GOVERNMENT AUTONOMOUS COLLEGE (AUTONOMOUS)
RAJAMAHENDRAVARAM

NAAC "A^{+}" GRADE

DEPARTMENT
OF
MICROBIOLOGY

BOARD OF STUDIES

2024-2025

(Single Major & Minor-I, II, III & IV Semester, III B.Sc.(MZC & FMZC) as per BOS Regulations 2024-25)

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ACADEMIC CELL, GOVERNMENT COLLEGE

(AUTONOMOUS) RAJAHMUNDRY

Proceedings of the Principal, Government College (Autonomous), Rajahmundry
Present: Dr. Ramachandra R.K, M.Sc., Ph.D.

Rc. No. 274/GCRJY /UG-BoS/ 2024-25 dt. 27.04.2024

Sub: Government College (A), Rajamahendravaram- UG Boards of Studies (BoS)-Nomination of Members – Orders issued.

Ref: 1. UGC Guidelines of for Autonomous Colleges-2023.
2. Proc. Of the VC No: ANUR/ANUR Government College (A) Rajahmundry BOS/2023

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Order

The Principal, Government College (Autonomous) Rajahmundry is pleased to nominate the following members to UG Board of Studies to frame the syllabus of **History subject** in all the semesters duly following the norms of the UGC regulations for the Autonomous colleges 2023. The Principal, Government College (Autonomous) Rajahmundry is pleased to nominate the following members to UG Board of Studies to frame the syllabus of **Microbiology subject** in all the semesters duly following the norms of the UGC regulationsfor the Autonomous colleges 2023.

S. No	Name	Designation
1	Smt. T. Sony	Chairman
2	Dr.T.Sujatha, Lecturer in Microbiology	Member
3	Smt. K. Sasikala, ABN&PRR College Kovvuru	University Nominee
4	Ms. D.Swapna Jasti Bullammai Degree College Rajmundry	Subject Expert
5	Mr.Y.Bobby HOD Quality control Pharma Labs Pvt Ltd VL Puram Junction, Rajmundry	Expert from Industry / corporate sector
6	A.Preeti III MZC, N.Alekya III FMZC, B.Gowri BSc Honours	Student Nominee

The above members are requested to attend the BoS meeting in May-2024 and share their valuable views, and suggestions on the following functionaries.

a) Prepare syllabi for the subject keeping in view the objectives of the

college, interest of the stake holders and National requirement for consideration and approval of the IQAC and Academic Council

b) Suggest methodologies for innovative teaching and evaluation techniques
c) Suggest the panel of names to the Academic Council for appointment of Examiners
d) Coordinate research, teaching, extension and other activities in the department of the College.
e) d) Suggest CLO, PLO, PI and subject experts to develop question bank in compliancewith Bloom's Taxonomy.

The above said members are requested to bestow their services for the successful organization of the event.

PRINCIPAL GOVERNMENT COLLEGE (AUTONOMOUS) 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 2024-25, held in the Department of Microbiology on 01-05-2024 at 10:00 AM 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 :** Smt. K. Sasikala, ABN&PRR College Kovvuru.
4. **Subject expert :** Ms. D.Swapna Jasti Bullammai Degree College Rajmundry
6. **Expert from Industry:** Mr.Y.Bobby HOD Quality control Pharma Labs Pvt Ltd VL Puram Junction, Rajmundry
7. **Student Nominee** : A.D.Preeti III MZC, N.Alekya III FMZC , B.Gowri B.Sc Honours

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	Hr/ week	credits
I	I	1	Introduction to Classical Biology	5	4
		2	Introduction to applied biology	5	4
	II	3	Introduction to Microbiology	3	3
			Introduction to Microbiology	2	1
		4	Bacteriology and Virology	3	3
			Bacteriology and Virology	2	1
II	III	5	Eukaryotic microorganisms	3	3
			Eukaryotic microorganisms	2	1
		6	Biomolecules & Enzymology	3	3
			Biomolecules & Enzymology	2	1
		7	Microbial and Analytical Techniques	3	3
			Microbial and Analytical Techniques	2	1
		8	Cell Biology and Genetics	3	3
			Cell Biology and Genetics	2	1
	IV	9	Molecular Biology and Microbial Genetics	3	3
			Molecular Biology and Microbial Genetics	2	1
		10	Microbial Physiology and Metabolism	3	3
			Microbial Physiology and Metabolism	2	1
		11	r DNA technology, Biostatistics& Bioinformatics	3	3
			r DNA technology, Biostatistics &Bioinformatics	2	1

It is resolved to approve the above course structure for admitted batch **2024-2025**.

MICROBIOLOGY: MINOR
w.e.f 2023-24 AY
COURSE STRUCTURE

Year	Semester	Course	Title	Hr/ week	credits
I	II	1	Introduction to Microbiology	3	3
			Introduction to Microbiology	2	1
II	III	2	Biomolecules & Enzymology	3	3
			Biomolecules & Enzymology	2	1
	IV	3	Molecular Biology and Microbial Genetics	3	3
			Molecular Biology and Microbial Genetics	2	1
		4	Microbial Physiology and Metabolism	3	3
			Microbial Physiology and Metabolism	2	1

It is resolved to approve the above course structure for admitted batch **2024-2025**.

III B.Sc (MZC & FMZC) MICROBIOLOGY (CBCS) Revised Syllabus – w.e.f. 2020-21

Year	Semester	Paper	Title	Marks	Credits
		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 2024-2025

The Board of Studies meeting for I, II, and III B.Sc Microbiology of all semesters for the academic year 2024-2025, was held at 10 AM on 01/05/2024. 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 Honours- Major and Minors B.Sc Microbiology w.e.f the academic year 2023-2024 as per the directions given by APSCHE and Council of Higher education, A.P. For B.Sc. 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 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 2024-25, 05 May -2024

Resolutions:

Agenda point-1:

Introduction of B.Sc Microbiology- Major and B.Sc Microbiology Minors for first & second year students w.e.f the academic year 2023-2024 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 III B.Sc (MZC & FMZC) 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 IV semester Microbiology major and Microbiology Minor with effect from the academic year 2024-2025. (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

For Semester I - 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 Semester I of the single major course in Microbiology for the new regulation taken up from 2023-24 academic years.

The members of BOS unanimasouly 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

Semester I (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**

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

Resolution IV B.

For Semester II- The question paper is divided into two parts. The first part comprises of sections A having essay questions. Each essay question allocated 08 marks.

The part 2 is of very short answer type questions with 02 marks for each one. there will be 10 questions in part 2.

The detailed split up of questions and marks allocated in the two sections is shown in detail in the following table.

This blue print will be applicable for Semester two onwards of the single major course in Microbiology for the new regulation taken up from 2023-24 academic years.

The members of BOS unanimasouly approved the Blue Print, Model Question Papers & Assignment Questions for each course.

Microbiology – Major Programmes

Blue Print for Question Papers from II Semester onwards

Unit Number	Section-A (Essay/ Split Essay) In either or pattern	Section-B (MCQ/ True or False/ Fill in the blank) – No choice	Weightage of marks
Unit-1	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-2	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-3	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-4	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-5	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M

SECTION-A **5 × 8 = 40 Marks**

Answer all the following questions. Draw labelled diagrams wherever necessary.

1. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay

2. (a) or (b) – If an essay

3. (a) or (b) – If an essay

4. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay

5. (a) or (b) – If an essay

SECTION-B **10 × 1 = 10 Marks**

Answer all the following questions.

6. From Unit-1

7. From Unit-1

8. From Unit-2

9. From Unit-2

10. From Unit-3

11. From Unit-3

12. From Unit-4

13. From Unit-4

14. From Unit-5

15. From Unit-5

Note: Question bank has to be prepared as shown below:

1. Essays 3 from each unit or 6 split essays (i.e., 8 short questions)

2. MCQs/Fill in blank/True or False (A maximum of 10 questions from each unit)

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 **2024 – 2025**.

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.	UniversityNominee :Smt. K. Sasikala ABN&PRR College Kovvuru	
4.	Subject expert : Ms. D.Swapna Jasti Bullammai Degree College , Rajmundry	
5.	Industrial nominee: Mr.Y.Bobby HOD Quality control Pharma Labs Pvt Ltd VL Puram Junction, Rajmundry	
6.	Student member A.D.Preeti III MZC, N.Alekya III FMZC, B.Gowri B.Sc Honours	

Rajahmundry **Chairman**
Date: 01--05-2024

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	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
2	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
3	T.Sasikala Lecturer in Microbiology	All	ABN College, Kovvuru 9885861088
4	Ms.D.Swapna Lecturer in Microbiology	All	Jasti Bullemmai Degree College Rajmundry 9063985708
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	All	GDC ANATAPUR

	Lecturer in Microbiology		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 Srikakulum 9052177822 Ch.shanthi123@gmail.com
12	Dr. Maqsood	All	SKR Government degree college, Tilak Naga Gudur Nellore 9849530338 mdmaqsood.micro@gmail.com
13	P. Aruna Lecturer in Microbiology	All	GDC Guntur WOMEN patchalaaruna@gmail.com
14	Dr. K.Sucharita Lecturer in Microbiology	All	GDC (W) GUNTUR 9963180561 sucharitak@gmail.com
15	Dr.Praveena Lecturer in Microbiology	All	GDC Guntur WOMEN

Members **Chairman**

Semester – 1

Course: 1 INTRODUCTION TO CLASSICAL BIOLOGY ,(Course code: 124401)

Hours/Week: 5 Credits: 4

Learning objectives

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

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 lifeprocesses.

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 andDisorders

3.3 Developmental Biology – Basic process of development (Gametogenesis, Fertilization, Cleavage and Organogenesis)

3.4 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.
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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 InternationalPublishers.
5. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolutionand 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. Pearsonpublishers.
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

(Course code: 124401) 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**

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

Major I

INTRODUCTION TO CLASSICAL BIOLOGY,(Course code: 124401)

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

(Course code: 124401) 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

(Course code: 124401), Course – 1 Question Bank for Introduction to Classical Biology I Year-I Semester Major

Unit-I: Introduction to systematics, taxonomy and ecology

1. Explain various levels of taxonomic hierarchy with characteristic features.
2. Discuss the importance and levels of biodiversity.
3. Describe the natural causes of climate change and the effects of climate change.

Unit-2: Essentials of Botany

1. Discuss the physiological functions of plant hormones.
2. Write an essay on the structure of monocot and dicot embryos.
3. Describe about the landscaping.

Uni-3: Essentials of Zoology

1. Explain the hierarchical classification of Kingdom Animalia and Chordata.
2. Describe the process of Gametogenesis, highlighting the key differences between spermatogenesis and oogenesis.
3. Explain the castes in Beehive. Discuss the Economic significance of Apiculture.

Unit-4: Cell Biology, Genetics and Evolution

1. Compare and contrast the ultrastructure of prokaryotic and eukaryotic cells with focus on their key organelles and functions.
2. Outline the key stages of the cell cycle. Add a note on the differences between mitosis and meiosis
3. Explain the central dogma of molecular biology.

Unit-5: Essentials of Chemistry

1. Give a brief account of the applications of chemistry in daily life. Add a note on the scope of chemistry.
2. Explain how different chemical bonds are formed.
3. Explain the principles of green chemistry.

Objective Type Questions

Unit-1: Introduction to systematics, taxonomy and ecology

1. The term taxon was coined by
2. A genus with a solitary species is called
3. The scientist who popularized the nomenclature
4. The lowest level of the taxonomic hierarchy is
5. _____is concerned with intraspecific populations and phylogenetic trends.
6. Expand the acronym ICBN
7. ICZN is published by
8. The scientific name of cabbage is
9. The scientific name of the Indian crow is
10. Consumers are also called as
11. Decomposers are also called as
12. _____food chain starts with a herbivore and ends with a top carnivore.
13. Biomass refers to

14. The total inorganic matter in an ecosystem at a given time is
15. The variation in the number and types of genes in the different species is termed as
16. The number of national parks meant for in-situ conservation in India is
17. Who coined the term biodiversity hotspots?
18 _____pollutants are not cycled in the environment
19 ____gas leakage at Bhopal caused a big loss of human life on 3rd December 1984
16. The burning of ____is responsible for the maximum release of greenhouse gases and causing global warming

Unit-3: Essentials of Zoology

1. _____is the space between the body wall and the alimentary canal called?
2. An organism with three germ layers is called as_____
3. The structural and functional unit of the kidney is _____
4. The structural and functional unit of the brain is _____
5. The swelling in the neck due to an enlarged thyroid gland is _____
6. The fusion process of male and female gametes is referred as_____
7. The division of cells in the early development of the embryo following fertilization is called as__
8. The culturing of silkworms is termed as_____
9. The culturing of honey bees is called_____
10. The term for culturing of aquatic animals is_____
11. The air sacs in the lungs are called as_____
12. The process of formation of gametes is called as_____
13. The sperm cells are formed from_____
14. How many numbers of ova are produced at the end of oogenesis?
15. Name the disease caused by hypersecretion of growth hormone.
16. Name the disease caused due to hypersecretion of the thyroid gland.
17. Cushion syndrome is caused by hypersecretion of _____hormone.
18. _____physiolog ical disorder occurs when pancreatic cells do not produce enough insulin.
19. Name the architectural body plan in animals with similar body segments and organ systems that are serially repeated one after another.
20. What is the name of the phase of embryonic development that starts at the end of gastrulation and continues until birth?

Unit-5: Essentials of Chemistry

1._____ is a bactericidal antibiotic.
2. The medicinal drugs used for the treatment of stress are ----------
3. The scientific study of the composition, characteristics and interactions of matter is ---------
4. Penicillin is_____ type of drug.
5. The electrostatic force of attraction between oppositely charged ions in a molecule is__
6. The chemical bond in KCl is_____
7. Name a molecule formed from covalent bond between two atoms_____
8. A triple covalent bond is seen in _____molecule.
9. The covalent bond present in a Chlorine molecule is_____

10 ---------- is the minimum energy required to form a chemical bond.
11. The hydrogen bond present in ortho-hydroxy benzoic acid is----------
12. _____is the other name for green chemistry.
13. Who is the father of green Chemistry?
14. Name the first principle of green chemistry.
15. _____focuses on the study of Carbon-based compounds.
16. _____is the most electronegative atom.
17. _____type of covalent bond is present in an Oxygen molecule.
18. Why Pi bonds are weaker than the sigma bonds?
19. Hydrophobic interactions are of ----------type between hydrophobic molecules.
20. Which branch of chemistry deals with the chemical processes and substances in the living organisms.

Matching Type Questions

Unit-2: Essentials of Botany

1.

SET-I	SET-II
1. Two kingdom system	A. Copeland
2. Four kingdom system	B. Carl Linnaeus
3. Five kingdom system	C. Carl Woese
4. Six kingdom system	D. R.Whittaker

2.

SET-I	SET-II
1. Bryophytes	A.Fruit bearing plants
2.Pteridophytes	B.Plants with naked seeds
3.Gymnosperms	C.Amphibians of plant kingdom
4.Angiosperms	D.Vascular Cryptogams

3.

SET-I	SET-II
1.End products in light phase	A.Lactic acid
2.End product of dark phase	B.Pyruvic acid
3.End product in glycolysis	C.ATP and $NADPH_2$
4.End product in fermentation	D.Starch

4.

SET-I	SET-II
1.Fruit ripening	A.Gibberellins
2.Dormancy	B.Auxins
3.Apical dominance	C.Ethylene
4.Flowering	D.Abscisic acid

5.

SET-I	SET-II
1.Ornithophily	A. Pollination by snails
2.Ophiophily	B.Pollination by bats
3.Malacophily	C.Pollination by birds
4.Chiropterophily	D.Pollination by snakes

6.

SET-I	SET-II
1.Anabolism	A.Respiration
2.Catabolism	B.Transpiration
3.Amphibolic pathway	C. Photosynthesis
4.Necessary evil in plants	D. Citric acid cycle

7.

SET-I	SET-II
1. Glycolysis	A. Stroma of Mitochondrion
2. Carbon fixation	B. Thylakoid membrane
3. Krebs cycle	C. Cytosol
4. Light reactions	D. Stroma of Chloroplast

8.

SET-I	SET-II
1.Composting	A.Making seed material for mushroom
2.Spawning	B.Mulching with soil
3.Casing	C.
4.Canning	D.Aerobic degradation of organic material

Unit-4: Cell biology, Genetics and Evolution

1.

SET-I	SET-II
1. Leptotene	A. Formation of chiasmata
2. Zygotene	B. Crossing over
3. Pachytene	C. Synapsis of homologous chromosomes
4. Diplotene	D. Chromosomal condensation

2.

SET-I	SET-II
1. DNA replication	A. RNA synthesis on a DNA template
2.Translation	B. Synthesis of daughter DNAs
3.Transcription	C.A change in DNA sequence
4.Mutation	D. Protein synthesis using mRNA

3.

SET-I	SET-II
1.Cell wall	A. Region of genetic material in Bacteria
2.Nucleoid	B. Site of protein synthesis
3.Plasma membrane	C. Non-living layer of a plant cell
4.Ribosome	D. Semi-permeable membrane

4.

SET-I	SET-II
1.Endoplasmic reticulum	A. Suicidal bags of a cell
2.Mitochondria	B.Synthesis of glycolipids
3.Golgi appratus	C. Tubular net-work in a cell
4.Lysosomes	D. Power houses of a cell

5.

SET-I	SET-II

1.Chromatin	A. Place where two sister chromatids are attached
2. Histones	B. Protective ends of chromosomes
3.Centromere	C. Proteins that help in DNA packing
4. Telomeres	D. DNA-protein complex in a chromosome

6.

SET-I	SET-II
1.Prophase	A. Movement ofdaughter chromosomes towards opposite poles
2.Metaphase	B. Formation of daughter nuclei
3.Anaphase	C. Chromatin condensation
4.Telophase	D. Chromosomes align at equator in a cell

7.

SET-I	SET-II
1. Robert Hooke	A. New cells born from pre-existing cells
2. Anton van Leeuwenhoek	B. Living organisms are composed of cells
3. Rudolf Virchow	C. Coined the term "cell"
4. Theodor Schwann	D. Observed microorganisms using a microscope

8.

SET-I	SET-II
1.DNA	A. Different forms of a gene
2.Chromosome	B. Genetic constitution of a living-being
3.Allele	C. Hereditary material
4.Genotype	D.A thread of nucleo-proteins

Semester – 1

Course: 2 ,(Course code: 124402) 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 complexbiological 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, Archaeaand 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 inPlant, Animal, Industrial and Pharmaceutical sciences.
3.2. Environmental Biotechnology – Bioremediation and Biofuels, Biofertilizers andBiopesticides.
3.3. Genetic engineering – Gene manipulation using restriction enzymes and cloningvectors; Physical, chemical, and biological methods of gene transfer.
3.4. Transgenic plants – Stress tolerant plants (biotic stress – BT cotton, abiotic stress – salttolerance). 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 testsof 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

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4. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chandpublishers, 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. CambridgePublishers.
7. U. Sathyanarayana, 2005. Biotechnology. 1st Edition. Books and Allied Publishers pvt.ltd., Kolkata.
8. Upadhyay, Upadhyay and Nath. 2016. Biophysical Chemistry, Principles andTechniques. 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 ofwastes 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.

Course -2 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**

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

Major II , (Course code: 124402)

Course -2 Model Paper, 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. 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 II,(Course code: 124402)

Course -2 Model paper 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

Course- 2 QUESTION BANK , (Course code: 124402)

I SEM B. Sc Honours Microbiology

Subject: Introduction to Applied Biology

Essay type

Questions:

Unit-1:

1. Write a note on Contributions of Edward Jenner and Louis Pasteur.
2. Explain out line structure of Bacteria with a neat labelled diagram.
3. Write a note on Innate Immunity.

Unit-2:

1. Write about classification of carbohydrates with suitable examples.
2. Write a note on Protein structure.
3. Write about outline Structures of DNA and

RNA. Unit-3:

1. Explain the role of Biofertilizers & Biopesticides in modern agriculture.
2. Write about outline of genetic engineering.
3. Give a note on Transgenic plants and

animals. Unit-4:

1. Write about Principle and applications of PCR.
2. Write about Principle and applications of ELISA.
3. Write a note on production of Monoclonal

antibodies. Unit-5:

1. Explain the methods of measurement of central tendency.
2. Define Genomics and Proteomics. Explain the difference between Genomics & proteomics and enlist their uses.
3. Write a note on biological databases with special reference to NCBI, EBI &Gen Bank.

