12 Marks**

9. Louis Pasteur
10. Amino acids
11. Bioremediation
12. DNA fingerprinting
13. NCBI

VERY SHORT ANSWER QUESTIONS

Answer any FOUR questions only **4×2=08 Marks**

14. Bacteria
15. DNA and RNA
16. BT cotton
17. Eugenics
18. Gen Bank

II SEMESTER
COURSE 3: - INTRODUCTION TO MICROBIOLOGY
credits -_3

I. Course Outcomes:

On successful completion of the course, the students will be able to

1. Understand the historical significance of microbiology and the contributions of key scientists.
2. Recognize the classification of microorganisms and their place in the living world.
3. Comprehend the scope and applications of microbiology, including the origin of microbial life and the distinction between eukaryotic and prokaryotic cells.
4. Describe the characteristics of bacteria, archaea, fungi, algae, and protozoa.
5. Describe viruses, including their nature, composition, and diversity in structure.
6. Develop practical skills in aseptic techniques, growth media preparation, isolation methods, and the identification of bacteria and fungi.

Unit - 1: History of Microbiology
Hours: 10

No. of

1. Discovery of Microscope and microbial world by Anton von Leeuwenhoek; Aseptic techniques with reference to Charak Samhita, Sushruta Samhita and Ignaz Philipp Semmelweis
2. Golden era of Microbiology- Refutation of abiogenesis; Germ theory of Disease; Discovery of vaccination; Discovery of penicillin
3. Major contributions of Scientists: Edward Jenner, Louis Pasteur, Robert Koch, Joseph Lister, Ivanowsky, Martinus Beijerinck and Sergei Winogradsky

Unit - 2: Place of Microorganisms in the living world

No. of Hours: 10

1. Haeckel's three Kingdom concept, Whittaker's five kingdom concept, three domain concept of Carl Woese
2. Definition and scope of Microbiology; Applications of Microbiology; Diverse groups of Microorganisms
3. Origin of microbial life on earth- Timeline, Miller's Experiment, endosymbiosis (cyanobacteria), distinguishing features of eukaryotic and prokaryotic cell

Unit - 3: Prokaryotic microorganisms and Viruses **No. of Hours:10**

General characteristics of Bacteria(Morphology,metabolic diversityand reproduction)

1. General characteristics of Archaea differentiating them from Bacteria
2. General characteristics of viruses (Nature, composition, size, host specificity, diversity in structure)

Unit - 4: Eukaryotic microorganisms **No. of Hours: 10**

1. Fungi - Habitat, nutrition, vegetative structure and modes of reproduction;
2. Algae- Habitat, thallus organization, photosynthetic pigments, storage forms of food, reproduction.
3. Protozoa–Habitat, cell structure, nutrition, locomotion, excretion, reproduction, encystment.

Unit - 5: Growing Microbes in Lab: Five I's **No. of Hours:05**

- 1.Inoculation-Aseptic methods of introducing inoculum to growth media; Composition of basic growth media, solid and liquid
2. Incubation and Isolation- Ambient temperature for growth of microorganisms; Concept of Pure culture, mixed culture and contaminated culture
- 3.Inspection and Identification - Observation of colour, size and shape of colonies;Wet mount and simple staining of bacteria and fungi

III. Skill Outcomes:

1. Implement safety protocols, handling hazardous materials, and practicing personal protective measures.
2. Identify microscope parts, adjusting focus and diaphragm, and accurately observing and documenting microscopic images.
3. Prepare smears, identifying different microorganisms, and interpreting microscopic characteristics.
4. Analyze electron micrographs, identifying virus types, and describing their morphology and size.
5. Operate Autoclave, Hot Air Oven, and Laminar Air Flow Chamber for sterilization and decontamination purposes.

**Model Blue Print for the Question paper and choice for
B.Sc., (Hons.) – Microbiology – Major/Minor courses (w.e.f. 2023-24 Academic Year)**

S.No.	Type of Questions	No. of questions to be given in the Question paper			No. of questions to be answered by the learner		
		No.	Marks allocated per question	Total marks	No.	Marks allocated per question	Total marks
PART-1							
1	SECTION - A Long Answer Questions (LAQ)	04	10	80	At least 01	10	30
2	SECTION - B Long Answer Questions (LAQ)	04	10		At least 01	10	
PART-2							
3	Short Answer Questions (SAQ)	05	04	20	03	04	12
4	Very Short Answer Questions (VSAQ)	05	02	10	04	02	08
Total questions & Total marks =		16	-	110	08	-	50

$$\text{Percentage of choice given} = \frac{110 - 50}{100} \times 100 = \frac{60}{100} \times 100 = 60\%$$

II SEMESTER

COURSE 3: - INTRODUCTION TO MICROBIOLOGY

TIME: 2 1/2 HOURS

Maximum Marks: 50

PART -1

Section- A

Answer any **THREE** attempting at least one from each section 3×10=30 Marks

1. Essay question from unit I.
2. Essay question from unit I
3. Essay question from unit II
4. Essay question from unit II

Section-B

5. Essay question from unit III
6. Essay question from unit III
7. Essay question from unit IV
8. Essay question from unit V

PART -2

SHORT ANSWER QUESTIONS

Answer any **THREE** questions only

3×4=12 Marks

- 9.Short question from unit I
- 10..Short question from unit II
11. Short question from unit III
- 12.Short question from unit IV
- 13.Short question from unit V
- 14.Short question from unit III

VERY SHORT ANSWER QUESTIONS

Answer any **FOUR** questions only

4×2=08 Marks

14. Very Short question from unit I
15. Very Short question from unit II
16. Very Short question from unit III
17. Very Short question from unit IV
18. Very Short question from unit V

Major I
SEMESTER-II
INTRODUCTION TO MICROBIOLOGY Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

PART -1

Section- A

Answer any **THREE** attempting at least one from each section **3×10=30 Marks**

1. write an essay on Aseptic techniques with reference to Charak Samhita, Sushruta Samhita and Ignaz Philipp Semmelweis.
2. Write about the major contributions of Edward Jenner and Louis Pasteur in the field of microbiology.
3. Explain definition and scope of Microbiology in detail.
4. Distinguish between Prokaryotic and Eukaryotic Cell.

Section-B

5. Explain the detailed structure of bacterial cell with neat labeled diagram.
6. Write an essay on general characters of viruses.
7. Write an essay on the General characters of Algae.
8. What is Growth media? Write about Composition of basic growth media.

PART -2

SHORT ANSWER QUESTIONS

Answer any **THREE** questions only 3×4=12 Marks

9. Discovery of penicillin
10. Hakeel's three kingdom concept.
11. General characters of Archaea
12. Reproduction in Protozoa
13. Pure culture

VERY SHORT ANSWER QUESTIONS

Answer any **FOUR** questions only 4×2=08 Marks

14. Winogradsky
15. Cyanobacteria
16. Endospore
17. Nutrition in fungi
18. Wet mount.

II SEMESTER

COURSE 3: - INTRODUCTION TO MICROBIOLOGY

credits -_1

1. Good Laboratory Practices and Biosafety
2. Compound Light microscope -Parts and its handling
3. Microscopic observation of bacteria, Algae and Fungi and protozoa
4. Observation of electron micrographs of viruses (Lambda, T4, TMV, HIV, SARS CoV-2, Polio)
5. Laboratory equipment -Working principles of Autoclave, Hot air oven, Laminar airflow chamber

IV.References:

1. Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). Microbiology. 5th Edition, Tata McGraw Hill Publishing Co., Ltd., New Delhi.
2. Dube, R.C. and Maheswari, D.K. (2000) General Microbiology. S Chand, New Delhi. Edition), Himalaya Publishing House, Mumbai.
3. Prescott, M.J., Harley, J.P. and Klein, D.A. (2012). Microbiology. 5th Edition, WCB McGraw Hill, New York.
4. Reddy, S.M. and Reddy, S.R. (1998). Microbiology Practical Manual, 3 rd Edition, Sri Padmavathi Publications, Hyderabad.
5. Singh, R.P. (2007). General Microbiology. Kalyani Publishers, New Delhi.
6. Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.
7. Jaya Babu (2006). Practical Manual on Microbial Metabolisms and General Microbiology. Kalyani Publishers, New Delhi.
8. Gopal Reddy et al., Laboratory Experiments in Microbiology

IV. Co-Curricular Activities:

1. Establish a Microbiology Club where students can come together to discuss and explore various topics related to microbiology.
2. Organizing microbiology-themed events like microbiology day 3 Poster presentations, oral presentations, and Q&A sessions.
3. Field Trips to Microbiology-related Sites
4. Establish a Microbiology Journal Club where students can review and discuss scientific articles related to microbiology.

II SEMESTER

COURSE 4: - BACTERIOLOGY AND VIROLOGY

credits -_3

Learning Outcomes:

On successful completion of the course, the students will be able to

1. Understand the concept of prokaryotic diversity and taxonomy.
2. Identify and describe the salient features of various bacterial groups
3. Comprehend the discovery, nature, and definition of viruses.
4. Describe the replication processes of specific viruses
5. Comprehend the concept of oncogenic viruses, and role of viruses in the ecosystem.

Unit -1: Bacterial Taxonomy and Ultrastructure

No. ofHours: 9

- 1.Introduction to prokaryotic diversity and taxonomy. Types of classification- Numerical and Phylogenetic
- 2.Introduction to Bergy's manual of Systematic Bacteriology
- 3.Non-Culturables and Metagenomics
- 4.Ultrastructure of a Bacterial Cell-Invariable components -cell wall, Structure and/Functions of cell membrane, cytoplasm, nucleoid; Variable components- plasmid, inclusion bodies, flagella (structure and arrangement), pili, capsule, endospore.

Unit - 2: Type studies of Bacteria and Archae

No. of Hours:9

1. Salient features of:
 - a) Photosynthetic bacteria - Purple bacteria, Green bacteria and *Anabaena*
 - b) Gliding bacteria - Myxobacteria and Cytophaga group
 - c) Filamentous -Actinomycetes
 - d) Spore forming bacteria - Bacillus and Clostridia
 - e) Miscellaneous - Mycoplasma, Rickettsia, Chlamydia
2. Salient features of Fermentative bacteria, Sulphur bacteria, Nitrogen fixing bacteria
3. Salient features of Extremophiles- Methanogens and halobacteria.

Unit - 3: General Properties and Classification of Viruses

No. of

Hours:9

1. Discovery of viruses, Nature and definition of viruses, general properties
2. Heirarchy of ICTV nomenclature
3. Outline of Baltimore system of classification.
4. Cultivation of Viruses, Virus Purification and Assay.

