



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM
B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

UG PROGRAM (4 Years Honors)
CBCS - 2020-21

B.Sc
MICROBIOLOGY



Syllabus and Model Question Papers



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BOS Meeting held on 22nd January 2021, 10:00AM
at NTR Convention Center,
Adikavi Nannaya University Campus

Agenda:

1. Adoption of revised-common program structure and revising/updating course-wise syllabi(in the prescribed format) as per the guidelines issued by APSCHE
2. Adoption of regulations on scheme of examination and marks/grading system of the University UG program
3. Preparation of Model question papers in prescribed format
4. List of equipments /software requirement for each lab/practical
5. Eligibility of students for joining the course
6. Eligibility of faculty for teaching the course
7. Any specific instructions to teacher/paper-setter/student/Chief superintendent /paperevaluator
8. List of paper-setter /paper evaluator with phone, email-id in the prescribed format

Members present:

Dr.K.Aruna
Convenor, BOS
Lecturer in Microbiology
ASD Govt. College for Women, Autonomous
Kakinada

Smt. Thokala Sony
Lecturer in Microbiology
SCIM Government degree college, Tanuku

Dr. J. Balaji Chandra Mouli
Assistant professor
Dept. of Biotechnology/Microbiology
Coordinator BOS AKNU, Rajahmundry.

Resolutions:



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The syllabus of B.Sc. MICROBIOLOGY (CBCS) revised by The APSCHE in 2020 has been reviewed by the undersigned BOS members of Microbiology, U.G Course, AKN University Rajahmundry.

The syllabi of five core courses (i.e. four semesters) have been approved with necessary corrections. Three core courses will be in the first three semesters, and the fourth and fifth courses will be in the fourth semester as tabulated in page no. 1. The major modifications (not exceeding 20%) made are listed below:

- I. *Microbial Physiology and Biochemistry* in semester II, the topics Extra chromosomal elements – plasmids have been shifted to unit V of the same course. Structure of ribosomes is deleted as it is covered in types of RNA Unit-I of the same course. In unit -V the topics plasmids(pBR322), cosmids, phasmids, lambda phage and M13 have been added. DNA polymerase have been deleted as it is covered in DNA replication.
- II. *Medical Microbiology and immunology* in semester IV, Unit III the topic Hepatitis A is replaced with Corona virus. RT PCR is introduced in Unit -IV. In unit-IV identification by biochemical characteristics is limited to IMViC. Normal flora of human body (Hands, Feet, Nostrils, Teeth Surface) & Effectiveness of Hand Sanitizers by Filter Paper Disc Method& Thumb impression method.
- III. In the Course *Microbial Ecology and Industrial Microbiology* the topic strain improvement is added instead of techniques involved in selection of industrial important metabolites from microbes as this is more suitable for the course. In unit-IV general composition of fermentation media (Carbon source, nitrogen source, minerals, vitamins & growth factors, Buffers, Precursors, Antifoam agents, water, oxygen) is introduced.
- IV. In the practical Course *Microbial Ecology and Industrial Microbiology* the following list of practicals are introduced
 - Isolation of microorganism from soil
 - MPN test
 - Isolation of food spoilage microorganisms from spoiled food samples
 - Crowded plate technique
 - Preparation of yoghurt
 - Production of single cell protein (any bacterial and fungal cultured dry mass)
 - Isolation of microorganism from different water samples



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DETAILS OF COURSE TITLES & CREDITS

Sem	Course No	Course Name	Course Type (L/T/P)	Hrs/Week	Credits	Max. Marks	Max. Marks
				Sciences:4+2	Sciences: 4+1	Internal/ Conti./ Mid Assessment	Sem- End Exam
I	1	Introduction To Microbiology and Microbial Diversity	T	4	4	25	75
	2	Introduction To Microbiology and Microbial Diversity Lab	L	2	1	-	50
II	3	Microbial Physiology and Biochemistry	T	4	4	25	75
	4	Microbial Physiology And Biochemistry Lab	L	2	1	-	50
III	5	Molecular Biology and Microbial	T	4	4	25	75
	6	Molecular Biology and Microbial Lab	L	2	1	-	50
IV	7	Immunology And Medical Microbiology	T	4	4	25	75
	8	Immunology and Medical Microbiology Lab	L	2	1	-	50
	9	Microbial Ecology and Industrial Microbiology	T	4	4	25	75
	10	Microbial Ecology and Industrial Microbiology Lab	L	2	1	-	50