Very short Answer questions (One word answer)

1. Who discovered tuberculosis bacilli? A.Robert Koch
2. Bacterial cell wall is made up A.Peptidoglycan
3. Write two examples of Eukaryotic microorganism A. Aspergillus, Entamoeba
4. Give an example of archaea bacteria? A. *Pyrolobus sps*, *Picrophilus sps*, Methylococci sps.
5. Who is the pioneer of antiseptic surgery? A. Joseph Lister (1827-1912)
6. Who invented petridish? A. Julius Richard petri
7. Who explained fermentation process? A. Louis Pasture
8. The fungi which derive their food directly from dead organic matter are known as------- A. Saprophytic fungi
9. What is the name of the special hyphal tips through which parasitic fungi absorb nutrients directly from the cytoplasm of the living host? A. Haustorium
10. A virus is made up of A. A protein coat and Nucleic acids
11. The protein coat of viruses that enclose the genetic material is called as A. Capsid
12. Give an example of Helical virus A. TMV
13. Cells involved in cell mediated immunity A. T -Cells
14. The immunity obtained during the life time is known as— A. Acquired immunity
15. Immune cells are produce predominantly in which organ of an adult human. A. Bone marrow
16. Immunoglobulins are produced by which cells? A. B-Cells.

17.Thymus is a primary organ of immune system-TRUE or FALSE
A. TRUE
18.The immunity which is conferred by birth is called A. Innate immunity
19. bacterial cells have ---------- kind of ribosomes. A.70S type
20.Mode of Bacterial reproduction A. Binary fission

Unit-III

21. An organism containing a gene which doesn't belong to it and is derived from somewhere else then the organism is said to be ____A. Transgenic
22. Give an example of transgenic plant A. Bt Cotton, Golden rice
23. What is the first human gene cloned in E.Coli A. Insulin
24. The young cells in the embryo that can develop into various types of tissue are named as
A. Stem cell
25. Give an example of plasmid A. pBR322, pUC19
26. Name the extrachromosomal DNA which can replicate autonomously in the cell .
A. Plasmid
27. Name the enzymes which can cut the DNA /RNA. A. Nucleases
28. Give example for Restriction Endonucleases A. EcoR 1, BamH1, Hind III.
29. Name the enzyme that polymerises the deoxyribonucleotides into DNA.
A. DNA Polymerase
30. Name the enzyme which join the adjacent 3'-OH and Phosphate to seal the nick in the DNA strands. A. DNA Ligases
31. write any two diseases due to errors in the DNA of the Humans
A. Sickle Cell anaemia, Tay Sachs disease, Muscular dystrophy
32. Give any two methods of transfer of DNA into the cells of Eukaryotes.
A. Microinjection, Electroporation, Chemical methods like coprecipitation with calcium phosphate, Bacterial protoplast fusion with mammalian cells.
33. Give example for viral Vectors A. M13, Lambda (λ), θ6.
34. Give two examples of biofertilizers A. Azotobacter, Azospirillum, anabaena, Nostoc.
35. Give two examples Biopesticides
A. *Bacillus thuringiensis, Trichoderma viride, Pseudomonas fluorescens*
36. Use of Microorganisms for the clean-up of environmental pollutants is called as
A. Bioremediation
37. Give examples for biofuels A. Biogas, Gasohol's
38. The first clinical application of gene therapy over a 4 year old girl was for which disease?
A. SCID (Severe combined Immunodeficiency Disease).
39. The human genome project was launched in the year 1990 and ended in which year?
A. 2003.
40. Restriction enzymes were discovered by A. Smith and Nathans.

Unit-V

41. a process where the samples for a study is obtained through conscious selection is called
A. Cluster sampling
42. Difference between primary data and secondary data?
A. The primary data is much more reliable than secondary data because it is collected directly from respondents
43. Standard deviation of all possible estimates from sample of fixed size is called
A. standard error.
44. Any population constants is known as A. parameter

45. The list of all items of a population is known as A. sampling frame.

46. The sampling procedure in which the population is divided into homogeneous groups and sample drawn from each group is called as A. Stratified random sampling

47. To calculate the median, all the items of a series have to be arranged in a/an—order
A. Ascending or descending order

48. Mode refers to the value within a series that occurs_____number of times
A. maximum

49. The sum of deviations from the_____is always zero A. Mean

50. 50.what is NCBI A. National centre for biotechnology Information

51. What is EBI? A. European Bioinformatics Institute

52. The databases Genbank, EMBL and DDBJ are updated daily. True/ false?
A. True

53.Genbank the nucleic acid sequence Database maintained by_____? A. NCBI.

54. _____is the data base that provides all the information about the human inheritance.
A. OMIM (Online mendelian Inheritance in Mam).

55. _____offers researchers a set of integrated tools for studying and analyzing genetic data. Users can explore and compare data from multiple sources including the NCBI databases or the user's own private data. A. Genome workbench

56. Give example for protein sequence database?
A. PIR (Protein Information resource), Swiss-port.

57. What is BLAST?
A. Basic Local Alignment Search Tool. It helps in compare and calculate data to identify the members of the gene family with the help of nucleic acid sequences or protein
sequence.

58. _____is a bibliographic database of more than 19 million citations for biomedical literature from MEDLINE, life science journals, and online books.
A. Pub Med

59._____is the study of sequence of the total or part of the genetic information and it functions. A. Genomics

60. Define proteomics? A. Proteomics is the study of the interactions, function, composition, and structures of proteins and their cellular activities.

Mach the following

1.

A.	Carbohydrates	1	Enzymes, hormones, protein
B.	Amino acids	2	Cholesterol and sterols
C.	Fatty acids	3	Amino acids
D.	protein	4	glucose

Ans: A-4, B-1, C-2,
D-3. 2.

A.	Monosaccharide	1	Lactose
B.	Disaccharide	2	Ribose

C.	polysaccharide	3	Fructose
D.	pentose	4	Starch

Ans: A-3. B-1,C-4,D-2.3

A.	Compound lipids	1	cholesterol
B.	Simple lipids	2	Glycolipids
C.	steroids	3	Palmitic acid
D.	Fatty acid	4	waxes

Ans: A-2,B-4,C-1,D-3

4.

A.	Globulins	1	Osmatic balance in the food
B.	Albumins	2	Oxygen transport in the blood
C.	Haemoglobin	3	Clotting of blood
D.	Fibrinogen	4	Defence mechanism

Ans: A-4, B- 1,C-2,D-3.

5.

A.	Acidic amino acid	1	Methionine
B.	Basic amino acid	2	Valine
C.	Neutral amino acid	3	Lysine
D.	Sulphur containing amino acid	4	Glutamic acid

Ans: A-4, B-3, C-2, D-1.6.

A.	Sugar in DNA	1	Adenine, Guanine
B.	Sugar in RNA	2	Thymine, Cytosine
C.	Purines	3	Ribose
D.	Pyrimidines	4	Deoxy ribose

Ans: A-4, B-3, C-1,
D-2. 7.

A.	Nucleotide	1	Cytosine + uracil

B.	Nucleoside	2	Sugar + Base+ Phosphate
C.	DNA	3	Sugar + Base
D.	RNA	4	Cytosine + Thymine

Ans: A-2, B-3, C-4, D-1.8.

A.	t RNA	1	Templet for protein synthesis
B.	m RNA	2	Structure of ribosome
C.	r RNA	3	Genetic material
D.	DNA	4	Transport amino acids

Ans: A-4, B-1, C-2, D-3.

9.

A.	t RNA	1	Single stranded straight chain
B.	m RNA	2	Cloverleaf
C.	r RNA	3	Double helical
D.	DNA	4	Folded single strand

A-2, B-1, C-2, D-3.

10.

A.	Autotrophy	1	glycolysis
B.	Catabolism	2	Amino acid synthesis
C.	Anabolism	3	Synthesize their own food
D.	Heterotrophy	4	Cannot make their food, depends on others

Ans: A-3,B-1,C-2,D-4.

11. Match PCR steps

A.	Denaturation	1	Polymerase chain reaction
B.	Annealing	2	$72^{O}C$
C.	Extension	3	$94^{O}C$
D.	PCR	4	$55^{O}C$

Ans: A-2,B-3,C-2, D-1.

12.

A.	Autoradiography	1	Separation of DNA on gel
B.	Southern blotting	2	Amplification of DNA
C.	Electrophoresis	3	DNA transferred to Nylon sheet
D.	PCR	4	X-ray Photography

Ans: a-4,B-3, C-1, D-2.

13.

A.	Western blotting	1	DNA separation
B.	DNA finger printing	2	RNA separation
C.	Southern blotting	3	Sequencing DNA
D.	Northern blotting	4	Protein separation

Ans: A- 4, B-3.C-1,D-2. 14.

A.	Genotype	1	Observable Character
B.	Phenotype	2	Genetic compliment
C.	Genomics	3	study of the interactions, function, composition, and structures of proteins and their cellular activities.
D.	Proteomics	4	study of sequence of the total or part of the genetic information.

A-2, B-1, C-4, D-3.

15.

A.	Eugenics	1	Identifying protein in a mixture by labelled antibody.
B.	Gene therapy	2	Theory proposed to create a perfect people or group through genetics
C.	Monoclonal antibody	3	Technique to modify persons gene to cure disease
D.	Immunoblotting	4	Hybridoma Technology

Ans: A-2, B-3, C-4,D-1.

16.

A.	Primary structure of protein	1	Helix or plate form

B.	Secondary structure of protein	2	2 or more polypeptide chains arranged
C.	Tertiary structure of protein	3	Linear sequence of amino acids
D.	Quaternary structure	4	Hallow ball like

Ans: A-3, b-1, C-4, D-2.

17.

A.	Bacterial cocci in group of four	1	Monotrichous
B.	Glycocalyx firmly attached to the cell wall	2	Tetrads
C.	Long filamentous appendages which propel bacteria	3	Capsule
D.	A state of single polar flagellum	4	Flagella

Ans: A-2, B-3, C-4, D-1.18.

A.	Possess alternate sugar and phosphate bond	1	Lipids
B.	Possess C, H and O	2	Amino acids
C.	Glycerol esterified with fatty acids	3	Nucleic acids
D.	A symmetric carbon with COOH and NH_2	4	Carbohydrates

Ans: A-3, B-4,C-1,D-2.19

A.	Antony Van Leeuwenhoek	1	Penicillin
B.	Alexander Fleming	2	Microscope
C.	Joseph lister	3	Anthrax
D.	Robert Koch	4	Antiseptic surgery

Ans: a-2, B-1,c-4,D-3.20

A.	Bacillus thuringiensis	1	Vector to introduce DNA into the plant.
B.	Agrobacterium tumefaciens	2	Taq polymerase
C.	Anabaena	3	Insecticide protein
D.	Thermus aquaticus	4	Biofertilizer

Ans: A-3, B-1,C-4,D-2.

II SEMESTER

COURSE 3, (Course code: 124403) 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 ofkey 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 ofmicrobial 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, isolationmethods, and the identification of bacteria and fungi.

Unit - 1: **History of Microbiology** **No. of Hours: 10**

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. ofHours: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 practicingpersonal protective measures.

2. Identify microscope parts, adjusting focus and diaphragm, and accuratelyobserving and documenting microscopic images.

3. Prepare smears, identifying different microorganisms, and interpretingmicroscopic characteristics.

4. Analyze electron micrographs, identifying virus types, and describing theirmorphology and size.

5. Operate Autoclave, Hot Air Oven, and Laminar Air Flow Chamber forsterilization and decontamination purposes.

II SEMESTER

COURSE 3: ,(Course code: 124403) INTRODUCTION TO MICROBIOLOGY

Blue Print for Question Papers from II Semester onwards

Unit Number	Section-A (Essay/ Split Essay) In either or pattern	Section-B (MCQ/ True or False/ Fill in the blank) – No choice	Weightage of marks
Unit-1	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-2	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-3	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-4	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-5	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M

SECTION-A **5 × 8 = 40 Marks**

Answer all the following questions. Draw labelled diagrams wherever necessary.

1. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay

2. (a) or (b) – If an essay

3. (a) or (b) – If an essay

4. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay

5. (a) or (b) – If an essay

SECTION-B **10 × 1 = 10 Marks**

Answer all the following questions.

6. From Unit-1

7. From Unit-1

8. From Unit-2

9. From Unit-2

10. From Unit-3

11. From Unit-3

12.

13. From Unit-4

14. From Unit-4

15. From Unit-5

16. From Unit-5

GOVERNMENT COLLEGE AUTONOMOUS, RAJAMAHENDRAVARAM
Department of Microbiology
Question Bank, II Semester, C 3 (Introduction to Microbiology)

Essay questions
Answer all the following questions, Draw labelled diagrams wherever necessary

UNIT	Q.No.	Questions	Marks
I	1.	a) Write notes on Charak Samhita b) Contribution of Edward Jenner	4+4=8
	2.	a) Contribution of Ignaz Philipp Semmelweis b) Major contribution of Louis Pasteur	4+4=8
	3.	a) Contribution of Robert Koch b) Contribution of Joseph Lister	4+4=8
II	1.	Explain Whittaker's five kingdom classification	8
	2.	Discuss the basic and applied branches of Microbiology	8
	3.	Distinguishing features of eukaryotic and prokaryotic cell	8
III	1.	Explain General characteristics of Bacteria	8
	2.	Distinguishing characters of Archaebacteria & Eubacteria	8
	3.	General characteristics of viruses	8
IV	1.	Write a note on Fungi	8
	2.	Write a note Algae	8
	3.	Write a note on Protozoa	8
V	1.	a) Describe the inoculation methods. b) Nutrient broth & Nutrient agar.	4+4=8
	2.	a) Colony characteristics of bacteria. b) Simple staining.	4+4=8
	3.	a) Explain various pure culture techniques. b) Wet mount.	4=4=8

Section -B
OBJECTIVE
(10x1=10)

UNIT-1

1. Anton von Leeuwenhoek is credited with the discovery of the first compound microscope. **(False)**
2. Charak Samhita and Sushruta Samhita contain descriptions of aseptic techniques used in ancient Indian medicine. **(True)**
3. The first antibiotic, _____, was discovered by Alexander Fleming in 1928. *(Penicillin)*
4. _____ developed the first vaccine for smallpox using cowpox material. *(Edward Jenner)*
5. The Germ Theory of Disease was proposed and proven by _____. *(Louis Pasteur and Robert Koch)*

UNIT -2

1. Haeckel's three-kingdom classification included Plantae, Animalia, and Monera. **(False)**
2. Carl Woese's three-domain system is based on differences in ribosomal RNA sequences. **(True)**
3. Whittaker's five-kingdom concept includes Monera, Protista, Fungi, Plantae, and _____. *(Animalia)*
4. Carl Woese proposed a three-domain system consisting of Bacteria, Archaea, and _____. *(Eukarya)*
5. Microbiology is the study of microscopic organisms, including bacteria, viruses, fungi, protozoa, and _____. *(Algae)*

UNIT-3

1. Unlike bacteria, archaea do not have a cell wall. **(False)**
2. Viruses are considered living organisms because they can replicate on their own. **(False)**
3. Bacteria exhibit diverse shapes, including cocci (spherical), bacilli (rod-shaped), and _____ (spiral-shaped). *(Spirilla)*
4. Unlike bacteria, archaea have unique membrane lipids composed of _____ linkages instead of ester linkages. *(Ether)*
5. Viruses can have genetic material made of either _____ or _____, but not both. *(DNA, RNA)*

UNIT-4

1. Fungi are autotrophic organisms that perform photosynthesis. **(False)**
2. Algae can be unicellular, colonial, or multicellular in their thallus organization. **(True)**
3. Protozoa excrete waste products mainly through the process of _____. *(Diffusion)*
4. The thread-like structures forming the body of multicellular fungi are called _____. *(Hyphae)*
5. The cyst stage in protozoa helps them survive unfavorable conditions and is known as _____. *(Encystment)*

UNIT-5

1. Solid growth media typically contain agar, while liquid media do not. **(True)**
2. A mixed culture consists of only one type of microorganism. **(False)**
3. The main solidifying agent used in microbiological media is _____. *(Agar)*
4. A culture that contains only one type of microorganism is called a _____. *(Pure culture)*
5. The technique used to observe live, unstained microorganisms under a microscope is called a _____. *(Wet mount)*

GOVERNMENT COLLEGE AUTONOMOUS, RAJAMAHENDRAVARAM

Department of Microbiology

Model question paper

II Semester, **C 3 (Introduction to Microbiology)**

Time : 3Hrs Max Marks : 50

SECTION – A

Answer all the following questions, Draw labelled diagrams wherever necessary

(5x8=40 Marks)

Q.No.	Questions	Marks	BL	CO	PO
1.	a) Write notes on Charak Samhita b) Contribution of Edward Jenner	4+4=8	1&2		
	(OR)				
	a) Contribution of Robert Koch b) Contribution of Joseph Lister	4=4=8	2&4		
2.	Explain Whittaker's five kingdom classification	8	6		
	(OR)				
	Distinguishing features of eukaryotic and prokaryotic cell	8	2&4		
3.	Explain General characteristics of Bacteria	8	2		
	(OR)				
	General characteristics of viruses	8	3&4		
4.	Write a note on Fungi	8	2		
	(OR)				
	Write a note on Algae	8	2		
5.	a) Describe the inoculation methods. b) Nutrient broth & Nutrient agar.	4+4=8	2&4		
	(OR)				
	a) Explain various pure culture techniques. b) Wet mount.	8	2		

Section -B
Answer any five of the following
(10x1=10)

FILL IN THE BLANKS

6. The first antibiotic, _____, was discovered by Alexander Fleming in 1928. *(Penicillin)*
7. Whittaker's five-kingdom concept includes Monera, Protista, Fungi, Plantae, and _____. *(Animalia)*
8. Bacteria exhibit diverse shapes, including cocci (spherical), bacilli (rod-shaped), and _____ (spiral-shaped). *(Spirilla)*
9. Protozoa excrete waste products mainly through the process of _____. *(Diffusion)*
10. The technique used to observe live, unstained microorganisms under a microscope is called a _____. *(Wet mount)*

True or False

1. Charak Samhita and Sushruta Samhita contain descriptions of aseptic techniques used in ancient Indian medicine. **(True)**
2. Haeckel's three-kingdom classification included Plantae, Animalia, and Monera. **(False)**
3. Viruses are considered living organisms because they can replicate on their own. **(False)**
4. Fungi are autotrophic organisms that perform photosynthesis. **(False)**
5. Solid growth media typically contain agar, while liquid media do not. **(True)**

II SEMESTER- PRACTICAL

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, SARSCoV-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 andexplore various topics related to microbiology.

2.Organizing microbiology-themed events like microbiologyday 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.

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II SEMESTER

COURSE 4: ,(Course code: 124404) 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 Ultrastructur
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 of Oncogenes 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-pathogen interactions.
3. Gain the ability to examine the bacteria through microscopy.
4. Demonstrate proficiency in isolating bacteria from natural environment

II SEMESTER

COURSE 4: - BACTERIOLOGY AND VIROLOGY

Blue Print for Question Papers from II Semester onwards

Unit Number	Section-A (Essay/ Split Essay) In either or pattern	Section-B (MCQ/ True or False/ Fill in the blank) – No choice	Weightage of marks
Unit-1	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-2	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-3	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-4	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-5	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M

SECTION-A **5 × 8 = 40 Marks**

Answer all the following questions. Draw labelled diagrams wherever necessary.

1. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay

2. (a) or (b) – If an essay

3. (a) or (b) – If an essay

4. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay

5. (a) or (b) – If an essay

SECTION-B **10 × 1 = 10 Marks**

Answer all the following questions.

