GOVERNMENT AUTONOMOUS COLLEGE (AUTONOMOUS)
RAJAMAHENDRAVARAM

NAAC "A^{+}" GRADE

DEPARTMENT OF MICROBIOLOGY

BOARD OF STUDIES

2021-2022

(All Semesters)

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8B2: Mushroom culture .....

8B3: Management of Human microbial Diseases ----------

8C1: Biostatistics and Bioinformatics ----------

8C2: Bio safety and Intellectual property right----------

8C3: Drug design and discovery----------

CLUSTER PAPERS: III B.SCM.Z.C-FOOD

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Proceedings of the Principal, Government College [A], Rajamahendravaram Present: Dr. R. David Kumar Swamy , M. Sc, M.Phil., Ph.D

Rc. No: Spl./Acad.Cell-GC[A]-RJY/2021.1, Dated: 13 september 2021

Sub: - Government College [A], Rajahmundry – **Boards of Studies** (BOS) – Nomination of Members - Orders Issued.

Ref: - UGC Autonomous Guidelines 2018.

ORDER:

The Principal, Government College [A], Rajamahendravaram is pleased to Constitute **Board of studies in MICROBIOLOGY** for framing the syllabi in Microbiology subject for all semesters duly following the norms of the UGC Autonomous guidelines.

S. No	Name	Designation
1	Smt. D. Jayasree Lecturer In- Charge/HoD, Department of Microbiology, GC[A], Rajahmundry	Chairman
2	All Faculty members in the department	Member
3	Dr. K. Aruna HOD, Dept. of Microbiology, ASD College for Women (A), Kakinada	Subject Expert
4	Smt. T. Sasikala ABN College, Kovvur	Subject Expert
5	Dr. A. Matta Reddy Dept. of Zoology, UCST, ANUR	University Nominee
6	Sri N. Srinivas, Manager, Coca Cola, Sri Sarvaraya Sugars, Bheemadolu	Expert from Industry/Corporate Sector
7	Mr. A. Harinaga Papa Rao	Student Nominee

The above members are requested to attend and share their views, 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 requirements for consideration and approval of the Academic cell.
(b). Suggest methodologies for innovate teaching and evaluation techniques
©. Suggest 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

The term of the members will be two years from the date of the nomination. The Chairman of the BOS (HOD/lecturer In-Charge of the department) is directed to coordinate with the Principal of the College and conduct BOS meetings as and when necessary, but at least once of a year.

Copy To
1. The above individuals
2. File

PRINCIPAL
GOVERNMENT COLLEGE (A)
RAJAHMUNDRY

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 2021-2022, held in the Department of Microbiology on 17-09-2021 at 11 AM with Smt. D.JAYASREE, Lecturer in-Charge, in the chair along with the following members.

1. **Chairman** : Smt. D. JAYASREE, Head of the Department of Microbiology, GC (A) – Rajamahendravaram.
2. **Faculty Member** : Smt. P. Suneeta, Lecturer in Microbiology, GC (A), RJY
3. **University Nominee** : Dr.A. Matta Reddy, Department of Zoology, UCST, Adikavi Nannaya University
4. **Subject expert** : Dr.K.Aruna, Head-Dept of Microbiology ASD Govt. College (W), Kakinada.
5. **Local Subject expert** : Smt. T. Sasikala, Lecturer, Dept of Microbiology ABN & PRR College, Kovvur
6. **Expert from Industry:** Sri. N.Srinivas, Manager, Coca-cola, Sri Sarvaraya Sugars, Bheemadolu.
7. **Student Nominee** : Mr. A. Hari Naga Paparao

AP STATE COUNCIL OF HIGHER EDUCATION

CBCS PATTERN FOR MICROBIOLOGY

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

YEAR	SEMESTER	PAPER	TITLE	MARKS	CREDITS
I	I	MBT - I	INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY	100	**4**
		MBP - I	INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY	50	**1**
	II	MBT - II	MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY	100	**4**
		MBP - II	MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY	50	**1**
II	III	MBT -III	MOLECULAR BIOLOGY AND MICROBIAL GENETICS	100	**4**
		MBP - III	MOLECULAR BIOLOGY AND MICROBIAL GENETICS	50	**1**
	IV	MBT - IV	IMMUNOLOGY AND MEDICAL MICROBIOLOGY	100	**4**
		MBP - IV	IMMUNOLOGY AND MEDICAL MICROBIOLOGY	50	**1**
		MBT - V	MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY	100	**4**
		MBP - V	MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY	50	**1**

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM
Structure of MICROBIOLOGY under CBCS Allocation of Credits

Year	Semester	Course Code	Course Title	Hrs/ Week L+P+T	Marks (SEE)	Marks in CIA	CREDITS
I B.Sc	I	MBY140	Introduction to microbiology and microbial diversity	4	50	50	**4**
		Practical	Introduction to microbiology and microbial diversity	2+1	50	--	**1**
	II	MBY141	Microbial physiology and biochemistry	4	50	50	**4**
		Practical	Microbial physiology and biochemistry	2+1	--	50	**1**
II B.Sc	III	MBY142	Molecular biology and microbial genetics	4	50	50	**4**
		Practical	Molecular biology and microbial genetics	2+1	50	--	**1**
	IV	MBT143	Immunology and medical microbiology	4	50	50	**4**
		Practical	Immunology and medical microbiology	2+1	--	50	**1**
		MBT144	Microbial ecology and industrial microbiology	4	50	50	**4**
		Practical	Microbial ecology and industrial microbiology	2+1	--	50	**1**

Year	Semester	Course Code	Title of the course (Paper)	Hrs/ Week L+P+T	Marks (SEE)	Marks CIA	Credits
III	**V**	**MBY 126**	Paper 5: Environmental & agricultural microbiology	3	50	50	03
			Practicals	2 +1	--	50	02
	(M.Z.C) & MZC-F	MBY117	Paper 6: Food and industrial microbiology	3	50	50	03
			Practicals	2 +1	--	50	02

Year	Semester	Paper	Course Title	Hours	Marks SEE	Marks CIA	Credits
III M.Z.C	VI	7	E-1 Microbial biotechnology E-2 Advances in Microbiology	3	50	50	03
			Practicals	2	50	--	02
		8A1	**Cluster paper – A** Diagnostic microbiology Practicals	3 2	50	50	03 02
		8A2	Biofertilizers and Biopesticides Practicals	3 2	50 50	50 --	03 02
		8A3	Microbial instrumentation and Biotechniques. Practicals/project work	3 2	50 50	50 --	03 02
		8B1	**Cluster paper – B** Microbes in sustainable agriculture Practicals	3 2	50 50	50 --	03 02
		8B2	Mushroom cultivation Practicals	3 2	50 50	50 --	03 02
		8B3	Management of Human microbial Diseases Practicals/project work	3 2	50 50	50 --	03 02
		8C1	**Cluster paper – C** Biostatistics and Bioinformatics Practicals	3 2	50 50	50 --	03 02
		8C2	Bio safety and Intellectual property rights Practicals/project work	3 2	50 50	50 --	03 02
		8C3	Drug design and Discovery Practicals/project work	3 2	50 50	50 --	03 02

Year	Semester	Paper	Course Title	Hours	SEE Marks	CIA Marks	Credits
III M.Z.C Food	VI	8A1	**Cluster paper – A** Microbial Quality Control in Food and Pharmaceutical Industries Practicals	3 2	50 50	50 --	03 02
		8A2	Food Microbiology and Biotechniques Practicals	3 2	50 50	50 --	03 02
		8A3	Food Microbiology Hygiene & Sanitation Project/Internship	3 2	50 50	50 --	03 02
		8B1	**Cluster paper – B** Post-Harvest Technology Practicals	3 2	50 50	50 --	03 02
		8B2	Sensory Evaluation and Food Packaging Practicals	3 2	50 50	50 --	03 02
		8B3	Food Adulteration & Food Toxicology Project/Internship	3 2	50 50	50 --	03 02
		8C1	**Cluster paper – C** Food processing and preservation Practicals	3 2	50 50	50 --	03 02
		8C2	Food Safety and Quality control Practicals	3 2	50 **50**	50 -	03 02
		8C3	Food Biotechnology Project/Internship	3 2	50 **50**	50 --	03 02

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM
DEPARTMENT OF MICROBIOLOGY

Minutes of Board of Studies 2020-2021

The Board of Studies meeting for I, II, and III B.Sc Microbiology of all semesters for the academic year 2021-2022, at 11 AM on 17/09/2021. The Chairperson Smt. D. Jayasree & other members of the Board of Studies met through Google Meet online and discussed the following agenda points:

❖ Agenda:

The members present were discussed various aspects of the Syllabus, model question papers of both Theory and Practicals for three year B.Sc., Degree Programme in Microbiology and also various pedagogic methods that are to be implemented for the academic year 2021-2022 and the following are the agenda points.