Unit - 4: Replication of Viruses**No. ofHours:9**

1. General features of Viral Replication
2. Replication of T4, lambda, TMV , HIV
3. Replication of Polio, Influenza, Adeno Viruses

Unit - 5: Pathogenic and other Viruse**No. ofHours:9**

1. Defective Viruses- viroids, virusoids, satellite viruses and Prions.
2. Emergence of Viral Pathogens, Introduction to Oncogenic viruses, Concept ofOncogenes and Protooncogenes
3. Role of viruses in Ecosystems; Applications in Biotechnology

III Skill Outcomes:

On successful completion of the course, the students will be able to

1. Develop practical skills in the isolation, identification, and cultivation of bacteria.
2. Acquire knowledge about the preparation of growth media and study host-pathogeninteractions.
3. Gain the ability to examine the bacteria through microscopy.
4. Demonstrate proficiency in isolating bacteria from natural environment

**Model Blue Print for the Question paper and choice for
B.Sc., (Hons.) – Microbiology – Major/Minor courses (w.e.f. 2023-24 Academic Year)**

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		No.	Marks allocated per question	Total marks	No.	Marks allocated per question	Total marks
PART-1							
1	SECTION - A Long Answer Questions (LAQ)	04	10	80	At least 01	10	30
2	SECTION - B Long Answer Questions (LAQ)	04	10		At least 01	10	
PART-2							
3	Short Answer Questions (SAQ)	05	04	20	03	04	12
4	Very Short Answer Questions (VSAQ)	05	02	10	04	02	08
Total questions & Total marks =		16	-	110	08	-	50

$$\text{Percentage of choice given} = \frac{110 - 50}{100} \times 100 = \frac{60}{100} \times 100 = 60\%$$

II SEMESTER

COURSE 4: - BACTERIOLOGY AND VIROLOGY

TIME: 2 1/2 HOURS

Maximum Marks: 50

PART -1

Section- A

Answer any **THREE** attempting at least one from each section

3×10=30 Marks

1. Essay question from unit I.
2. Essay question from unit I
3. Essay question from unit II
4. Essay question from unit II

Section-B

5. Essay question from unit III
6. Essay question from unit III
7. Essay question from unit IV
8. Essay question from unit V

PART -2

SHORT ANSWER QUESTIONS

Answer any **THREE** questions only

3×4=12 Marks

- 9.Short question from unit I
- 10..Short question from unit II
11. Short question from unit III
- 12.Short question from unit IV
- 13.Short question from unit V
- 14.Short question from unit III

VERY SHORT ANSWER QUESTIONS

Answer any **FOUR** questions only

4×2=08 Marks

14. Very Short question from unit I
15. Very Short question from unit II
16. Very Short question from unit III
17. Very Short question from unit IV
18. Very Short question from unit V

Major I
SEMESTER-II
BACTERIOLOGY AND VIROLOGY -Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

PART -1

Section- A

Answer any **THREE** attempting at least one from each section **3×10=30 Marks**

1. Write an essay on classification of bacteria according to Bergey's Manual of systematic bacteriology.
2. Write in detail about the ultrastructure of bacterial cell wall.
3. Write an essay on salient features of Photosynthetic bacteria
4. Write an essay on Salient features of Extremophiles- Methanogens and halobacteria.

Section-B

5. Explain about the discovery of viruses and their general properties
6. Write an essay on cultivation of viruses.
7. Explain replication in T4 and Lambda phase.
8. Write a note on Role of viruses in Ecosystems; Applications in Biotechnology

PART -2

SHORT ANSWER QUESTIONS

Answer any **THREE** questions only 3×4=12 Marks

9. Plasmids
10. Actinomycetes
11. ICTV nomenclature
12. Replication in Influenzae
13. Satellite viruses and Prions.

VERY SHORT ANSWER QUESTIONS

Answer any **FOUR** questions only 4×2=08 Marks

14. Flagella
15. Mycoplasma
16. Viroid
17. Polio Virus
18. Oncogenes

COURSE 4: - BACTERIOLOGY AND VIROLOGY

credits -1


1. Study of bacteria by colony observation and staining-simple, gram
2. Observation of motility and capsule
3. Isolation of bacteria using Winogradsky column and observation
4. Study of viruses (Bacteriophage, TMV and HIV) using micrographs
5. Isolation and enumeration of bacteriophages (PFU) from water/sewage sample using double agar layer technique.
6. Studying isolation and propagation of animal viruses by chick embryo technique.
7. Study of cytopathic effects of viruses using photographs.
8. Perform local lesion technique for assaying plant viruses.

References:

1. Prescott, M.J., Harley, J.P. and Klein, D.A. Microbiology. 5th Edition WCB McGrawHill, New York, (2002).
2. Tortora, G.J., Funke, B.R. and Case, C.L. Microbiology : An Introduction. Pearson Education, Singapore, (2004).
3. Alcom, I.E. Fundamentals of Microbiology. VI Edition, Jones and Bartlett Publishers. Sudbury. Massachusetts, (2001).
4. Black J.G. Microbiology-Principles and Explorations. John Wiley & Sons Inc. New York, (2002).
5. Tom Besty, D.C Jim Koegh. Microbiology Demystified McGRAW-HILL.
6. Christopher Burrell Colin Howard Frederick Murphy. Fenner and White's Medical Virology 5th Edition. Academic Press

Co-Curricular Activities:

1. Invite guest speakers, to provide insights into the latest advancements and emerging trends in bacteriology and virology.
2. Conduct laboratory workshops that allow students to gain hands-on experience in bacterial culture techniques
3. Case Study Competitions: Organize case study competitions where students can work in teams to analyze and solve hypothetical cases related to bacteriology and virology
4. Arrange field trips to microbiology research facilities, such as government labs, industrial settings, or healthcare institutions

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. MZC, FMZC (III Semester)			
Course Code MBY-142	TITLE OF THE COURSE MOLECULAR BIOLOGY AND MICROBIAL GENETICS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Knowledge on basics of organic chemistry & metabolic pathways	3	1	-	3

Course Objectives:

1. To understand DNA, RNA, structure and Replication.
2. Gene expression & regulation
3. DNA damage, mutations and repair. Gene transfer methods.
4. Genetic engineering

Course Outcomes:

On Completion of the course, the students will be able to-

CO1	1. This Course provides Understanding of molecular biology
CO2	2. Develop knowledge on genetic engineering

UNIT- I: Nucleic acids

No. of hours: 12

DNA and RNA: Role in heredity-The central dogma
Watson and Crick model of DNA
Types of RNA: structure and functions
Organization of DNA in prokaryotes

UNIT- II : Genetic material and replication

No. of hours: 12

Experiments which established DNA as genetic material, RNA as genetic material
Mechanism of DNA Replication in Prokaryotes
Proof of semi conservative mechanism of replication (Messelson – Stahl Experiment)
Extra chromosomal genetic elements – Plasmids and transposons

UNIT- III: Gene expression and regulation

No. of hours: 12

Concept of gene – Mutton, recon and cistron; One gene- one polypeptide, one gene- one enzyme and one gene-one product hypothesis.
Genetic code
Structure of ribosomes
Protein synthesis – Transcription and translation in Prokaryotes

Regulation of gene expression in bacteria – *lac* operon

UNIT- IV: Mutations, damage and repair

No. of hours: 12

Outlines of DNA damage and repair mechanisms

Mutations – spontaneous and induced, base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions

Mutagens – Physical and Chemical mutagens

Bacterial recombination – Transformation, Conjugation, Transduction (Generalized and specialized transductions)

UNIT- V: Genetic engineering

No. of hours: 12

Basic principles of genetic engineering: Restriction endonucleases, DNA polymerases and ligases. Vectors.

Outlines of gene cloning methods.

Polymerase chain reaction.

Genomic and cDNA libraries.

General account on application of genetic engineering in industry, agriculture and medicine.

SUGGESTED READING:

- Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi.
- Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
- Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.
- Lewin, B. (2000). Genes VIII. Oxford University Press, England.
- Maloy, S.R., Cronan, J.E. and Freifelder, D. (1994). Microbial Genetics, Jones and Bartlett Publishers, London.
- Ram Reddy, S., Venkateswarlu, K. and Krishna Reddy, V. (2007) A text Book of Molecular Biotechnology. Himalaya Publishers, Hyderabad.
- Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958). Principles of Genetics. 5 th Edition. McGraw Hill, New York.
- Smith, J.E. (1996). Biotechnology, Cambridge University Press.
- Snyder, L. and Champness, W. (1997). Molecular Genetics of Bacteria. ASM press,
- Strickberger, M.W. (1967). Genetics. Oxford & IBH, New Delhi.

Paper III: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

Section		Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Total questions	No of questions answered	Marks allotted
A	Essay Questions	2	2	2	1	1	8	4	10x4 = 40
B	Short questions	2	2	2	2	2	10	5	2X5=10

Microbiology Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

Section- A

Answer any FIVE question

4×10=40 Marks

1. a) Essay question from unit I.
(or)
b). Essay question from unit I
2. a) Essay question from unit II
Or
b) Essay question from unit II
3. a) Essay question from unit III
(or)
b). Essay question from unit III
4. a) Essay question from unit IV
(or)
b). Essay question from unit V

Section-B

Answer any FIVE questions only

5×2=10Marks

- 5.Short question from unit I
- 6.Short question from unit I
- 7.Short question from unit II
- 8.Short question from unit II
- 9.Short question from unit III
- 10.Short question from unit III
- 11.Short question from unit IV
- 12.Short question from unit IV
- 13.Short question from unit V

Microbiology Model Question Paper (Theory)

MBY-140: MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Paper: I SEMESTER –III

Time: 2 1/2Hrs

Max.Marks:50

Part-A

Note: Answer ALL questions

4x10 = 40M

1. a) Explain Watson and crick model of DNA along with labelled diagram.

OR

b) Write a note on organisation of DNA in prokaryotes.

2. a) Write about experimental proof of DNA as genetic material.

OR

b) Explain DNA replication in prokaryotes with labelled diagram

3. a) Explain protein synthesis in prokaryotes with labelled diagram.

OR

b) Write a note on lack operon.

4. a) Define mutations and explain different types of mutations.

OR

b) Describe outlines of gene cloning methods.

Part-B

Answer any five questions. All carry equal marks.

5. Central dogma

10. Muton, Recon and Cistron

6. Types of RNA

11. Conjugation

7. Plasmids

12. Transduction

8. Transposons

13. Restriction endonucleases

9. Genetic code

14. PCR

Additional inputs

AMES TEST

GMOS

RTPCR

Assignment questions

Watson & Crick model of DNA

Replication

Transcription

Translation

Genetic Code

Mutations

Outlines Of Gene Cloning

Web links

<https://ccelms.ap.gov.in/rusa/user/gtitles/122>

<https://www.scienceprofonline.com/virtual-micro-main.html>

<https://slidetodoc.com/history-of-microbiology-from-the-virtual-microbiology-classroom/>

<https://studylib.net/doc/5795921/microbial-growth-lecture-powerpoint>


<https://youtube.com/channel/UCAXheRahnkShRUKSRbbihuQ>

CO-PO Mapping

(1: Slight [Low];2: Moderate [Medium]; 3: Substantial [High], '-' : No correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

MBP – III: MOLECULAR BIOLOGY AND MICROBIAL GENETICS

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code MBY 421P	TITLE OF THE COURSE <u>MBP – II: MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY</u>	I B.Sc. MZC & FMZC (II Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic Microbiology	-	-	2	2

1. Study of different types of DNA and RNA using micrographs and model / schematic representations.
2. Study of semi-conservative replication of DNA through micrographs / schematic representations
3. Isolation of genomic DNA from *E. coli*
4. Estimation of DNA using UV spectrophotometer.
5. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
6. Resolution and visualization of proteins by Polyacrylamide Gel Electrophoresis (SDS - PAGE).
7. Problems related to DNA and RNA characteristics, Transcription and Translation.
8. Induction of mutations in bacteria by UV light.
9. Instrumentation in molecular biology - Ultra centrifuge, Transilluminator, PCR

REFERENCE BOOKS FOR LAB:

- Wilson, K. and Walker, J. (1994). **Practical Biochemistry**. 4th Edition, Cambridge University Press, England.
- Sawhney, S.K. and Singh, R. (2000). **Introductory Practical Biochemistry**, Narosa Publishing House, New Delhi.
- Dubey, R.C. and Maheswari, D.K. (2002). **Practical Microbiology**. S. Chand & Co. Ltd., New Delhi.
- Plummer, D.T. (1988). **An Introduction to Practical Biochemistry**. 3rd Edition, Tata Mc GrawHill, New Delhi.
- Reddy, S.M. and Reddy, S.R. (1998). **Microbiology – Practical Manual**, 3rd Edition, Sri Padmavathi Publications, Hyderabad.