6. From Unit-1

7. From Unit-1

8. From Unit-2

9. From Unit-2

10. From Unit-3

11. From Unit-3

12. From Unit-4

13. From Unit-4

14. From Unit-5

15. From Unit-5

Government College (Autonomous) Rajahmundry

Department of Microbiology,

II Semester: C4 – Question Bank (Bacteriology and Virology)

Section-A
(Essay Type-8 marks Questions)

Unit	Q.No	Questions	Marks	BL	CO	PO
Unit 1	1	Give a brief account on biological systems of classification and branches of taxonomy	8	2	1	2
	2	Explain the Ultrastructure of Bacterial Flagella and it functions	8	2	1	2
	3	Explain the Ultrastructure of bacterial cell wall	8	3	2	2
Unit-2	4	Write a brief note on Photosynthetic bacteria i. Purple bacteria ii. Green bacteria	4+4=8	4	2	2
	5	Write a brief note on i. Mycoplasma ii. Rickettsia	4+4=8	4	2	2
	6	Write a note on i. Methanogenic bacteria ii. Halophilic bacteria	4+4=8	4	2	2
Unit-3	7	Give a brief account on general characters of Viruses	8	1	3	2
	8	Write out line classification of Viruses according to Baltimore System	8	3	3	2
	9	Explain any two methods of cultivation of viruses	8	2	3	2
Unit-4	10	Explain the mode of replication in i. TMV ii. HIV	4+4=8	2	4	2
	11	Explain the mode of replication in bacteriophage T4 and Lambda.	4+4=8	2	4	2
	12	Explain the mode of replication in i. Adeno virus ii. Influenza viruses	4+4=8	3	4	2
Unit-5	13	Short notes on i. Viroids ii. Prions	4+4=8	1	4	2
	14	Explain the concept of i. Protooncogenes ii. Oncogenes	4+4=8	2	5	2
	15	Write about the role and applications of viruses in Biotechnology	8	3	5	2

SECTION-B (One-mark questions)

Unit-1:

1. Who proposed a natural system of classification of angiosperms? (George Bentham and Hooker)
2. Engler and Prantl proposed the ---------- classification. (Phylogenetic)
3. The extrachromosomal DNA present in Bacterial cell is called Nucleoid. (TRUE/ FALSE)
4. Prokaryotic ribosome is ------- type . (70S type with two sub units-30S and 50S)
5. In prokaryotes, the hair-like outgrowths which attaches to the surface of other bacterial cells are called Pili. (TRUE/FALSE)

Unit-II

1. Example of cell wall less bacteria. (Mycoplasma)
2. Q-fever is caused by Coxiella burnetiid. (TRUE/FALSE)
3. Obligate parasite of higher animals and not transmitted by arthropods is a Chlamydia. (TRUE/FALSE)
4. Microbes capable of producing methane are called ---------- (Methanogens.)
5. Give example of spore forming bacteria---- (Clostridium and Bacillus)

Unit-III

1. TMV was first observed by ---------- (Dimitri Ivanowski (1892))
2. Virus Capsid is made up of identical protein subunits called -----(Capsomeres)
3. Expand ICTV--------(International Committee on Taxonomy of Viruses)
4. Influenzae and HIV are Examples for enveloped viruses (TRUE/FALSE)
5. HeLa, Hep 2 and KB cells are Examples of Diploid cell culture (TRUE/FALSE)

Unit-IV

1. Most DNA viruses assemble in the -Cytoplasm ; whereas most RNA viruses develop solely in Nucleus. (TRUE/FALSE)
2. In Positive stranded RNA viruses genomic RNA can be translated directly as mRNA. (TRUE/FALSE)
3. Lysogenic cycle is seen in-------(Lambda phase)
4. The genome of HIV is------(Positive sense RNA)
5. Polio virus belongs to the family -------- (Picorna viridae)

Unit-V

1. The infective particle with short strands of circular, and single-stranded RNA without the protein coats is called as----------(Viroid)
2. Define Prions? (Prions are infectious protein particles responsible for a group of transmissible and/or inherited neurodegenerative diseases.)
3. Human Papilloma Virus (HPV) is an example of carcinogenic Viruses (TRUE/FALSE)
4. Oral polio vaccine and Measles vaccine are killed virus vaccine. Example of satellite viruses? (TRUE/FALSE)
5. What is Virusoid? (Circular single-stranded RNAs dependent on plant viruses for replication and encapsulation. The genome of virusoids consist of several hundred nucleotides and only encodes structural proteins.)

Government College (Autonomous) Rajahmundry
Department of Microbiology
II Semester: C4 – Model Question paper (Bacteriology and Virology)

Time-2.30 Hrs max.Marks:50

SECTION-A

Answer all the following questions. Draw labelled diagrams wherever necessary.

(5× 8 = 40 Marks)

Q.No	Questions	Marks	BL	CO	PO
1	Give a brief account on biological systems of classification and branches of taxonomy	8	2	1	2
	(OR)				
	Explain the Ultrastructure of bacterial cell wall	8	3	2	2
2	Write a brief note on Photosynthetic bacteria i. Purple bacteria ii. Green bacteria	4+4=8	4	2	2
	(OR)				
	Write a brief note on i. Mycoplasma ii. Rickettsia		4	2	2
3	Give a brief account on general characters of Viruses	8	1	3	2
	(OR)				
	Explain any two methods of cultivation of viruses	8	2	3	2
4	Explain the mode of replication in i. TMV ii. HIV	4+4=8	2	4	2
	(OR)				
	Explain the mode of replication in bacteriophage T4 and Lambda.	4+4=8	3	4	2
5	Short notes on i. Viroids ii. Prions	4+4=8	1	4	2
	(OR)				
	Write about the role and applications of viruses in Biotechnology	8	3	5	2

SECTION-B **10X1=10 Marks**

Answer all the following questions.

1. The extrachromosomal DNA present in Bacterial cell is called as Nucleoid. (TRUE/FALSE)
2. Prokaryotic ribosome is _____type
3. Example of cell wall less bacteria_____
4. Obligate parasite of higher animals and not transmitted by arthropods is Chlamydia (TRUE/FALSE)
5. Microbes capable of producing methane are called Methanotrophs. (TRUE/FALSE)
6. Clostridium tetani is an example of spore forming bacteria. TRUE/FALSE)
7. Expand ICTV_____
8. Write Example for enveloped viruses_____
9. Most DNA viruses assemble in the Cytoplasm: whereas most RNA viruses develop solely in Nucleus. (TRUE/FALSE)
10. Define Prions?

II SEMESTER PRACTICALS
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/sewagesample using double agar layer technique.
6. Studying isolation and propagation of animal viruses by chick embryotechnique.
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.andKlein,D.A.Microbiology. 5th Edition WCB Mc GrawHill, New York, (2002).
2. Tortora, G.J., Funke ,B.R. and Case, C.L. Microbiology : An Introduction. Pearson Education, Singapore, (2004).
3. Alcomo,I.E.FundamentalsofMicrobiology.VIEdition, JonesandBartlettPublishers.Sudbury.Massachusetts, (2001).
4. BlackJ.G.Microbiology-Principlesand Explorations.JohnWiley&SonsInc.NewYork, (2002).
5. Tom Besty,D.C Jim Koegh.Microbiology Demystified McGRAW-HILL.
6. Christopher Burrell Colin Howard Frederick Murphy. Fenner and White's MedicalVirology 5th Edition.Academic Press

Co-Curricular Activities:

1. Invite guest speakers, to provide insights into the latest advancements andemerging trends in bacteriology and virology.
2. Conduct laboratory workshops that allow students to gain hands-on experience inbacterial culture techniques
3. Case Study Competitions: Organize case study competitions where students canwork 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

III SEMESTER

COURSE 5: ,(Course code: 124405) EUKARYOTIC MICROORGANISMS
credits -_3

Course Outcomes:

- On successful completion of the course, the students will be able to
- Understand the characteristics, classification, andreproductive mechanisms of fungi, algae, and protozoa.
- Recognize the importance of fungi in biotechnology, including theirroles in food production, medicine, and agriculture.
- Comprehend the significance of algae in various industries,the environment, and as a source of food.
- Identify pathogenic protozoa and understand their impact on humanhealth and the environment.

Unit 1: Fungi No. of Hours:9

1. Habitat, distribution, nutritional requirements, fungal cell ultra-structure, fungal wall, Outline classification of Fungi
2. Reproduction in different fungal groups- Phycomycetes,Ascomycetes, Basidiomycetes and Deuteromycetes
3. Heterokaryosi s, heterothallism and parasexual mechanism.
4. Fungal dimorphism (Candida albicans)

Unit 2: Importance of Fungi NO. of Hours:9

1. Role of fungi in biotechnology: food, medicine and pharmaceutical industry (baking, brewing, antibiotics, alcohols, enzymes, organic acids, and pharmaceuticals)
2. Beneficial Role of fungi in Agriculture: Biofertilizers, Myco toxins; Biological control (Myco fungicides, Myco herbicides, Myco insecticides).
3. Mushrooms and its cultivation. (White button, Milky and Oyster)
4. Fungi as plant and animal pathogens (Cercospora, Puccinia, Candida, Aspergillus)

Unit 3: Algae No. of Hours:9

1. Algae- occurrence, thallus organization, algae cell ultra-structure, pigments,flagella, eyespot food reserves, outline classification
2. Vegetative, asexual and sexual reproduction in Algae
3. Photosynthetic apparatus, and outline of Photosynthesis in Algae

Unit 4: Importance & cultivation of Algae No. of Hours:9

1. Importance of algae in agriculture, industry, environment and food withexamples.
2. Algal culture techniques- Indoor, Outdoor, Closed, Open, Batch, continuous,Fed batch
3. Culture media and growth parameters for algal cultivation (Spirulina)

Unit 5: Protozoa **No. of Hours:9**

1. General characteristics with special reference to Amoeba, Paramecium

2. Pathogenic Protozoa- Plasmodium, Leishmania and Giardia

3. Importance of protozoa (in waste management, soil fertility, industry and scientific study)

4. Culturing protozoans from natural sources-Hay water, pond water, Chalkley's solution

5. Haplobiontic (Nemalion), Haplontic (Chlamydomonas), Diplontic (Cladophora), Diplobiontic (Polysiphonia) and Diplohaplontic (Cladophora) life cycles. deleted

I. 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 fungi and algae.
2. Acquire knowledge about the preparation of growth media and study host-pathogen interactions.
3. Gain the ability to examine the vegetative and reproductive structures ofselected genera through microscopy.
4. Demonstrate proficiency in purifying and preserving pure cultures of commonalgae and fungi.

COURSE 5: - EUKARYOTIC MICROORGNISMS

Blue Print for Question Papers from II Semester onwards

Unit Number	**Section-A (Essay/ Split Essay) In either or pattern**	**Section-B (MCQ/ True or False/ Fill in the blank) – No choice**	**Weightage of marks**
Unit-1	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-2	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-3	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-4	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-5	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M

SECTION-A **5 × 8 = 40 Marks**

Answer all the following questions. Draw labelled diagrams wherever necessary.

1. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay
2. (a) or (b) – If an essay
3. (a) or (b) – If an essay
4. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay
5. (a) or (b) – If an essay

SECTION-B **10 × 1 = 10 Marks**

Answer all the following questions.

6. From Unit-1
7. From Unit-1
8. From Unit-2
9. From Unit-2
10. From Unit-3
11. From Unit-3
12. From Unit-4
13. From Unit-4
14. From Unit-5
15. From Unit-5

COURSE 5: - EUKARYOTIC MICROORGANISMS
MODEL QUESTION PAPER

SECTION A
Answer all the questions. 5x8= 40

1. a).Describe Habitat, distribution, nutritional requirements, fungal cell ultra-structure, fungal wall, Outline classification of Fungi.(BT-2) (Essay question 8 marks)
(OR)
b).Analyse Fungal dimorphism (Candida albicans). (BT-4) (Essay question 8 marks)

2. a).Describe the Role of Fungi in Biotechnology. (BT-2) (Essay question 8 marks)
(OR)
b). Examine the Beneficial role of fungi in agriculture. (BT-4) (Essay question 8 marks)

3. a).Discuss Algae- occurrence, thallus organization, algae cell ultra-structure,pigments, flagella, eyespot food reserves, outline classification. (BT-2) (Essay question 8 marks)
(OR)
b).Explain Vegetative, asexual and sexual reproduction in Algae. (BT-2) (Essay question 8 marks)

4. a).Analyse the Importance of Algae in Agriculture, Industry, Environment, and Food.(BT-4). (Essay question 8 marks)
(OR)
b).Develop Culture Media and Growth Parameters for Algal Cultivationwith Reference to Spirulina. (BT-4) (Essay question 8 marks)

5. a). Explain General characteristics of protozoa with special reference to Amoeba, Paramecium. (BT-2) (Essay Question- 8 marks)
(OR)
b).Develop Culture Media and Growth Parameters for Algal Cultivationwith Reference to Spirulina.
(BT-4) (Essay question 8 marks)

SECTION B
OBJECTIVE 10X1=10

1. Which of the following fungi is commonly used in the production ofantibiotics such as penicillin?
   a) Aspergillus
   b) Penicillium
   c) Candida
   d) Puccinia
   Answer: b) Penicillium
2. Fungi play a major role in brewing by facilitating the fermentationprocess. Which of the following fungi is primarily used in brewing beer?
   a) Saccharomyces cerevisiae
   b) Candida albicans
   c) Aspergillus niger
   d) Cercospora
   Answer: a) Saccharomyces cerevisiae
3. Which of the following algae is commonly used as a biofertilizer inrice cultivation?
   a) Chlorella
   b) Spirulina

c) Anabaena
d) Laminaria
Answer: c) Anabaena

4. Plasmodium, the causative agent of malaria, is transmitted tohumans through:
   a) Airborne spores
   b) Contaminated water
   c) Mosquito bites
   d) Direct skin contact
   Answer: c) Mosquito bites
5. _____is a protozoan that causes severe diarrhea and gastrointestinal distress in humans, usually from contaminated watersources.
   Answer: Giardia
6. One of the most important environmental benefits of algae is their abilityto fix , which helps reduce greenhouse gas levels. Answer: carbon dioxide (CO_2)
7. _____is a commonly used medium for algal culture, particularlyfor cultivating Spirulina. Answer: Zarrouk's medium
8. Fungal cell walls are made primarily of cellulose, just like plant cellwalls.
9. Answer: False Mycofungicides are fungi used to control fungal plant pathogens, promoting healthy crop growth. Answer: True
10. White button mushrooms (Agaricus bisporus) are one of the mostcommercially cultivated mushrooms worldwide. Answer: True

Course -5 QUESTION BANK- ESSAY QUESTIONS

UNIT-1

1. Describe Habitat, distribution, nutritional requirements, fungal cell ultra-structure, fungal wall, Outline classification of Fungi.(BT-2) (Essay question 8 marks)
2. Split Essay (BT-4) 4 marks each
   a) Examine Heterokaryosis in fungi
   b) Examine Heterothallism in fungi
3. Analyse Fungal dimorphism (Candida albicans). (BT-4) (Essay question 8 marks)

Unit-2

1. Describe the Role of Fungi in Biotechnology. (BT-2) (Essay question 8 marks)
2. Examine the Beneficial role of fungi in agriculture. (BT-4) (Essay question 8 marks)
3. Split Essay. (BT-5) 4 marks each
   a) Prepare for cultivation of White Button Mushrooms (Agaricus bisporus)

b) Explain Aspergillosis

Unit-3

1. Discuss Algae- occurrence, thallus organization, algae cell ultra-structure,pigments, flagella, eyespot food reserves, outline classification. (BT-2) (Essay question 8 marks)
2. Explain Vegetative, asexual and sexual reproduction in Algae. (BT-2) (Essay question 8 marks)
3. Split essay. (BT-2) 4 marks each

a) Photosynthetic Apparatus in Algae

b) Outline of Photosynthesis in Algae

Unit-4

1. Analyse the Importance of Algae in Agriculture, Industry, Environment, and Food. (BT-4). (Essay question 8 marks)
2. Split essay . (BT-4) 4 marks each

a) Develop Indoor Algal Cultures

b) Develop Outdoor Algal Cultures

3. Develop Culture Media and Growth Parameters for Algal Cultivationwith Reference to Spirulina. (BT-4) (Essay question 8 marks)

Unit-5

1. Explain General characteristics of protozoa with special reference to Amoeba, Paramecium. (BT-2) (Essay Question- 8 marks)
2. Split essay . (BT-2)
   a) Plasmodium (Split Essay 4 Marks)
   b) Giardia (Split Essay 4 Marks)
3. Write notes on Culturing protozoans from natural sources-Hay water, pondwater, Chalkley's solution. (BT-2) (Essay Question- 8 marks)

SHORT ANSWERS

UNIT 1

Multiple Choice Questions (MCQs)

1. Which of the following is a common habitat for fungi?
   a) Freshwater
   b) Soil
   c) Inside human body

d) All of the above
Answer: d) All of the above

2. Which group of fungi is also known as "imperfect fungi" due to theabsence of a sexual reproductive stage?
   a) Ascomycetes
   b) Basidiomycetes
   c) Deuteromycetes
   d) Phycomycetes
   Answer: c) Deuteromycetes

3. Which of the following is a feature of fungal cell walls?
   a) Made of cellulose
   b) Contains chitin
   c) Lacks a cell wall
   d) Composed of phospholipids
   Answer: b) Contains chitin

4. Heterokaryosis in fungi refers to:
   a) The presence of multiple types of nuclei in a single cell
   b) Fusion of gametes
   c) Sexual reproduction
   d) Spore formation
   Answer: a) The presence of multiple types of nuclei in a single cell
5. Candida albicans exhibits dimorphism, which means:
   a) It has a unique reproductive cycle
   b) It can exist in both yeast and filamentous forms
   c) It has two types of nuclei
   d) It is found in both plants and animals
   Answer: b) It can exist in both yeast and filamentous forms

Fill in the Blanks

6. Fungi are typically heterotrophic, meaning they obtain their nutrients by__ Answer: absorption
7. In Ascomycetes, sexual reproduction results in the formation of sporescalled within a sac-like structure known as an ascus. Answer: ascospores
8. The process where two genetically different hyphae fuse but their nucleiremain separate is called _____. Answer: heterokaryosis

True or False

9. Fungal cell walls are made primarily of cellulose, just like plant cellwalls. Answer: False (Fungal cell walls are made of chitin, not cellulose.)
10. Basidiomycetes are characterized by producing their sexual spores on specialized structures called basidia.Answer: True

UNIT 2

Multiple Choice Questions (MCQs)

11. Which of the following fungi is commonly used in the production ofantibiotics such as penicillin?
    a) Aspergillus
    b) Penicillium

c) Candida
d) Puccinia
Answer: b) Penicillium

12. Fungi play a major role in brewing by facilitating the fermentationprocess. Which of the following fungi is primarily used in brewing beer?
    a) Saccharomyces cerevisiae
    b) Candida albicans
    c) Aspergillus niger
    d) Cercospora
    Answer: a) Saccharomyces cerevisiae
13. Which of the following is an edible mushroom commonly cultivatedfor food production?
    a) Puccinia
    b) Milky Mushroom
    c) Aspergillus
    d) Cercospora
    Answer: b) Milky Mushroom
14. Mycoherbicides are used in agriculture to control:
    a) Insects
    b) Fungal pathogens
    c) Weeds
    d) Nutrient levels in soil
    Answer: c) Weeds
15. Which of the following fungi is known to cause infection in humansand is classified as a pathogen?
    a) Penicillium
    b) Cercospora
    c) Candida albicans
    d) White button mushroom
    Answer: c) Candida albicans

Fill in the Blanks

16. Fungi such as_____are used to produce enzymes like amylase,which is important in the food industry. **Answer:** Aspergillus niger
17. Mycotoxins, such as aflatoxins, are toxic compounds produced by fungilike , which can contaminate crops and affect human and animal health. **Answer:** Aspergillus
18. The fungal pathogen_____is responsible for causing leaf spotdisease in plants like sugarcane and other crops. **Answer:** Cercospora

True or False

19. Mycofungicides are fungi used to control fungal plant pathogens, promoting healthy crop growth. Answer: True
20. White button mushrooms (Agaricus bisporus) are one of the mostcommercially cultivated mushrooms worldwide. Answer: True

UNIT 3

Multiple Choice Questions (MCQs)

1. Which of the following pigments is commonly found in green algae?
    a) Phycoerythrin
    b) Chlorophyll a
    c) Fucoxanthin
    d) Phycocyanin

Answer: b) Chlorophyll a

2. Algae are primarily found in which type of habitat?
   a) Terrestrial forests
   b) Freshwater and marine environments
   c) Deserts
   d) Underground caves

   Answer: b) Freshwater and marine environments
3. What type of food reserve is stored in red algae?
   a) Starch
   b) Glycogen
   c) Floridean starch
   d) Lipids

   Answer: c) Floridean starch
4. Which structure is responsible for detecting light in some motilealgae?
   a) Pyrenoid
   b) Stigma (eyespot)
   c) Nucleus
   d) Contractile vacuole

   Answer: b) Stigma (eyespot)
5. The process of photosynthesis in algae mainly takes place in whichcellular structure?
   a) Nucleus
   b) Mitochondria
   c) Chloroplast
   d) Ribosome

   Answer: c) Chloroplast

Fill in the Blanks

6. The thallus organization of algae can be unicellular, colonial, filamentous, or__.
   Answer: multicellular
7. Algae such as Chlamydomonas use_____for locomotion, whichare whip-like structures that enable movement in water. Answer: flagella
8. In sexual reproduction, algae undergo a process where two gametes fuseto form a____.
   Answer: zygote

True or False

9. Algae store their food reserves in the form of lipids and starch, depending on the type of algae. Answer: True
10. Photosynthesis in algae primarily uses chlorophyll b as the majorpigment, similar to higher plants. Answer: False (Algae primarily use chlorophyll a as the major pigment.)