1. Implementing New Revised Curriculum Framework of APSCHE for I & II BSc Microbiology for the academic year 2021-22.
2. Revision of / up gradation of syllabus for all the Semesters of III BSc programme
3. Mode of instruction (60% online+40% off line)
4. Model question papers & blue prints
5. Panel of paper setters
6. SEE: CIA evaluation
7. Additional inputs in the curriculum
8. Proposal for extension activities/ community services/ field trips/ industrial visits for the students
9. Enrolling students in Swayam / MOOC courses of Microbiology
10. Study projects for III B.Sc MZC / Internships for III B.Sc MZC-Food students
11. Value added course / Certificate course on “Introductory to Food Processing & Safety”
12. Any other proposal with the permission of the chair

BOARD OF STUDIES MEETING 2021-22, 17th September 2021

Resolutions:

Agenda point 1: New Revised Curriculum Framework of APSCHE for I & II BSc Microbiology for the academic year 2021-2022
Discussion: The members of BOS discussed the entire syllabus of I & II B.Sc semesters and approved the incorporated changes and given suggestions.
Resolution 1: It is resolved to adopt the same Revised Curriculum Framework of APSCHE 2020 for I & II Year B.Sc students by the Department of Microbiology according to our Teaching, Learning and Evaluation pattern which are in force at present. The changes include…
MBY 140: Deleted the topic from Unit IV "Growth media- Natural, synthetic and semi synthetic media, Basal and complex media, selective, enrichment, enriched and differential media" and incorporated in next semester course MBY 141 – Unit IV
MBY 144: Immunology and Medical Microbiology – Herd Immunity concept in Unit I and General account of Covid 19 disease

Agenda point 2: Revision of / up gradation of syllabus for all the Semesters of III BSc
Discussion: The members of BOS discussed the entire syllabus of 5 & 6 semesters and given their valuable suggestions.
Resolution 2: It is resolved to continue the same syllabus for 5 & 6 semesters of III B.Sc with following revision of papers
MBY 127 P: Study of Microscopic photomicrographs of Bio gas, Bio ethanol producing bacteria

MBY 119: COVID 19 Diagnostic methods

MBY139: Food Microbiology Hygiene & Sanitation - Food Handling procedures (Raw & cooked food) in pandemic situations.

Agenda point 3: Mode of instruction (60% offline + 40% online)
Resolution 3: The members discussed and resolved to approve the same.

Agenda point 4: Model question papers & blue prints
Discussion: The members of BOS discussed the Model question papers for both theory and Practicals.

Resolution 4**:** It is resolved to follow the old pattern of question paper model for all semesters of B.Sc Microbiolgy.

Agenda point 5: Panel of question paper setters & examiners
Discussion: The members of BOS discussed Panel of paper setters & examiners

Resolution 5: It is resolved to approve the list of examiners & paper setters enclosed (Pg. No.09) for the year 2021- 2022.

Agenda point 6: SEE: CIA evaluation
Discussion: The members present discussed the SEE: CIA evaluation and ratified the same.

Resolution 6: Resolved to continue 50:50 CIA & SEE evaluation pattern for I, II & III year B.Sc students

Agenda point 7: Additional inputs in the curriculum
Discussion: The members present discussed the Additional inputs in the curriculum

Resolution 7: It is resolved to approve the additional inputs included in the curriculum

Agenda point 8: Proposal for extension activities, community service / field trips/ industrial visits/ for the students.
Discussion: The members present discussed.

Resolution 8: It is resolved to take the knowledge of present corona pandemic situation and look into alternative department activities and other possibilities

Agenda point 9: Enrolling students in Swayam / MOOC courses of Microbiology

Resolution 9: It is resolved to enroll II and III B.Sc students in Microbiology related online courses through Swayam / MOOCs platforms

Agenda point 10: Student projects for III B.Sc MZC

Discussion: The members present discussed the possibilities of projects depending on the pandemic situation, mode will be decided as wet lab/survey based or may be online surveys as and when required.
Resolution 10: It is resolved and approved the same.

Agenda point 11: Certificate course on "Introductory to Food Processing & Safety"

Resolution 10: It is resolved to continue the same for II B.Sc Microbiology students

Agenda point 12: Use of online pedagogy tools

(i) Use of Amrita virtual Labs (OER) for Practical exercises
(ii) Use of you tube videos for online practical sessions
(iii) Recording the practical experiments and sharing through Google class

Agenda point 13: Any other proposal with the permission of the chairman

- **Signatures of Members:**

S.no	Name	signature
1.	Chairman : Smt.D.Jayasree Head of the Department of Microbiology, Govt. College (A) – Rajamahendravaram.	
2.	Faculty member : Smt P.Suneeta Lecturer in Microbiology Govt. College (A) – Rajamahendravaram	
4.	University nominee: Dr. A. Matta Reddy, Department of Zoology, UCST Aadikavi Nannaya University	
5.	Subject expert : Dr.K.Aruna Head-Dept of Microbiology ASD Govt.college (W), Kakinada.	
6.	Local nominee / Subject expert : T. Sasikala - Dept of Microbiology ABN & PRR College, Kovvur	
7.	Industrial nominee : Sri N.Srinivas Manager, Coca-Cola, Sri sarvaraya Sugars, Bheemadolu.	
9.	Student member : Mr. Hari Naga Papa Rao	

Rajahmundry **Chairman**
Date: 11-06-2020

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

DEPARTMENT OF MICROBIOLOGY

BOS MEETING 2020-2021

List of Examiners/Paper Setters:

S.No	Name of the paper setter	Name of the college &Place
1	S. Anuradha	CR Reddy (W), Eluru
2	R. Sakunthala, K. Jasmin	DNR College, Bhimavaram
3	Y. Anitha	PR College, Kkd
4	Dr.K.Aruna	ASD college, Kkd
5	T. Sasikala	ABN & PRR college, Kovur
6	Y.Neeraja P.Suneela Rani	St. Therissa, Eluru
7	Dr. K. Venkata Reddy	SKSD Mahila kalasala, Thanuku

Members **Chairman**

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS – 2021

CBCS PATTERN FOR MICROBIOLOGY

Paper I: MBY – 140: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

TOTAL HOURS: 60 **CREDITS: 4**

UNIT-I: History of Microbiology & Place of Microorganisms in the living world

No. of hours: 12

History of Microbiology- Theory of spontaneous generation-Biogenesis and abiogenesis; in the context of contributions of Anton von Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Ivanowsky, Martinus Beijerinck and Sergei Winogradsky

Importance and applications of microbiology

Place of Microorganisms in the Living World – Haeckel's three Kingdom concept, Whittaker's five kingdom concept, three domain concept of Carl Woese

UNIT-II: Prokaryotic microorganisms and Viruses **No. of hours: 12**

Ultra structure of Prokaryotic cell- cell wall (in detail); Structure and/Functions (in brief) of cell membrane, cytoplasm, nucleoid, plasmid, inclusion bodies, flagella (brief structure and arrangement), pili, capsule, endospore

General characteristics of Bacteria (Size, shape, arrangement, reproduction) : heterotrophic, autotrophic, parasitic, obligate intracellular parasitic bacteria. General characteristics of Archaea

General characteristics of viruses, Cultivation of Viruses (in brief)

Morphology, Structure and replication of TMV and Lambda

UNIT-III: Eukaryotic microorganisms **No. of hours: 12**

Fungi - Habitat, nutrition, vegetative structure and modes of reproduction; outline classification

Algae - Habitat, thallus organization, photosynthetic pigments, storage forms of food, reproduction.

Protozoa – Habitat, cell structure, nutrition, locomotion, excretion, reproduction, encystment, outline classification

UNIT-IV: Principles of Microscopy, Sterilization and Disinfection **No. of hours: 12**

Principles of microscopy – Compound (Bright field, Dark field, Phase contrast, Fluorescence) and Electron microscopy (SEM and TEM).

Staining Techniques - Simple and Differential staining techniques (Gram staining, spore staining, Acid fast staining).

Sterilization and disinfection techniques –

Physical methods: autoclave, hot- air oven, pressure cooker, laminar air flow, filter sterilization, Radiation methods: UV rays, Gamma rays.

Chemical methods: alcohols, aldehydes, fumigants, phenols, halogens and hypochlorites.

UNIT-V: Isolation pure Culture of Bacteria **No. of hours: 12**

Isolation of Microorganisms from natural habitats.

Pure culture techniques: dilution-plating, Streak-plate, Spread-plate, Pour-Plate and micromanipulator.

Preservation of microbial cultures: sub culturing, overlaying cultures with mineral oils, lyophilization, sand cultures, and storage at low temperature.

INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

TOTAL HOURS: 30 **CREDITS: 1**

1. Microbiology Good Laboratory Practices and Biosafety.
2. Preparation of culture media for cultivation of bacteria
3. Preparation of culture media for cultivation of fungi
4. Physical methods - autoclave, hot-air oven, pressure cooker, laminar air flow, filter sterilization.
5. Light compound microscope and its handling
6. Simple staining
7. Gram's staining
8. Hanging-drop method.
9. Isolation of pure cultures of bacteria by serial dilution and streak/spread/pour plate method.
10. Electron micrographic study of viruses-TMV, HIV, Bacteriophages
11. Observation of electron micrographs of bacterial cells/ Microscopic observation of cyanobacteria (*Nostoc*, *Spirulina*), algae (*Scenedesmus*sp Diatoms) and fungi (*Saccharomyces*, *Rhizopus*, *Aspergillus*, *Penicillium*, *Fusarium*).

- Additional input:
  - Basic techniques of Preservation of bacterial cultures
  - Calibrations of microscopic measurements (Ocular, stage micrometers)- bacteria

SUGGESTED READING:

- Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). Microbiology. 5th Edition, Tata Mc Graw Hill Publishing Co., Ltd., New Delhi.
- Dube, R.C. and Maheswari, D.K. (2000) General Microbiology. S Chand, New Delhi. Edition), Himalaya Publishing House, Mumbai.
- Power, C.B. and Daginawala, H.F. (1986). General Microbiology Vol I & II
- Prescott, M.J., Harley, J.P. and Klein, D.A. (2012). Microbiology. 5th Edition, WCB Mc GrawHill, New York.
- Reddy, S.M. and Reddy, S.R. (1998). Microbiology Practical Manual, 3 rd Edition, Sri Padmavathi Publications, Hyderabad.
- Singh, R.P. (2007). General Microbiology. Kalyani Publishers, New Delhi.
- Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.
- Microbiology Edited by Prescott
- Jaya Babu (2006). Practical Manual on Microbial Metabolisms and General Microbiology. Kalyani Publishers, New Delhi.
- Gopal Reddy *et al.*, Laboratory Experiments in Microbiology

Microbiology Model Question Paper (Theory)

MBY-140: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Paper: I SEMESTER –I

Time: 2 1/2Hrs **Max.Marks:50**

Part-A

Note: Answer ALL questions **4x10 = 40M**

1. a) Discuss the various contributions of Robert Koch and Winogradsky?