Web links

<https://vlab.amrita.edu/?sub=3&brch=73>

<https://learn.chm.msu.edu/vibl/>

<https://www.labster.com/microbiology-virtual-labs/>

<https://www.scienceprofonline.org/vmc/microbiology-laboratory-course-teaching-materials.html>


<https://virtuallabs.nmsu.edu/>

<https://www.merlot.org/merlot/viewMaterial.htm?id=79694>

CO-PO Mapping

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. MZC, FMZC (IV Semester)			
Course Code MBY-143	TITLE OF THE COURSE <u>MEDICAL MICROBIOLOGY AND</u> <u>IMMUNOLOGY</u>				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Introductory microbiology	3	1	-	3

Course Objectives:

1. To study types of immunity, immune organs, cells, antibodies and antigen-antibody interactions.
2. Microbes in health & diseases, Principles of diagnosis
3. Prevention & treatment

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Explain No-specific body defence and the immune response
CO2	Develop knowledge on disease transmission and control
CO3	Demonstrate on collection and handling of laboratory specimens

Skill Development- Basic Medical Lab techniques	UNIT-II & III	Employability- Hospitals, Diagnostic labs	UNIT-IV&V
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UNIT-I: Immune System

No. of hours: 12

Concept of Innate and Adaptive immunity

Primary and secondary organs of immune system – thymus, bursa fabricus, bone marrow, spleen, lymph nodes and lymphoid tissues

Cells of immune system- Identification and function of B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils and eosinophils

Complement system (in brief)

UNIT-II : Immune response

No. of hours: 12

Characteristics of antigen (Foreignness, Molecular size, Heterogeneity and solubility) haptens.

Antibodies – basic structure and types.

Generation of Immune Response - Primary and Secondary Immune Response

MHC- Functions of MHC I & II molecules

Generation of Humoral Immune Response (Plasma and Memory cells), Immune complex formation and elimination - Agglutination, Precipitation, Neutralisation, Complement fixation, Phagocytosis

Generation of Cell Mediated Immune Response

Hypersensitivity- definition and types (in brief)

UNIT- III: Microbes in Health and Disease

No. of hours: 12

Normal flora of human body.

Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity,

Opportunistic infections, Nosocomial infections.

General account on microbial diseases – causal organism, pathogenesis, epidemiology, diagnosis, prevention and control of the following

Bacterial diseases – Tuberculosis, Typhoid, Botulism

Fungal diseases – Candidiasis.

Protozoal diseases – Malaria.

Viral Diseases - Hepatitis- A and AIDS

UNIT- IV: Principles of Diagnosis

No. of hours: 12

General principles of diagnostic microbiology- Collection, transport of clinical samples

Identification by culturing

Identification by biochemical/physiological properties

Identification by molecular assays (PCR, DNA probes)

Identification by serological tests (ELISA, Immunofluorescence, Agglutination based tests, Complement fixation)

UNIT- V: Prevention and Treatment

No. of hours: 12

Vaccines – Active (Natural and recombinant) and passive

Monoclonal antibodies- Production and application

Antimicrobial agents- General modes of action of antibacterial (Penicillin, Streptomycin), antifungal (Amphotericin and Griseofulvin), antiviral (Amantadine, Acyclovir) agents

Interferons

Tests for antimicrobial susceptibility (Disc diffusion)

Antibiotic resistance in bacteria

TEXT AND REFERENCE BOOKS:

Reddy, S.R. and Reddy, K.R. (2006). **A Text Book of Microbiology - Immunology and Medical Microbiology**, Himalaya Publishing House, Mumbai.

Tizard, I.R. (1995). **Immunology : An Introduction**, WB Saunders, Philadelphia, USA.

Riott, I.M. (1998). **Essentials of Immunology**, ELBS and Black Well Scientific Publishers, England.

Goldsby, Kindt, T.J. and Osborne, B.A. (2004). **Kuby Immunology**, 6th Edition, W.H.Freeman and Company, New York.

Lydyard, P.M., Whelan, A. and Fanger, M.W. (2000). **Instant Notes in Immunology**, Viva Books Pvt. Ltd., New Delhi.

Chakraborty, B. (1998). **A Text Book of Microbiology**, New Central Book Agency (P) Ltd, Calcutta, India.

Ananthanarayana, R. and Panicker, C.K.S. (2000). **Text Book of Microbiology**, 6th Edition, Oriental Longman Publications, USA.

Gupte, S. (1995). **Short Text Book of Medical Microbiology**, 8th Edition, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.

- Annadurai, B. (2008). **A Textbook of Immunology and Immunotechnology**. S. Chand & Co. Ltd., New Delhi.
- Dey, N., T.K. and Sinha, D. (1999). **Medical Bacteriology Including Medical Mycology and AIDS**. New Central Book Agency (P) Ltd. Calcutta, India.
- Shetty, N. (1994). **Immunology – Introductory Textbook**. New Age International Pvt. Ltd., New Delhi.
- Singh, R.P. (2007). **Immunology and Medical Microbiology**. Kalyani Publishers, New Delhi.

Paper-IV: Immunology and medical microbiology

Section		Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Total questions	No of questions answered	Marks allotted
A	Essay Questions	2	2	2	1	1	8	4	10x4 = 40
B	Short questions	2	2	2	2	2	10	5	2X5=10

Microbiology Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

Section- A

Answer any FIVE question

4×10=40 Marks

1. a) Essay question from unit I.
(or)
b). Essay question from unit I
2. a) Essay question from unit II
Or
b) Essay question from unit II
3. a) Essay question from unit III
(or)
b). Essay question from unit III
4. a) Essay question from unit IV
(or)
b). Essay question from unit V

Section-B

Answer any FIVE questions only

5×2=10Marks

- 5.Short question from unit I
- 6.Short question from unit I
- 7.Short question from unit II
- 8.Short question from unit II
- 9.Short question from unit III
- 10.Short question from unit III
- 11.Short question from unit IV
- 12.Short question from unit IV
- 13.Short question from unit V
14. Short question from unit V

Microbiology Model Question Paper (Theory)

MBY-140: MEDICAL MICROBIOLOGY AND IMMUNOLOGY

Paper: I SEMESTER –IV

Time: 2 1/2Hrs

Max.Marks:50

Part-A

Note: Answer ALL questions

4x10 = 40M

1. a) What is acquired immunity and explain its important characteristics.

OR

b) Write a note on cells of immune system.

2. a) What is antigen and explain important characteristics of antigen.

OR

b) Write a note on hypersensitivity and its types.

3. a) Write a note on normal flora of human body.

OR

b) Give a general account on casual organism, pathogenesis, symptoms, diagnosis, treatment and prevention of malaria.

4. a) Write a note on ELISA and CFT(Complement Fixation test)

OR

b) Explain the production and application of monoclonal antibodies.

Part-B

Answer any five questions. All carry equal marks.

5. Lymph node

10. AIDS

6. Thymus

11. Immunofluorescence

7. MHC

12. Agglutination

8. IgM

13. Vaccines

9. TB

14. Penicillin

Additional input

General account of COVID 19

Case studies

Assignment questions

1. Explain Non specific defense mechanisms
2. Write a note on Cells of the immune system
3. Explain Structure of immunoglobulin
4. Write a note on Vaccines
5. Write a note on Antibacterial, antivirals & antifungals

Web links

<https://ccelms.ap.gov.in/rusa/user/gtitles/122>

<https://www.scienceprofonline.com/virtual-micro-main.html>

<https://slidetodoc.com/history-of-microbiology-from-the-virtual-microbiology-classroom/>


<https://studvlib.net/doc/5795921/microbial-growth-lecture-powerpoint>

<https://youtube.com/channel/UCAXheRahnkShRUKSRbbihuQ>

CO-PO Mapping

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No correlation)

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CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code MBY 143P	TITLE OF THE COURSE <u>MEDICAL MICROBIOLOGY AND</u> <u>IMMUNOLOGY</u>	II B.Sc. MZC & FMZC (IV Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic Microbiology	-	-	2	2

TOTAL HOURS: 30

CREDITS: 1

1. Identification of human blood groups.
2. Separate serum from the blood sample (demonstration).
3. Immunodiffusion by Ouchterlony method.
4. Identification of any of the bacteria (*E. coli*, *Pseudomonas*, *Staphylococcus*, *Bacillus*) using laboratory strains on the basis of cultural, morphological and biochemical characteristics: IMViC, urease production and catalase tests
5. Study of composition and use of important differential media for identification of bacteria: EMB Agar, McConkey agar, Mannitol salt agar, Deoxycholate citrate agar, TCBS Isolation of bacterial flora of skin by swab method.
6. Antibacterial sensitivity by Kirby-Bauer method
7. Determination of minimal inhibitory concentration of an antibiotic
8. Study symptoms of the diseases with the help of photographs: Anthrax, Polio, Herpes, chicken pox, HPV warts, Dermatomycoses (ring worms)
9. Study of various stages of malarial parasite in RBCs using permanent mounts.

REFERENCE BOOKS

- Talwar, G.P. and Gupta, S.K. (1992). **A Hand Book of Practical and Clinical Immunology**. CBS Publications, New Delhi.
- Baren, E.J. (1994). **Bailey and Scott's Diagnostic Microbiology**, 9th Edition, Mosby Publishers.
- Dubey, R.C. and Maheswari, D.K. (2002). **Practical Microbiology**, S. Chand & Co., New Delhi.
- Samuel, K.M. (Ed.) (1989). **Notes on Clinical Lab Techniques**, M.K.G. Iyyer & Son Publishers, Chennai.
- Wadher, B.J. and Reddy, G.L.B. (1995). **Manual of Diagnostic Microbiology**, Himalaya Publishing House, Mumbai.
- Dey, N.C., Dey, T.K., Dey, M. and Sinha, D. (1998). **Practical Microbiology, Protozoology, and Parasitology**. New Central Book Agency (P) Ltd. Calcutta.

Web links

<https://vlab.amrita.edu/?sub=3&brch=73>

<https://learn.chm.msu.edu/vibl/>

<https://www.labster.com/microbiology-virtual-labs/>

<https://www.scienceprofonline.org/vmc/microbiology-laboratory-course-teaching-materials.html>


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(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

	Government College (Autonomous) Rajahmundry	Program & Semester II B.Sc. MZC, FMZC (IV Semester)			
Course Code MBY-144	TITLE OF THE COURSE <u>MICROBIAL ECOLOGY AND INDUSTRIAL</u> <u>MICROBIOLOGY</u>				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Introductory microbiology	3	1	-	3

TOTAL HOURS: 60

CREDITS: 4

Course Objectives:

1. To study role of microorganisms in nutrient cycling, microorganism in waste treatment and degradation of xenobiotics
2. To determine the potability of drinking water
3. To study concepts of screening and strain improvement

Course Outcomes:

On Completion of the course, the students will be able to-

CO1	Understand fundamental concept in soil microbial diversity, basic concept of biogeochemical cycles and plant growth promotion and plant diseases
CO2	Understands the role of microorganisms in treatment of solid and liquid waste.
CO3	Acquire knowledge on application of microorganisms in agro – environmental fields.
CO4	Get basic information design of fermenter, fermentation processes and Single cell proteins.