UNIT 4

Multiple Choice Questions (MCQs)

1. Which of the following algae is commonly used as a biofertilizer inrice cultivation?
   a) Chlorella
   b) Spirulina
   c) Anabaena
   d) Laminaria

   Answer: c) Anabaena
2. Which type of algal culture system allows continuous harvesting ofalgae while replenishing nutrients regularly?
   a) Batch culture

b) Fed-batch culture
c) Continuous culture
d) Open culture
Answer: c) Continuous culture

3. Spirulina is widely known for its application in which of the followingindustries?
   a) Textile industry
   b) Pharmaceutical industry
   c) Biofuel industry
   d) Food and dietary supplements
   Answer: d) Food and dietary supplements
4. Which parameter is most important for optimizing algal growth inculture systems?
   a) Light intensity
   b) pH level
   c) Temperature
   d) All of the above
   Answer: d) All of the above
5. Open pond systems for algae cultivation are commonly used because:
   a) They have low operational costs
   b) They prevent contamination
   c) They allow for strict control of growth conditions
   d) They are only suitable for indoor environments
   Answer: a) They have low operational costs

Fill in the Blanks

6. Algae play a crucial role in the production of_____, which areused as stabilizers in the food industry (e.g., ice cream and sauces). Answer: hydrocolloids (like agar, alginate, and carrageenan)
7. One of the most important environmental benefits of algae is their abilityto fix , which helps reduce greenhouse gas levels. Answer: carbon dioxide (CO_2)
8. _____is a commonly used medium for algal culture, particularlyfor cultivating Spirulina. Answer: Zarrouk's medium

True or False

9. Algal biofuels are considered a renewable energy source because algae can be grown rapidly and produce high amounts of lipids forbiodiesel production.
   Answer: True
10. Fed-batch culture is a closed system where nutrients are addedperiodically to the culture but the volume remains constant. Answer: True

UNIT 5

Multiple Choice Questions (MCQs)

1. Which of the following protozoa moves by the use of pseudopodia?
   a) Paramecium
   b) Amoeba
   c) Plasmodium
   d) Giardia
   Answer: b) Amoeba
2. Plasmodium, the causative agent of malaria, is transmitted tohumans through:
   a) Airborne spores

b) Contaminated water
c) Mosquito bites
d) Direct skin contact
Answer: c) Mosquito bites

3. Which protozoan is known for its characteristic cilia, which aids inmovement and feeding?
   a) Amoeba
   b) Paramecium
   c) Giardia
   d) Leishmania
   Answer: b) Paramecium
4. The Diplontic life cycle, in which the dominant phase is diploid, isfound in which organism?
   a) Cladophora
   b) Nemalion
   c) Chlamydomonas
   d) Polysiphonia
   Answer: a) Cladophora
5. Which protozoan is responsible for causing leishmaniasis?
   a) Plasmodium
   b) Giardia
   c) Leishmania
   d) Amoeba
   Answer: c) Leishmania

Fill in the Blanks

6. _____is a protozoan that causes severe diarrhea and gastrointestinal distress in humans, usually from contaminated watersources.
   Answer: Giardia
7. Protozoa play an important role in waste management as they help in the of organic material in sewage treatment processes. Answer: decomposition
8. The culture technique using_____is commonly employed to grow protozoa from natural sources like pond water. Answer: Hay water

True or False

9. Chlamydomonas exhibits a haplontic life cycle, where the main lifestage is haploid.
   Answer: True
10. Diplobiontic organisms, such as Polysiphonia, have both diploid andhaploid multicellular stages in their life cycle. Answer: True

III SEMESTER
COURSE 5: - EUKARYOTIC MICROORGANISMS
credits -**_1** **PRACTICAL**

1. Preparation of Potato Dextrose Medium.
2 Isolation and identification of pathogenic and non-pathogenic fungi.
3. Study of host-pathogen interaction.
4. Study of the vegetative and reproductive structures of following genera through temporary and permanent slides: *Mucor,Saccharomyces, Penicillium, Agaricus* and *Alternaria*
5. Purification and preservation of pure cultures of common algae and fungi.

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1. Alexopoulus, C.J., Mims,C.W. and Blackwel, M, Introductory Mycology.John Wiley,New York.
2. Mehrotra, R.S. and K.R.Aneja An Introduction to Mycology. New AgeInternational press, New Delhi
3. Webster, J. Introduction to fungi. Cambridge University Press. Cambridge, U.K. (1985).
4. Bessey E.A. Morphology and Taxonomy of fungi. Vikas Publishing House Pvt.Ltd.,New Delhi.
5. Jhon Webster and R W S Weber. Introduction to Fungi. Cambridge UniversityPress2007.
   A. V. S. S. .Sambamurty. A Textbook of Algae. I.K. International PublishingHouse Pvt.Limited, 2010
6. H.D. Kumar and H.N. Singh.A Textbook on Algae (Macmillan internationalcollegeedition)

Co- Curricular Activities

1. Conduct hands-on microscopy workshops using to observe eukaryotic microorganisms
2. Organize field trips to natural habitats, such as forests, ponds, or marineenvironments, where eukaryotic microorganisms thrive.
3. Arrange culturing workshops where students can learn how to isolate andculture eukaryotic microorganisms in the laboratory.
4. Eukaryotic Microorganism Photography Contest

III SEMESTER

(Course code: 124406) COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

credits -_3

I. Course Outcomes:

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

- Understand the classification and properties of carbohydrates, including monosaccharides, disaccharides, polysaccharides, and sugar derivatives.
- Gain knowledge of lipids and fatty acids, including their classification, structures, functions, and their role in cell signaling and metabolism.
- Comprehend the structure and functions of amino acids and proteins, including their primary, secondary, tertiary, and quaternary structures.
- Learn about the structure and functions of nucleic acids, including DNA and RNA, as well as the concept of base composition and nucleic acid- protein interactions. They will also be introduced to the role of vitamins in metabolism.
- Understand the structure of enzymes, enzyme classification, and mechanismsof action. They will also learn about the factors influencing enzyme activity and various types of enzyme inhibition.

UNIT-I: Carbohydrates No. of hours: 9

1. General characters and outline classification of Carbohydrates
2. Monosaccharides- Glucose, fructose, ribose; Stereo isomerism of monosaccharides, epimers, mutarotation and anomers of glucose
3. Disaccharides- concept of reducing and non-reducing sugars; Sucrose, Lactose
4. Polysaccharides- Storage -Starch, glycogen, Structural- Cellulose peptidoglycan and chitin
5. Sugar derivatives- glucosamine.

UNIT-II: Lipids and fatty acids No. ofhours: 9

1. Definition and classification of lipids. Structure and properties of lipids.
2. Importance of lipids in biological systems.
3. Introduction to fatty acids: definition, structure, and nomenclature. Saturated and unsaturated fatty acids.
4. Triglycerides: structure, function, and metabolism. Phospholipids: structure, function, and role in cell membranes. Steroids: structure, biosynthesis, and physiological roles.Waxes: structure, functions, andapplications.

UNIT-III: Amino acids and Proteins. No. of hours:9

1. Biochemical structure and notation of standard protein amino acids
2. General characteristics of amino acids and proteins.
3. Primary, secondary, tertiary and quaternary structures of Protein
4. Non protein amino acids: Gramicidin, beta-alanine, D-alanine and D- glutamic acid.

UNIT-IV: **Nucleic acids and Vitamins No. of hours:9**

1. Structure and functions of DNA and RNA.
2. Base composition. A+T and G+C rich genomes. Basic concept ofnucleic acids protein interactions.
3. Concept and types of vitamins and their role in metabolism.

UNIT-V: Enzymes No. of hours: 9

1. Structure of enzyme, Apoenzyme and cofactors, prosthetic group- TPP, coenzyme -

NAD, metal cofactors; Definitions of terms – enzyme unit, specific activity and turnover number

2. Classification of enzymes, Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis.
3. Effect of pH and temperature on enzyme activity.
4. Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive and allosteric.

III. Skill Outcomes:

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

1. Qualitatively Identify mono and disaccharides
2. Qualitatively Identify specific aminoacids
3. Quantitatively estimate DNA
4. Quantitatively estimate protein

III SEMESTER PRACTICALS

COURSE 6: - BIOMOLECULES AND ENZYMOLOGY credits -1

1. Qualitative tests for sugars
2. Qualitative Analysis of Aminoacids.
3. Colorimetric estimation DNA by diphenylamine method.
4. Colorimetric estimation of proteins by Biuret/Lowry method

References:

1. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company Caldwell, D.R. (1995). Microbial Physiology and Metabolism, W.C. Brown Publications,Iowa, USA.
2. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2 nd Edition, CBS Publishers and Distributors, New Delhi.
3. Sashidhara Rao, B. and Deshpande, V. (2007). Experimental Biochemistry: A student Companion. I.K. International Pvt. Ltd.
4. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
5. Voet,D. and Voet J.G (2004) Biochemistry 3rd edition, John Wileyand Sons
6. White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.

IV. Co-Curricular Activities:

1. Organize Biomolecule Modeling Workshops where students can learn to build physical models or use computer simulations to visualize biomolecules such as proteins, nucleic acids, carbohydrates, and lipids. These workshops can help students understand the three-dimensional structures and interactions of biomolecules, enhancing their comprehension of molecular biology concepts.
2. Assign Biomolecule and Enzyme Case Studies case studies that require students to analyze real-world scenarios related to biomolecules and enzymes in medicine, biotechnology, or environmental science.

COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

Blue Print for Question Papers from II Semester onwards

Unit Number	**Section-A (Essay/ Split Essay) In either or pattern**	**Section-B (MCQ/ True or False/ Fill in the blank) – No choice**	**Weightage of marks**
Unit-1	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-2	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-3	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-4	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M
Unit-5	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 M

SECTION-A **5 × 8 = 40 Marks**

Answer all the following questions. Draw labelled diagrams wherever necessary.

16. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay
17. (a) or (b) – If an essay
18. (a) or (b) – If an essay
19. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay
20. (a) or (b) – If an essay

SECTION-B **10 × 1 = 10 Marks**

Answer all the following questions.

21. From Unit-1
22. From Unit-1
23. From Unit-2
24. From Unit-2
25. From Unit-3
26. From Unit-3
27. From Unit-4
28. From Unit-4
29. From Unit-5
30. From Unit-5

COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

MODEL QUESTION PAPER

SECTION-A **5 × 8 = 40 Marks**

Answer all the following questions. Draw labelled diagrams wherever necessary.5X8=40

1. i).Explain polysaccharides. Storage polysaccharides starch, glycogen and structural polysaccharides cellulose, peptidoglycan and chitin

   or Essay 8 M (BTL-1)

   ii) Split essay

   A) Write a note on glucosamine

   B) Sucrose

   SPLIT ESSAY 4 M (BTL-2)

2. i. Discuss definition and functions of lipids? Essay 8M (BTL-1)

   Or

   ii. Write notes on triglycerides.

   Essay 8M (BTL-2)

3. i Discuss the role of proteins ? Essay 8M (BTL-1)

   or

   ii. Explain the primary secondary tertiary and quaternary strucuture of proetins.?Essay 8M (BTL-1)

4. i. Explain the structure and functions of DNA & RNA? Essay 8M (BTL-2)

   Or

   ii. Discuss the concept and types of vitamins? Essay 8M (BTL-2)

5. i. Explain enzyme classification? Split essay 4 M (BTL-6)

   Or

   ii. Write an essay on mechanism of action of enzymes .essay 8 M (BTL-1)

SECTION-B **10 × 1 = 10 Marks**

Answer all the following questions.

1. Which of the following is a disaccharide?
   a. Fructose b. Starch c. Sucrose d. Cellulose (Answer:Sucrose)
2. **What is the main function of triglycerides in the body?**
   a. a) To form cell membranes
   b. b) To store energy
   c. c) To act as hormones
   d. d) To waterproof surfaces **Answer**: b) To store energy
3. **Which of the following is a type of steroid?**
   a. a) Glycogen
   b. b) Cholesterol
   c. c) Triglyceride
   d. d) Waxy cuticle **Answer**: b) Cholesterol
4. **Which of the following is a non-essential amino acid?**
   a. a) Lysine
   b. b) Valine
   c. c) Glycine
   d. d) Tryptophan **Answer**: c) Glycine

5. **Which part of an enzyme is responsible for binding to the substrate?**
   a. A) Allosteric site
   b. B) Active site
   c. C) Inhibitory site
   d. D) Cofactor **Answer:** B) Active site
6. **In a DNA molecule, the percentage of adenine (A) is always equal tothe percentage of:**
   a. Cytosine (C)
   b. Thymine (T)
   c. Guanine (G)
   d. Uracil
   Answer :B
7. The storage form of glucose in animals is_____.(Answer:Glycogen)
8. Glucosamine is commonly found in joint supplements. T/F (Answer:True)
9. The enzyme pepsin has an optimal pH around_____, making it well-suited for the acidic environment of the stomach. Answer: 2
10. Water-soluble vitamins, such as vitamin C and the B vitamins, must beconsumed regularly because they are not_____in the body. Answer: stored

COURSE 6: - BIOMOLECULES AND ENZYMOLOGY

QUESTION BANK-ESSAY QUESTIONS

UNIT-1

1. Explain polysaccharides. Storage polysaccharides starch, glycogen and structural polysaccharides cellulose, peptidoglycan and chitin . (BT-2)
2. Give outline on general characteristics of carbohydrates.(BT-2)
3. Split essay (BT-3)
   A) Uses of glucosamine
   B) Define and list properties of Sucrose

UNIT-2

1. Discuss definition and functions of lipids.
2. Write notes on triglycerides. Essay
3. Split essay
   A) Write notes on steroids
   B) Write notes on waxes unit-3

UNIT-3

1. Discuss the role of proteins in biological systems. **(BT-2)**
2. Explain the primary secondary tertiary and quaternary strucuture of proetins. **(BT-2)**
3. Split essay (BT-1)
   a) Define and list properties Amino acids
   b) Define and list properties Gramicidin

UNIT-4

1. Explain the structure and functions of DNA & RNA. **(BT-2)**
2. Split essay 4 marks **(BT-3)**
   A) Examine base composition in DNA
   B) Comapre A+T rich genomes and G+C rich genomes
3. Discuss the concept and types of vitamins . **(BT-**

UNIT-5

1. Explain enzyme classification. **(BT-4)**
2. Write an essay on mechanism of action of enzymes. **(BT-2)**
3. Split essay 4 marks. **(BT-6)**

a) Appraise Lock and key hypothesis
b) Write about effect of PH on enzyme activity

Short Answers

UNIT 1

Multiple Choice Questions (MCQs)

1. Which of the following is a monosaccharide?
   a.Sucrose b. Glucose c. Lactose d. Maltose (Answer:Glucose)
2. Which of the following is a disaccharide?
   aFructose b. Starch c. Sucrose d. Cellulose (Answer:Sucrose)
3. Glucosamine is a type of:
   a.Monosaccharide b. Disaccharide c. Amino sugar d. Polysaccharide(Answer:Amino sugar)
4. Which of the following sugars is known as milk sugar? a.Glucose b. Fructose c. Lactose d. Sucrose (Answer:Lactose)

Fill in the Blanks

5. The storage form of glucose in animals is_____.(Answer:Glycogen)
6. The main structural component of plant cell walls is ___.(answercellulose)
7. ___is the monosaccharide commonly found in fruit.

(Answer:Fructose)

8. The process by which polysaccharides are broken down into monosaccharides is called (answer:Hydrolysis)

True or False

9. Cellulose is a type of disaccharide. T/F(Answer:False)
10. 10.Glucosamine is commonly found in joint supplements. T/F (Answer:True)

UNIT 2

Multiple Choice Questions

11. Which type of lipid is the main component of cell membranes?
   a. a) Triglycerides
   b. b) Phospholipids
   c. c) Steroids
   d. d) Waxes **Answer**: b) Phospholipids

12. What is the main function of triglycerides in the body?
   a. a) To form cell membranes
   b. b) To store energy
   c. c) To act as hormones
   d. d) To waterproof surfaces **Answer**: b) To store energy

13. Which component is found in a phospholipid molecule?
   a. a) Three fatty acids
   b. b) A phosphate group
   c. c) Cholesterol
   d. d) A steroid ring structure **Answer**: b) A phosphate group

14. Which of the following is a type of steroid?
   a. a) Glycogen
   b. b) Cholesterol
   c. c) Triglyceride
   d. d) Waxy cuticle **Answer**: b) Cholesterol

15. What is the primary role of waxes in nature?
   a. a) To provide energy
   b. b) To serve as a hormone precursor
   c. c) To waterproof surfaces
   d. d) To store genetic information **Answer**: c) To waterproof surfaces

Fill in the Blanks

16. Saturated fatty acids have_____double bonds between the carbonatoms in their hydrocarbon chains. (Answer**: no)**

17. _____fatty acids have one or more double bonds, making them lesstightly packed and typically liquid at room temperature. (Answer**: Unsaturated)**

18. Triglycerides are composed of three fatty acids esterified to a _____molecule. (Answer**:glycerol)**

True or False

19. Unsaturated fatty acids are typically found in animal fats and are solid atroom temperature.
   Answer**: False (This describes saturated fatty acids)**

10. Phospholipids contain both hydrophobic and hydrophilic regions, making them essential for forming cell membranes. Answer**: True**

UNIT 3

Multiple Choice Questions

20. Which of the following is a non-essential amino acid?
   a. a) Lysine
   b. b) Valine
   c. c) Glycine
   d. d) Tryptophan **Answer**: c) Glycine

21. Which amino acid contains a sulfur atom?

a. a) Alanine
b. b) Cysteine
c. c) Phenylalanine
d. d) Glutamine **Answer**: b) Cysteine

22. Which of the following is the main structural protein found in hairand nails?

a. a) Hemoglobin
b. b) Keratin
c. c) Myosin
d. d) Albumin **Answer**: b) Keratin

23. Which type of protein acts as a biological catalyst to speed upchemical reactions?

a. a) Hormones
b. b) Enzymes
c. c) Structural proteins
d. d) Antibodies **Answer**: b) Enzymes

24. Which of the following is a component of the antibiotic mixtureknown as gramicidin?

a. a) D-Alanine
b. b) L-Glutamic acid
c. c) Gramicidin A
d. d) β-Alanine **Answer**: c) Gramicidin A

25. Which non-protein amino acid is a precursor to carnosine, amolecule important for buffering acid in muscles?

a. a) D-Alanine
b. b) β-Alanine
c. c) Gramicidin
d. d) D-Glutamic acid **Answer**: b) β-Alanine

Fill in the Blanks

26. **The protein_____is responsible for oxygen transport in the blood.** **Answer**: Hemoglobin

27. The____structure of a protein refers to the overall 3D shapeformed by folding the polypeptide chain.
Answer: Tertiary

True or False

28. All amino acids found in proteins are in the L-form.TRUE

29. Phenylalanine is a polar amino acid.
FALSE

UNIT 4

Multiple Choice Questions (MCQs)

30. Which of the following is NOT a difference between DNA and RNA?

a. DNA is double-stranded, while RNA is single-stranded
b. DNA contains thymine, while RNA contains uracil
c. DNA has a ribose sugar, while RNA has a deoxyribose sugar
d. DNA is more stable than RNA
Answer :D

31. In a DNA molecule, the percentage of adenine (A) is always equal tothe percentage of:

a. Cytosine (C)
b. Thymine (T)
c. Guanine (G)
d. uracil Answer :b

32. In a G+C rich genome, which of the following statements is true?

a. The DNA is more stable

b. The DNA is less stable
c. The DNA has more A-T pairs
d. The genome is more prone to mutations