   OR

   b) Discuss the controversy over spontaneous generation vs. Biogenesis theory?

2. a) Define differential staining? Explain the any two methods of differential Staining methods.

   OR

   b) Write about Whittaker's five kingdom concept and three domain concept of Carl Woes classification?

3. a) Explain in Detailed about physical methods of sterilization?

   OR

   b) Define Disinfection? Explain the following chemical methods of sterilization Alcohols, Halogens, Aldehydes

4. a) Write an essay on various methods of Preservation Techniques?

   OR

   b) Give a detailed account on ultra structure of Bacterial cell?

Part-B

Answer any TWO questions. All carry equal marks **2 x 5 =10M**

5. Edward Jenner
6. General characteristics of algae
7. Principle and procedure of autoclaving.
8. Differences between Streak plate method &Pour plate method.
9. Structure of flagellum.

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS – 2021

Paper II: MBY 141: MICROBIAL BIOCHEMISTRY AND METABOLISM

TOTAL HOURS: 60 **CREDITS: 4**

UNIT-I: Biomolecules **No. of hours: 12**

General characters and outline classification of Carbohydrates (Monosaccharides-Glucose, fructose, ribose, Disaccharides- Sucrose, Lactose, Polysaccharides- Starch, glycogen, Cellulose)
General characters and outline classification of Lipids and fatty acids (phospholipids, polybêta hydroxy alkanes)
General characteristics of amino acids and proteins. Amino acids in peptidoglycan
Structure of Nucleic acid

UNIT-II: Enzymes **No. of hours: 12**

Properties and classification of Enzymes.
Biocatalysis - induced fit and lock and key models.
Coenzymes and Cofactors.
Inhibition of enzyme activity- competitive, noncompetitive, uncompetitive and allosteric.
Factors effecting enzyme activity

UNIT – III: Analytical Techniques **No. of hours: 12**

Principle and applications of - Colorimerty
Chromatography (paper, thin-layer and column),
Spectrophotometry (UV & visible),
Centrifugation and Gel Electrophoresis (Agarose and SDS).

UNIT – IV: Microbial Nutrition and growth **No. of hours: 12**

Nutritional requirements of Microorganisms and Methods of uptake of nutrients by cell
Nutritional groups of microorganisms- autotrophs, heterotrophs, lithotrophs, organotrophs, phototrophs, chemotrophs
Growth media- Natural, synthetic and semi synthetic media, Basal and complex media, selective, enrichment, enriched and differential media
Microbial Growth- different phases of growth in batch cultures; Synchronous, continuous, biphasic growth.
Factors influencing microbial growth
Methods for measuring microbial growth: Direct microscopy, viable count estimates, turbidometry and biomass.

UNIT- V: Microbial metabolism **No. of hours: 12**

Aerobic respiration - Glycolysis, TCA cycle, ED Pathway, Electron transport
Oxidative and substrate level phosphorylations.
Anaerobic respiration (Nitrate and sulphate respiration)
Fermentation- lactic acid and ethanol fermentations
Outlines of oxygenic and anoxygenic photosynthesis in bacteria

MBP – II: MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY

TOTAL HOURS: 30 **CREDITS: 1**

1. Qualitative Analysis of Carbohydrates.

2. Qualitative Analysis of Aminoacids.

3. Colorimetric estimation of proteins by Biuret / Lowry method.

4. Separation of components of a given mixture using a laboratory scale centrifuge.

5. Separation of mixtures by paper / thin layer chromatography.

6. Demonstration of column packing in any form of column chromatography.

7. Effect of temperature / pH on bacterial growth

8. Demonstration of electrophoretic technique

9. Study and plot the growth curve of E. coli by Turbidometry and standard plate count methods

SUGGESTED READING:

- 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.

- Lehninger, A.L., Nelson, D.L. and Cox, M.M. (1993). Principles of Biochemistry, 2 nd Edition, CBS Publishers and Distributors, New Delhi.

- Sashidhara Rao, B. and Deshpande, V. (2007). Experimental Biochemistry: A student Companion. I.K. International Pvt. Ltd.

- Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd ed., W.H.Freeman

- Voet,D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS - 2021

MB III: MBY – 142: MOLECULAR BIOLOGY AND MICROBIAL GENETICS

TOTAL HOURS: 60 **CREDITS: 4**

UNIT- I: Nucleic acids **No. of hours: 12**

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

UNIT- II : Genetic material and replication **No. of hours: 12**

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

UNIT- III: Gene expression and regulation **No. of hours: 12**

Concept of gene - Muton, recon and cistron; One gene- one polypeptide, one gene- one enzyme and one gene-one product hypothesis.
Genetic code
Structure of ribosomes
Protein synthesis – Transcription and translation in Prokaryotes
Regulation of gene expression in bacteria – *lac* operon
.

UNIT- IV: Mutations, damage and repair **No. of hours: 12** Outlines of DNA damage and repair mechanisms
Mutations - spontaneous and induced, base pair changes, frame shifts, deletions, inversions, tandem duplications, insertions
Mutagens - Physical and Chemical mutagens
Bacterial recombination – Transformation, Conjugation, Transduction (Generalized and specialized transductions)

UNIT- V: Genetic engineering **No. of hours: 12**

Basic principles of genetic engineering: Restriction endonucleases, DNA polymerases and ligases. Vectors.
Outlines of gene cloning methods.
Polymerase chain reaction.
Genomic and cDNA libraries.
General account on application of genetic engineering in industry, agriculture and medicine.

MBP – III: MOLECULAR BIOLOGY AND MICROBIAL GENETICS

TOTAL HOURS: 30 **CREDITS: 1**

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

SUGGESTED READING:

- Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi.
  Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
- Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.
- Lewin, B. (2000). Genes VIII. Oxford University Press, England.
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- Verma, P.S. and Agarwal, V.K. (2004). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Co. Ltd., New Delhi.

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

II BSC; MICROBIOLOGY

Paper III: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

Semester – 3, Model Question Paper

Time: 3hrs **Max Marks: 50**

PART-A

Answer Four of the following; **10x4=40 M**

1. a) Explain semi-conservative mechanism of replication with the help of enzymes involved in it? (Or)
b) Write notes on experiments to prove that DNA is Genetic material?

2. a) Write in detail about various types of mutations?
(Or)
b) Write notes on methods of genetic recombination in bacteria?

3. a) Discuss in detail about types of RNA and their functions?
(Or)
b) Write in detail about genetic code?

4. a) Explain about *Lac Operon* model?
(Or)
b) Write an essay on applications of genetic engineering?

PART – B

Answer any Two questions **5 x 2 = 10 M**

1. Plasmids
2. Physical mutagens
3. SOS repair mechanism
4. Structure of ribosomes
5. Translation
6. PCR
7. Restriction endonucleases
8. PBR 322

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS – 2021

MBY –143: IV: MEDICAL MICROBIOLOGY AND IMMUNOLOGY

TOTAL HOURS: 60 **CREDITS: 4**

UNIT-I: Immune System **No. of hours: 12**

Concept of Innate and Adaptive immunity
Primary and secondary organs of immune system – thymus, bursa fabricus, bone marrow, spleen, lymph nodes and lymphoid tissues
Cells of immune system- Identification and function of B and T lymphocytes, null cells, monocytes, macrophages, neutrophils, basophils and eosinophils
Complement system (in brief)

UNIT-II : Immune response **No. of hours: 12**

Characteristics of antigen (Foreignness, Molecular size, Heterogeneity and solubility) haptens.
Antibodies – basic structure and types.
Generation of Immune Response - Primary and Secondary Immune Response
MHC- Functions of MHC I & II molecules
Generation of Humoral Immune Response (Plasma and Memory cells), Immune complex formation and elimination - Agglutination, Precipitation, Neutralisation, Complement fixation, Phagocytosis
Generation of Cell Mediated Immune Response
Hypersensitivity- definition and types (in brief)
.

UNIT- III: Microbes in Health and Disease **No. of hours: 12**

Normal flora of human body.
Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity, Opportunistic infections, Nosocomial infections.
General account on microbial diseases – causal organism, pathogenesis, epidemiology, diagnosis, prevention and control of the following
Bacterial diseases – Tuberculosis, Typhoid, Botulism
Fungal diseases – Candidiasis.
Protozoal diseases – Malaria.
Viral Diseases - Hepatitis- A and AIDS

UNIT- IV: Principles of Diagnosis **No. of hours: 12**

General principles of diagnostic microbiology- Collection, transport of clinical samples
Identification by culturing
Identification by biochemical/physiological properties
Identification by molecular assays (PCR, DNA probes)
Identification by serological tests (ELISA, Immunofluorescence, Agglutination based tests, Complement fixation)

UNIT- V: Prevention and Treatment **No. of hours: 12**

Vaccines – Active (Natural and recombinant) and passive
Monoclonal antibodies- Production and application
Antimicrobial agents- General modes of action of antibacterial (Penicillin, Streptomycin), antifungal (Amphotericin and Griseofulvin), antiviral (Amantadine, Acyclovir) agents
Interferons
Tests for antimicrobial susceptibility (Disc diffusion)
Antibiotic resistance in bacteria

- Additional input: Herd Immunity concept – Unit IGeneral account of COVID 19 Disease in Unit III

MBP – IV: MEDICAL MICROBIOLOGY AND IMMUNOLOGY

TOTAL HOURS: 30 **CREDITS: 1**

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

SUGGESTED READING:

- Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.