Skill Development- Screening techniques, Industrial productions Practicals, Study projects Internships	UNIT- II,III, IV & V	Employability- Production, Q& C, R& D Food & Industrial Microbiology	UNIT- II,III, IV & V	Entrepreneurship Startups in Food & Industrial Microbiology	UNIT- II,III, IV & V
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UNIT – I: Microorganisms in environment

No. of hours: 12

Role of microorganisms in Biogeochemical cycles (Carbon, nitrogen, phosphorus)
 Microbe-microbe interactions – Synergism, mutualism, commensalism, antagonism, competition, parasitism, predation,
 Plant- Microbe interactions – Plant growth promoting Microorganisms, Plant pathogens
 Extremophilic microorganisms

UNIT – II : Microorganisms in Food and Water

No. of hours: 12

Microbes in waste management- solid and liquid waste (aerobic and anaerobic)

Microbes in degradation of Xenobiotics

Microbes in drinking water- detection of potability by (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique, Microbes in food –intrinsic and extrinsic parameters that affect microbial growth in food

UNIT – III: Industrial Microbiology

No. of hours: 12

Microorganisms of industrial importance – yeasts (*Saccharomyces cerevisiae*), moulds (*Aspergillus niger*) bacteria (*E.coli*), actinomycetes (*Streptomyces griseus*).

Screening techniques.

Industrially important Primary and secondary microbial metabolites - Techniques involved in selection of industrially important metabolites from microbes.

UNIT – IV: Fermentation processes

No. of hours: 12

Design of fermenter (for control of pH, temperature, dissolved oxygen, foaming and aeration)

Types of fermenter – batch, continuous and fed batch.

Types of fermentation processes – solid state, liquid state, batch, fed-batch, continuous.

Fermentation media (Crude and synthetic media; molasses, corn- steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates)

Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

UNIT – V: Microbial Productions

No. of hours: 12

Microbial production of Industrial products: Citric acid, Ethanol, Penicillin, Glutamic acid, vitamin B12, Amylase, Yogurt

Microbial cells as food- SCP

TEXT AND REFERENCE BOOKS:

Atlas, R.M. and Bartha, R. (1998). **Microbial Ecology - Fundamentals and Applications**, Addison Wesley Longman, Inc., USA

Paul, E.A. and Clark, F.E. (1989). **Soil Microbiology and Biochemistry**, Academic Press, USA.

Lynch, J.M. and Poole, N.J. (1979). **Microbial Ecology – A Conceptual Approach**, Blackwell Scientific Publications, USA

Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). **Principles of Fermentation Technology**, Aditya Books (P) Ltd. New Delhi.

Doyle, M.P., Beuchat, L.R. and Montville, T.J. (1997). **Food Microbiology: Fundamentals and Frontiers**. ASM Press, Washington D.C., USA.

Patel, A.H. (1984). **Industrial Microbiology**, Mac Milan India Ltd., Hyderabad.

Cassida, L.E. (1968). **Industrial Microbiology**, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.

Crueger, W. and Crueger, A. (2000). **Biotechnology – A Text Book of Industrial Microbiology**, Panima Publishing Corporation, New Delhi

Reed, G. (Ed.) (1987). **Prescott & Dunn's Industrial Microbiology**, 4th Edition, CBS Publishers & Distributors, New Delhi.

Subba Rao, N.S. (1999). **Soil Microorganisms and Plant Growth**. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Reddy, S.R. and Singara Charya, M.A. (2007). **A Text Book of Microbiology - Applied Microbiology**. Himalaya Publishing House, Mumbai.

Semester IV Paper-II : MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY

Section		Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Total questions	No of questions answered	Marks allotted
A	Essay Questions	2	2	2	1	1	8	4	10x4 = 40
B	Short questions	2	2	2	2	2	10	5	2X5=10

Microbiology Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

Section- A

Answer any FIVE question

4×10=40 Marks

1. a) Essay question from unit I.
(or)
b). Essay question from unit I
2. a) Essay question from unit II
Or
b) Essay question from unit II
3. a) Essay question from unit III
(or)
b). Essay question from unit III
4. a) Essay question from unit IV
(or)
b). Essay question from unit V

Section-B

Answer any FIVE questions only

5×2=10Marks

- 5.Short question from unit I
- 6.Short question from unit I
- 7.Short question from unit II
- 8.Short question from unit II
- 9.Short question from unit III
- 10.Short question from unit III
- 11.Short question from unit IV
- 12.Short question from unit IV
- 13.Short question from unit V
14. Short question from unit V

Microbiology Model Question Paper (Theory)

MBY-140: MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY

SEMESTER –IV Paper: II

Time: 2 1/2Hrs

Max.Marks:50

Part-A

Note: Answer ALL questions

4x10 = 40M

1. a) Explain role of micro organisms in carbon cycle.

OR

b) Write a note on Plant growth promoting Rhizobacteria.

2. a) Explain the role of Micro organisms in Solid waste management.

OR

b) Explain biological waste water treatment.

3. a) Explain industrial importance of yeast and moulds.

OR

b) Write a note on Primary screening methods.

4. a) Explain design of an Industrial fermentator.

OR

b) Explain the industrial production of Vitamin B12

Part-B

Answer any five questions. All carry equal marks.

5. Mutualism

10. Difference between primary and secondary metabolites

6. Antagonism

11. Batch fermentation

7. Membrane filter technique

12. Molasses

8. Define Bio-remediation

13. Yogurt

9. Streptomyces griseus

14. SCP

Additional input

Solid waste management in Rajahmundry
Studies on SWL from Paper mill in Rajahmundry
Industrial production of wine & beer

Assignment questions

1. Explain role of microorganisms in biogeochemical cycles.
2. Explain various microbial interactions.
3. Primary screening techniques
4. Design of fermenter
5. Industrial fermentation media
6. Various industrial fermentations

Web links

<https://ccelms.ap.gov.in/rusa/user/gtitles/122>

<https://www.scienceprofonline.com/virtual-micro-main.html>

<https://slidetodoc.com/history-of-microbiology-from-the-virtual-microbiology-classroom/>


<https://studylib.net/doc/5795921/microbial-growth-lecture-powerpoint>

<https://youtube.com/channel/UCAXheRahnkShRUKSRbbihuQ>

CO-PO Mapping

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CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code MBY 144P	TITLE OF THE COURSE <u>MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY</u>	II B.Sc. MZC & FMZC (IV Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic Microbiology	-	-	2	2

1. Microbial fermentation for the production and estimation of ethanol
2. Isolation of amylase producing microorganisms from soil
3. Production of amylase from bacteria and fungi
4. Assay of amylase
5. Demonstration of fermenter
6. Production of wine from grapes
7. Growth curve and kinetics of any two industrially important microorganisms.
8. Microbial fermentation for the production and estimation of citric acid


Web links

<https://vlab.amrita.edu/?sub=3&brch=73>
<https://learn.chm.msu.edu/vibl/>
<https://www.labster.com/microbiology-virtual-labs/>
<https://www.scienceprofonline.org/vmc/microbiology-laboratory-course-teaching-materials.html>
<https://virtuallabs.nmsu.edu/>
<https://www.merlot.org/merlot/viewMaterial.htm?id=79694>

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CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. MZC, FMZC (V Semester)			
Course Code MBY-140 A1	TITLE OF THE COURSE FOOD, AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Introductory microbiology	3	1	-	3

Aim and objectives of Course

To provide knowledge on important microbes in food, Agriculture and Environmental Microbiology

Learning Outcomes of Course

Up on completion of the course students able to

CO1: Demonstrate with the wide diversity of microbes and their spoilage food, food intoxication and food born infections

CO2: Able to understand principles of food preservation, fermented foods and microbes as food.

CO3: The student will acquire knowledge on application of microorganisms in agro – environmental fields

CO4: Get fundamental concepts in principles of plant disease control an industrial application of Microbiology

CO5: The student will have fundamental concepts in soil microbiology and soil water and aero microbial diversity and microbial interactions Basic concepts in treatment of drinking water. Understands the role of microorganisms in treatment of solid and liquid waste.

UNIT – 1**No. of Hours: 8**

Intrinsic and extrinsic parameters that affect microbial growth in food

Microbial spoilage of food - fruits, vegetables, milk, meat, egg, bread and canned foods

Food intoxication (botulism).

Food-borne diseases (salmonellosis) and their detection.

UNIT – II**No. of Hours: 8**

Principles of food preservation - Physical and chemical methods.

Fermented Dairy foods – cheese and yogurt.

Microorganisms as food – SCP, edible mushrooms (white button, oyster and paddy straw).

Probiotics and their benefits.

UNIT – III**No. of Hours: 8**

Soil Microbiology: Microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur.

Biological nitrogen fixation.

Microflora of Rhizosphere and Philosopher microflora, microbes in composting.

Importance of mycorrhizal inoculums, types of mycorrhizae associated plants, mass inoculums. Production of VAM, field applications of Ectomycorrhizae.

UNIT - IV**No. of Hours: 8**

Beneficial microorganisms in Agriculture: Biofertilizer (Bacterial Cyanobacterial and Fungal), microbial insecticides, Microbial agents for control of Plant diseases.

Plant – Microbe interactions.

Diseases caused by bacteria and fungi to various commercial crops: groundnut rust & Citrus canker and food crops: **Rice Blast** (*Pyriculariaoryzae*) Bacterial blight of rice (*Oryzasativa* and *O. glaberrima*)

Biodegradation, Biogas production, Biodegradable plastics.

UNIT – V

No. of Hours: 12

Terrestrial Environment: Soil profile and soil microflora. Aquatic Environment: Microflora of fresh water and marine habitats. Atmosphere: Aeromicroflora and dispersal of microbes. Extremophiles.

Methods to detect portability of water samples.

Outlines of Solid Waste management: Sources and types of solid waste, Methods of solid waste disposal (composting and sanitary landfill).

Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary and tertiary sewage treatment.

TEXT & REFERENCE BOOKS

Doyle, M.P., Beuchat, L.R. and Montville, T.J. (1997). **Food Microbiology: Fundamentals and Frontiers**. ASM Press, Washington D.C., USA.

Frazier, W.C. and Westhoff, D.C. (1988). **Food Microbiology**, Mc Graw-Hill, New York.

Jay, J.M. (1996). **Modern Food Microbiology**, Chapman and Hall, New York.

Ray, B. (1996). **Fundamentals of Food Microbiology**, CRC Press, USA.

Subba Rao, N.S. (1993). **Biofertilizers in Agriculture and Forestry**, 3rd Edition Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Rangaswami, G. and Bhagyaraj, D.J. (2001). **Agricultural Microbiology**, 2nd Edition, Prentice Hall of India, New Delhi.

Atlas, R.M. and Bartha, R. (1998). **Microbial Ecology - Fundamentals and Applications**, Addison Wesley Longman, Inc., USA

Paul, E.A. and Clark, F.E. (1989). **Soil Microbiology and Biochemistry**, Academic Press, USA.