Note: *Course type code: T: Theory, L: Lab, P: Problem-solving



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a. Proposed combination subjects

BSc CBMB(Chemistry, Botany &Microbiology) BSc (Chemistry, Biochemistry &Microbiology)

BSc (Nutrition, Biochemistry & Microbiology)

BSc (Computer Science, Biochemistry & Microbiology) BSc (Chemistry, Zoology &Microbiology)

BSc (Food Chemistry, Zoology & Microbiology)

b. Student eligibility for joining in the course:

Eligibility Criteria for BSc - MICROBIOLOGY

1. BiPC – Intermediate with Botany, physics, chemistry
2. MBPC (CBSE) - Mathematics, Biology, Physics, Chemistry
3. MPC- Mathematics, Physics, Chemistry
4. MLT vocational course - Medical lab technology
5. MPHW (F)- Multipurpose Health Worker
6. SERI VOCATIONAL
7. CP&M-Crop Production & Management
8. DAIRY- Dairying livestock & management
9. FISH- Fisheries vocational
10. OT-Ophthalmic technician
11. PT-physiotherapy vocational

REFERENCE: <https://oamdc.ap.gov.in/courseEligibilityReport.do>

c. Faculty eligibility for teaching the course: MSc Microbiology with NET/SLET/Ph.D

d. List of Proposed Skill enhancement courses with syllabus, if any Not Yet finalized by APSCHE

e. Any newly proposed Skill development/Life skill courses with draft syllabus and required resources, **Visit AKNU Website**



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- f. Required instruments/software/ computers for the course (Lab/Practical course-wiserequired i.e., for a batch of 15 students)

SEM. No.	Lab/Practical Name	Names of Instruments/Software/ computers required with specifications	Brand Name	Qty Required
I	MBP-I INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY	Autoclave	Biotech	2
		Hot air Oven	Biotech	1
		Incubator	Biotech	1
		Laminar air flow/Inoculation Chamber	Biotech	1
		Microscopes	Olympus	10
		Refrigerator	Whirlpool	1
II	MBP-II MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY	Chromatography chamber	Thermo Fisher Scientific	5
		Table top Centrifuge	Remi	2
		Ultra-Centrifuge	Remi	1
		Colorimeter	X- Rite	5
		Ph Meter	Lab India	4
		Column chromatography	Thermo Fisher Scientific	1
		Gel electrophoresis Unit	Thermo Fisher Scientific	1
		Gel documentation Unit	Thermo Fisher Scientific	1
III	MBP-III MOLECULAR BIOLOGY AND MICROBIAL GENETICS	Spectrophotometer	HITACHI	1
IV	MBP-IV IMMUNOLOGY AND MEDICAL MICROBIOLOGY	NIL	-	-
IV	MBP-V MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY	NIL	-	-

- g. List of Suitable levels of positions eligible in the Govt/Pvt organizations



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Suitable levels of positions for these graduates either in industry/govt organization like., technical assistants/ scientists/ school teachers., clearly define them, with reliable justification