- 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.

- Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11th edition Wiley-Blackwell Scientific Publication, Oxford.

- Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

- Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

- Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Microbiology. 4th edition. Elsevier Publication.

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

Paper-IV: Immunology and medical microbiology

Model Question Paper

Time: 2 1/2hrs **Max Marks = 50**

PART-A

Answer FOUR of the following: **4x10=40 M**

Draw neat labeled diagrams

1. a. Explain types of immunity?

(or)

b. Write notes on cells of immune system and their functions?

2. a. Write in detail about types of antigens and factors effecting antigenicity?

(or)

b. Write notes on antigen and antibody interactions?

3. a. Discuss in detail about collection and transport of clinical samples?

(or)

b.Write In detail about methods of laboratory diagnosis of microbial infections?

4. a. Write in detail about mechanism of action of anti bacterial agents?

(or)

b. explain about the following.

i) Tuberculosis

ii) Hepatitis - A

PART-B

Answer any Two of the following: **5 X 2 = 10 Marks**

5. Secondary organs of immune system.
6. Macrophage
7. ELISA
8. Monoclonal antibodies.
9. Autoimmunity.
10. Normal flora of human body.
11. Antiviral substances.
12. Vaccines.

B.Sc MICROBIOLOGY (CBCS) REVISED SYLLABUS - 2021

MBY 144 – V: MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY

TOTAL HOURS: 60 **CREDITS: 4**

UNIT – I: Microorganisms in environment **No. of hours: 12**

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

UNIT – II : Microorganisms in Food and Water **No. of hours: 12**

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

UNIT – III: Industrial Microbiology **No. of hours: 12**

Microorganisms of industrial importance – yeasts (*Saccharomyces cerevisiae*), moulds (*Aspergillus niger*) bacteria (*E.coli*), actinomycetes (*Streptomyces griseus*).
Screening techniques.
Industrially important Primary and secondary microbial metabolites - Techniques involved in selection of industrially important metabolites from microbes.

UNIT – IV: Fermentation processes **No. of hours: 12**

Design of fermenter (for control of pH, temperature, dissolved oxygen, foaming and aeration)
Types of fermenter – batch, continuous and fed batch.
Types of fermentation processes – solid state, liquid state, batch, fed-batch, continuous.
Fermentation media (Crude and synthetic media; molasses, corn- steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates)
Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

UNIT – V: Microbial Productions **No. of hours: 12**

Microbial production of Industrial products: Citric acid, Ethanol, Penicillin, Glutamic acid, vitamin B12, Amylase, Yogurt
Microbial cells as food- SCP

MBP – V: MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY

Total hours: 30 **Credits: 1**

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

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM

III B.Sc MICROBIOLOGY (CBCS) SYLLABUS

SEMESTER- V, PAPER – V

MBY – 126 : ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY

UNIT – I

- Terrestrial Environment: Soil profile and soil micro flora
- Aquatic Environment: Micro flora of fresh water and marine habitats
- Atmosphere: Aeromicroflora and dispersal of microbes

UNIT – II

- Role of microorganisms in nutrient cycling (Carbon, nitrogen, phosphorus).
- Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for fecal coli forms (b) Membrane filter technique.
- Microbial interactions – mutualism, commensalism, antagonism, competition, parasitism, predation.

UNIT – III

- 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 (oxidation ponds, trickling filter, activated sludge process and septic tank) and tertiary sewage treatment.

UNIT – IV

- Plant Growth Promoting Microorganisms - Mycorrhizae, Rhizobia, *Azospirillum, Azotobacter, Frankie,*Phosphate-solubilizers and Cyanobacteria.
- Outlines of biological nitrogen fixation (symbiotic, non-symbiotic).
- Biofertilizers -*Rhizobium*.

UNIT – V

- Concept of disease in plants. Symptoms of plant diseases caused by fungi, bacteria, and viruses. Plant diseases - groundnut rust, Citrus canker and tomato leaf curl.
- Principles of plant disease control**.**

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

III BSC MICROBIOLOGY

Paper – V: Environmental & agricultural Microbiology

Model Question Paper

Time: 21/2 hours **Max Marks: 50**

SECTION - A

Answer ALL of the following questions. **(4 x 10 =40marks)**
Draw neat and labeled diagrams wherever necessary

1. a) Describe Soil profile and Soil Micro flora

(or)

b) Write about Aeromicroflora and dispersal of microbes

2. a) Explain Microbial interactions

(or)

b) Discuss the role of Microorganisms in carbon cycle

3. a) Give an account on Sewage treatment

(or)

b) Write the Methods of Solid waste disposal

4. a) Describe plant growth promoting microorganisms

(or)

b) Describe the concept and principles of plant disease control.

SECTION – B

Answer any TWO of the following questions **(2 x 5 = 10 marks)**

5. Extremophiles
6. MPN
7. Antagonism
8. BOD
9. Marine Micro flora
10. Rhizobium
11. Citrus Canker
12. Non Symbiotic nitrogen fixation

III B.Sc : MICROBIOLOGY - SEMESTER-V

ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY

Practical syllabus

CREDITS: 2

1. Preparation of soil extract agar and any one culture media for algal growth
2. Isolation of microbes (bacteria and fungi) from soil.
3. Study of air micro flora by petriplate exposure method.
4. Microbiological Analysis of potable water Standard Plate Count
5. Determination of Dissolved Oxygen (DO) of water samples.
6. Isolation of *Rhizobium* from root nodules.
7. Isolation of actinomycetes on I.S.P. media (International Streptomyces project media)
8. Observation of photo micrographs of plant diseases of local importance - Citrus canker, Tikka disease of Groundnut, Bhendi yellow vein mosaic, Rusts, Smuts, Powdery mildews, Tomato leaf curl.

SUGGESTED READINGS

- Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
- Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, Wiley Blackwell, 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. 2ndedition. John Wiley & Sons Inc. New York & London.
- Okafor, N (2011). Environmental Microbiology of Aquatic & Waste systems. 1st edition, Springer, New York.
- Singh A, Kuhad, RC & Ward OP (2009). Advances in Applied Bioremediation. Volume 17, Springer- Verlag, Berlin Hedeilberg

GOVERNMENT COLLEGE (A) RAJAMAHENDRAVARAM

III B.Sc MICROBIOLOGY (CBCS) SYLLABUS

SEMESTER- V, PAPER – VI

MBY - 117 : FOOD AND INDUSTRIAL MICROBIOLOGY

CREDITS: 3

UNIT- I

- 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

- 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

- Microorganisms of industrial importance – yeasts, (*Saccharomyces cerevisiae*) moulds, (*Aspergillus niger*) Bacteria (*E.coli*), Actinomycetes (*Streptomyces griseous*).
- Outlines of Isolation and Screening and strain improvement of industrially-important microorganisms.

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UNIT – IV

- Types of fermentation processes – solid state, liquid state, batch, fed- batch, continuous. Basic concepts of Design of Fermentor.
- Ingredients of Fermentation media
- Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

UNIT – V

- Microbial production of Industrial products - Citric acid, Ethanol, amylases, penicillin, glutamic acid and vitamin B12.

- **Additional input:** Recycling of industrial wastes

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM III BSC; MICROBIOLOGY

FOOD AND INDUSTRIAL MICROBIOLOGY

PAPER – V, Model Question Paper

Time: 21/2 hours **Max Marks: 50**

SECTION - A

Answer ALL of the following questions. **(4 x 10 =40marks)**
Draw neat and labeled diagrams wherever necessary

1. a) Write about Intrinsic and extrinsic parameters that affect microbial growth in food

(or)

b) Explain Food-borne diseases and their detection

2. a) Give an account on Principles of food preservation

(or)

b) Write about Microorganisms as food

3. a) Give an account Microorganisms of industrial importance

(or)

b) Give an account on Outlines of Isolation and Screening of industrially-important microorganisms.

4. a) Write a note on the downstream process

(or)

b) Explain in detailed about Industrial production of penicillin

SECTION – B

Answer any TWO of the following questions **(2x5= 10 marks)**

5. Food intoxication
6. Probiotics
7. Fermentor
8. Salmonellosis
9. Amylase production
10. Industrial importance of Actinomycetes
11. Ingredients of Fermentation media
12. Penicillin

III B.Sc: MICROBIOLOGY - SEMESTER-V

FOOD AND INDUSTRIAL MICROBIOLOGY

Practical syllabus

CREDITS:2

1. Isolation of bacteria and fungi from spoiled bread/fruits/vegetables
2. Preparation of Yogurt/Dahi
3. Determination of the microbiological quality of milk sample by MBRT
4. Isolation of antagonistic microorganisms by crowded plate technique
5. Design of fermentor (identification of diagrams of various types of fermentors and labeling of parts)
6. Microbial fermentation for the production and estimation of ethanol from Grapes.
7. Microbial fermentation for the production and estimation of citric acid.