III B.Sc Microbiology ,Semester -V

Blue Print For MB T A1: FOOD, AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY

Section		Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Total questions	No of questions answered	Marks allotted
A	Essay Questions	2	2	2	1	1	8	4	10x4 = 40
B	Short questions	2	2	2	2	2	10	5	2X5=10

Total Marks= 50

Microbiology Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

Section- A

Answer any FIVE question

4×10=40 Marks

1. a) Essay question from unit I.
(or)
b). Essay question from unit I
2. a) Essay question from unit II
Or
b) Essay question from unit II
3. a) Essay question from unit III
(or)
b). Essay question from unit III
4. a) Essay question from unit IV
(or)
b). Essay question from unit V

Section-B

Answer any

- 5.Short question from unit I
- 6.Short question from unit I
- 7.Short question from unit II
- 8.Short question from unit II
- 9.Short question from unit III
- 10.Short question from unit III
- 11.Short question from unit IV
- 12.Short question from unit IV
- 13.Short question from unit V
- 14 Short question from unit VI

Microbiology Model Question Paper (Theory)

MBY-140 FOOD, AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY

Paper: II SEMESTER –IV

Time: 2 1/2Hrs

Max.Marks:50

Part-A

Note: Answer ALL questions

a) Explain extrinsic parameters that affect microbial growth in food

OR

b) Write a note on botulism

2. a) Explain production of cheese.

OR

b) Write a note on probiotics and its health benefits.

3. a) Explain the role of microorganisms in the sulphur cycle.

OR

b) Explain biological nitrogen fixation.

4. a) Write a note on biofertilizers.

OR

b) Explain micro flora of freshwater and Marine habitats.

Part-B

Answer any five questions. All carry equal marks.

5. Salmonellosis

10. Phosphorus cycle

6. Microbial spoilage of canned foods

11. Groundnut rust

7. Yoghurt

12. Biodegradable plastics

8. SCP

13. Sanitary landfill

9. VAM

14. BOD

Additional input

1. Indian fermented foods- Idli, Dosa, Dhokla
2. Study Solid waste management in Rajahmundry
3. Student projects on quality of water

Assignment questions

1. Food spoilage
2. Principles of food preservation - Physical and chemical methods
3. Soil Microbiology
4. Biofertilizer
5. Solid Waste management
6. Liquid waste management

Web links

<https://ccelms.ap.gov.in/rusa/user/gtitles/122>

<https://www.scienceprofonline.com/virtual-micro-main.html>

<https://slidetodoc.com/history-of-microbiology-from-the-virtual-microbiology-classroom/>


<https://studylib.net/doc/5795921/microbial-growth-lecture-powerpoint>

<https://youtube.com/channel/UCAXheRahnkShRUKSRbbihuQ>

CO-PO Mapping

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code MBY 145P AI	TITLE OF THE COURSE FOOD, AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY	III B.Sc. MZC & FMZC (V Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic Microbiology	-	-	2	2

Total hours: 40**Credits: 2**

1. Isolation of bacteria and fungi spoiled bread / fruits / vegetables
2. Preparation of yogurt / dahi
3. Determination of microbiological quality of milk sample by MBRT
4. Enumeration of bacteria, fungi and actinomycetes from soil
5. Enumeration and identification of rhizosphere micro flora
6. Isolation of rhizobium from root nodules.
7. Isolation of azatobacter from soil.
8. Observation description of any three bacterial and fungal plant diseases
9. Staining and observation of VAM.
10. Analysis of soil - pH, Moisture content and water holding capacity.
11. Study of air flora by petriplate exposure method.
12. Analysis of potable water: SPC, Presumptive, confirmed and completed test, determination of coli form count in water by MPN.
13. Determination of Biological Oxygen Demand (BOD) of waste water samples.

SUGGESTED READINGS:

Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition, Benjamin/Cummings Science Publishing, USA

Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.

Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.

Lynch JM & Hobbie JE. (1988). Microorganisms in Action: Concepts & Application in Microbial Ecology. Blackwell Scientific Publication, U.K.

Madigan MT, Martinko JM and Parker J. (2014). Brock Biology of Microorganisms. 14th edition. Pearson/ Benjamin Cummings.

Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press.

Martin A. (1977). An Introduction to Soil Microbiology. 2nd edition. John Wiley & Sons Inc. New York & London.

Singh A, Kuhad, RC & Ward OP (2009). Advances in Applied Bioremediation. Volume 17, Springer-Verlag, Berlin Hedeilberg

Stolp H. (1988). Microbial Ecology: Organisms Habitats Activities. Cambridge University Press, Cambridge, England.

Subba Rao NS. (1999). Soil Microbiology. 4th edition. Oxford & IBH Publishing Co. New Delhi.

Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

Web links

<https://vlab.amrita.edu/?sub=3&brch=73>

<https://learn.chm.msu.edu/vibl/>

<https://www.labster.com/microbiology-virtual-labs/>

<https://www.scienceprofonline.org/vmc/microbiology-laboratory-course-teaching-materials.html>


<https://virtuallabs.nmsu.edu/>

<https://www.merlot.org/merlot/viewMaterial.htm?id=79694>

CO-PO Mapping

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. MZC, FMZC (V Semester)			
Course Code MBY-145 A2	TITLE OF THE COURSE MANAGEMENT OF HUMAN MICROBIAL DISEASES AND DIAGNOSIS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Introductory microbiology	3	1	-	3

Aim and objectives of Course

To realize the principles of prevention and treatment of microbial diseases and to understand the concepts and development of microbial diseases in animals

Learning outcomes of Course

Up on completion of the course students able to

CO1: Develop knowledge and skills on microbiological laboratory skills for identification of pathogens

CO2: Students will demonstrate the collection of clinical samples

CO3: Students will get knowledge on staining techniques

CO4: Students able to perform diagnostic techniques

CO5: To understand drug resistance

UNIT – I**No.of Hours: 8**

Definition and concept of health, disease, infection, and pathogen.

Bacterial Diseases: Cholera, Pneumonia, and Dysentery.

Viral Diseases: COVID-19, Poliomyelitis & Chicken pox

Fungal diseases: Dermatormycosis and Athletes foot.

Protozoan Diseases: Amoebiasis.

UNIT- II**No. of hours: 8**

Collection of clinical samples (oral cavity, throat, skin, blood, CSF, urine and faeces) and precautions required.

Method of transport of clinical samples to laboratory and storage.

UNIT- III**No. of hours: 8**

Mechanism of bacterial pathogenicity, colonization and growth, virulence, virulence factors, exotoxins, enterotoxins, endotoxins and neurotoxins.

Examination of sample by staining - Gram stain, Ziehl-Neelson staining for tuberculosis, Giemsa-stained thin blood film for malaria.

Preparation and use of culture media - Blood agar, Chocolate agar, Lowenstein-Jensen medium, Mac Conkey agar.

Distinct colony properties of various bacterial pathogens.

UNIT- IV**No. of hours: 6**

Serological Methods - Agglutination, ELISA, immunofluorescence, Nucleic acid based methods - PCR, Nucleic acid probes.

Diagnosis of Typhoid, Dengue and HIV, Swine flu.

UNIT- V

No. of hours: 6

Importance, Determination of resistance/sensitivity of bacteria using disc diffusion method, Determination of minimal inhibitory concentration (MIC) of an antibiotic by serial double dilution method. Problems of drug resistance and drug sensitivity.
Drug resistance in bacteria.

SUGGESTED READING

Ananthanarayan R and Paniker CKJ (2009) Textbook of Microbiology, 8th edition, Universities Press Private Ltd.

Reddy, S.R. and Reddy, K.R. (2006). **A Text Book of Microbiology - Immunology and Medical Microbiology**, Himalaya Publishing House, Mumbai.

Gupte, S. (1995). **Short Text Book of Medical Microbiology**, 8th Edition, Jaypee Brothers Medical Publishers (P) Ltd, New Delhi.

III B.Sc Microbiology ,Semester -V

Blue Print For MB T A2 MANAGEMENT OF HUMAN MICROBIAL DISEASES AND DIAGNOSIS

Section		Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Total questions	No of questions answered	Marks allotted
A	Essay Questions	2	2	2	1	1	8	4	10x4 = 40
B	Short questions	2	2	2	2	2	10	5	2X5=10

Total Marks= 50

Microbiology Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

Section- A

Answer any FIVE question

4×10=40 Marks

1. a) Essay question from unit I.
(or)
b). Essay question from unit I
2. a) Essay question from unit II
Or
b) Essay question from unit II
3. a) Essay question from unit III
(or)
b). Essay question from unit III
4. a) Essay question from unit IV
(or)
b). Essay question from unit V

Section-B

Answer any FIVE questions only

5×2=10Marks

- 5.Short question from unit I
- 6.Short question from unit I
- 7.Short question from unit II
- 8.Short question from unit II
- 9.Short question from unit III
- 10.Short question from unit III
- 11.Short question from unit IV
- 12.Short question from unit IV
- 13.Short question from unit V
- 14 Short question from unit VI

Microbiology Model Question Paper (Theory)

MBY-140: MANAGEMENT OF HUMAN MICROBIAL DISEASES AND DIAGNOSIS

Paper: II SEMESTER –IV

Time: 2 1/2Hrs

Max.Marks:50

Part-A

Note: Answer ALL questions

1. a) Write the causative agent, pathogenesis, symptoms, diagnosis, treatment and prevention of Cholera.

OR

b) Write the causative agent, pathogenesis, symptoms, diagnosis, treatment and prevention of Dermatomycosis.

2. a) explain collection of clinical samples and precautions required.

OR

b) explain method of transport of clinical samples to laboratory and storage.

3. a) explain the principle and procedure of ziehl-nelson stain for tuberculosis.

OR

b) write the preparation and use of blood and lowenstein-jenson medium.

4. a) write the use of PCR in diagnostics.

OR

b) write a note on drug resistance in bacteria.

Part-B

Answer any five questions. All carry equal marks.

5. Polio

10. Mac. Conkey agar

6. Covid 19

11. ELISA

7. Throats swab


12. Nucleic acid probes

8. CSF

13. MIC

9. Exotoxins

14. Anti-microbial Sensitivity test

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code MBY 145P A2	TITLE OF THE COURSE MANAGEMENT OF HUMAN MICROBIAL DISEASES AND DIAGNOSIS	III B.Sc. MZC & FMZC (V Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic Microbiology	-	-	2	2

1. Collection transport and processing of clinical specimens (Blood, Urine, Stool and Sputum).

Receipts, Labelling, recording and dispatching clinical specimens.

2. Physical, Chemical & microscopic examination of clinical samples – urine, stool, puss, sputum.

3. Isolation and identification of following pathogens from clinical samples: *E.coli*, *Salmonella* and *Pseudomonas*.

4. Demonstration of permanent slides of the following parasites:

a) *Entamoeba histolytica*

b) *Ascaris* spp.

c) *Plasmodium* spp.

d) *Mycobacterium tuberculosis* & *Mycobacterium leprae*

5. Estimation of haemoglobin (Acid haematin and cyan methanoglobin method).

6. ESR and PCV determination.

7. Immuno hematology: Blood group typing by slide test & tube for ABO & Rh systems.

8. Isolation of bacteria in pure culture and Antibiotic sensitivity.

SUGGESTED READING

Ananthanarayan R and Paniker CKJ (2009) Textbook of Microbiology, 8th edition, Universities Press Private Ltd.

Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication.

Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and McCartney Practical Medical Microbiology, 14th edition, Elsevier.

Randhawa, VS, Mehta G and Sharma KB (2009) Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd.

Tille P (2013) Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby.

Additional inputs

1. Study Visit to clinical laboratories
2. Community projects on Communicable diseases
3. Guest lectures/ interactive classes with medical laboratory technicians
4. Conduct surveys on epidemiology of certain diseases.