Answer :A

33. Which of the following best describes a nucleosome?

a. A segment of DNA wrapped around histone proteins
b. A unit of RNA polymerase on DNA
c. A protein complex that unwinds DNA
d. A region of DNA that is highly transcribed

Answer :A

34. Vitamins are classified into two main types based on their solubility.Which of the following is a fat-soluble vitamin?
    a. a) Vitamin B6
    b. b) Vitamin C
    c. c) Vitamin K
    d. d) Vitamin B12 Answer : c) vitamin c
35. Which vitamin can be synthesized by the body when exposed tosunlight?
    a. a) Vitamin A
    b. b) Vitamin C
    c. c) Vitamin D
    d. d) Vitamin B12
    e. Answer: c) Vitamin D

Fill in the Blanks

36. In DNA, guanine (G) pairs with_____, and adenine (A) pairswith .(answer Cytosineand thymine)
37. In RNA, the base_____replaces thymine (T) found in DNA.(answer uracil)
38. A segment of DNA rich in A+T pairs is likely to be _____(more/less) stable
39. Water-soluble vitamins, such as vitamin C and the B vitamins, must beconsumed regularly because they are not_____in the body. Answer: stored

True or False

40. In a double-stranded DNA molecule, the total number of purines isalways equal to the total number of pyrimidines. (True/False) Answer: True
41. RNA is typically double-stranded like DNA. (True/False)Answer: False
42. Fat-soluble vitamins are stored in the body's fatty tissues and liver, andexcess amounts can lead to toxicity. (True/False) Answer: True

UNIT 5

Multiple Choice Questions (MCQs)

43. Which part of an enzyme is responsible for binding to the substrate?

a. A) Allosteric site
b. B) Active site
c. C) Inhibitory site
d. D) Cofactor **Answer:** B) Active site

44. Which of the following is an example of a transferase enzyme?

a. A) Amylase
b. B) Lactate dehydrogenase
c. C) Alanine aminotransferase
d. D) DNA ligase **Answer:** C) Alanine aminotransferase

45. Which type of enzyme inhibition can be overcome by increasing theconcentration of the substrate?

a. A) Noncompetitive inhibition

b. B) Uncompetitive inhibition
c. C) Allosteric inhibition
d. D) Competitive inhibition **Answer:** D) Competitive inhibition

46. Which enzyme class catalyzes the rearrangement of atoms within amolecule?

a. A) Oxidoreductases
b. B) Isomerases
c. C) Ligases
d. D) Lyases **Answer:** B) Isomerases

47. What happens to enzyme activity when the pH is far from its optimalvalue?

a. A) Increases
b. B) Decreases
c. C) Stays the same
d. D) Always becomes zero **Answer:** B) Decreases

48. At very high temperatures, enzymes lose their activity because they:

a. A) Become more active
b. B) Denature
c. C) Bind to more substrates
d. D) Increase their turnover number **Answer:**B) Denature

Fill in the Blanks

49. The Lock and Key Hypothesis suggests that the enzyme's active site is __in shape, perfectly matching the substrate. Answer: rigid
50. The enzyme pepsin has an optimal pH around_____, making it well-suited for the acidic environment of the stomach.

Answer: 2

III SEMESTER

COURSE 7: MICROBIAL AND ANALYTICAL TECHNIQUES, (Course code: 124407)

credits -_3

Course Outcomes:

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

- Understand the principles and applications of microscopy techniques, including bright field microscopy and electron microscopy (SEM and TEM), as well as staining techniques.
- Know various sterilization and disinfection techniques, including physical methods (dry heat, moist heat, filtration, radiation) and chemical methods (disinfectants, alcohols, aldehydes, fumigants, phenols, halogens, heavy metals).
- Perform pure culture isolation, maintenance and preservation of cultures, cultivation of anaerobic bacteria, and accessing viable non-culturable bacteria (VNBC).
- Understand the principles and applications of spectrophotometry and chromatography techniques, including UV-visible spectrophotometry, colorimetry, turbidometry, paper chromatography, and column chromatography.
- Gain knowledge of centrifugation principles and applications, electrophoretic techniques (agarose and SDS polyacrylamide gel), and the principles and applications of radioisotopes.

Unit -1: Microscopy No. of Hours: 9hrs

1. Microscopy: Principle, mechanism and applications of Bright fieldmicroscope.
2. Principle, mechanism and applications of electron microscope (SEMand TEM). Micrometry.
3. Staining Techniques – Simple, negative and Differential stainingtechniques (Gram staining, spore staining, Acid fast staining).

Unit-2: Sterilization & Disinfection Techniques No. Of Hours: 9hrs

1. Sterilization, Disinfection, Antiseptic, Germicide, Sanitizer, Fungicide, Virucide, Bacteriostatic and Bactericidal agent.
2. Physical methods of microbial control: Dry heat-Incineration, Hot air oven; Moistheat-Pressure cooker, autoclave; Filter sterilization- laminar air flow, Membrane filter; Radiation methods – UV rays, Gamma rays.
3. Chemical methods of microbial control: disinfectants, types and mode of action-alcohols, aldehydes, fumigants, phenols, halogens and heavy metals.

Unit -3: Microbiological techniques No. of Hours:9hrs

1.Pure culture isolation: Streaking, serial dilution and plating methods, micromanipulator; cultivation.

2.Maintenance and preservation/stocking of pure cultures: sub culturing, overlaying cultures with mineral oils, lyophilization, sand cultures, storage at low temperature, Culture collection centers(MTCC, ATCC, DSMZ);

3.Cultivation of anaerobic bacteria; Accessing Viable non-culturable bacteria (VNBC). Buffers in culture medium. Cultivation of fungi, Actinomycetes, yeasts.

Unit-4: Spectrophotometry & Chromatography No. of Hours: 9

1 Spectroscopy – Principles, laws of light absorption, Instrumentation and applications of UV- visible spectrophotometer. Colorimetry and turbidometry.

2 Chromatography: Principles and applications of paper chromatography (Ascending, Descending and 2-D), Thin layer chromatography.

3 Principle and applications of column chromatography (Partition, adsorption, ionexchange, exclusion and affinity chromatography). Column packing and fraction collection.

Unit - 5: Centrifugation, Electrophoresis & Radioisotopes No. of Hours:9

1 Centrifugation-Principles, types and applications.
2 Electrophoretic technique (agarose and SDS polyacrylamide gel) its Components, working principle and applications
3 Radioisotopes– characters and applications of radioisotopes, principle of autoradiography.

II. Skill Outcomes:

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

1. Recognize different microscopy techniques, identify microbial cell structures, interpret micrograph images, and understanding the principles of image contrast.
2. Prepare stained slides, differentiate stained and unstained structures, recognizingstaining techniques, and describing the staining characteristics of microbial cells.
3. Perform the staining procedure, distinguishing between Gram-positive and Gram-negative bacteria, recognizing the importance of Gram's staining in bacterial classification, and interpreting Gram-stained slides.
4. Understand sterilization principles, operate autoclave and hot air oven, implement proper sterilization protocols, ensure sterility of media and glassware, and recognizethe importance of sterile techniques in microbiology.
5. Understand streaking techniques, perform streak plate method, obtain isolated colonies, recognize contamination, and demonstrate proficiency in maintaining purecultures for further study.

III SEMESTER PRACTICALS

COURSE 7: MICROBIAL AND ANALYTICAL TECHNIQUES **credits -_1**

1. Study of bright field, dark field and phase contrast, Electron microscopemicrographs to visualize microbial cells.
2. Simple staining & Negative staining.
3. Gram's staining.
4. Sterilization of medium using Autoclave, Sterilization of glassware using Hot AirOven.
5. Isolation of pure cultures of bacteria by streaking method.
6. Isolation of bacteria from natural habitat by spread and pour plate method (usingserial dilution method)
7. Separation of monosaccharides/amino acids by paper/thinlayer chromatography.
8. Demonstration of column packing in gel filtration chromatography.
9. Determination of absorption max for an aromatic amino acid.
10. Separation of bacterial cells (cell pellet) from broth culture by using a laboratoryscale centrifuge.
11. Separation of DNA fragments by Agarose gel electrophoresis.

References:

1. Pelczar M., Chan E.C.S. and Krieg, N.R. Microbiology. Tata Mc Grew HillPublishing Co. Ltd., New Delhi.
2. Stainier R.V., Ingraham, J.L., Wheelis, M.L. and Painter P.R. The Microbial World.Printice-Hall of India (Pvt.) Ltd., New Delhi
3. Wilson& Walker. Principles and Techniques in Practical B i o c h e m i s t r y . 5thEditionCambridge University Press (2000).
4. Murphy D.B. Fundamental of Light Microscopy & Electron Imaging.1st Edition.Wiley Liss. (2001).
5. K L Ghatak. Techniques and Methods In Biology PHI Publication (2011)
6. Pranav Kumar. Fundamentals and Techniques of Biophysics and Molecular Biology(2016)
7. Aurora Blair. Laboratory Techniques & Experiments in Biology.Intelliz Press
8. D.T Plummer. An Introduction to Practical Biochemistry. McGraw Hill Publication1987
9. Beckner, W.M., Kleinsmith L.J and Hardin J. The world of cell. IV editionBenjamin /Cummings (2000)

Co-Curricular Activities:

1. Competition in performing laboratory techniques like staining
2. Artwork with bacteria or fungi in petridish
3. Quiz in identifying microscopic technique in various micrographs

COURSE 7: MICROBIAL AND ANALYTICAL TECHNIQUES
Blue Print for Question Papers from III Semester

Unit Number	Section-A (Essay/ Split Essay) In either or pattern	Section-B (MCQ/ True or False/ Fill in the blank) – No choice	Weightage of marks
Unit-1	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-2	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-3	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-4	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-5	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks

SECTION-A **10 M 5 × 8 = 40 Marks**

Answer all the following questions.

Draw labelled diagrams wherever necessary.

1. (a) – (i) and (ii) Or (b) - (i) and (ii)
2. (a) or (b) – If an essay
3. (a) or (b) – If an essay
4. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay
5. (a) or (b) – If an essay

SECTION-B **10X1=10 Marks**

Answer all the following questions.

6. From Unit-1
7. From Unit-1
8. From Unit-2
9. From Unit-2
10. From Unit-3
11. From Unit-3
12. From Unit-4
13. From Unit-4
14. From Unit-5
15. From Unit-5

II SEMESTER
C-7 (MICROBIAL AND ANALYTICAL TECHNIQUES)
Model Question Paper

Time:2.30 Hrs **max. marks:5**

Section-A 5X8=40

(Answer all the questions. Draw the labelled diagrams when necessary.)

Unit	Q.N	Questions	Marks	BL	CO	PO
I	1.	Explain about principle and construction of light microscope.	8	2	1	
		OR				
		Generalise principle and applications of Scanning Electron microscope.	8	3	1	
II	2.	A. State definitions and examples of Fungicide, Viricide, Bacteriostatic and Bactericidal agents B. Write a short note on sterilization by UV and Gama Rays	4 4	1 &3	2	
		OR				
		Describe working principle and applications of Autoclave	8	2	2	
III	3	Define MTCC and ATCC. Evaluate Subculture, Lyophilization and lower temperature methods for the preservation of stock cultures	2+6	1& 4	3	
		OR				
		Explain different methods of cultivating Anaerobic Bacteria	8	3	3	
IV	4	Describe the instrumentation and Applications of Spectroscopy	8	3	4	
		OR				
		Explain principle and applications of Paper Chromatography	8	2& 3	4	
V	5	Differentiate types of Centrifuges and their applications	8	2	5	
		OR				
		Analyse characters and applications of Radio Isotopes	8	4	5	

SECTION -B **10x1=10**

(very short answers-each question carries one mark)

1. Which of the following is true about the principle of a Bright-field microscope?
   a) It uses phase-shifted light to visualize specimens.
   b) It illuminates the specimen directly, producing a dark image against a bright background.
   c) It only works for live organisms.
   d) It requires a vacuum for imaging.
   Answer: b) It illuminates the specimen directly, producing a dark image against a bright background.
2. In Micrometry, the unit most commonly used for measuring microscopic objects is:
   a) Millimeter
   b) Centimeter
   c) Micrometer
   d) Nanometer Answer: c) Micrometer

3. Autoclaving sterilizes by using _____heat under pressure to kill microorganisms, including spores. Answer: moist
4. Gamma rays are a type of ionizing radiation that sterilizes by breaking _____bonds within microbial DNA. Answer: chemical
5. True or False: Sand cultures are a method used to preserve bacteria in sterile, dry sand at room temperature. Answer: True
6. Subculturing is the process of transferring microorganisms from one _____to another to maintain pure cultures. Answer: medium
7. The absorbance of a solution is directly proportional to:
   a) Concentration of the solution
   b) Wavelength of light
   c) pH of the solution
   d) Temperature Answer: a) Concentration of the solution
8. In affinity chromatography, specific interactions between a target molecule and a ligand attached to the stationary phase are used to achieve _____.
   Answer: separation
9. The principle of centrifugation is based on which of the following?
   a) Gravitational force
   b) Electromagnetic force
   c) Centripetal force
   d) Centrifugal force Answer: d) Centrifugal force
10. SDS-PAGE electrophoresis uses polyacrylamide gels to separate proteins based on their _____. Answer: molecular weight.

Course-7 (MICROBIAL AND ANALYTICAL TECHNIQUES)

Question Bank

Essay type questions (Pick any Two from each Unit for Internal Choice)

Unit -I

Q.No	Questions	Marks	BL	CO	PO
1.	Explain about principle and construction of light microscope.	8	2	1	
2.	Generalise principle and applications of Transmission Electron microscope.	8	3	1	
3.	Generalise principle and applications of Scanning Electron microscope.	8	3	1	

Unit -II

Q.No	Questions	Marks	BL	CO	PO
1.	C. State definitions and examples of Fungicide, Viricide, Bacteriostatic and Bactericidal agents D. Write a short note on sterilization by UV and Gama Rays	4 4	1 &3 2	2	
2.	Describe working principle and applications of Autoclave	8	2	2	
3.	Evaluate different methods of Chemical means of sterilization	8	4	2	

Unit -III

Q.No	Questions	Marks	BL	CO	PO
1.	Justify streak plate and spread plate methods and their Uses in obtaining pure cultures	8	5	3	
2.	Define MTCC and ATCC. Evaluate Subculture, Lyophilization and lower temperature methods for the preservation of stock cultures	2+6	1& 4	3	
3.	Explain different methods of cultivating Anaerobic Bacteria	8	3	3	

Unit -IV

Q.No	Questions	Marks	BL	CO	PO
1.	Describe the instrumentation and Applications of Spectroscopy	8	3	4	
2.	Explain principle and applications of Paper Chromatography	8	2& 3	4	
3.	A. Explain about principle of Ion Exchange Chromatography B. Explain principle of Affinity Chromatography	4+4	3	4	

Unit -V

Q.No	Questions	Marks	BL	CO	PO
1.	Differentiate types of Centrifuges and their applications	8	2	5	
2.	Give outlines of working principle and applications of Gel Electrophoresis.	8			
3.	Analyse characters and applications of Radio Isotopes	8	4	5	

QUESTION BANK VERY VERY SHORT ANSWER

COURSE 7: MICROBIAL AND ANALYTICAL TECHNIQUES

UNIT-1

Multiple Choice Questions (MCQ)

11. Which of the following is true about the principle of a Bright-field microscope?
    a) It uses phase-shifted light to visualize specimens.
    b) It illuminates the specimen directly, producing a dark image against a bright background.
    c) It only works for live organisms.
    d) It requires a vacuum for imaging.
    Answer: b) It illuminates the specimen directly, producing a dark image against a bright background.
12. In Micrometry, the unit most commonly used for measuring microscopic objects is:
    a) Millimeter
    b) Centimeter
    c) Micrometer
    d) Nanometer Answer: c) Micrometer
13. Which staining technique is used to differentiate bacteria into Gram-positive and Gram-negative?
    a) Simple staining
    b) Gram staining
    c) Negative staining
    d) Acid fast staining Answer: gram staining
14. In Spore staining, what color do the spores appear after staining with malachite green?
    a) Red
    b) Blue
    c) Green
    d) Pink Answer: c) Green Fill in the Blanks

1. In Bright-field microscopy, the image is formed by light that is _____by the specimen. Answer: transmitted
2. Electron microscopes use a beam of _____instead of visible light to achieve higher resolution. Answer: electrons
3. Acid-fast staining is primarily used to identify organisms like _____that have waxy cell walls. Answer: Mycobacterium
4. Negative staining is particularly useful for observing _____, which may not be easily stained with other methods. Answer: capsules True or False
5. True or False: Simple staining uses only one dye, making it effective for differentiating between multiple types of microorganisms. Answer: False
6. True or False: Scanning Electron Microscopy (SEM) is ideal for observing the surface details of a specimen. Answer: True

UNIT-2

Multiple Choice Questions (MCQ)

1. Which method of sterilization uses dry heat to destroy microorganisms?
    a) Autoclave
    b) Incineration
    c) Filtration
    d) Radiation Answer: Incineration
2. Which of the following is not a physical method of microbial control?
    a) Radiation
    b) Autoclave
    c) Fumigants
    d) Hot Air oven Answer : Fumigants

3. Alcohols act as disinfectants by:
   a) Denaturing proteins and disrupting cell membranes
   b) Binding to DNA and causing mutations
   c) Preventing protein synthesis
   d) Inhibiting cell wall formation
   Answer: a) Denaturing proteins and disrupting cell membranes
4. What is the main mode of action of UV radiation in controlling microbial growth?
   a) Disrupting cell membranes
   b) Causing thymine dimers in DNA
   c) Denaturing enzymes
   d) Destroying bacterial spores
   Answer: b) Causing thymine dimers in DNA Fill

in the Blanks

5. Autoclaving sterilizes by using _____heat under pressure to kill microorganisms, including spores. Answer: moist
6. Gamma rays are a type of ionizing radiation that sterilizes by breaking _____bonds within microbial DNA. Answer: chemical
7. Fungicides are chemical agents specifically designed to kill _____.
   Answer: fungi

True or False

8. True or False: Moist heat sterilization, like autoclaving, is more effective than dry heat sterilization because water conducts heat more effectively than air.
   Answer: True
9. True or False: Phenols disrupt cell walls and membranes, making them effective disinfectants, especially in healthcare settings.
   Answer: True
10. True or False: Filtration is a method of sterilization that removes microorganisms from solutions by trapping them in filters, and it is especially useful for heat-sensitive materials.
    Answer: True

UNIT-3

Multiple Choice Questions (MCQ)

1. Which method is commonly used for isolating pure bacterial cultures?
   a) Streak plate method
   b) Filtration
   c) Spore staining
   d) Gram staining Answer: a) Streak plate method
2. Which of the following is used to maintain bacterial cultures over long periods of time by lowering metabolic activity?
   a) Lyophilization
   b) Serial dilution
   c) Streaking
   d) Gram staining Answer: a) Lyophilization
3. Which device is used in isolating single cells during the pure culture technique?
   a) Centrifuge
   b) Autoclave
   c) Micromanipulator
   d) Spectrometer Answer : Micromanipulator
4. What is the primary goal of serial dilution in microbiology?
   a) To decrease the number of bacteria
   b) To isolate individual colonies from a mixed culture
   c) To increase the concentration of a sample
   d) To measure the bacterial motility

Answer: b) To isolate individual colonies from a mixed culture

5. Which of the following culture collection centers is located in India?
   a) MTCC
   b) ATCC
   c) DSMZ
   d) NCCS Answer: a) MTCC

Fill in the Blanks

6. Subculturing is the process of transferring microorganisms from one _____to another to maintain pure cultures. Answer: medium
7. Anaerobic bacteria require specialized conditions for cultivation because they cannot tolerate _____in their environment. Answer: oxygen True or False
8. True or False: Sand cultures are a method used to preserve bacteria in sterile, dry sand at room temperature. Answer: True
9. True or False: ATCC is an international culture collection center that provides cultures of bacteria, fungi, and other microorganisms. Answer: True
10. True or False: The cultivation of fungi typically requires an acidic medium, such as Sabouraud's agar, to inhibit bacterial growth. Answer: True

UNIT-4

Multiple Choice Questions (MCQ)