SUGGESTED READING

1. Adams MR and Moss MO. (1995). Food Microbiology. 4th edition, New Age International (P) Limited Publishers, New Delhi, India.
2. Banwart JM. (1987). Basic Food Microbiology. 1st edition. CBS Publishers and Distributors, Delhi, India.
3. Casida LE. (1991). Industrial Microbiology. 1st edition. Wiley Eastern Limited.
4. Crueger W and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd Edition. Panima Publishing Company, NewDelhiFrazier WC and Westhoff DC. (1992). Food Microbiology. 3rd edition. Tata McGraw- Hill Publishing Company Ltd, New Delhi, India.
5. Jay JM, Loessner MJ and Golden DA. (2005). Modern Food Microbiology. 7thedition, CBS Publishers and Distributors, Delhi,India
6. Patel AH. (1996). Industrial Microbiology .1st Edition. MacMillan India Limited Publishing Company Ltd. New Delhi, India
7. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition, Elsevier ScienceLtd.
8. Tortora GJ, Funke BR, and Case CL. (2008). Microbiology: An introduction. 9th Edition. Pearson Education

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM

III B.Sc MICROBIOLOGY (CBCS) SYLLABUS

VI- SEMESTER -PAPER-VII (Elective – 1)

MBY - 127: MICROBIAL BIOTECHNOLOGY

CREDITS: 3

UNIT- I

- Microbial biotechnology: Scope and its applications in human therapeutics, agriculture (Biofertilizers, PGPR, Mycorrhizae), environmental, and food technology.
- Genetically engineered microbes for industrial application: Bacteria and yeast

UNIT- II

- Recombinant microbial production processes in pharmaceutical industries - Streptokinase, recombinant vaccines (Hepatitis B vaccine).
- Over view of production and applications of Microbial polysaccharides, Bioplastics and Microbial biosensors

UNIT- III

- Microbial based transformation of steroids and sterols.
- Bio-catalytic processes and their industrial applications: Production of high fructose syrup and production of cocoa butter substitute.
- Immobilization methods and their application: Whole cell immobilization

UNIT- IV

- Bio-ethanol and bio-diesel production: commercial production from lignocellulosic waste and algal biomass.
- Biogas production: Methane and hydrogen production using microbial culture. Microorganisms in bioremediation: Degradation of xenobiotics.
- Mineral recovery, removal of heavy metals from aqueous effluents.

UNIT- V

- Outlines of Intellectual Property Rights: Patents, Copyrights, Trademarks

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM

B.Sc MICROBIOLOGY (CBCS) SYLLABUS

MBY - 127: MICROBIAL BIOTECHNOLOGY

Model Question Paper

Time: 2 1/2Hrs **Max.Marks:50**

Section – A

ANSWER ANY Four OF THE FOLLOWING **4 x 10=40 marks**

Draw labeled diagrams wherever necessary

1. a) Discuss applications of microbial biotechnology?

   (or)

   b) Industrial applications of genetically engineered microbes?
2. a) Write production process of recombinant Hepatitis B vaccine?

   (or)

   b) Explain production process ad applications of microbial polysaccharides and bioplastics?
3. a) Describe immobilization methods and applications?

   (or)

   b)Explain microbial based transformation of steroids?
4. a) Explain in bio-diesel production?

   (or)

b) Out lines of intellectual property rights for copyrights and trademarks?

Section B

Answer any Two of the following **2x5=10 marks**

5. Biofertilizer
6. Streptokinase
7. Biosensors
8. Whole cell immobilization
9. Xenobiotics
10. Patents
11. Bio ethanol
12. Bioplastics

GOVERNMENT COLLEGE (A), RAJAMAHENDRAVARAM

III BSC MICROBIOLOGY

SEMESTER-VI: MICROBIAL BIOTECHNOLOGY

Practical Syllabus

TOTAL HOURS: 36 CREDITS: 2

1. Yeast cell immobilization in calcium alginate gels
2. Enzyme immobilization by sodium alginate method
3. Pigment production from fungi (Trichoderma / Aspergillus / Penicillium)
4. Isolation of xylanase producing bacteria
5. Isolation of lipase producing bacteria
6. Study of algal Single Cell Proteins
7. Study of Microscopic photomicrographs of Bio gas, Bio ethanol producing bacteria

SUGGESTED READING

1. Crueger W, Crueger A (1990) Biotechnology: **A text Book of Industrial Microbiology** 2nd edition Sinauer associates, Inc.
2. Demain, A. L and Davies, J. E. (1999). **Manual of Industrial Microbiology and Biotechnology**, 2nd Edition, ASM Press.
3. 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
4. Prescott, Harley and Klein's **Microbiology** by Willey JM, Sherwood LM, Woolverton CJ (2014), 9th edition, Mc Graw Hill Publishers.
5. Ratledge, C and Kristiansen, B. (2001). **Basic Biotechnology**, 2nd Edition, Cambridge University Press.
6. Stanbury PF, Whitaker A, Hall SJ (1995) **Principles of Fermentation Technology** 2nd edition., Elsevier Science
7. Swartz, J. R. (2001). **Advances in Escherichia coli production of therapeutic proteins. CurrentOpinion in Biotechnology**, 12, 195–201.

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM

III B.Sc MICROBIOLOGY

VI– SEMESTER – PAPER-VII (Elective – 2)

MBY – 128: ADVANCES IN MICROBIOLOGY

TOTAL HOURS: 36 **CREDITS:3**

UNIT- I

Salient features of sequenced microbial genomes, core genome pool, flexible Genome pool and concept of Pangenome. Evolution of bacterial virulence - Genomic islands, Pathogenicity islands (PAI) and their characteristics.

UNIT- II

Brief history and development of Metagenomics. Understanding bacterial Diversity using Metagenomics approach. Prospecting genes of biotechnological Importance using Metagenomics. Basic knowledge of viral metagenome, Metatranscriptomics, metaproteomics and metabolomics

UNIT- III

Epiphytic fitness and its mechanism in plant pathogens. Hypersensitive Response (HR) to plant pathogens and its mechanism. 'Ilpe three secretion Systems (TTSS) of plant and animal pathogens.

UNIT - IV

Biofilms: Tlpes of microorganisms, molecular aspects and significance in Environment, health care, virulence and antimicrobial resistance

UNIT.V

Networking in biological systems, Quorum sensing in bacteria. Co-ordinated Regulation of bacterial virulence factors. Basics of synthesis of poliovirus in Laboratory. Future implications of synthetic biology with respect to bacteria And viruses.

MBY – 128: ADVANCES IN MICROBIOLOGY

Model Question Paper

Time: 2 1/2 hours Maximum: 50marks

SECTION - A

Answer ALL of the following questions 4 x l0 = 40marks

Draw neat and labeled diagrams wherever necessary

1. a) Discuss about Salient features of Sequenced microbial genomes.

(or)

b) Write about the Characteristics of Genomic islands and Pathogenicity islands.

2. a) Describe Brief history and development of Metagenomics.

(or)

b) Give an account on basic knowledge of metatranscriptomics and metaproteomics.

3. a) What is Epiphytic fitness and Discuss its mechanism in plant pathogens.

(or)

b) Explain the mechanism of Hypersensitive response to plant pathogens.

4. a) Write about the Significance of Biofilms in environment.

(or)

b) Discuss about Basics of Synthesis ofpoliovirus in laboratory.

SECTION - B

Answer any FIVE of the following questions 2x5=10 M
=20marks Draw neat and labeled diagrams wherever necessary

1. Quorum Sensing
2.Viral metagenome
3. TTSS
4.Virulence
5.Biofilms
6.Pangenome
7.Metabolomics
8. Antimicrobial resistance

MBY – 128: ADVANCES IN MICROBIOLOGY

Practical Syllabus

TOTALHOURS:36 **CREDITS:2**

1. Extraction of metagenomic DNA from soil
2. To understand the impediments in extracting metagenomic DNA fromsoil
3. PCR amplification of metagenomic DNA using universal l6s ribosomal gene primers
4. Case study to understand how the poliovirus genome was synthesized in the laboratory
5. S.Case study to understand how networking of metabolic pathways in bacteria takes place

SUGGESTED READING :

1. Fraser CM, Read TD and Nelson KE. Microbial Genomes, 2004, HumanaPress
2. Miller RV and Day MJ. Microbial Evolution- Gene establishment, survival and exchange, 2OO4, ASM Press
3.Bul1 AT. Microbial Diversity and Bioprospecting, 2004, ASM Press.
4. Sangdun C. Introduction to Systems Biolory, 2007, Humana Press
5. Klipp E, Liebermeister W. Systems Biolory - A Textbook,2OO9, Wiley - VCH Verlag
6. Caetano-Anolles G. Evolutionary Genomics and Systems Biologr, 2010, John Wiley and Sons
7. Madigan MT, Martink JM, Dunlap PV and Clark DP (2014) Brook's Biolory of Microorganisms, 14th edition, Pearson-Bejamin Cumming Wilson BA, Salyers AA Whitt DD and Winkler ME (2Oll)Bacterial Pathogenesis- A molecular Approach, 3rd edition, ASM Press,
8. Bouarab K, Brisson and Daayf F (2009) Molecular Plant-Microbe interaction CAB International.
9. Voit Eo (2012) A First Course in Systems Biologr, Ist edition,Garland Science

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM

III B.Sc MICROBIOLOGY (CBCS) SYLLABUS

CLUSTER PAPERS UNDER ELECTIVE

MBY -119: 8A1 - DIAGNOSTIC MICROBIOLOGY

TOTAL HOURS: 36 **CREDITS: 3**

UNIT- I **No. ofhours: 8**

- Study of Bacteria (Tuberculosis and Typhoid) Viral (Influenza and HIV) Fungal (Aspergillosis and Candidiasis) and Protozoan Malaria and Amebiasis) diseases affecting humans.