Assignment questions

1. Write notes on viral diseases
2. Different methods of transport of clinical samples
3. Write an essay on Virulence factors of Bacteria and Viruses
4. Write about drug resistance and drug sensitivity.

Web links

<https://vlab.amrita.edu/?sub=3&brch=73>

<https://learn.chm.msu.edu/vibl/>

<https://www.labster.com/microbiology-virtual-labs/>

<https://www.scienceprofonline.org/vmc/microbiology-laboratory-course-teaching-materials.html>


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<https://www.merlot.org/merlot/viewMaterial.htm?id=79694>

CO-PO Mapping

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. MZC, FMZC (V Semester)			
Course Code MBY-145 B1	TITLE OF THE COURSE MICROBIAL BIOTECHNOLOGY AND r – DNA TECHNOLOGY				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Introductory microbiology	3	1	-	3

Aim and objectives of Course

To study applications of microbial biotechnology and r DNA technology.

Learning outcomes of Course

Up on completion of the course students able to

CO1: Students should be able to demonstrate with the wide diversity of microbes and their potential use in medicine, agriculture and industry biotechnology regulation and ethics.

CO2: Students will get knowledge on restriction endonuclease in r DNA technology and selection of transformed cells

CO3: Students will get knowledge on cloning vehicles in r DNA technology

CO4: Student will able to understand gene sequencing methods

CO5: Students will get knowledge on of genetically modified crops. And role of microorganisms in creation of transgenic animals and plants.

UNIT – I**No. of hours: 8**

Introduction to microbial biotechnology, Bacterial genes, genomes and genetics. Recombinant microbial biotechnology products, biotechnology regulation and ethics. Biomass and bio fuels: plant biomass (cellulose, starch, pectin, gum materials). Animal biomass (chitin, milk, whey, slaughter, house waste). Microbial biomass (algal blooms, in fresh and sea water), fungal mushrooms, fermentation waters by yeasts, and bacterial biomass.

UNIT- II**No. of hours: 8**

Restriction and Modification: Classification of restriction endonucleases. Enzymes used in molecular cloning; Polymerases, ligases, phosphatases, kinases and nucleases; Advanced Molecular biology techniques, Electrophoresis and Blotting techniques.

Cutting and joining DNA: (cohesive end ligation, methods of blunt end ligation).

Transfection and transformation. Selection of transformed cells. Screening methods (Genetic marker and blue white screening).

UNIT- III**No. of hours: 7**

Cloning vehicles - Plasmid, Bacteriophage, Construction of genomic and cDNA libraries.

Advantages of cDNA libraries. Concept of single cell proteins, probiotics and their applications. Microbial production of fuels: alcohols, hydrogen and methane. Microbial production of polymers: xanthenes gums.

UNIT- IV**No. of hours: 7**

Methods of gene sequencing – Maxam - Gilberts and Sanger's dideoxy chain termination methods; Polymerase chain reaction technique (Components in PCR and PCR conditions).

Methods of gene transfer in fungi, yeast and higher plants using microinjection, microprojectile bombardment (gene gun method, Electroporation and *Agrobacterium* mediated transformation.

Expression of cloned genes in bacteria, yeast, plant and animal cells.

Basic principles and application of biosensors. Nucleic acid probe technology.

UNIT- V

No. of hours: 7

Concept of genetically modified microorganisms. Bt cotton : production, advantages and limitations.

Probable advantages and disadvantages of genetically modified crops.

Role of microorganisms in creation of transgenic animals and plants.

TEXT & REFERENCE BOOKS

- Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi.
- Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
- Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.
- Lewin, B. (2000). Genes VIII. Oxford University Press, England.
- Maloy, S.R., Cronan, J.E. and Freifelder, D. (1994). Microbial Genetics, Jones and Bartlett Publishers, London.
- Ram Reddy, S., Venkateswarlu, K. and Krishna Reddy, V. (2007) A text Book of Molecular Biotechnology. Himalaya Publishers, Hyderabad.
- Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958). Principles of Genetics. 5 th Edition. McGraw Hill, New York.
- Smith, J.E. (1996). Biotechnology, Cambridge University Press.
- Snyder, L. and Champness, W. (1997). Molecular Genetics of Bacteria. ASM press,
- Strickberger, M.W. (1967). Genetics. Oxford & IBH, New Delhi.

III B.Sc Microbiology ,Semester -V**Blue Print For MB T B1 -Microbial Biotechnology & r – DNA Technology**

Section		Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Total questions	No of questions answered	Marks allotted
A	Essay Questions	2	2	2	1	1	8	4	10x4 = 40
B	Short questions	2	2	2	2	2	10	5	2X5=10

Total Marks= 50**Microbiology Model Question Paper (Theory)**

TIME: 2 1/2 HOURS

Maximum Marks: 50

Section- A**Answer any FIVE question****4×10=40 Marks**

1. a) Essay question from unit I.
(or)
b). Essay question from unit I
2. a) Essay question from unit II
Or
b) Essay question from unit II
3. a) Essay question from unit III
(or)
b). Essay question from unit III
4. a) Essay question from unit IV
(or)
b). Essay question from unit V

Section-B**Answer any FIVE questions only****5×2=10Marks**

- 5.Short question from unit I
- 6.Short question from unit I
- 7.Short question from unit II
- 8.Short question from unit II
- 9.Short question from unit III
- 10.Short question from unit III
- 11.Short question from unit IV
- 12.Short question from unit IV
- 13.Short question from unit V
- 14 Short question from unit V

Microbiology Model Question Paper (Theory)

MBY-140: MICROBIAL BIOTECHNOLOGY AND r – DNA TECHNOLOGY

Paper: II SEMESTER –IV

Time: 2 1/2Hrs

Max.Marks:50

Part-A

Note: Answer ALL questions

1.a) Write a note on plant biomass

OR

b) Write a note on microbial biomass

2. a) Write a note on enzymes used in genetic engineering.

OR

b) What are the general screening methods in genetic engineering for selection of bacteria with rDNA.

3. a) Write a note on commonly used cloning vectors in rDNA technology.

OR

b) Explain microbial production of Xanthum gum.

4. a) Write a note on basic principles and applications of biosensors.

OR

b) Write a note on BT cotton.

Part-B

Answer any five questions. All carry equal marks.

5. Bio ethics

10. SCP

6. Whey

11. Gene-gun method

7. Blunt and ligation

12. Micro injection

8. Transfection

13. Transgenic animals

9. C-DNA

14. GMO's

ASSIGNMENT QUESTIONS

1. Explain biofuels
2. Outlines of gene cloning
3. Methods of gene sequencing
4. Genetically modified crops

Web links

<https://ccelms.ap.gov.in/rusa/user/gtitles/122>

<https://www.scienceprofonline.com/virtual-micro-main.html>

<https://slidetodoc.com/history-of-microbiology-from-the-virtual-microbiology-classroom/>

<https://studylib.net/doc/5795921/microbial-growth-lecture-powerpoint>


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CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

MBT- BI :MICROBIAL BIOTECHNOLOGY AND r – DNA TECHNOLOGY

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code MBY 145P B1	TITLE OF THE COURSE MICROBIAL BIOTECHNOLOGY AND r – DNA TECHNOLOGY	III B.Sc. MZC & FMZC (V Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic Microbiology	-	-	2	2

TOTALHOURS: 36**CREDITS: 2**

1. Culturing of mushrooms
2. Isolation of yeast from grapes.
3. Production of wine
4. Production of ethyl alcohol
5. Isolation of Plasmid DNA from E.coli
6. Tissue culture: callus cultivation
7. Fermentative production of ethyl alcohol
8. Transformation in Bacteria using plasmid.
9. Restriction digestion of DNA and its electrophoretic separation.
10. Ligation of DNA molecules and their testing using electrophoresis.
11. Activity of DNAase and RNAase on DNA and RNA.
12. Isolation of Plasmid DNA.
13. Demonstration of PCR.

Web links

<https://vlab.amrita.edu/?sub=3&brch=73>

<https://learn.chm.msu.edu/vibl/>

<https://www.labster.com/microbiology-virtual-labs/>

<https://www.scienceprofonline.org/vmc/microbiology-laboratory-course-teaching-materials.html>

<https://virtuallabs.nmsu.edu/>


<https://www.merlot.org/merlot/viewMaterial.htm?id=79694>

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

BSc Microbiology Syllabus (w.e.f:2020-2021A.B)

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. MZC, FMZC (V Semester)			
Course Code MBY-145 B2	TITLE OF THE COURSE BIOSTATISTICS AND BIOINFORMATICS				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Introductory microbiology	3	1	-	3

Aim and objectives of Course

To understand Biostatistics and Bioinformatics

Learning outcomes of Course

Up on completion of the course students able to

CO1: Understand biological data bases

CO2: Summarize Searching sequence data bases

CO3: Students able to use appropriate tests for bio variable analysis

CO4: Able to understand analytical tests and Construction of phylogenetic trees by clustering methods

CO5: Able to understand protein modelling methods

UNIT – I**No. of hours: 7**

Definition, nature and scope of bioinformatics. Bioinformatics versus computational biology. Branches of bioinformatics. Basic concepts in bioinformatics. Introduction to Biological data bases: NCBI, EMBL, EXPASY, PIR, Pfam. Concept of World Wide Web: HTML, HTTP.

UNIT – II**No. of hours: 7**

Searching sequence data bases using BLAST. Multiple sequence alignment– progressive alignment–profiles–multi dimensional dynamic programming. Biostatistics: Measures of Central tendency and distribution–mean, median, mode, range, standard deviation, variance.

UNIT – III**No. of hours: 7**

Basic principles of probability theory, Bayes theorem, Normal distribution, statistical inference –Types of errors and levels of significance. Comparison of variance (F-test), small sample test, t-test for comparison of means, chi square test. Analysis of variance–one way and two way, multiple comprises.

UNIT – IV**No. of hours: 7**

Correlation and Linear regression. Sequence Analysis: Introduction to hidden Markov models. Genomics and proteomics: Molecular phylogenetics: Construction of Phylogenetic trees using parsimony method and branch & bound method. Clustering methods– UPGMA & neighbour-joining. Fragment assembly, peptide sequencing using mass and spectroscopy data. Comparative genomics.

UNIT – V**No. of hours: 8**

Modelling: Protein secondary structure prediction–Chou Fasmanrules– Neural networks–discriminate analysis. Prediction of transmembrane segments in Membrane proteins. Protein3D structure prediction– homology– threading – Potential energy functions–energy minimization–molecular dynamics–simulated annealing.

TEXT & REFERENCE BOOKS

1. Daniel, 2006, Biostatistics, Eighth Edition. John Wiley and sons.
2. Durbin, Eddy, Krogh, Mithison, Biological sequence analysis.
3. T.A.AttwoodandD.J.parry-smith, 2001, Introduction of Bioinformatics.
4. A.D.Baxevaris,1998, Bioinformatics:Apracticalguidetotheanalysisof Genes and proteins,(Edited) B.F.Publication.
5. David W, 2005, Bio-informatics;sequenceandGenomeAnalysis,2ndEdition By Mount CB Spublishers.