1. Which law explains the relationship between absorbance and concentration in UV- Visible spectrophotometry?
   a) Beer-Lambert Law
   b) Newton's Law
   c) Dalton's Law
   d) Charles' Law Answer: a) Beer-Lambert Law
2. The absorbance of a solution is directly proportional to:
   a) Concentration of the solution
   b) Wavelength of light
   c) pH of the solution
   d) Temperature Answer: a) Concentration of the solution
3. In thin layer chromatography (TLC), the stationary phase is typically composed of:
   a) Paper
   b) Silica gel
   c) Agarose
   d) Cellulose Answer : Silica gel
4. Which type of chromatography is most suitable for separating proteins based on their charge?
   a) Paper chromatography
   b) Adsorption chromatography
   c) Ion-exchange chromatography
   d) Gel-filtration chromatography
   e) Answer: c) Ion-exchange chromatography

Fill in the Blanks

5. Beer-Lambert law states that the absorbance of a solution is directly proportional to the _____of the solution and the path length.
   Answer: concentration
6. In colorimetry, a solution's concentration is determined by measuring the intensity of the _____produced by a specific color. Answer: light
7. In affinity chromatography, specific interactions between a target molecule and a ligand attached to the stationary phase are used to achieve _____ Answer: seperation

True or False

8. In column chromatography, partition chromatography separates components based on their

different solubilities in two immiscible liquids. Answer: True

9. True or False: In adsorption chromatography, the mobile phase is a solid, and the stationary phase is a liquid. Answer: False
10. True or False: Gel filtration chromatography separates molecules based on their size, with smaller molecules eluting first. Answer: False

UNIT-5

Multiple Choice Questions (MCQ)

1. The principle of centrifugation is based on which of the following?
   a) Gravitational force
   b) Electromagnetic force
   c) Centripetal force
   d) Centrifugal force Answer: d) Centrifugal force
2. Which type of centrifugation is commonly used to separate cellular organelles based on their size and density?
   a) Ultracentrifugation
   b) Density gradient centrifugation
   c) Differential centrifugation
   d) Microcentrifugation Answer: c) Differential centrifugation
3. What is the purpose of SDS in SDS-PAGE electrophoresis?
   a) To denature proteins and give them a uniform negative charge
   b) To stain proteins for visualization
   c) To act as a buffer solution
   d) To separate proteins by charge
   Answer: a) To denature proteins and give them a uniform negative charge
4. In autoradiography, which of the following is used to detect radioactive materials?
   a) X-ray film
   b) UV light
   c) Fluorescence
   d) Mass spectrometry Answer: X-ray film

Fill in the Blanks

5. In ultracentrifugation, particles are separated based on their _____and buoyant density,
   using extremely high rotational speeds. Answer: size
6. Agarose gel electrophoresis is commonly used to separate _____based on size. Answer: nucleic acids (DNA/RNA)
7. SDS-PAGE electrophoresis uses polyacrylamide gels to separate proteins based on their _____. Answer: molecular weight True or False

9. True or False: In density gradient centrifugation, the sample forms layers based on the density of the particles, with heavier particles moving to the top. Answer: False
10. True or False: Autoradiography allows visualization of radioactive molecules on a gel after electrophoresis. Answer: True

III SEMESTER

COURSE 8: - CELL BIOLOGY AND GENETICS, (Course code: 124408)

Unit 1 Hours : 09

1. Cell theory and cell organelles (Mitochondria, Chloroplasts, Lysosomes, Glyoxysomes and Peroxisomes, Golgi apparatus and ER).
2. Cell cycle and its regulation.
3. Cytoskeleton: Structure and organization of actin, myosin and intermediate filaments, microtubules, and their role.

Unit 2 Hours : 09

1. Structure and functions Cell membrane, proton pumps associated (Na-K, Cacalmodulin etc. and their distribution), phagocytosis, pinocytosis, exocytosis.
2. Nuclear envelope, structure of nuclear pore complex, nuclear lamina, transport across nuclear membrane, Nucleolus.
3. Elementary knowledge of development and causes of cancer; Oncogenes and suppressor genes,

Unit 3 Hours : 09

1. Protein sorting and Transport Intracellular signal transduction pathways (GPCR , ERK Pathway, mTOR Signaling)
2. Programmed Cell Death; Stem cells.
3. Specialized chromosomes (polytene, lampbrush)

UNIT 4 Hours : 09

1. Mendalien Genetics , Mono hybrid and Dihybrid cross , Law of dominance segregation and Independent assortment.
2. Chromosome theory of inheritance, Pedigree analysis, Incomplete dominance and co-dominance,
3. Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Allele frequencies, Genotype frequencies.

Unit – 5 Hours : 09

1. Linkage and Crossing over, Molecular mechanism of crossing over. Recombination frequency as a measure of linkage intensity,
2. Hardy-Weinberg Law, role of natural selection, Genetic drift. Speciation
3. Sex determination – Sex linked inheritance, extra chromosomal Inheritance

Course: 8 PRACTICAL

1. Cell counting and Viability
2. Mitosis from onion root tips
3. Meiosis of onion root tips
4. Study of ultrastructure of cell (Plasma membrane, Nucleus, Nuclear Pore Complex, Chloroplast, Mitochondrion, Golgi bodies, Lysosomes, SER and RER)
5. Identification and study of types of cancer, cancer cells by permanent slides/ photographs.
6. Study of Linkage, recombination, gene mapping using marker-based data from Drosophila.
7. Demonstration of DNA fingerprinting.
8. Pedigree chart analysis.

Course – 8 Cell Biology and genetics

Blue Print for Question Papers from III Semester

Unit Number	Section-A (Essay/ Split Essay) In either or pattern	Section-B (MCQ/ True or False/ Fill in the blank) – No choice	Weightage of marks
Unit-1	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-2	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-3	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-4	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-5	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks

SECTION-A **10 M 5 × 8 = 40 Marks**

Answer all the following questions.

Draw labelled diagrams wherever necessary.

1. (a) – (i) and (ii) Or (b) - (i) and (ii)
2. (a) or (b) – If an essay
3. (a) or (b) – If an essay
4. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay
5. (a) or (b) – If an essay

SECTION-B **10X1=10 Marks**

Answer all the following questions.

6. From Unit-1
7. From Unit-1
8. From Unit-2
9. From Unit-2
10. From Unit-3
11. From Unit-3
12. From Unit-4
13. From Unit-4
14. From Unit-5
15. From Unit-5

Course-8 (CELL BIOLOGY AND GENETICS)
Model Question Paper
Time:2.30 Hrs **max.marks:50**
Section-A 5X8=40

(Answer all the questions. Draw the labelled diagrams when necessary.)

Unit	**Q.N**	**Questions**	**Marks**	**BL**	**CO**	**PO**
I	1.	State Cell theory. Explain detailed structure of Chloroplast	2+6	1& 2	1	
		OR				
		Illustrate cell cycle and it s regulation	8	3	1	
II	2.	Review structure and functions of Cell membrane	8	6	2	
		OR				
		Define and describe about Oncogenes and suppressor genes.	8	1	2	
III	3	Generalise different Intracellular signal transduction pathways.	8	3	3	
		OR				
		Explain about Programmed cell death	8	2	3	
IV	4	Define and distinguish between Incomplete dominance and co-dominance.	8	1& 5	4	
		OR				
		Define Multiple alleles, Lethal alleles, Epistasis and Pleiotropy.	4x2=8	1	4	
V	5	Evaluate the role of Natural selection and its role in Genetic drift and genetic shift	8	4		
		OR				
		Write a short note on A. Sex linked inheritance extra chromosomal Inheritance	4+4	2	5	

SECTION-B 10x1=10

(very short answers-each

1. Which organelle is responsible for packaging and modifying proteins in eukaryotic cells?
   a) Mitochondria
   b) Lysosomes
   c) Golgi apparatus
   d) Endoplasmic reticulum
   Answer: c) Golgi apparatus

2. What is the main function of peroxisomes?
   a) Protein synthesis
   b) Lipid synthesis
   c) Detoxification of harmful substances
   d) ATP production Answer: c) Detoxification of harmful substances
3. True or False: The nuclear lamina is a mesh-like structure that provides mechanical support to the nuclear envelope and regulates nuclear events such as DNA replication.
   Answer: True
4. True or False: Oncogenes normally function to suppress tumor growth, but when mutated, they can lead to uncontrolled cell division. Answer: False
5. The mTOR signaling pathway is crucial for regulating cell growth and _____, responding to nutrients, growth factors, and energy status.
   Answer: metabolism
6. Lampbrush chromosomes are large, extended chromosomes found in the oocytes of _____and amphibians, with loops of chromatin active in transcription.
   Answer: birds
7. In a monohybrid cross, which of the following is the phenotypic ratio observed in the F2 generation according to Mendel's law of dominance?
   a) 1:2:1
   b) 3:1
   c) 9:3:3:1
   d) 1:1 Answer: b) 3:1
8. Which of Mendel's laws states that alleles for different traits are inherited independently of one another?
   a) Law of Segregation
   b) Law of Dominance
   c) Law of Independent Assortment
   d) Law of Linkage Answer: c) Law of Independent Assortment
9. Crossing over results in new combinations of alleles, which contributes to genetic _____in a population.
   Answer: variation
10. True or False: The process of natural selection acts only on phenotypes, not genotypes.
    Answer: True

Course-8 (CELL BIOLOGY AND GENETICS)

QUESTION BANK

Essay type questions (Pick any Two from each Unit for Internal Choice)

Unit -I

Q.No	Questions	Marks	BL	CO	PO
1.	State Cell theory. Explain detailed structure of Chloroplast	2+6	1&2	1	
2.	Discuss detailed structure and functions of Mitochondria	8	2	1	
3.	Illastrate cell cycle and it s regulation	8	3	1	

Unit -II

Q.No	Questions	Marks	BL	CO	PO
1.	Review structure and functions of Cell membrane	8	6	2	
2.	Discuss about structure and functions of nuclear membrane	8	3	2	
3.	Define and describe about Oncogenes and suppressor genes.	8	1	2	

Unit -III

Q.No	Questions	Marks	BL	CO	PO
1.	Generalise different Intracellular signal transduction pathways.	8	3	3	
2.	Explain about Programmed cell death	8	2	3	
3.	State structure and importance of Lampbrash and polytene chromosomes	8	2	3	

Unit -IV

Q.No	Questions	Marks	BL	CO	PO
1.	Compare and evaluate Mendal's Law of segregation and independent assortment	8	4&5	4	
2.	Define and distinguish between Incomplete dominance and co-dominance.	8	1&5	4	
3.	Define Multiple alleles, Lethal alleles, Epistasis and Pleiotropy.	4x2=8	1	4	

Unit -V

Q.No	Questions	Marks	BL	CO	PO
1.	Define crossing over. Interpret molecular mechanism of Crossing over	8	1&3	5	
2.	Evaluate the role of Natural selection and its role in Genetic drift and genetic shift	8	4		
3.	Write a short note on A. Sex linked inheritance B. extra chromosomal Inheritance	4+4	2	5	

QUESTION BANK VERY VERY SHORT ANSWERS
UNIT-1
Multiple Choice Questions (MCQ)
11. Which statement is part of the cell theory?
    a) All organisms are made up of multiple cells.
    b) Cells arise only from pre-existing cells.
    c) Cells do not contain hereditary material.
    d) Energy flows outside of cells.
    Answer: b) Cells arise only from pre-existing cells.
12. Which organelle is responsible for packaging and modifying proteins in eukaryotic cells?
    a) Mitochondria
    b) Lysosomes
    c) Golgi apparatus
    d) Endoplasmic reticulum
    Answer: c) Golgi apparatus
13. What is the main function of peroxisomes?
    a) Protein synthesis
    b) Lipid synthesis
    c) Detoxification of harmful substances
    d) ATP production
    Answer: c) Detoxification of harmful substances
14. Which phase of the cell cycle involves the duplication of DNA?
    a) G1 phase
    b) S phase
    c) G2 phase
    d) M phase
    Answer: b) S phase
15. Which cytoskeletal structure is primarily involved in muscle contraction?
    a) Microtubules
    b) Intermediate filaments
    c) Actin filaments
    d) Golgi network
    Answer: c) Actin filaments

Fill in the Blanks

1. Mitochondria are often referred to as the _____of the cell because they produce ATP through cellular respiration.
   Answer: powerhouse
2. The cytoskeleton is composed of actin filaments, intermediate filaments, and _____, each contributing to the cell's shape and internal organization.
   Answer: microtubules
3. The G1 checkpoint in the cell cycle ensures that the cell is ready to enter the S phase and begin _____replication.
   Answer: DNA

True or False

4. True or False: Lysosomes are involved in the breakdown of cellular waste and damaged organelles.
   Answer: True
5. True or False: Intermediate filaments are primarily involved in the transport of vesicles throughout the cell.
   Answer: False

UNIT-2

Multiple Choice Questions (MCQ)

1. The primary function of the Na+/K+ pump in the cell membrane is to:
   a) Transport glucose into the cell
   b) Maintain the electrochemical gradient by moving 3 Na+ ions out and 2 K+ ions in
   c) Facilitate passive diffusion of ions
   d) Pump calcium ions into the endoplasmic reticulum
   Answer: b) Maintain the electrochemical gradient by moving 3 Na+ ions out and 2 K+ ions in
2. Which process involves the cell engulfing large particles or debris from the extracellular environment?
   a) Pinocytosis
   b) Phagocytosis
   c) Exocytosis
   d) Diffusion Answer: b) Phagocytosis
3. The nuclear pore complex primarily functions to:
   a) Regulate the movement of molecules between the nucleus and the cytoplasm
   b) Produce ribosomal RNA
   c) Anchor the nuclear envelope to the cytoskeleton
   d) Synthesize DNA
   Answer: a) Regulate the movement of molecules between the nucleus and the cytoplasm
4. Which gene, when mutated, is most commonly associated with promoting the development of cancer?
   a) p53
   b) BRCA1
   c) Ras
   d) almudolin Answer: c) Ras
5. Which of the following is a function of tumor suppressor genes?
   a) Promote cell growth and division
   b) Initiate DNA repair mechanisms
   c) Inhibit apoptosis
   d) Increase the rate of cellular metabolism
   Answer: b) Initiate DNA repair mechanisms

Fill in the Blanks

6. The calmodulin protein binds to _____ions to regulate various cellular processes, including signal transduction pathways. Answer: calcium (Ca^{2+})
7. Exocytosis is a process where vesicles fuse with the plasma membrane to release their contents into the ____space. Answer: extracellular
8. The nucleolus is the site within the nucleus responsible for synthesizing _____. Answer: ribosomal RNA

True or False

9. True or False: The nuclear lamina is a mesh-like structure that provides mechanical support to the nuclear envelope and regulates nuclear events such as DNA replication. Answer: True
10. True or False: Oncogenes normally function to suppress tumor growth, but when mutated, they can lead to uncontrolled cell division.
    Answer: False

UNIT-3

Multiple Choice Questions (MCQ)

1. Which organelle is primarily involved in the sorting and modification of proteins before they are transported to their destination?
   a) Mitochondria
   b) Golgi apparatus
   c) Lysosomes
   d) Nucleus Answer: b) Golgi apparatus
2. G protein-coupled receptors (GPCRs) activate which molecule after binding to a ligand?
   a) mTOR
   b) G proteins
   c) ERK
   d) DNA Answer: b) G proteins
3. Which signal transduction pathway is activated by growth factors and leads to cell proliferation?
   a) GPCR Pathway
   b) ERK/MAPK Pathway
   c) mTOR Pathway
   d) Apoptotic Pathway Answer: b) ERK/MAPK Pathway
4. Programmed cell death, or apoptosis, is characterized by all of the following EXCEPT:
   a) Cell shrinkage
   b) DNA fragmentation
   c) Inflammation
   d) Caspase activation
   Answer: c) Inflammation
5. Polytene chromosomes are primarily found in:
   a) Human liver cells
   b) Drosophila salivary glands
   c) Frog oocytes
   d) Mammalian neurons Answer: b) Drosophila salivary glands

Fill in the Blanks

6. The mTOR signaling pathway is crucial for regulating cell growth and _____, responding to nutrients, g
   Answer: metabolism
7. Lampbrush chromosomes are large, extended chromosomes found in the oocytes of _____and amphibians, with loops of chromatin active in transcription. Answer: birds
8. Stem cells have the ability to differentiate into specialized cell types and are also capable of __division, giving rise to identical stem cells.
   Answer: self-renewing

True or False

9. True or False: In the GPCR signaling pathway, GTP-bound G proteins activate downstream effectors such as adenylyl cyclase or phospholipase C.
   Answer: True
10. True or False: Apoptosis is an uncontrolled cell death process that results in damage to neighboring cells and tissue. Answer: False

UNIT-4

Multiple Choice Questions (MCQ)

1. In a monohybrid cross, which of the following is the phenotypic ratio observed in the F2 generation according to Mendel's law of dominance?
   a) 1:2:1
   b) 3:1
   c) 9:3:3:1
   d) 1:1 Answer: b) 3:1
2. Which of Mendel's laws states that alleles for different traits are inherited independently of one another?
   a) Law of Segregation
   b) Law of Dominance
   c) Law of Independent Assortment
   d) Law of Linkage Answer: c) Law of Independent Assortment
3. What type of inheritance is shown when both alleles in a heterozygote are fully expressed, as in AB blood type?
   a) Incomplete dominance
   b) Co-dominance
   c) Pleiotropy
   d) Epistasis Answer: b) Co-dominance
4. In pedigree analysis, a filled-in square represents a(n):
   a) Male without the trait
   b) Female without the trait
   c) Male with the trait
   d) Female with the trait Answer: c) Male with the trait
5. In a dihybrid cross, the phenotypic ratio of the F2 generation is typically:
   a) 1:2:1
   b) 9:3:3:1
   c) 3:1
   d) 1:1 Answer: b) 9:3:3:1 Fill in the Blanks
6. Multiple alleles refer to a gene having more than two _____, such as the ABO blood group system. Answer: alleles
7. Lethal alleles can cause death when present in the _____state, often resulting in altered Mendelian ratios in offspring.
   Answer: homozygous
8. Pleiotropy occurs when a single gene affects _____traits, as seen in conditions like Marfan syndrome. Answer: multiple

True or False

9. True or False: In incomplete dominance, the heterozygote exhibits a phenotype that is an intermediate between the two homozygous phenotypes.
   Answer: True
10. True or False: Epistasis occurs when one gene masks or alters the expression of another gene at a different locus. Answer: True

UNIT-5

Multiple Choice Questions (MCQ)

1. Linkage refers to:
   a) Genes located on different chromosomes
   b) Genes that are inherited together because they are located on the same chromosome
   c) Genes that do not assort independently
   d) Both b and c Answer: d) Both b and c

2. During crossing over, genetic material is exchanged between:
   a) Non-homologous chromosomes
   b) Homologous chromosomes
   c) Sister chromatids
   d) None of the above Answer: b) Homologous chromosomes
3. Recombination frequency is used to measure:
   a) The mutation rate in a population
   b) The intensity of linkage between genes
   c) The rate of natural selection
   d) The rate of genetic drift
   Answer: b) The intensity of linkage between genes
4. Genetic drift is most pronounced in:
   a) Large populations
   b) Small populations
   c) Stable environments
   d) Diverse ecosystem
   Answer: b) Small populations

Fill in the Blanks

5. Speciation occurs when populations of the same species become _____and evolve into different species over time.
   Answer: reproductively isolated
6. Sex-linked inheritance typically involves genes located on the_____ chromosomes. Answer: sex
7. Extra-chromosomal inheritance refers to the transmission of genetic material found outside the _____. Answer: nucleus
8. Crossing over results in new combinations of alleles, which contributes to genetic _____in a population.
   Answer: variation

True or False

9. True or False: The process of natural selection acts only on phenotypes, not genotypes. Answer: True
10. True or False: In linkage, genes that are located far apart on the same chromosome assort independently.
    Answer: False

IV SEMESTER, (Course code: 124409)
COURSE 9: - MOLECULAR BIOLOGY AND MICROBIAL GENETICS

credits -_3

I. Course Outcomes:

By the Completion of the course the learner should able to–

1. Understand the nature of genetic material, its organization in prokaryotes and eukaryotes, and the role of DNA and RNA.
2. Explain the process of DNA replication in prokaryotes and the involvement of enzymes and factors.
3. Recognize the characteristics, types, and applications of extra chromosomal genetic elements such as plasmids and transposons.
4. Differentiate between classical and modern concepts of genes, understand gene structure, and the process of transcription.
5. Comprehend the genetic code, translation process, and regulation of gene expression in bacteria.
6. Define and classify mutations, understand their molecular basis, and gain knowledge of DNA repair mechanisms.
7. Familiarize with genetic recombination in bacteria, including conjugation, transformation, and transduction processes.