UNIT- II

- 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

- 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

- Serological Methods - Agglutination, ELISA, immune fluorescence, Nucleic acid based methods - PCR, and PCR TYPES, Nucleic acid probes.
- Typhoid, Dengue, Swine flu and HIV.
- COVID 19 Diagnostic methods

UNIT- V

- 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

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM

B.Sc MICROBIOLOGY (CBCS) SYLLABUS
8A1 - DIAGNOSTIC MICROBIOLOGY

Model Question Paper

Time: 2 1/2Hrs **Section – A** **Max.Marks:50**

Answer Any Four of The Following **4 x 10=40 marks**
Draw labeled diagrams wherever necessary

1. a) What is tuberculosis? Describe the characters of the causal agent and discus the pathogenesis of the disease?

(or)

b) Describe the causal agent, laboratory diagnosis, and prevention ad treatment of influenza?

2. a) Describe the various methods used to collect samples?

(or)

b)Describe various methods of transport of clinical samples to laboratory and storage?

3. a) Write Grams staining and Giems-staining techniques for examination of clinical samples

(or)

b) Write composition and preparation of culture media for identification of pathogens?

4.a) Explain serological methods for identification of pathogens?

(or)

b) Give a concise account of disk diffusion tests for antimicrobial drug susceptibility?

Section B

Answer any five of the following **2x5=10 marks**

5. Aspergillosis
6. Malaria
7.Transport media
8 .Ziehl-Neelson staining
9. Lowenstein-Jensen media
10.ELISA

MBY -119: 8A1 - DIAGNOSTIC MICROBIOLOGY
PRACTICAL Syllabus

TOTAL HOURS: 36 CREDITS: 2

1. Collection transport and processing of any one of the following clinical specimens (Blood/ Urine/ Stool/Sputum).
2. Receipts, Labeling, recording and dispatching clinical specimens.
3. Isolation of bacteria in pure culture and Antibiotic sensitivity.
4. Identification of common bacteria (*E.coli, Staphylococcus aureus and Streptococcus sps)* by studying their morphology, cultural character, Biochemical reactions, and other tests.
5. Maintenance and preservation of stock culture.

SUGGESTED READING

1. Ananthanarayan R and Paniker CKJ (2009) **Textbook of Microbiology**, 8th edition, Universities Press Private Ltd.
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013) Jawetz, Melnick and Adelberg's **MedicalMicrobiology**. 26thedition. McGraw Hill Publication
3. Collee JG, Fraser, AG, Marmion, BP, Simmons A (2007) Mackie and Mccartney Practical**Medical Microbiology**, 14th edition, Elsevier.
4. Randhawa, VS, Mehta G and Sharma KB (2009) **Practicals and Viva in Medical Microbiology** 2nd edition, Elsevier India Pvt Ltd
5. Tille P (2013) Bailey's and Scott's **Diagnostic Microbiology**, 13th edition, Mosby

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM

III B.Sc MICROBIOLOGY (CBCS) SYLLABUS

8A2- INSTRUMENTATION AND BIOTECHNIQUES

CREDITS: 3

UNIT-I

- Bright field and dark field microscopy. Fluorescence Microscopy, Phase contrast Microscopy, Confocal Microscopy and Micrometry

UNIT- II

- Principle and applications of study of absorption Spectra of bimolecules
- Analysis of bimolecular using UV and visible range Turbidometry.

UNIT – III

- Principles and applications of paper chromatography (including Descending and 2D), Column packing and fraction collection. Gel filtration
- chromatography, ion-exchange chromatography' GLC and HPLC'

UNIT-IV

- Principle and applications of native polyacrylamide gel electrophoresis, SDS polyacrylamide gel electrophoresis, 2D gel electrophoresis and Iso electric focusing.

UNIT- V

- Preparative and analytical centrifugation, fixed angle and swinging bucket rotors. RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation and ultracentrifugation'

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM B.Sc MICROBIOLOGY (CBCS) SYLLABUS

THIRD YEAR – 6th SEMESTER

8A2: INSTRUMENTATION AND BIOTECHNIQUES

Model Question Paper

Time: 3 Hrs **Maximum: 60 Marks**

Section - A

Answer Any Four of the Following **(4 x 10 = 40marks)**

Draw neat and labeled diagrams wherever necessary

1. a) Write an essay on phase contrast microscopy. (or)
   b) Explain Micrometry.
2. a) Write about principles and applications of paper Chromatography. (or)
   b)Describe Gel filtration chromatography and ion exchange chromatography.
3. a) Explain details about SDS-PAGE. (or)
   b) Write about principle and applications of native polyacrylamide gel Electrophoresis.
4. a) Write principle and applications of study of absorption spectra of biomolecules. (or)
   b) Discuss about Ultracentrifugation and density gradient centrifugation.

Section - B

Answer any Twoof the following questions **(2 x5 = 10marks)**

5. 2D gel Elechophoresis
6. Immunofluorescence
7. GLC
8. Confocal microscopy
9. RCF
10. Isoelechic focusing

8A2 - INSTRUMENTATION AND BIOTECHNIQUES
PRACTICALS

CREDITS:2

1. Study of fluorescent micrographs to visualize bacterial cells.
2. Ray diagrams of phase contrast microscopy and Electron microscopy.
3. Separation of mixtures by paper / thin layer chromatograph.
4. Demonstration of column packing in any form of column chromatography.
5. Separation of protein mixtures by any form of chromatography.
6. Separation of protein mixtures by Polyacrylamide Gel Electrophoresis(PAGE).
7. Determination of lambda max for an unknown sample and calculation of extinction coefficient.
8. Separation of components of a given mixture using a laboratory scale centrifuge.
9. Understanding density gradient centrifugation with the help of pictures.

SUGGESTED READING

1. NelsonDL and CoxMM'(2008).LehningerPrinciplesofBiochemistry,5e Ed., W.H. Freeman and ComPany'
2. Willey MJ, Sherwood LM & Woolverton C J' (2013)' Prescott' Harley and Klein's Microbiolos" gthEd" McGraw Hill'
3. Karp G. (2010) Cell and Molecular Biolory: Concepts and Experiments' 6th edition. John Wiley & Sons' Inc'
4. De Robertis EDP and De Robertis EMF. (2006). cell and Molecular BioloSl.8thedition.LipincottWilliamsandWilkins,Philadelphia.
5. Cooper G.M. and Hausman R'E' (2009)' The Cell: A Molecular Approach' Sft Edition. ASM Press Associates, MA. & Sunderland, Washington D'C', Sinauer

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM

III B.Sc MICROBIOLOGY

MBY -121: 8A3 -BIOFERTILIZERS AND BIOPESTICIDES

TOTAL HOURS: **CREDITS: 3**

UNIT – I

- General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers.
- Symbiotic N2 fixers: Rhizobium - Isolation, characteristics, types, innoculum production and field application, legume/pulses plants
- Frankia from non-legumes and characterization.
- Cyanobacteria and Azolla, characterization, mass multiplication, Role in rice cultivation, Crop response, field application.

UNIT – II

- Free living Azospirillum, Azotobacter - isolation, characteristics, mass innoculum production and field application.

UNIT – III

- Phosphate solubilizing microbes - Isolation, characterization, mass innoculum production, field application

UNIT – IV

- Importance of mycorrizal innoculum, types of Mycorrhizae and associated plants, Mass innoculum production of VAM, field applications of Ectomycorrhizae and VAM.

UNIT – V

- General account of microbes used as bioinsecticides and their advantages over synthetic pesticides. Bacillusthuringiensis- production, Field applications.
- Viruses – NPV cultivation and field applications.

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM

III B.Sc MICROBIOLOGY
8A3 -BIOFERTILIZERS AND BIOPESTICIDES

Model Question Paper

Time: 2 1/2Hrs **Section – A** **Max.Marks: 50**

Answer Any Four of The Following **4 x 10=40 marks**
Draw labeled diagrams wherever necessary

1. a) Write an account on microbes used as biofertilizers for various crops and their advantages over chemical fertilizers?

(or)

b) Describe mass multiplication of cyanbacteria and field application in rice cultivation?

2 a) Explain Isolation mass multiplication of *Azospirillum* and field application?

(or)

b) Describe isolation, mass multiplication field application of Azatobacter?

3. a) Describe isolation, mass multiplication field application of phosphate solubilizing microbes? (or)

b) List out various phosphate solubilizing microbes and its importance?

4.a) Explain various types of mycorrhizae?

(or)

b) How NPV cultivated and its applications in field?

Section B

Answer any Two of the following **2x5=10marks**

6. Rhizobium
7. Frankia
8. Azolla
9. Bioinsecticides
10. Ectomycorrhizae
11. Biofertilizers
12. Sedarophores

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM

III B.Sc MICROBIOLOGY (CBCS) SYLLABUS

MBY -120: 8B1 - Microbes in Sustainable Agriculture

CREDITS: 3

UNIT – I:

1. Soil as Microbial Habitat, soil properties. Diversity and distribution of Microorganisms in soil. Mineralization of cellulose, hemicelluloses, lignin, Phosphate, nitrate.