III B.Sc Microbiology ,Semester -V

Blue Print B2- PAIR -BIOSTATISTICS AND BIOINFORMATICS

Section		Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Total questions	No of questions answered	Marks allotted
A	Essay Questions	2	2	2	1	1	8	4	10x4 = 40
B	Short questions	2	2	2	2	2	10	5	2X5=10

Total Marks= 50

Microbiology Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

Section- A

Answer any FIVE question

4×10=40 Marks

1. a) Essay question from unit I.
(or)
b). Essay question from unit I
2. a) Essay question from unit II
Or
b) Essay question from unit II
3. a) Essay question from unit III
(or)
b). Essay question from unit III
4. a) Essay question from unit IV
(or)
b). Essay question from unit V

Section-B

Answer any FIVE questions only

5×2=10Marks

- 5.Short question from unit I
- 6.Short question from unit I
- 7.Short question from unit II
- 8.Short question from unit II
- 9.Short question from unit III
- 10.Short question from unit III
- 11.Short question from unit IV
- 12.Short question from unit IV
- 13.Short question from unit V
- 14 Short question from unit V

Microbiology Model Question Paper (Theory)

MBY-140 BIOSTATISTICS AND BIOINFORMATICS

Paper: II SEMESTER –IV

Time: 2 1/2Hrs

Max.Marks:50

Part-A

Note: Answer ALL questions

1.a) Write a note on definition, nature and scope of bioinformatics.

OR

b) Explain bioinformatics versus computational biology.

2. a) Explain searching sequence data using BLAST

OR

b) Write a note on multiple sequence alignment

3. a) Write a note on basic principles of probability theory

OR

b) Explain comparison of variance, small sample test, T-Test and Chisquare test.

4. a) Explain peptide sequencing using mass and spectroscopy data

OR

b) Write a note on protein 3D structure prediction.

Part-B

Answer any five questions. All carry equal marks.

5. NCBI

10. Analysis of variance

6. World wide web

11. Markov models

7. BLAST

12. UPGMA

8. Standard deviations

13. Protein secondary structure prediction

9. Types of errors

14. Simulated annealing

Web links

<https://ccelms.ap.gov.in/rusa/user/gtitles/122>

<https://www.scienceprofonline.com/virtual-micro-main.html>

<https://slidetodoc.com/history-of-microbiology-from-the-virtual-microbiology-classroom/>

<https://studylib.net/doc/5795921/microbial-growth-lecture-powerpoint>


<https://youtube.com/channel/UCAXheRahnkShRUKSRbbihuQ>

CO-PO Mapping

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

MBP B2 - BIOSTATISTICS AND BIOINFORMATICS

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code MBY 145P B2	TITLE OF THE COURSE BIOSTATISTICS AND BIOINFORMATICS	III B.Sc. MZC & FMZC (V Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic Microbiology	-	-	2	2

TOTAL HOURS: 36**CREDITS: 2**

1. Isolation of plasmid DNA from *E.coli* cells
2. Quantitative and qualitative analysis of proteins / DNA by using spectrophotometer.
3. Demonstration of Southern hybridization
4. Demonstration of amplification DNA by PCR.
5. Use of software for sequence analysis of nucleotides and proteins.
6. Problem related to t – test and χ^2 test.
7. Use of Internet/software for sequence analysis of nucleotides and proteins:
8. Studies of public domain data bases for nucleic acid and protein sequences.
9. Determination of protein structure (PDB).
10. Genome sequence analysis
11. Problems related to measures of central tendency, dispersion, t-test and chi Square test.

SUGGESTED READINGS:

1. Daniel, 2006, Biostatistics, Eighth Edition. John Wisley and sons.
2. Durbin, Eddy, Krogh, Mithison, Biological sequence analysis.
3. T.A.Attwood and D.J. parry-smith, 2001, Introduction of Bioinformatics.
4. A.D.Baxevaris, 1998, Bioinformatics: A practical guide to the analysis of Genes and proteins, (Edited) B.F. Publication.
5. David W, 2005, Bio-informatics; sequence and Genome Analysis, 2nd Edition By Mount CB Spublishers.

Web links

<https://vlab.amrita.edu/?sub=3&brch=73>

<https://learn.chm.msu.edu/vibl/>

<https://www.labster.com/microbiology-virtual-labs/>


<https://www.scienceprofonline.org/vmc/microbiology-laboratory-course-teaching-materials.html>

<https://virtuallabs.nmsu.edu/>

<https://www.merlot.org/merlot/viewMaterial.htm?id=79694>

CO-PO Mapping**(1: Slight [Low];2: Moderate [Medium]; 3: Substantial [High], '-': No correlation)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. MZC, FMZC (V Semester)			
Course Code MBY-145 C1	TITLE OF THE COURSE MICROBIAL QUALITY CONTROL, INSTRUMENTATION AND TECHNIQUES				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Introductory microbiology	3	1	-	3

Aim and objectives of Course

To study quality control in food and pharmaceutical industries and analytical techniques

Learning outcomes of Course

Up on completion of the course students able to

CO1: Develop skills on disinfection of instruments and equipment's in laboratory and Hospitals and documentation

CO2: To understand the working principle of basic laboratory equipments

CO3: To understand the techniques like MPN and direct microscopic methods

CO4: To understand and demonstrate Principles of Microscopy, handling and uses of microscopes

CO5: To understand and demonstrate the various analytical and separation techniques

UNIT – I**No. of hours: 7**

Microbial quality control definition, history and introduction. Standard Methods involved in assessment of microbial quality control. Q.A and Q.C definitions and importance. Traditional Microbiological Quality Controlling methods: Sampling methods, TVC, APC and serial dilution techniques. Microbiological criteria. Laboratory facility design for quality control: Sterilization, disinfection and decontamination. Personnel training: Hygiene and handling techniques. Documentation. Good laboratory practices.

UNIT – II**No. of hours: 8**

Culture media used in QC and QA: Design of specialized media for identification of pathogens. Good laboratory practices in culture media preparation: raw material, water, pH. Uses of media.

Selective and indicator media used in pharmaceutical and food industries. Instruments associated in QC and QA: Principle involved, working conditions, uses and precautions of Laminar Air Flow (LAF), Autoclave, Incubator, pH meter, Colony counter, Hot air oven, Centrifuges and storage devices.

UNIT – III**No. of hours: 7**

Techniques for enumeration of microorganisms: sample preparation from Aqueous, soluble, insoluble, medical and pasteurized materials. Counting methods: pour plate, spread plate, membrane filtration. Most Probable Number (MPN) and MIC. Turbidimetric methods. Staining techniques for identification bacteria and Fungi.

UNIT – IV**No. of hours: 7**

Microscopy – Principles of light, phase, fluorescent & electron microscopes; Microscopic techniques: Basic principles and applications of phase – contrast microscopy, fluorescent microscopy and electron microscopy, types of electron microscopy– scanning and transmission. Radio isotopes: radiometric analysis, stable and radioactive isotopes, preparation, labelling, detection and measurement of isotope.

UNIT - V

No. of hours: 7

Principles of Centrifugation – Centrifugation techniques – preparative and analytical methods, density gradient centrifugation. General principles and applications of chromatography – Paper, Column, Thin layer, Gas, Ion exchange, Affinity chromatography, HPLC, FPLC, GCMS and Gel filtration. Electrophoresis- moving boundary, zone (Paper Gel) electrophoresis. Immuno electrophoresis. Immunoblotting. Isoelectric focusing, 2-Delectrophoresis, Principles of colorimetry

TEXT & REFERENCE BOOKS

1. Hand book of Microbial Quality control by Rosamund. M, Baird Norman. A, Hodges and Stephen. P, Denyer. CRC press.
2. The Microbiological Quality of Food, 1st Edition, Editors: Antonio Bevilacqua Maria Rosaria Corbo Milena SinigagliaeBook ISBN: 9780081005033 Imprint:Wood head Publishing.
3. Guide to Microbiological Control in Pharmaceuticals and Medical Devices, Second Edition, Stephen P. Denyer, Rosamund M. Baird, CRC Press.
4. WILSON & WALKER, Practical Biochemistry: Principles and techniques, Academic publishers.
5. UPADHYAY, UPADHYAY &NATH, Biophysical Chemistry: Principles and techniques, Himalaya Publishers.

III B.Sc Microbiology ,Semester -V

Blue Print for C1- PAIR : Microbial Quality Control, Instrumentation & Techniques

Section		Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Total questions	No of questions answered	Marks allotted
A	Essay Questions	2	2	2	1	1	8	4	10x4 = 40
B	Short questions	2	2	2	2	2	10	5	2X5=10

Total Marks= 50

Microbiology Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

Section- A

Answer any FIVE question

4×10=40 Marks

1. a) Essay question from unit I.
(or)
b). Essay question from unit I
2. a) Essay question from unit II
Or
b) Essay question from unit II
3. a) Essay question from unit III
(or)
b). Essay question from unit III
4. a) Essay question from unit IV
(or)
b). Essay question from unit V

Section-B

Answer any FIVE questions only

5×2=10Marks

- 5.Short question from unit I
- 6.Short question from unit I
- 7.Short question from unit II
- 8.Short question from unit II
- 9.Short question from unit III
- 10.Short question from unit III
- 11.Short question from unit IV
- 12.Short question from unit IV
- 13.Short question from unit V
- 14 Short question from unit V

Microbiology Model Question Paper (Theory)

**MBY-140 MICROBIAL QUALITY CONTROL, INSTRUMENTATION AND
TECHNIQUES**

Paper: II SEMESTER –IV

Time: 2 1/2Hrs

Max.Marks:50

Part-A

Note: Answer ALL questions

1.a) Write a note on traditional microbiological quality controlling methods.

OR

b) Write a note on personal training, hygiene and handling techniques.

2. a) explain selective and indicator media used in pharmaceutical and food industries.

OR

b) Explain instruments associated in quality analysis and quality control.

3. a) Write a note on techniques for enumeration of microorganisms.

OR

b) Briefly explain staining techniques for identification of bacteria

4. a) Explain the basic principle and application of phase contrast microscopy.

OR

b) Explain the use of affinity chromatography.

Part-B

Answer any five questions. All carry equal marks.

5. TVC

10. MIC

6. Serial dilution techniques

11. SEM

7. Autoclave

12. Radio isotopes

8. Hot air oven

13. Centrifuge

9. MPN

14. Calorimetry

Web links

<https://ccelms.ap.gov.in/rusa/user/gtitles/122>

<https://www.scienceprofonline.com/virtual-micro-main.html>

<https://slidetodoc.com/history-of-microbiology-from-the-virtual-microbiology-classroom/>

<https://studylib.net/doc/5795921/microbial-growth-lecture-powerpoint>


<https://youtube.com/channel/UCAXheRahnkShRUKSRbbihuQ>

CO-PO Mapping

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

MBP-C1: MICROBIAL INSTRUMENTATION AND BIOTECHNIQUES

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code MBY 145P CI	TITLE OF THE COURSE MICROBIAL QUALITY CONTROL, INSTRUMENTATION AND TECHNIQUES	III B.Sc. MZC & FMZC (V Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic Microbiology	-	-	2	2

1. Isolation and enumeration of bacteria from food / pharmaceutical source.
2. Quality Assurance of water by MPN method.
3. Preparation of any two selective and indicator media commonly used Q.A & Q.C
4. Microbial quality of in and around laboratory conditions.
5. Isolation and Identification of fungi by using selective media and staining procedures.
6. Identification of MIC of any one antibiotic.
7. Colorimetric and spectroscopic estimation of nucleic acids.
8. Microscopic observations of examination of bacteria, fungi and actinomycetes.
9. Separation of cell components by centrifugation technique.
10. Demonstration of immune electrophoresis.
11. Demonstration of HPLC.