S.No.	Position	Company/ Govt organization	Remarks	Additional skills required, if any
1	Ward Sanitation & Environment Secretary (Grade-II)	Andhra Pradesh Government		Patience Attention to detail Decisiveness Independence Excellent IT skills Numerical skills Analytical skills Teamworking skills Communication skills Technical and critical thinking skills
2	Research Assistant	CSIR, DBT		
3	Quality Assurance Technologists	Food & Pharma companies		
4	Medical Representative	Pharma companies		
5	Pharmacologist	Pharma companies		
6	Food Technologist	Food industry		
7	Industrial	Microbiology Industries		
8	Food Technologist	Food companies		
9	Lecturer, Professor	College/ university		
	Environmental Microbiologists	Government/ Environmental Agency		
10	Research Scientist	University/ Government Institutions		
11	Beverage Industry	Beverage Industry		
12	Agriculture Department	Biofertilizers/ Biopesticides		
13	Aquafeed/ Probiotic	Aquaculture		
14	Personal Care Product and Cosmetic Scientists and Technologists	Cosmetics, Shampoos, Soaps		
15	Govt. Veterinary Biological Research Institute	Animal Vaccine Production		



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- h. List of Govt. organizations / Pvt companies for employment opportunities or internships or projects

S.No	Company/ Govt organization	Position type	Level of Position
1	Government of Andhra Pradesh	Ward Sanitation & Environment Secretary	Grade-II
2	Biocontrol Lab	Internship	Grade-I
3	SIFT, Kakinada	Microbiologist /Projects	Grade-I
4	Soil testing lab Samalkot	Microbiologist /Projects	Grade-I
5	Local Hospitals	Internship	Grade-II
6	Dr.Reddys lab Yanam	Pharmacologist	Grade-II
7.	Aquafeed/Probiotics	Microbiologist	Grade-II
8.	Seafood, Fish processing units	QC Microbiologists	Grade-II
9	VBRI, Samalkot	Internship	Grade-I
10	Horticultural Research Station, Ambajipeta	Internship	Grade-I

- i. Any specific instructions to the teacher /paper setters/Exam-Chief Superintendent

WEIGHTAGE OF THE COURSE CONTENT

S.NO	UNIT	Short Answer Questions Marks: 5X5=25	Essay Questions Marks:5X10=50
1	I	02 or 01	02
2	II	01 or 02	02
3	III	02	02
4	IV	01	02
5	V	02	02
Total no of questions		08	10



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3. Program objectives, outcomes, co-curricular and assessment methods

1. Aim and objectives of UG program BSc Microbiology:

The programme BSc Microbiology introduces students to the vast array of microbes viz bacteria, archaea, viruses, fungi and protozoa around us, their diversity and applications. The programme has a strong practical emphasis, providing students with the basic laboratory skills required for a career in either applied or research microbiology.

Program outcomes:

- PO1: Graduates will acquire adequate knowledge and leadership skills for a successful career
- PO2: Graduates will be able to analyze and solve biology based problems.
- PO3: Graduates will cooperate with each other to solve problems with creative thinking.
- PO4: Graduates will acquire practical skills- plan & execute experimental techniques independently as well as to analyse & interpret data.
- PO5: Graduates will effectively be able to manage resources & time.
- PO6: Graduates will be able to learn independently and develop critical thinking.
- PO7: Graduates will accomplish ability to communicate effectively and able to understand ethical responsibility.
- PO8: Graduates will get adequate knowledge to use information & communication technology.
- PO9: Graduates will carry on to learn and to adapt in a world of constantly evolving technology.

2. Program Specific outcomes:

Microbiology students who graduate with a Bachelor of Science with Microbiology will

- PSO1: Acquire knowledge on fundamentals of Microbiology
- PSO2: Understand details of bacterial, fungal, algal and viral morphology and physiology.
- PSO3: Competently be able to cultivate and characterize bacterial and fungal forms.
- PSO4: Grasp the fundamental concepts of immunity and the contribution of organs and cells in the development of immune response.
- PSO5: Gain insight into the various aspects of microbial genetics.
- PSO6: Be proficient on cloning vectors and rDNA technology.
- PSO7: Assimilate technical skills on microbial genetics and molecular biology.
- PSO8: Realize the application-oriented aspects of Microbiology.
- PSO9: Understand the concepts and development of microbial diseases in animals & plants.
- PSO10: Realize the principles of prevention and treatment of microbial diseases.