UNIT - II:

2. Carbon dioxide, methane, nitrous oxide, nitric oxide -production and control

UNIT – III:

3. Biocontrol mechanisms - Microorganisms used as Biocontrol agents against Microbial plant pathogens, Insects, Weeds.

UNIT - IV:

4. plant growth promoting bacteria, biofertilizers - symbiotic (Bradirhizobium, Rhizobium, Frankia), Non symbiotic (Azospirillum, Azotobacter, Mycorrhizae, MHBs, phosphate solubilizers, algae).
5. Novel combination of microbes as biofertilizers, PGPRs

UNIT – V:

6. Biotech feed, silage, Biomanure, biogas, biofuels - advantages and processing parameters. Advantages,
7. Social and environmental aspects of GM crops, BT crops, golden rice, transgenic animals.

8B1 - MICROBES IN SUSTAINABLE GRICULTURE

PRACTICALS

CREDITS: 2

1. Study of soil Profile.
2. Study of micro flora of different types of soils.
3. Rhizobium as soil inoculants characteristics and field application.
4. Azotobacter as soil inoculants characteristics and field application.
5. Design and functioning of a biogas plant.
6. Isolation of cellulose degrading organisms.

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III B.Sc MICROBIOLOGY (CBCS) SYLLABUS

MBY – 129: 8B2 - MUSHROOM CULTTVATION

TOTAL HOURS: 36 **CREDITS: 3**

UNIT – I

No of Hours: 8

8. History and scope of mushroom cultivation. Types of edible mushrooms available in India. Mushroom morphology. Different parts of a typical Mushroom & variations in mushroom morphology. Button, Paddy straw& Oyster- General Morphology, distinguishing characteristics.

UNIT - II

No of Hours: 6

9. Classification Based on occurrence, natural habitats, color of spores, Morphology of fruiting layers, Structure and texture of fruiting bodies. Key to Differentiate edible from Poisonous mushrooms. Economic importance of edible Mushrooms.

UNIT - III

No of Hours: 10

10. Cultivation of Button, Oyster and Paddy straw Mushrooms: Collection of raw Materials, compost & composting, spawn & spawning, casing & case run, Cropping, picking & packing, marketing.

UNIT – IV

No of Hours: 6

11. Nutritional profile of mushrooms, health benefits of mushrooms. Mushroom Toxins and illness, mushroom recipes.

UNIT - V

No of Hours: 6

12. Effect of physical and chemical factors on the growth of mushrooms. Crop Management during spawn running, casing to mushroom period, the cropping Period. Post harvest management.

8B2 - MUSHROOM CULTIVATION PRACTICALS

CREDITS: 2

1. Microscopic and anatomical observations of different mushroom species. .
2. Preparation of spawn under controlled conditions (preparation of mother Spawn in saline bottle and polypropylene bag and their multiplication
3. Types of Compost preparation and sterilization.
4. Mushroom bed preparation - paddy straw, sugarcane trash, maize Straw, banana leaves/waste.
5. Spawning, casing, Cropping and harvesting.
6. Substrate preparation, bed preparation, spawning and cropping.
7. Diseases of mushrooms (photographs).
8. Visit to relevant Labs/Field Visits

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III B.Sc MICROBIOLOGY (CBCS) SYLLABUS

MBY – 131: 8B3: MANAGEMENT OF HUMAN MICROBIAL DISEASES

TOTAL HOURS: 36 **CREDITS: 3**

UNIT – I

- Introduction to human microbial diseases caused by bacteria, virus, fungi and protozoa. Definition and concept of health, disease, infection, and pathogen. Types of human microbial diseases and their transmission, causative agents and symptoms of human microbial diseases.

UNIT – II

- General account of epidemiology: principles of epidemiology, current epidemics (AIDS, nosocomal, acute respiratory syndromes). Measures for prevention of epidemic – global health consideration, emerging and re-emerging infectious diseases. Biological warfare and Biological weapons.

UNIT – III

- Over view of diseases caused by virus – AIDS, Hepatitis, Influenza, Rabies, Chikengunya and Polio, poxvirus, herpes virus, chiken pox virus – history, causative agent, pathogenesis, diagnosis, drugs and inhibitors.

UNIT – IV

- Harmful microbial interaction: human entry of pathogens into the host, types of bacterial pathogens, mechanism of bacterial pathogenicity, colonization and growth, virulence, virulence factors, exotoxins, enterotoxins, endotoxins, neurotoxins – avoidance of host defense mechanisms, damage to host cell, host factors for infection & innate resistance to infection.

UNIT – V

- Laboratory diagnosis of Common infective syndromes and parasitic manifestations; Methods of transmission and role of vectors- biology of vectors. (1) House fly (2) Mosquitoes (3) sand fly. Need and significance of epidemiological studies.

  Epidemiological investigations to identify a disease, Problems of drug resistance and drug sensitivity. Drug resistance in bacteria.

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM III B.Sc

MICROBIOLOGY (CBCS) SYLLABUS

6th - SEMESTER PAPER

MBY- 132 - 8C1 Biostatistics and Bioinformatics

TOTAL HOURS: 36 **CREDITS: 3**

UNIT – I **No.of hours: 7**

- Definition, nature and scope of bioinformatics. Bioinformatics versus computational biology. Branches of bioinformatics. Basic concepts in bioinformatics.

UNIT – II **No.of hours: 7**

- Biostatistics: probability and distribution. Poisson and binomial distributions. Measurement of central tendency (mean, mode and range) and dispersion (standard error and standard deviation).

UNIT – III **No.of hours: 7**

- Computational phylogenetics – various applications. Phylip software. Microarray, Bio informatics – Experimental design & Over view of data analysis.

UNIT – IV **No.of hours: 8**

- Basic concepts of system biology. Over view of computer aided drug design. Searching sequence database using BLAST. Concept of genomics and proteomics.

UNIT – V **No.of hours: 7**

- Population and sampling test of significance. Student t-test for small samples. Chi^2 test for analysis, correlation and regression. Computer applications in Biotechnology.

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III B.Sc MICROBIOLOGY

Practical Syllabus: 8C1 Biostatistics and Bioinformatics

TOTAL HOURS: 36 **CREDITS: 2**

1. Isolation of plasmid DNA from *E.coli* cells
2. Quantitative and qualitative analysis of proteins / DNA by using spectrophotometer.
3. Demonstration of Southern hybridization
4. Demonstration of amplification DNA by PCR.
5. Use of software for sequence analysis of nucleotides and proteins.
6. Problem related to t – test and chi^2 test.

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MICROBIOLOGY (CBCS) SYLLABUS

MBY – 133 - 8C 2 Bio safety and Intellectual property right

CREDITS: 3

UNIT – I

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

UNIT – II

- 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.

UNIT – III

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

UNIT – IV

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

UNIT – V

- Copy right and rights related to copy right, patent claims, the legal decision – making process.
- International standards as per WHO, ISI, bio safety and validation. International organization agencies and treaties.

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III B.Sc MICROBIOLOGY

Practical Syllabus

TOTAL HOURS: 36 **CREDITS: 2**

1. Study of components and design of a BSL – III laboratory
2. Filing applications for approval from bio safety committee
3. Filing primary applications for patents
4. Study of steps of patenting process
5. A case study of patent.
6. Study of bio safety measures in pharmaceutical industry.
7. Study on QA & QC parameters followed in R&D laboratory.

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MICROBIOLOGY (CBCS) SYLLABUS

MBT- 134 - 8C3 DRUG DESIGN AND DISCOVERY

Unit – I

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).

Unit – II

Sources of Drugs- Microbial drugs, Plants as a source of drugs, E. coli as a source of recombinant therapeutic proteins. Expression of recombinant proteins in yeasts, animal cell culture systems.. Rational drug design and Combinatorial approaches to drug discovery

Unit-III

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-IV

Vaccines and adjuvant- Traditional vaccine preparations, attenuated, dead or inactivated bacteria, Attenuated and inactivated viral vaccines, Toxoids, antigen-based and other vaccine preparations. Impact of genetic engineering on vaccine technology. Peptide vaccines and vaccine vectors. Adjuvant technology: Adjuvant mode of action.

Unit – V

Nucleic acid as drugs- Gene therapy: Basic approach to gene therapy, Vectors used in gene therapy -Retroviral vectors, Additional viral-based vectors, Manufacture of viral vectors, Non-viral vectors. Gene therapy and genetic disease, cancer, Gene therapy and AIDS. Genebased vaccines.

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III B.Sc MICROBIOLOGY (M.Z.C – Food)

MBY -122: 8A1 - Microbial Quality Control in Food and Pharmaceutical Industries

TOTAL HOURS: **CREDITS: 3**

UNIT – I

- Good laboratory practices - Good microbiological practices.
- Biosafety cabinets – Working of biosafety cabinets, using protective clothing, specification for BSL-1, BSL-2, BSL-3.
- Discarding biohazardous waste – Methodology of Disinfection, Autoclaving & Incineration

UNIT – II

- Culture and microscopic methods - Standard plate count, Most probable numbers, Direct microscopic counts,
- Biochemical and immunological methods: Limulus lysate test for endotoxin, gel diffusion, sterility testing for pharmaceutical products

UNIT – III

- Molecular methods - Nucleic acid probes, PCR based detection, biosensors.

UNIT – IV

- Enrichment culture technique, Detection of specific microorganisms - on XLD agar, SalmonellaShigellaAgar, Manitol salt agar, EMB agar, McConkey Agar, Saboraud Agar
- Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centres (COB, 10 min Resazurin assay).

UNIT – V

- Hazard analysis of critical control point (HACCP) - Principles, flow diagrams, limitations.
- Microbial Standards for Different Foods and Water – BIS standards for common foods and drinking water.

References:

1. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer
2. Pharmaceutical Microbiology – W.B. Hugo
3. . Frazier, W.C. 1978. Food Microbiology.McGraw Hill.