Unit - 1: DNA/RNA as genetic material, Replication of DNA

1. Experimental evidences that established DNA and RNA as genetic material. Genome organization in prokaryotes and eukaryotes.

1.1 Replication of DNA in prokaryotes.: Bidirectional and unidirectional replication, Semiconservative replication, Proof of Semiconservative replication (Messelson – Stahl Experiment). Mechanism of DNA Replication in Prokaryotes: step by step process, Enzymes and factors involved in replication- Primase, Helicase, Gyrase, DNA polymerases, DNA ligase, SSB proteins.

1.2 Extra chromosomal genetic elements: General characters, types and applications of Plasmids and transposons.

Unit - 2: Concept of gene, Transcription **No. of Hours:9**

2.1 Classical Concept of gene: Muton, Recon and Cistron; One gene-one enzyme and one gene - one polypeptide and One gene – One Product hypotheses.

2.2Modern concept of gene: Definition of gene; Open reading frame; structural, constitutive and regulatory genes; uninterrupted genes, Split genes- concept of introns and exons.

2,3 Protein synthesis in Prokaryotes: Transcription- Definition, difference from replication, promoter, RNA Polymerase, mechanism of transcription. RNA splicing in eukaryotes;

Unit - 3: Translation and regulation of gene expression No. of Hours:9 Protein

synthesis in Prokaryotes

1.1 Genetic code: Salient features, Wobble hypothesis.

1.2 Translation- Charging of tRNA, aminoacyl tRNA synthetases, Mechanisms of initiation, elongation and termination of polypeptides. Inhibitors of protein synthesis.

1.3 Regulation of gene expression in bacteria – lac operon.

Unit - 4: Mutations and DNA repair **No. of Hours:9**

4.1 Mutations: Definition and types of Mutations (Spontaneous and induced, Somatic and germline); Physical and chemical mutagens;

4.2 Molecular basis of mutations (base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions); Functional mutants (loss and gain of functionmutants); Uses of mutations.

4.3 Outlines of DNA repair mechanisms: Direct repair, Excision repair, Mismatch Repair, Recombination Repair, SOS Repair.

Unit - 5: Genetic recombination in bacteria **No. of Hours:9**

1.1 Conjugation - discovery, F-factor, F+ & Hfr, mechanism ofconjugation, applications of conjugation;

1.2 Transformation- Discovery, mechanism of transformation, Competence Factors affecting transformation and application of transformation.

1.3 Transduction- discovery, mechanism and types of transduction.

III. Skill Outcomes:

1. performing cell lysis and purification, quantifying DNA, and recognizing the importance of genomic DNA isolation.
2. Estimate DNA using UV Spectrophotometer include preparing DNA samples, measuring absorbance at 260 nm, calculating DNA concentration, and assessing DNA purity.
3. Solve Problems related to DNA and RNA characteristics, Transcription and Translation. 4. Analyze and solve problems related to DNA and RNA structure, understanding transcription and translation processes, and interpreting the impact of mutations on protein synthesis.
4. Prepare gels, loading DNA samples, visualizing DNA bands, analyzing fragment size, and understanding the principles of electrophoresis.
5. Understand Mutagenesis principles, perform UV exposure, assessing mutation frequency, and comprehend the effects of mutations on bacterial phenotypes.

COURSE -9 PRACTICAL

1. Isolation of genomic DNA from E. coli
2. Estimation of DNA using UV spectrophotometer (A260measurement).
3. Problems related to DNA and RNA characteristics, Transcription and Translation.
4. Resolution and visualization of DNA by Agarose Gel Electrophoresis.
5. Problems related to DNA and RNA characteristics, Transcription and Translation.
6. Induction of mutations in bacteria by UV light.
7. Study of different conformations of plasmid DNA through agarose gel electrophoresis.
8. Demonstration of bacterial transformation
9. Instrumentation in molecular biology – Ultra centrifuge, Transilluminator, PCR
10. Study of different types of DNA and RNA using micrographs and model / schematic
11. representations
12. Study of semi-conservative replication of DNA through micrographs / schematic
13. Representations

IV. References Text books:

1. James D. Watson Tania A. Baker, Stephen P. Bell Alexander Gann, Michael Levine, Richard Losick, 2013, Molecular Biology of the Gene, 5th Edition, Pearson Edu Publishers.
2. Roger Y. Stanier, Edward A. Adelberg, John L. Ingraham, 1977, General Microbiology 5th edition, London Macmillan.
3. David Freifelder1986 Molecular Biology 3rd edition, Jones & Bartlett Publishers
4. T.A. Brown, Gene cloning and DNA analysis- An Introduction, 4thedition
5. Bernard R. Glick and Jack. J. Pasternak, Molecular Biotechnology. 3rd edition
6. David Freifelder.Essentials of molecular biology.Jones and Bartlett Publishers, 1998

V. Co-Curricular Activities:

1. Conduct poster presentations, oral presentations, and interactive sessions.
2. Visit laboratories employing molecular biology techniques

Life Sciences – Major Programmes B.Sc

COURSE 9: - MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Microbiology honours

Blue Print for Question Papers from II Semester

SECTION-A (5x 8 = 40 Marks)

Answer all the following questions.

Unit Number	Section-A (Essay/ Split Essay) In either or pattern	Section-B (MCQ/ True or False/ Fill in the blank) – No choice	Weightage of marks
Unit-1	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-2	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-3	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-4	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-5	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks

SECTION-B **10X1=10 Marks**

Draw labelled diagrams wherever necessary.

1. (a) – (i) and (ii) Or (b) - (i) and (ii)
2. (a) or (b) – If an essay
3. (a) or (b) – If an essay
4. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay
5. (a) or (b) – If an essay

Answer all the following questions.

6. From Unit-1
7. From Unit-1
8. From Unit-2
9. From Unit-2
10. From Unit-3
11. From Unit-3
12. From Unit-4
13. From Unit-4
14. From Unit-5
15. From Unit-5

Department of Microbiology

II B.Sc Microbiology Honours- IV SEMESTER

COURSE -9: MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Model Question Paper

Time:2.30 Hrs **max. marks:50**

Section-A **5X8=40 (**Answer all the questions. Draw the labelled diagrams when necessary.)

Unit	Q. N	Questions	Marks	BL	CO	PO
I	1	Interpret the experimental evidences that established DNA as a Genetic material.	8	3	1	4
		(OR)				
		Explain the mechanism of DNA replication in Prokaryotes	8	2	2	4
II	2.	Conclude and contrast the Classical concept of Gene	8	4	4	4
		(or)				
		Illustrate the Mechanism of Transcription	8	2	4	4
III	3	List the salient features of Genetic code	8	1	5	4
		(OR)				
		Evaluate the Gene expression in E. Coli by Lac operon concept	8	4	5	4
IV	4	Define Mutations. Describe different types of physical and chemical mutagens	1+7	1& 3	6	4
		(OR)				
		Give outlines of different DNA repair mechanisms	8	2	6	4
V	5	Differentiate F factor and Hfr strains. Explain the mechanism of Conjugation in Bacteria	8	4& 2	7	4
		(or)				
		Interpret the Lederberg and Zender experiment and explain mechanism of Transduction	4+4	3& 2	7	4

Section -B

Answer the following questions **1X10=10**

6. Give an example of a Microorganism having RNA as a Genetic material
7. Messelson – Stahl Experiment is to prove that the DNA replication is by Semiconservative method. (TRUE/FALSE)
8. One-gene one enzyme concept was given by----------
9. mRNA splicing takes place in only in Eukaryotes . (TRUE/FALSE)
10. What is wobble hypothesis?
11. Tetracycline is an inhibitor of protein synthesis. (TRUE/FALSE)
12. What is SOS repair?
13. UV radiation is a physical mutagen. (TRUE/FALSE)
14. What is transformation?
15. Integration of F plasmid in the recipient Bacteria is called Episome. (TRUE/FALSE)

Department of Microbiology

II B.Sc Microbiology Honours- IV SEMESTER

COURSE -9: MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Model Question Paper

Time:2.30 Hrs **max. marks:50**

Section-A **5X8=40**

(Answer all the questions. Draw the labelled diagrams when necessary.)

Unit	Q. N	Questions	Marks	BL	CO	PO
I	1	Interpret the experimental evidences that established DNA as a Genetic material.	8	3	1	4
	2	Explain General characters of Plasmids and Transposons	8	2	3	4
	3	Explain the mechanism of DNA replication in Prokaryotes	8	2	2	4
II	4	Conclude and contrast the Classical concept of Gene	8	4	4	4
	5	Generalise the modern concept of gene in detail	8	3	4	4
	6	Illustrate the Mechanism of Transcription	8	2	4	4
III	7	List the salient features of Genetic code	8	1	5	4
	8	Outline the process of Translation in Prokaryotic organisms	8	2	5	4
	9	Evaluate the Gene expression in E. Coli by Lac operon concept	8	4	5	4
IV	10	Define Mutations. Describe different types of physical and chemical mutagens	1+7	1& 3	6	4
	11	Demonstrate the molecular basis of mutations in detail	8	4	6	4
	12	Give outlines of different DNA repair mechanisms	8	2	6	4
V	13	Differentiate F factor and Hfr strains. Explain the mechanism of Conjugation in Bacteria	8	4& 2	7	4
	14	Explain the mechanism of Translation and illustrate few applications of Transformation	4+4	2& 3	7	4
	15	Interpret the Lederberg and Zender experiment and explain mechanism of Transduction	4+4	3& 2	7	4

Section -B

Answer the following questions. Each question carries one mark.

1. Give an example of a Microorganism having RNA as a Genetic material
2. Messelson – Stahl Experiment is to prove that the DNA replication is by Semiconservative method. (TRUE/FALSE)
3. SSB protein function is to bind the Double stranded DNA during Replication (TRUE/FALSE)
4. Function of Enzyme Gyrase----------
5. Short length of DNA synthesized on Lagging strand are called----------
6. One-gene one enzyme concept was given by----------
7. Who gave the definition of Gene?
8. What is Recon?
9. Intron denote non coding regions and exons denotes coding regions (TRUE/FALSE)

10. ---------- region is the recognition site for RNA Polymerase during transcription.
11. mRNA splicing takes place in only in Eukaryotes (TRUE/FALSE)
12. Genetic code may be overlapping ((TRUE/FALSE)
13. What is wobble hypothesis?
14. What are the termination Codons?
15. Tetracycline is an inhibitor of protein synthesis. (TRUE/FALSE)
16. Define frame shift mutation--------
17. What is SOS repair?
18. Ethydium bromide is an alkylating agent (TRUE/FALSE)
19. UV radiation is a physical mutagen. (TRUE/FALSE)
20. What is transformation?
21. Grifith's experiment on Pneumococci leads to discovery of Transformation (TRUE/FALSE)
22. Bacterial conjugation was first described by---------
23. Integration of F plasmid in the recipient Bacteria is called Episome. (TRUE/FALSE)
24. What is abortive transduction?
25. ---------- ion enhance the competency during transformation.

IV SEMESTER , (Course code: 1244010)

COURSE 10: - MICROBIAL PHYSIOLOGY AND METABOLISM

credits -_3

I. Course Outcomes:

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

1. Understand the nutritional requirements of microorganisms and the different methods of nutrient uptake. They will also gain knowledge of different nutritional groups and types of growth media used for microbial cultivation.
2. Comprehend microbial growth, including the definition of growth, generation time, and the different phases of growth. They will also learn about factors influencing microbial growth and methods for measuring it.
3. Gain knowledge of thermodynamics in biological systems, including concepts of free energy, enthalpy, and entropy. They will also learn about ATP structure and properties, oxidation-reduction reactions, and carbohydrate breakdown pathways.
4. Understand microbial respiration, including aerobic and anaerobic respiration, chemoautotrophy, and fermentative modes.
5. Differentiate the processes of oxygenic and anoxygenic photosynthesis.

UNIT I: Microbial Nutrition No. of hours: 9

1. Nutritional requirements of Microorganisms
2. Methods of uptake of nutrients by cells- Primary and secondary active transport, concept of uniport, symport and antiport Group translocation; Iron uptake
3. Nutritional groups of microorganisms-based on C, energy and electron. sources
4. Growth media - synthetic, nonsynthetic, selective, enrichment and differential media.

UNIT II: Microbial Growth No. of hours:9

1. Microbial Growth- Definitions of growth, generation time and specific growth rate; different phases of growth in batch cultures;
2. Synchronous, continuous, biphasic growth.
3. Factors influencing microbial growth
4. Methods for measuring microbial growth - Direct microscopy, viable count estimates, turbidometry and biomass.

UNIT IV: Thermodynamics; Breakdown of Carbohydrates

1. Thermodynamics in biological systems - Concept of free energy, Enthalpy, Standard Free Energy change of reaction, Entropy. First and Second law of Thermodynamics. Open and Closed system.
2. Structure and properties of ATP, Standard Free energy change of hydrolysis of ATP and other high energy compounds. Biological oxidation-reduction reactions. Structure and Function of NAD and FAD.
3. Breakdown of carbohydrates· Glycolytic pathways- EMP, HMP shunt/pentose phosphate pathway and ED; TCA cycle.

UNIT V: Microbial Respiration and Fermentation No.

1. Aerobic respiration - ETS and oxidative phosphorylation
2. Anaerobic respiration, chemoautotrophy - oxidation of inorganic compounds - N, S, Fe and H.
3. Fermentative modes in microorganisms with special reference to alcoholic, Lactic acid fermentations

UNIT V: Bacterial Photosynthesis No. of hours:9

1. Photosynthetic pigments, Photosynthetic apparatus in prokaryotes
2. Outline of oxygenic photosynthesis in bacteria
3. Outline of anoxygenic photosynthesis in bacteria

II. Skill Outcomes:

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

1. Understand the impact of temperature and pH on bacterial growth and metabolism.
2. Gain proficiency in colony counting techniques for microbial enumeration.
3. Analyze and interpret growth curve data to understand bacterial growth dynamics.
4. Develop skills in observing and identifying cyanobacteria under the microscope.
5. Apply knowledge of microbial growth factors and techniques to interpret and analyze experimental results.

COURSE 10: - MICROBIAL PHYSIOLOGY AND METABOLISM PRACTICAL

1. Effect of Temperature on bacterial growth 2.Effect of pH on bacterial growth
2. Colony count in Plates
3. Study and plot the growth curve of E. coli by turbidometric and standard plate count methods
4. Observation and identification of permanent slides of cyanobacteria

IV References:

1. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H.Freeman and Company Caldwell, D.R. (1995). Microbial Physiology and Metabolism, W.C. Brown Publications,Iowa, USA.
2. Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2 nd Edition, CBS Publishers and Distributors, New Delhi.
3. Sashidhara Rao, B. and Deshpande, V. (2007). Experimental Biochemistry: A student Companion. I.K. International Pvt. Ltd.
4. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman
5. Voet,D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons
6. White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.

V Co-Curricular Activities:

1. Assignments in nutrient utilization, energy production, metabolic pathways,
2. Students can study microbial growth curves, metabolic pathways, or physiological responses to environmental factors.
3. Organize seminars where students can deliver presentations on specific topics in microbial physiology and metabolism.
4. Create visual representations of microbial metabolic pathways.

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Life Sciences – Major Programmes

COURSE 10: - MICROBIAL PHYSIOLOGY AND METABOLISM

B.Sc Microbiology honours

Blue Print for Question Papers from II Semester

SECTION-A (5x 8 = 40 Marks)

Answer all the following questions.

Unit Number	Section-A (Essay/ Split Essay) In either or pattern	Section-B (MCQ/ True or False/ Fill in the blank) – No choice	Weightage of marks
Unit-1	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-2	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-3	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-4	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-5	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks

SECTION-B **10X1=10 Marks**

Draw labelled diagrams wherever necessary.

1. (a) – (i) and (ii) Or (b) - (i) and (ii)
2. (a) or (b) – If an essay
3. (a) or (b) – If an essay
4. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay
5. (a) or (b) – If an essay

Answer all the following questions.

6. From Unit-1
7. From Unit-1
8. From Unit-2
9. From Unit-2
10. From Unit-3
11. From Unit-3
12. From Unit-4
13. From Unit-4
14. From Unit-5
15. From Unit-5

GOVERNMENT COLLEGE AUTONOMOUS, RAJAMAHENDRAVARAM

Department of Microbiology

Model question paper for II B.Sc. Microbiology Honours

IV Semester, **C 10** (**- MICROBIAL PHYSIOLOGY AND METABOLISM**)

Time : 3Hrs Max Marks : 50

SECTION – A

Answer all the following questions, Draw labelled diagrams wherever necessary

(5x8=40 Marks)

Q.No.	Questions	Marks	BL	CO	PO
1.	Explain Nutritional requirements of Microorganisms	8	1&2		
	(OR)				
	Explain Growth media - synthetic, nonsynthetic, selective, enrichment and differential media	8	1&2		
2.	Explain different phases of growth in batch cultures.	8	2&4		
	(OR)				
	Explain First and Second law of Thermodynamics. Open and Closed system.	8	1&2		
3.	Explain Glycolytic pathway and mention its significance.	8	1&3		
	(OR)				
4.	Explain ETS and oxidative phosphorylation.	8	2		
	(OR)				
	Explain Fermentative modes in microorganisms with special reference to alcoholic, Lactic acid fermentations.	8	2&4		
5.	Explain Photosynthetic pigments, Photosynthetic apparatus in prokaryotes	8	2		
	(OR)				
	Explain Outline of oxygenic photosynthesis in bacteria	8	2		

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Section -B
Answer any five of the following
(10x1=10)

FILL IN THE BLANKS

1. _____ is a transport process that moves molecules against their concentration gradient using ATP. (Primary active transport)

2.In direct microscopic counting, a special slide called a _____ chamber is often used. (Petroff-Hausser or Hemocytometer)

3. The _____ law of thermodynamics states that entropy of a closed system always increases over time. (Second)

4. In anaerobic respiration, microorganisms use electron acceptors such as _____ instead of oxygen. (Nitrate / Sulfate / CO_2 / Ferric ions)

5. The _____ is the structure in prokaryotes where photosynthesis takes place. (Photosynthetic apparatus)

True or False (Tick the correct answer)

6. Facilitated diffusion requires ATP to transport molecules across the membrane. (False)

7. Generation time is the time required for a microbial population to double. (True)

8. The first law of thermodynamics states that energy can be created and destroyed. (False)

9. Lactic acid fermentation produces ethanol and carbon dioxide as major byproducts. (False) (It produces lactic acid, not ethanol.)