3. Recommended Skill enhancement courses: (Titles of the courses given below and details of the syllabus for 4 credits (i.e., 2 units for theory and Lab/Practical) for 5 hrs class- cum-lab work
Not Yet finalized by APSICHE

4. Recommended Co-curricular activities:(Co-curricular Activities should not promote copying from text book or from others' work and shall encourage self/independent and group learning)
OBJECTIVES:

The co-curricular activities are aimed at strengthening the theoretical knowledge with an activity related to the content taught in the class room. The aesthetic development, character building, spiritual growth, physical growth, moral values, creativity of the student.

The different types of co-curricular activities relevant to Microbiology domain are listed below:



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A. Measurable:

1. Assignments on:
2. Student seminars (Individual presentation of papers) on topics relating to:
3. Quiz Programmes on:
4. Individual Field Studies/projects:
5. Group discussion on:
6. Group/Team Projects on:

B General

1. Collection of news reports and maintaining a record of paper-cuttings relating to topics covered in syllabus
2. Group Discussions on:
3. Watching TV discussions and preparing summary points recording personal observations etc., under guidance from the Lecturers
4. Any similar activities with imaginative thinking.
5. Organization of first-aid camp, swachhbharat, cleanliness week, Nutrition, personal hygiene and health awareness etc
6. Exposure to scientific instruments and hands-on experience
7. Field visit/Industrial visit/Research Laboratory visit and submission of report

5. Recommended Continuous Assessment methods:

In the student evaluation pattern, each paper carries 100 marks out of which 25 marks are allotted for internal assessment and remaining 75 marks for external assessment as given below.

Pattern of Evaluation	Allotted Marks	Minimum Pass marks	Allotted time	Remarks
Internal Assessment	25	10	1 Hour	Assessed by calculating average of two descriptive internals
External Assessment	75	28	3 Hours	-

Internal Assessment in Each Semester 25 marks

- Part-I: 15 marks, average of two descriptive internal exams (Each descriptive exam duration is 1 hour)
- Part-II: 5 Marks for Assignment
- Part-III: 5 marks for Attendance



B Sc	Semester: I	Credits: 4
Course: 1	Introduction to Microbiology and Microbial Diversity	Hrs/Wk: 4

Aim and objectives of Course:

To understand History & Development of Microbiology, Microscopy, staining and sterilization techniques, Ultra-structure of cell, Different methods of microbial characterization To study nature of viruses, viral classification, cultivation of viruses and Type study of TMV & HIV

Learning outcomes of Course

Up on completion of the course students able to

1. Explain relationship and apply appropriate terminology relating to the structure, Genetics, metabolism and ecology of prokaryotic microorganisms, Algae, viruses and Fungi.
2. Students will get basics and importance of Microbiology.
3. Demonstrate appropriate laboratory skill and techniques related to isolation, staining, identification and control of microorganisms.

UNIT I:

History of Microbiology & Place of Microorganisms in the living world: History of Microbiology 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: Ultra-structure of Prokaryotic cell- Cell Wall, Cell Membrane, Cytoplasm, Nucleoid, Plasmid, Inclusion Bodies, Flagella Pili, Capsule, Endospore General characteristics of Bacteria (Size, shape, arrangement, reproduction) General characteristics of Rickettsia, Mycoplasmas, Cyanobacteria, Archaea General characteristics of viruses, Cultivation of Viruses (in brief) Morphology, Structure and replication of TMV and Lambda Bacteriophage.

UNIT III:

Eukaryotic microorganisms: 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:

Isolation and Culture of Bacteria and Fungi: Growth media- Natural, synthetic and semi synthetic media. Selective, Enrichment, and Differential media 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, storage at low temperature.

UNIT V:

Principles of Microscopy, Sterilization and Disinfection: Principles of microscopy - Bright field and Electron microscopy (SEM and TEM). Staining Techniques - Simple and Differential staining techniques (Gram staining, Spore 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 hypochlorite's.