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III B.Sc MICROBIOLOGY

8A1 -Microbial Quality Control in Food and Pharmaceutical Industries

Model Question Paper

Time: 2 1/2Hrs **Max.Marks:50**

Section – A

Answer Any Four of the Following 4 **x 10=40 marks**

Draw labeled diagrams wherever necessary

1. a) Discuss Biosafety in microbiology and biomedical laboratories? (or)
   b) How to discard biohazardous waste?

2. a) Describe the various culture and microscopic methods to enumerate the microorganisms? (or)

   b) Write Biochemical methods for endotoxin and sterility tests for pharmaceutical products?
3. a) What are nucleic acid probes and what are they used for?
   (or)
   b) Define PCR? Write methodology for detection and diagnosis of infectious diseases?

4. a) Describe various detection methods of microbiological quality of milk?
   OR
   b) Discuss Hazard analysis of critical control point (HACCP) - Principles, and its limitations

Section B

Answer any five of the following **2x5=10 marks**

5. Incineration
6. Gel diffusion
7. Biosensors
8. SDA
9. MBRT
10. EMB agar
11. HACCP
12. Mac Conkey agar

8A1 - Microbial Quality Control in Food and Pharmaceutical Industries

PRACTICAL Syllabus

TOTAL HOURS: **CREDITS: 2**

1. Microbiological laboratory safety- General rules & Regulations.

2. Sterility tests for Instruments – Autoclave & Hot Air Oven

3. Disinfection of selected instruments &Equipments

4. Sterility of Air and its relationship to Laboratory & Hospital sepsis.

5. Sterility testing of Microbiological media

6. Sterility testing of any one Pharmaceutical product

7. Standard qualitative analysis of water.

8. Microbiological analysis of homogenized food samples by direct microscopic count

SUGGESTED READING

1. Baird RM, Hodges NA and Denyer SP (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.
2. Garg N, Garg KL and Mukerji KG (2010) Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.
3. Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3rd ed. Academic Press
4. Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer
5. Laboratory Exercises in Microbiology, George.A.Wistreich&Max.D.Lechtman, 3 rd Ed, Glencoe press, London.
6. Manual of diagnostic microbiology, Dr.B.J.Wadher&Dr.G.L.Bhoosreddy, Firs.Ed., Himalaya publishing house, Nagpur.
7. Microbiology - A laboratory manual, Cappuccino & Sherman , 6 th Ed, Pearson Education Pharmaceutical Microbiology – Purohit
8. Pharmaceutical Microbiology – W.B. Hugo

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III B.Sc MICROBIOLOGY 6th - SEMESTER SYLLABUS

8A2 - FOOD MICROBIOLOGY AND BIOTECHNIQUES

UNIT - I: Food Biochemistry:

• Carbohydrate metabolism: Oxidation of glucose by glycolysis, TCA cycle, HMP path way, Glycogenolysis.
• Protein metabolism: Urea cycle, Biosynthesis of nucleic acids, protein biosynthesis.

UNIT -II: Food Microbiology:

- Factors associated with food spoilage: Micro-organisms, contamination during processing and handling.
- Fundamentals of control of microorganism in foods; use of high and low temp., dehydration, freezing, freeze-drying, irradiation and preservatives in food preservation.
• Microorganisms important in food preservation: Moulds, yeast, bacteria, characteristics and identification.

Unit III: Food Intoxication:

- Food Intoxication-Toxins produced by Staphylococcus, Cholera, Clostridium, Aspergillus;
- Bacterial pathogens and diseases- Salmonella, Shigella, Bacillus, Escherichia coli, Campylobacter;

Unit IV:

- PCR- Mechanism and application, and DNA finger printing in microbial detection in foods.
- SDS polyacrylamide gel electrophoresis

Unit V:

- Principles of Microscopy: Bright field and dark field microscopy. Fluorescence Microscopy, Phase contrast Microscopy, Confocal Microscopy, Electron microscopy and Micrometry

REFERENCE:

1. Satyanarayana, U., Bio-chemistry,Books and allied(Pvt), 8/1-Chinthamani das line Calcutta 2001.

2. Thalwar GP Text book of biochemistry and human biology. Second edition,prentice Hall of India-pvt 1989.

3. Deb AC. Fundamentals of bio-chemistry. Seventh Edition New Book house (P)Ltd, 1998.

4. Frazier, W.C. 1978. Food Microbiology.McGraw Hill.

5. Industrial Microbiology by Samuel C. Prescott

6. Parihar and Parihar Dairy Microbiology, SaraswatiPurohit, Jodhpur India, 2007

7. Prajapati J. B. (1995), Fundamentals of Dairy Microbiology.

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM III B.Sc

MICROBIOLOGY (CBCS) SYLLABUS

8A2 - FOOD MICROBIOLOGY AND BIOTECHNIQUES

PRACTICALS

1. Study of fluorescent micrographs to visualize bacterial cells.
2. Ray diagrams of phase contrast microscopy and Electron microscopy.
3. Preparation of bacterial smears, simple staining, differential staining, spore staining, staining of molds and yeasts.
4. Preparation of common laboratory media for cultivation of bacteria, yeast and molds.
5. Isolation of micro-organisms by standard plate count method.
6. Sampling of air, water, dust, soil, food handlers to study the various sources of transmission of microorganism in foods.
7. Separation of protein mixtures by Polyacrylamide Gel Electrophoresis (PAGE).
8. Industrial visit on molecular methods

REFERENCES

1. Biophysical Chemistry Principles and Techniques- Upadhyay, Nath.

2. Practical Biochemistry" Principles and Techniques - Ed Keith Wilson and John Walker Cambridge University press, Cambridge , U K.

3.Frazier, W.C. and Westhoff , D.C. (1988): Fourth Edition, Focd Microbiology, McGraw Hill Inc. Jay James, M. (1986): Third Edition, Modem Food Microbiology, Van Nostrand Reinhold Company inc.

4. Pelezar, M.I. and Reid, R.D. (1978): Microbiology, IYlcGraw Hill Book Company, New York. Benson Harold, J. (1990):

5. Microbiological applications, Wn. C. Brown Publishers, U.S.A. Collins, C.H. and Lyne, P.M. (1976).

6. Microbiological Methods, Buttersworth, London.

GOVERNMENT COLLEGE OF (A), RAJAMAHENDRAVARAM
III B.Sc MICROBIOLOGY (CBCS) SYLLABUS

8A3 –Food Microbiology Hygiene & Sanitation

TOTAL HOURS: **CREDITS: 3**

UNIT- I

- Brief history of food microbiology and introduction to important microorganisms in foods. Primary sources of microorganisms in foods
- Fermented foods and their benefits. Indices of food, milk and water sanitary quality
- Microbiological criteria (Bacteriological analysis) of foods, water and milk testing

UNIT- II

- **Public health hazards due to contaminated foods:** food borne infections and intoxications - symptoms, mode and sources of transmission and methods of prevention. Investigation and detection of food borne disease out-break.

UNIT- III

- **Hygiene & Sanitation :** Hygiene and sanitation in food sector - pest control measures, Garbage and Sewage disposal, Water - Sources, purification; Principles of Hazards Analysis & Critical Control Point (HACCP)
- **Food Packaging:** Types & functions of packaging materials used in foods.
- Packaging material as a threat, impact on health and controlling measures.

UNIT- IV

- General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers.
- Symbiotic N2 fixers: Rhizobium - Isolation, characteristics, types, inoculum production and field application, legume/pulses plants: Frankia from non-legumes and characterization.
- Cyanobacteria and Azolla, characterization, mass multiplication, Role in rice cultivation, Crop response, field application.

UNIT- V

- Outlines of Intellectual Property Rights: Patents, Copyrights, Trademarks; Public perception of GM foods. IPR – GMO Act – 2004.

- Additional input: **Food Handling (Raw & cooked food) in pandemic situations.**

REFERENCES:

1. Frazier, W.C. 1978. Food Microbiology.McGraw Hill.

2. Parihar and Parihar Dairy Microbiology, SaraswatiPurohit, Jodhpur India, 2007

3. Prajapati J. B. (1995), Fundamentals of Dairy Microbiology.

4. Food science and nutrition by Sunetra roday, 2nd edition, Oxford university press.

5. Food preservation technology with processing book, B.Siva Shankar, KINDLE EDITION, 2002

6. Text book of food science and technology, Arantina sharma3rd edition, 2017

7. Food safety management, Yasminematargemi, 1st edition,2013

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DEPARTMENT OF MICROBIOLOGY

BOS Additional inputs / Syllabus Revision topics

2021-2022

S.No	Semester	Paper & Title	Additional inputs /Deletion/ Additions	Remarks
1	1	Introductory to Microbiology & Microbial Diversity	Growth media- Natural, synthetic and semi synthetic media, Basal and complex media, selective, enrichment, enriched and differential media (Deletion)	Inapt place to study and shifted to next semester
2	2	Microbial Physiology and Biochemistry	1. Growth media- Natural, synthetic and semi synthetic media, Basal and complex media, selective, enrichment, enriched and differential media (Addition)	Appropriate to study along with Unit IV topics of 2 sem
Syllabus Revision topics				
3	3	Immunology & Medical Microbiology	Herd immunity **concept, COVID 19 Disease,**	As the present pandemic situation demand this knowledge
4		8A3 –Food Microbiology Hygiene & Sanitation	Food Handling Procedures (Raw & cooked food) under pandemic situations.	‘’
5		8A1: Diagnostic Microbiology	COVID-19 Diagnosis	‘’
	5	Food & Industrial Microbiology	2. Survey of food industries in East Godavari 3. Recycling of industrial wastes	Proposed by industrial Nominee