10. The photosynthetic apparatus in prokaryotes is located in the plasma membrane or specialized membrane structures. (True)

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GOVERNMENT COLLEGE AUTONOMOUS, RAJAMAHENDRAVARAM

Department of Microbiology

Question Bank for II B.Sc. Microbiology Honours

IV Semester, **C 10** (**- MICROBIAL PHYSIOLOGY AND METABOLISM**)

Time : 3Hrs Max Marks : 50

SECTION – A

Answer all the following questions, Draw labelled diagrams wherever necessary

(5x8=40 Marks)

UNIT	Q.No.	Questions	Marks
I	1.	Explain Nutritional requirements of Microorganisms	8
	2	Describe Nutritional groups of microorganisms-based on C, energy and electron sources	
	3	Explain Growth media - synthetic, nonsynthetic, selective, enrichment and differential media	8
II	1.	Explain different phases of growth in batch cultures.	8
	2	Write notes on Factors influencing microbial growth	
	3	Describe Methods for measuring microbial growth - Direct microscopy, viable count estimates,turbidometry and biomass	8
III	1	Explain First and Second law of Thermodynamics. Open and Closed system.	8
	2	Write about the Structure and Function of NAD and FAD.	
	3	Explain Glycolytic pathway and mention its significance.	
IV	1	Explain ETS and oxidative phosphorylation.	
	2	Briefly anaerobic respiration.	
	3	Explain Fermentative modes in microorganisms with special reference to alcoholic, Lactic acid fermentations	
V	1	Explain Photosynthetic pigments, Photosynthetic apparatus in prokaryotes	8
	2	Explain Outline of oxygenic photosynthesis in bacteria	8
	3	Explain Outline of anoxygenic photosynthesis in bacteria	

Section -B

Answer any five of the following

(10x1=10)

UNIT-1

1. Photoautotrophs obtain both their energy and carbon from organic compounds.

(False)
2. Facilitated diffusion requires ATP to transport molecules across the membrane. (False)
3. Iron uptake in microorganisms often involves siderophores to help transport iron into the cell. (True)
4. _____ is a transport process that moves molecules against their concentration gradient using ATP. (Primary active transport)
5. Microorganisms that use organic carbon as their carbon source are called _____. (Heterotrophs)

UNIT-2

1. The lag phase in batch culture is a period of intense cell division. (False)
2. Generation time is the time required for a microbial population to double. (True)
3. Turbidometry is a method used to directly count individual microbial cells. (False)
4. The time required for a microbial population to double in number is called _____. (Generation time)
5. In direct microscopic counting, a special slide called a _____ chamber is often used. (Petroff-Hausser or Hemocytometer)

UNIT-3

1. The first law of thermodynamics states that energy can be created and destroyed. (False)
2. ATP is considered a high-energy molecule due to its phosphoanhydride bonds. (True)
3. The _____ law of thermodynamics states that entropy of a closed system always increases over time. (Second)
4. The standard free energy change of ATP hydrolysis is approximately _____ kcal/mol. (-7.3 kcal/mol)
5. The _____ cycle is a central metabolic pathway that generates NADH and $FADH_2$ for oxidative phosphorylation. (TCA/Krebs)

UNIT-4

1. Oxidative phosphorylation generates ATP using a proton gradient established by the ETS. (True)
2. Chemoautotrophs obtain their energy by oxidizing inorganic compounds such as ammonia or hydrogen sulfide. (True)
3. Lactic acid fermentation produces ethanol and carbon dioxide as major byproducts. (False) (It produces lactic acid, not ethanol.)
4. _____ is the final electron acceptor in aerobic respiration. (Oxygen / O_2)
5. In anaerobic respiration, microorganisms use electron acceptors such as _____ instead of oxygen. (Nitrate / Sulfate / CO_2 / Ferric ions)

UNIT-5

1. Chlorophyll a is the only photosynthetic pigment found in all photosynthetic bacteria. (False)
2. The photosynthetic apparatus in prokaryotes is located in the plasma membrane or specialized membrane structures. (True)
3. Anoxygenic photosynthesis uses water as an electron donor, similar to oxygenic photosynthesis. (False)
4. The _____ is the structure in prokaryotes where photosynthesis takes place. (Photosynthetic apparatus)
5. In oxygenic photosynthesis, water is split to generate electrons, releasing _____ as a byproduct. (Oxygen/O_2)

IV SEMESTER, (Course code: 1244011)

COURSE 11: r DNA TECHNOLOGY, BIOINFORMATICS AND BIOSTATISTICS

credits -_3

I. Course Outcomes:

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

1. Learn the principles and techniques of genetic engineering, including g restriction endonucleases, and DNA transformation.
2. Understand the use of vectors and the basics of polymerase chain reacti also explore the applications of genetic engineering in industry, agr medicine.
3. Gain knowledge of blotting techniques, DNA labeling, DNA sequenc basics of intellectual property rights.
4. Learn about bioinformatic resources, sequence databases, sequence align use of biostatistics in data analysis.
5. Develop skills in measuring central tendency and dispersion, understand types of data, and utilizing biostatistical software for analysis and data pr

UNIT- I: Recombinant DNA Technology **No. of Hours: 9**

1. Basic principles of genetic engineering. Steps in gene cloning.
2. Restriction endonucleases- applications of Type II restriction enzymes in genetic engineering; DNA polymerases and ligases;Use of linkers and adaptors
3. Vectors – Cosmid , Bacteriophages , BAC, YAC
4. Transformation of DNA by Chemical method, Electroporation.

UNIT- II: Applications of r-DNA technolog

1. **Genomic and C-DNA Libraries, RFLP, RAPD,**
2. Basics of Polymerase chain Reaction
3. Application of genetic engineering in industry, agriculture and medicine, Hybirdoma Technology.

UNIT- III: Techniques in genetic engineering and IPR

1. **Blotting Techniques.**
2. **Labeling of DNA, DNA foot printing.**
3. **DNA Sequencing-Sanger's method**
4. **Outlines of Intellectual property Rights (Patents,Trademark,Copyright)**

UNIT- IV:Bioinformatics **No. of Hours: 9**

1. Bioinformatic resources : NCBI, EBI, DDBJ, PUBMED, BIOMED.
2. Sequence Databases – GENBANK, BLAST, FASTA, ExPasy, PDB, NDB, UNIPROT – SWISS PROT.
3. Sequence alignment – Sequence homology, pairwise sequence alignment, automated DNA sequencing, ChIP.

UNIT- V:Biostatistics **No. of Hours: 9**

1. Measurement of central tendency : MEAN , MEDIAN, MODE.
2. Measurement of dispersion : RANGE, MEANDEVIATION , STANDARD DEVIATION.
3. Use of Biostatistic softwares.
4. Sample and population ; Types of Data , methods of Data presentation.

III. Skill Outcomes: On successful completion of the course, the student will be able to

1. Perform plasmid DNA isolation, agarose gel electrophoresis
2. Understand the principles and applications of DNA fingerprinting for genetic profiling and identification.

3. Utilize nucleic acid and protein databases to access, retrieve, and analyze genetic and protein sequence information
4. Apply sequence alignment algorithms and tools
5. Develop skills using bioinformatics tools and databases

COURSE 11: r DNA TECHNOLOGY, BIOINFORMATICS AND BIOSTATISTICS
PRACTICAL

1. Isolation of plasmid DNA by Agarose gel Electrophoresis.
2. Preparation of Recombinant vector by using T4 DNA Ligase.
3. To Understand the concept of DNA fingerprinting by Random Ampilification of Polymorphic DNA.
4. Nucleic acid and protein databases.
5. Sequence alignment
6. Sequence homology and Gene annotation.

References

1. Ghosh Z. and Bibekanand M. (2008) Bioinformatics: Principles and Applications. Oxford University Press.
2. Pevsner J. (2009) Bioinformatics and Functional Genomics. II Edition. Wiley-Blackwell. 3.Campbell A. M., Heyer L. J. (2006) Discovering Genomics, Proteomics and Bioinformatics. II Edition. Benjamin Cummings. Crueger W, Crueger A (1990) Biotechnology: A text Book of Industrial Microbiology 2nd edition Sinauer associates,Inc.
3. Demain, A. L and Davies, J. E. (1999). Manual of Industrial Microbiology and Biotechnology, 2nd Edition, ASM Press.
4. Glazer AN and Nikaido H (2007) Microbial Biotechnology, 2nd edition, Cambridge University Press Glick BR, Pasternak JJ, and Patten CL (2010) Molecular Biotechnology 4th edition, ASM Press Gupta PK (2009) Elements of Biotechnology 2nd edition, Rastogi Publications
5. Prescott, Harley and Klein's Microbiology by Willey JM, Sherwood LM, Woolverton CJ (2014), 9th edition, Mc Graw Hill Publishers.
6. Ratledge, C and Kristiansen, B. (2001). Basic Biotechnology, 2nd Edition, Cambridge University Press.
7. Stanbury PF, Whitaker A, Hall SJ (1995) Principles of Fermentation Technology 2nd edition., Elsevier Science
8. Swartz, J. R. (2001). Advances in Escherichia coli production of therapeutic proteins. Current Opinion in Biotechnology, 12, 195–201.

V Co – curricular Activities:

1. Training of students and basic gene cloning methods.
2. Industrial visit on Recombinant products.
3. Prepearation of videos on labeling of DNA and DNA sequencing.
4. Students participation in seminars of the copyright, Patent, Trademark and IPR.
5. Assignments on PCR, Restriction enzymes , vectors , RFLP, RAPD, Hybridoma Technology, Sequence alignment tools of DNA , central tendancy , Data collection and presentation.
6. Conducting group discussion , Quiz, debate in related topics.

Life Sciences – Major Programmes
COURSE 11: r DNA TECHNOLOGY, BIOINFORMATICS AND BIOSTATISTICS
B.Sc Microbiology honours

Blue Print for Question Papers from II Semester

SECTION-A (5x 8 = 40 Marks)

Answer all the following questions.

Unit Number	Section-A (Essay/ Split Essay) In either or pattern	Section-B (MCQ/ True or False/ Fill in the blank) – No choice	Weightage of marks
Unit-1	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-2	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-3	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-4	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks
Unit-5	8 Marks / 2×4 Marks	1 mark (2 Questions)	10 Marks

SECTION-B **10X1=10 Marks**

Draw labelled diagrams wherever necessary.

1. (a) – (i) and (ii) Or (b) - (i) and (ii)
2. (a) or (b) – If an essay
3. (a) or (b) – If an essay
4. (a) – (i) and (ii) or (b) - (i) and (ii) – if split essay
5. (a) or (b) – If an essay

Answer all the following questions.

6. From Unit-1
7. From Unit-1
8. From Unit-2
9. From Unit-2
10. From Unit-3
11. From Unit-3
12. From Unit-4
13. From Unit-4
14. From Unit-5
15. From Unit-5

GOVERNMENT COLLEGE AUTONOMOUS, RAJAMAHENDRAVARAM

Department of Microbiology

Model question paper for II B.Sc. Microbiology Honours

IV Semester, C 11 (rDNA Technology, Bioinformatics and Biostatistics)

Time : 30Hrs

Max Marks : 50

SECTION – A

Answer all the following questions, Draw labelled diagrams wherever necessary

(5x8=40 Marks)

Q.No.	Questions	Marks	BL	CO	PO
1.	Explain different Gene transfer methods	8	3	1	
	(OR)				
	Discuss about BAC and YAC and explain their role in Genetic Engineering	8	2	1	
2.	Explain Hybridoma technique and steps involved in it	8	1&2	2	
	(OR)				
	Explain about various applications of Genetic engineering	8	4	2	
3.	What are Intellectual Property Rights (IPR) and explain it types	8	2	3	
	(OR)				
	Explain about blotting techniques and state their applications	8	2	3	
4.	Explain the differences between BLASTA and FASTA. Mention their applications in Bioinformatics	8	1&3	4	
	(OR)				
	Explain about Sequence alignment in Bioinformatics.	8	2	4	
5.	Define mean, median and mode with suitable examples	8	1&3	5	
	(OR)				
	Explain about the uses of Biostatistics software.	8	6	5	

Section -B
Answer all the following Objective
(10x1=10 marks)

Fill in the blanks

1. _____ are initially Isolated from bacteria that cut DNA at specific sequences.

2. The desired DNA fragment is amplified using _____ technique.

3. A _____ is a form of right granted by the government to an inventor for a period of time, which provides the owner to exclude others from making, using, selling, etc. of his own product.

4._____ is a database of protein sequences that includes annotations and links to other databases.

5._____ is used to analyze data and perform statistical analysis of biological and medical data.

True or False (Tick(✓) the correct one)

6. DNA polymerases are enzymes that joins the two DNA molecule covalently together. (**True/False)**

7. Hybridoma technology produces highly pure and specific antibodies like monoclonal antibodies. **(True/False)**

8. Southern blotting technique is used to detect both DNA and RNA in the given sample. (**True/False**)

9. PubMed is a free database of biomedical and life sciences literature that supports bioinformatics research. (**True/False)**

10. In Statistics, the sample mean considers the entire population data from the given data. (**True /False)**

GOVERNMENT AUTONOMOUS COLLEGE(A), RAJAMAHENDRAVARAM
Department of Microbiology
Question bank, Semester - 4, II YEAR B.Sc. Microbiology Honours
Major C 11 rDNA Technology, Bioinformatics and Biostatistics

UNIT- 1 Recombinant DNA Technology

Essays (8 Marks each)

1. What is Gene cloning? What are the steps involved in Gene Cloning
2. Explain different Gene transfer methods
3. Discuss about BAC and YAC and explain their role in Genetic Engineering

Objective (1 Mark each)

1. **Restriction enzymes** are initially Isolated from bacteria that cut DNA at specific sequences.
2. **Cosmids** are hybrid vectors that combine features of plasmids and bacteriophage lamda.
3. **Bacterial Artificial chromosomes (BACs)** are used to clone large pieces of DNA, such as genes or entire genomic regions.
4. Genetic engineering is a process used to manipulate genetic materials to alter, add, and repair specific genes to achieve desired traits. (**True**)
5. DNA polymerases are enzymes that joins the two DNA molecule covalently together. (**False)**

UNIT – 2 Applications of rDNA technology

Essays (8 Marks)

1. Explain about various applications of Genetic engineering
2. Explain PCR technique and steps involved in PCR
3. Explain Hybridoma technique and steps involved in hybridoma technique.

Objective (1 Mark each)

1. **Genomic library** is a collection of DNA fragments that together makeup the total genomic DNA a single organism.
2. The desired DNA fragment is amplified using **Polymerase Chain Reaction (PCR)** technique.
3. The DNA polymerase enzyme extracted from the bacterium **Thermus aquaticus**, is most widely used in PCR since its establishment.
4. Denaturation is the final step in PCR technique where the DNA polymerase enzyme add nucleiotides to the annealed primer to form a new complementary strand. (**False**)
5. Hybridoma technology produces highly pure and specific antibodies like monoclonal antibodies. **(True)**

UNIT -3 Techniques in genetic engineering and IPR

Essays (8 Marks)

1. Explain in detail about DNA sequencing- Sanger's method
2. What are Intellectual Property Rights(IPR) and explain it types
3. Explain about blotting techniques and state their applications

Objective (1 Mark each)

1. The blotting technique which is used to detect RNA in the sample is **Northern blotting**.
2. **Intellectual property rights (IPR)** are legal rights that protect creative works, inventions, and ideas.
3. A **Patent** is a form of right granted by the government to an inventor for a period of time, which provides the owner to exclude others from making, using, selling, etc. of his own product.
4. A trademark is a sign, symbol, design or expression of the owner that distinguishes a particular product from other similar products. (**True**)
5. Southern blotting technique is used to detect both DNA and RNA in the given sample. (**False**)

UNIT – IV Bioinformatics

ESSAYS (8 Marks)

1. Explain about BLASTA and FASTA. Mention their applications in Bioinformatics
2. Explain about Sequence alignment in Bioinformatics.
3. Validate the importance of NCBI and PubMed as Bioinformatic resources

Objective (1 Mark each)

1. **SWISS-PROT** is a database of protein sequences that includes annotations and links to other databases.
2. **GenBank** is s public data-base of DNA sequences that contain information about more than 300,000 orgnaisms.
3. A tool in bioinformatics that is used for determining the similar biological sequences is known as **BLAST**.
4. PubMed is a free database of biomedical and life sciences literature that supports bioinformatics research. (**True)**
5. ExPASy is a web portal that provides access to databases and software tools for life sciences research. (**True)**

UNIT -V Biostatistics

ESSAYS (8 Marks)

1. Define mean, median and mode with suitable examples
2. Explain about Range, Mean deviation and standard deviation with suitable examples
3. Define Biostatistics and explain about the uses of Biostatistics software.

Objective (1 Mark each)

1. In statistics, the **mean** is the average of a set of numbers.
2. In statistics, the **standard deviation** is a measure of the amount of variation of the values of a variable about its mean.
3. **Biostatic software** is used to analyze data and perform statistical analysis of biological and medical data.
4. In statistics, range is the difference between the highest and lowest values in a set of data. (**True).**
5. In Statistics, the sample mean considers the entire population data from the given data. (**False)**

	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. Salmanellosis
6. Microbial spoilage of canned foods
7. Yoghurt
8. SCP
9. VAM
10. Phosphorus cycle
11. Groundnut rust
12. Biodegradable plastics
13. Sanitary landfill
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

	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: Dermatomycosis 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
6. Covid 19
7. Throats swab
8. CSF
9. Exotoxins
10. Mac. Conkey agar
11. ELISA
12. Nucleic acid probes
13. MIC
14. Anti-microbial Sensitivity test

	Government College (Autonomous) Rajahmundry	**Program & Semester** III B.Sc. MZC & FMZC (V Semester)			
Course Code MBY 145P A2	**TITLE OF THE COURSE** **MANAGEMENT OF HUMAN MICROBIAL DISEASESAND DIAGNOSIS**				
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 Psedumonas.*
4. Demonstration of permanent slides of the following parasites:
    a) *Entamoeba histolytica*
    b) *Ascarisspps.*
    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 2ndedition, 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
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 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

1. Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi.
2. Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
3. Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.
4. Lewin, B. (2000). Genes VIII. Oxford University Press, England.
5. Maloy, S.R., Cronan, J.E. and Freifelder, D. (1994). Microbial Genetics, Jones and Bartlett Publishers, London.
6. Ram Reddy, S., Venkateshwarlu, K. and Krishna Reddy, V. (2007)
7. A text Book of Molecular Biotechnology. Himalaya Publishers, Hyderabad.Sinnot E.W., L.C. Dunn and T. Dobzhansky. (1958).
8. Principles of Genetics. 5 th Edition. McGraw Hill, New York.Smith, J.E. (1996).
9. Biotechnology, Cambridge University Press.Snyder, L. and Champness, W. (1997).
10. 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
6. Whey
7. Blunt and ligation
8. Transfection
9. C-DNA
10. SCP
11. Gene-gun method
12. Micro injection
13. Transgenic animals
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
https://youtube.com/channel/UCAXheRahnkShRUKSRbbihuQ

CO-PO Mapping

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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

MBT- BI :MICROBIAL BIOTECHNOLOGY AND r – DNA TECHNOLOGY

	Government College (Autonomous) Rajahmundry	**Program & Semester** III B.Sc. MZC & FMZC (V Semester)			
Course Code MBY 145P B1	**TITLE OF THE COURSE** **MICROBIAL BIOTECHNOLOGY AND r – DNA TECHNOLOGY**				
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

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

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, HTPP.

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 Phytogenetic 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 Wisley 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
6. World wide web
7. BLAST
8. Standard deviations
9. Types of errors
10. Analysis of variance
11. Markov models
12. UPGMA
13. Protein secondary structure prediction
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

TOTALHOURS: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 chi^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.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.

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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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
6. Serial dilution techniques
7. Autoclave
8. Hot air oven
9. MPN
10. MIC
11. SEM
12. Radio isotopes
13. Centrifuge
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
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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

MBP-C1: MICROBIAL INSTRUMENTATION AND BIOTECHNIQUES

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

1. Isolation and enumeration of bacteria form 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

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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-145 C2	**TITLE OF THE COURSE** **DRUG DESIGN, DISCOVERY AND ITELECTUAL 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 an 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 (parent, 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, 6thEdition, Black Well science.
2.Shanson D.C., Microbiology in clinical practice, 2nd edition, London; Wright.
3.TSammes Ellis Horwood, opicsin Antibiotic chemistryVolItoV.
4.WulfCrueger, 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 drugaction.
7. DenyesS.P.&BairdR.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, NewYork.
9.SydneyH.Willin, Murray M.Tuckerman,WilliamS.Hitchings IV, Good Manufacturing practices of pharmaceuticals, second Edt.,Mercel 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
6. E. Coli as a source of recombinant protein
7. Toxoids
8. Gene based vaccines
9. Copy rights
10. Trade marks
11. Bio-ethics
12. Bio-weapons
13. Gene chips
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/
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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

MBP – C2: DRUG DESIGN, DISCOVERY AND ITELECTUAL PROPERTY RIGHTS (IPR)
TOTALHOURS:40 CREDITS: 3

	Government College (Autonomous) Rajahmundry	**Program & Semester** III B.Sc. MZC & FMZC (V Semester)			
Course Code MBY 145P C2	**TITLE OF THE COURSE** **DRUG DESIGN, DISCOVERY AND ITELECTUAL PROPERTY RIGHTS (IPR)**				
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 actinimycetes.
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, 6thEdition, Black Well science.
2.Shanson D.C., Microbiology in clinical practice, 2nd edition, London; Wright.
3.TSammes Ellis Horwood, opicsin Antibiotic chemistryVolItoV.
4.WulfCrueger, 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 drugaction.
7. DenyesS.P.&BairdR.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, NewYork.
9.SydneyH.Willin, Murray M.Tuckerman,WilliamS.Hitchings IV, Good Manufacturing practices of pharmaceuticals, second Edt.,Mercel Dekker NC Nework.

[14

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/
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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

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