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RECOMMENDED TEXT BOOKS:

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. Power, C.B. and Daginawala, H.F. (1986). General Microbiology Vol I & II
4. Prescott, M.J., Harley, J.P. and Klein, D.A. (2012). Microbiology. 5th Edition, WCB McGrawHill, New York.
5. Reddy, S.M. and Reddy, S.R. (1998). Microbiology Practical Manual, 3 rd Edition, Sri Padmavathi Publications, Hyderabad.

REFERENCE BOOKS:

1. Singh, R.P. (2007). General Microbiology. Kalyani Publishers, New Delhi.
2. Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.
3. Microbiology Edited by Prescott
4. Jaya Babu (2006). Practical Manual on Microbial Metabolisms and General Microbiology. Kalyani Publishers, New Delhi.
5. Gopal Reddy *et al.*, Laboratory Experiments in Microbiology



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B Sc	Semester: I	Credits: 1
Course: 1(L)	Introduction to Microbiology and Microbial Diversity Lab	Hrs/Wk: 2

List of the Practical's:

1. Microbiology Good Laboratory Practices and Biosafety.
2. Preparation of culture media for cultivation of bacteria- Nutrient broth & Nutrient agar
3. Preparation of culture media for cultivation of fungi – Sabourauds agar
4. Sterilization of medium using Autoclave
5. Sterilization of glassware using Hot Air Oven
6. Light compound microscope and its handling
7. Microscopic observation of bacteria (Gram +ve bacilli and cocci, Gram -ve bacilli), Algae and Fungi.
8. Simple staining
9. Gram's staining
10. Hanging-drop method & temporary wet mount (TWM) for observation of living microorganisms.
11. Isolation of pure cultures of bacteria by serial dilution and Streak/Spread/Pour Plate Method.
12. Preservation of bacterial cultures by Serial subculturing & Slant Preparation with mineral oil overlay.
13. Observation of electron micrographs of bacterial cells

RECOMMENDED TEXT BOOKS:

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. Power, C.B. and Dagainawala, H.F. (1986). General Microbiology Vol I & II
4. Prescott, M.J., Harley, J.P. and Klein, D.A. (2012). Microbiology. 5th Edition, WCB McGrawHill, New York.
5. Reddy, S.M. and Reddy, S.R. (1998). Microbiology Practical Manual, 3 rd Edition, Sri Padmavathi Publications, Hyderabad.
6. Singh, R.P. (2007). General Microbiology. Kalyani Publishers, New Delhi.
7. Stanier, R.Y., Adelberg, E.A. and Ingram, J.L. (1991). General Microbiology, 5th Ed., Prentice Hall of India Pvt. Ltd., New Delhi.
8. Microbiology Edited by Prescott
9. Jaya Babu (2006). Practical Manual on Microbial Metabolisms and General Microbiology. Kalyani Publishers, New Delhi.
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B Sc	Semester: II	Credits: 4
Course: 2	Microbial Physiology and Biochemistry	Hrs/Wk: 4

Aim and objectives of Course:

To understand DNA, RNA, Protein structure and synthesis. DNA damage, mutations and repair. Gene transfer methods.

Learning outcomes of Course:

1. This Course provides Understanding of biomolecular synthesis and control will help in further study.
2. Develop knowledge on microbial genetics and molecular biology

UNIT I:

Biomolecules: General characters and outline classification of Carbohydrates (Monosaccharides- Glucose, Fructose, Ribose, Disaccharides- Sucrose, Lactose, Polysaccharides- Starch, glycogen, Cellulose) General characters and outline classification of fatty acids (Saturated & Unsaturated Fatty Acids) Lipids (Simple & complex lipids) General characteristics of Amino Acids and Proteins. Structure of Nucleic acids.

UNIT II:

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

UNIT IV:

Microbial Nutrition and growth: Nutritional requirements of Microorganisms Nutritional groups of microorganisms- autotrophs, heterotrophs, lithotrophs, organotrophs, phototrophs, chemotrophs
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: 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.