Suggested readings:


6. Hand book of Microbial Quality control by Rosamund. M, Baird Norman. A, Hodges and Stephen. P, Denyer. CRC press.
7. The Microbiological Quality of Food, 1st Edition, Editors: Antonio Bevilacqua Maria Rosaria Corbo Milena SinigagliaeBook ISBN: 9780081005033 Imprint:Wood head Publishing.
8. Guide to Microbiological Control in Pharmaceuticals and Medical Devices, Second Edition, Stephen P. Denyer, Rosamund M. Baird, CRC Press.
9. WILSON & WALKER, Practical Biochemistry: Principles and techniques, Academic publishers.
10. UPADHYAY, UPADHYAY &NATH, Biophysical Chemistry: Principles and techniques, Himalaya Publishers.

Web links

- <https://vlab.amrita.edu/?sub=3&brch=73>
<https://learn.chm.msu.edu/vibl/>
<https://www.labster.com/microbiology-virtual-labs/>
<https://www.scienceprofonline.org/vmc/microbiology-laboratory-course-teaching-materials.html>
<https://virtuallabs.nmsu.edu/>
<https://www.merlot.org/merlot/viewMaterial.htm?id=79694>

CO-PO Mapping**(1: Slight [Low];2: Moderate [Medium]; 3: Substantial [High], '-': No correlation)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

	Government College (Autonomous) Rajahmundry	Program & Semester III B.Sc. MZC, FMZC (V Semester)			
Course Code MBY-145 C2	TITLE OF THE COURSE DRUG DESIGN, DISCOVERY AND INTELLECTUAL PROPERTY RIGHTS (IPR)				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites	Introductory microbiology	3	1	-	3

Aim and objectives of Course

To study drug design, discovery and IPR

Learning outcomes of Course

Up on completion of the course students able to

CO1:Students should be able to understand approaches for drug design, sources of drugs and molecular mechanism of drugs

CO2:Students should be able to understand drug development process

CO3:Get knowledge on vaccines, gene therapy and gene based vaccines

CO4:Students will get knowledge on outlines of intellectual property rights, ISI and Bio standards

CO5:Students will understand concepts Bio safety and ethics

Unit – I**No. of Hours: 7**

Introduction- History of drug design, Current approaches and philosophies in drug design, Molecular mechanisms of diseases and drug action with examples. Pharmaceutical products of microbial origin (antibiotics) animal origin (sex hormones), plant origin (Alkaloids & Morphine). Sources of Drugs- Microbial drugs, Plants as a source of drugs, *E. coli* as a source of recombinant therapeutic proteins.

Unit – II**No. of Hours: 7**

Expression of recombinant proteins in yeasts, animal cell culture systems. Rational drug design and Combinatorial approaches to drug discovery. Drug development process- Impact of genomics and related technologies upon drug discovery: Gene chips, Proteomics, Structural genomics and Pharmacogenetics. Drug manufacturing process- Guides to good manufacturing practice.

Unit – III**No. of Hours: 7**

Vaccines and adjuvant- Traditional vaccine preparations, Attenuated and inactivated viral and bacterial vaccines, Toxoids. Peptide vaccines. Adjuvant technology. Nucleic acid as drugs- Gene therapy: Basic approach to gene therapy, Vectors used in gene therapy - Manufacture of viral vectors, Non-viral vectors. Gene therapy and genetic disease, cancer, Gene therapy and AIDS. Gene based vaccines.

Unit – IV**No. of Hours: 8**

Introduction: general introduction to IPR (patent, plant breeder's right). Trademarks, industrial design, trade secrets (or) undisclosed information integrated circuit designs.

Patenting principle, international – standards and patent validity (neem and relaxins), recent developments in patent system and patentability of biotechnology, invention IPR issues of the Indian context. Copy right and rights related to copy right, International standards as per WHO, ISI, bio safety and validation.

Unit – V**No. of Hours: 7**

Biotechnology and hunger: challenges for the Indian biotechnological research and industries. Bio safety: the Cartagena protocol on bio safety.

Bio safety management: key to the environmentally responsible use of biotechnology, ethical implications of biotechnology product techniques, social and ethical implications of biological weapons

TEXT & REFERENCE BOOKS

1. W.B.Hugo & A.D.Russell, Pharmaceutical Microbiology edited, 6th Edition, Black Well science.
2. Shanson D.C., Microbiology in clinical practice, 2nd edition, London; Wright.
3. T.Sammes Ellis Horwood, opicin Antibiotic chemistry Vol I to V.
4. Wulf Crueger, Biotechnology – A text book of Industrial Microbiology, 2nd Edition, Panima publishers
5. A.H.Patel, 1984, Industrial Microbiology, Macmilan India Limited.
6. Coulson C.J., London; Taylor and Francis, Molecular mechanisms of drug action.
7. Denyes S.P. & Baird R.M. Chichester, Ellis Horwood, Guide to microbiological Control in Pharmaceuticals.
8. Murray S. Cooper, Quality control in the Pharmaceutical Industry-Edt., Vol-II, Academic press, New York.
9. Sydney H. Willin, Murray M. Tuckerman, William S. Hitchings IV, Good Manufacturing practices of pharmaceuticals, second Edt., Merceel Dekker NC Nework.

III B.Sc Microbiology ,Semester -V

Blue Print for C 2 - PAIR: C -Drug Design, Discovery & Itelectual Property Rights (IPR)

Section		Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Total questions	No of questions answered	Marks allotted
A	Essay Questions	2	2	2	1	1	8	4	10x4 = 40
B	Short questions	2	2	2	2	2	10	5	2X5=10

Total Marks= 50

Microbiology Model Question Paper (Theory)

TIME: 2 1/2 HOURS

Maximum Marks: 50

Section- A

Answer any FIVE question

4×10=40 Marks

1. a) Essay question from unit I.
(or)
b). Essay question from unit I
2. a) Essay question from unit II
Or
b) Essay question from unit II
3. a) Essay question from unit III
(or)
b). Essay question from unit III
4. a) Essay question from unit IV
(or)
b). Essay question from unit V

Section-B

Answer any FIVE questions only

5×2=10Marks

- 5.Short question from unit I
- 6.Short question from unit I
- 7.Short question from unit II
- 8.Short question from unit II
- 9.Short question from unit III
- 10.Short question from unit III
- 11.Short question from unit IV
- 12.Short question from unit IV
- 13.Short question from unit V
- 14 Short question from unit V

Microbiology Model Question Paper (Theory)

**MBY-140 MICROBIAL QUALITY CONTROL, INSTRUMENTATION AND
TECHNIQUES**

Paper: II SEMESTER –IV

Time: 2 1/2Hrs

Max.Marks:50

Part-A

Note: Answer ALL questions

1. a) Write a note on history, current approaches and philosophies in drug design

OR

b) Write a note on pharmaceutical products of microbial origin.

2. a) Explain rational drug design and combinatorial approaches to drug discovery

OR

b) Explain drug development process in brief

3. a) Write a note on traditional vaccine preparation

OR

b) Briefly explain basic approach to gene therapy

4. a) Write a note on recent developments in patent system and patentability of biotechnology.

OR

b) Write a note on biosft with special reference to the Cartagena protocol on biosafety.

Part-B

Answer any five questions. All carry equal marks.

5. Alkaloids and morphine

10. Trade marks

6. E. Coli as a source of recombinant protein

11. Bio-ethics

7. Toxoids

12. Bio-weapons

8. Gene based vaccines

13. Gene chips

9. Copy rights

14. Proteomics

Web links

<https://ccelms.ap.gov.in/rusa/user/gtitles/122>

<https://www.scienceprofonline.com/virtual-micro-main.html>

<https://slidetodoc.com/history-of-microbiology-from-the-virtual-microbiology-classroom/>

<https://studylib.net/doc/5795921/microbial-growth-lecture-powerpoint>

<https://youtube.com/channel/UCAXheRahnkShRUKSRbbihuQ>

CO-PO Mapping


(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-' : No correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
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CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

MBP – C2: DRUG DESIGN, DISCOVERY AND INTELECTUAL PROPERTY RIGHTS (IPR)

TOTALHOURS:40

CREDITS: 3

	Government College (Autonomous) Rajahmundry	Program & Semester			
Course Code MBY 145P C2	TITLE OF THE COURSE DRUG DESIGN, DISCOVERY AND INTELECTUAL PROPERTY RIGHTS (IPR)	III B.Sc. MZC & FMZC (V Semester)			
Teaching	Hours Allocated: 30 (Practical)	L	T	P	C
Pre-requisites	Basic Microbiology	-	-	2	2

1. Isolation of antibiotic producing bacteria from soil samples
2. Isolation of drug resistant plasmid from bacteria (E.coli).
3. Isolation of Actinomycetes from soil.
4. Identification of antibacterial activity of actinomycetes.
5. Identification of antibacterial activity of fungi
6. Identification of antagonistic activity of any two fungal species.
7. Assay of any one antibiotic (Penicillin).
8. Determination of MIC of any one antibiotic (penicillin / streptomycin).
9. Study of components and design of a BSL – III laboratory
10. Filing applications for approval from bio safety committee
11. Filing primary applications for patents
12. Study of steps of patenting process
13. A case study of patent.
14. Study of bio safety measures in pharmaceutical industry.
15. Study on QA & QC parameters followed in R&D laboratory.

SUGGESTED READINGS:

1. W.B.Hugo & A.D.Russell, Pharmaceutical Microbiology edited, 6th Edition, Black Well science.
2. Shanson D.C., Microbiology in clinical practice, 2nd edition, London; Wright.
3. T.Sammes Ellis Horwood, opicin Antibiotic chemistry Vol I to V.
4. Wulf Crueger, Biotechnology – A text book of Industrial Microbiology, 2nd Edition, Panima publishers
5. A.H.Patel, 1984, Industrial Microbiology, Macmilan India Limited.
6. Coulson C.J., London; Taylor and Francis, Molecular mechanisms of drug action.
7. Denyes S.P. & Baird R.M. Chichester, Ellis Horwood, Guide to microbiological Control in Pharmaceuticals.
8. Murray S. Cooper, Quality control in the Pharmaceutical Industry-Edt., Vol-II, Academic press, New York.
9. Sydney H. Willin, Murray M. Tuckerman, William S. Hitchings IV, Good Manufacturing practices of pharmaceuticals, second Edt., Merce Dekker NC Nework.

Web links

<https://vlab.amrita.edu/?sub=3&brch=73>

<https://learn.chm.msu.edu/vibl/>

<https://www.labster.com/microbiology-virtual-labs/>

<https://www.scienceprofonline.org/vmc/microbiology-laboratory-course-teaching-materials.html>

<https://virtuallabs.nmsu.edu/>

<https://www.merlot.org/merlot/viewMaterial.htm?id=79694>

CO-PO Mapping

(1: Slight [Low]; 2: Moderate [Medium]; 3: Substantial [High], '-': No correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	3	2	3	3	3	1	2	2	3	3	3	3
CO2	3	2	3	3	2	3	3	1	3	3	3	2	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	2
CO4	3	2	2	2	2	2	3	3	1	1	2	2	2
Avg.	2.75	2.5	2.5	2.75	2.25	2.5	2.25	2	2	2.5	2.75	2.25	2.5

Practical Examination pattern for Semester End Examinations

Practical examination in Department of MICROBIOLOGY is held before end of semester exams twice in a year to test practical skills among the students.

Total marks allotted for practical are **50** marks two hours in each semester

The division of marks is as follows

Section		Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V	Total questions	No of questions answered	Marks allotted
A	Essay Questions	2	2	2	1	1	8	4	10x4 = 40
B	Short questions	2	2	2	2	2	10	5	2X5=10