RECOMMENDED TEXT BOOKS:

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, 2nd 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.,
5. W.H.Freeman
6. Voet, D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons
7. White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.



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B Sc	Semester: II	Credits: 1
Course: 2(L)	Microbial Physiology and Biochemistry Lab	Hrs/Wk: 2

List of Experiments:

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 / Salt concentration on bacterial growth
8. Demonstration of electrophoretic technique
9. Study and plot the growth curve of E. coli by turbidometric and Standard Plate Count methods

RECOMMENDED TEXT BOOKS & REFERENCE BOOKS:

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, 2nd 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.,
5. W.H. Freeman
6. Voet, D. and Voet J.G (2004) Biochemistry 3rd edition, John Wiley and Sons
7. White, D. (1995). The Physiology and Biochemistry of Prokaryotes, Oxford University Press, New York.



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B Sc	Semester: III	Credits: 4
Course: 3	Molecular Biology and Microbial Genetics	Hrs/Wk: 4

Aim and objectives of Course:

To understand different biomolecules, analytical techniques, bacterial nutrition, growth and metabolism

Learning outcomes of Course: Up on completion of this course students should able to:

1. Explain working principle and applications of Colorimetry, Chromatography, Spectrophotometry, Centrifugation and Gel Electrophoresis.
2. Knowledge on Microbial nutrition, bacterial growth, metabolism and Respiration.
3. The student will get first-hand experience on separation methods

UNIT I:

Nucleic acids: 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:Experiments which established DNA as genetic material RNA as genetic material, Mechanism of DNA Replication in Prokaryotes, Proof of semi conservative mechanism of replication (Meselson - Stahl Experiment)

UNIT III:

Gene expression and regulation: Concept of gene - Mutton, recon and cistron. Genetic code Protein synthesis - Transcription and translation in Prokaryotes Regulation of gene expression in bacteria -*lac* operon

UNIT IV:

Mutations, damage and repair: Outlines of DNA damage and repair mechanism Mutations - spontaneous and induced Chromosomal aberrations - deletions, inversions, tandem duplications, insertions Point mutations- base pair changes, frame shifts Mutagens - Physical and Chemical mutagens Bacterial recombination-Transformation, Conjugation, Transduction (Generalized and specialized transductions)

UNIT V:

Genetic engineering: Basic principles of genetic engineering. Restriction endonucleases, DNA ligases. Vectors – plasmids (pBR322), Cosmids, Phagemids, lambda phage vector, M 13 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.

RECOMMENDED TEXT BOOKS:

1. Freifelder, D. (1990). Microbial Genetics. Narosa Publishing House, New Delhi. Freifelder, D. (1997). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
2. Glick, B.P. and Pasternack, J. (1998). Molecular Biotechnology, ASM Press, Washington D.C., USA.
3. Lewin, B. (2000). Genes VIII. Oxford University Press, England.
4. Maloy, S.R., Cronan, J.E. and Freifelder, D. (1994). Microbial Genetics, Jones and Bartlett Publishers, London.
5. Ram Reddy, S., Venkateshwarlu, K. and Krishna Reddy, V. (2007) A text Book of Molecular Biotechnology. Himalaya Publishers, Hyderabad.
6. Sinnott E.W., L.C. Dunn and T. Dobzhansky. (1958). Principles of Genetics. 5 th Edition. McGraw Hill, New York.
7. Smith, J.E. (1996). Biotechnology, Cambridge University Press.
8. Snyder, L. and Champness, W. (1997). Molecular Genetics of Bacteria. ASM press,
9. Strickberger, M.W. (1967). Genetics. Oxford & IBH, New Delhi. Verma, P.S. and Agarwal, V.K. (2004). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Co. Ltd., New Delhi



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM
B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

B Sc	Semester: III	Credits: 1
Course: 3(L)	Molecular Biology and Microbial Genetics Lab	Hrs/Wk: 2

List of the Experiments:

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

REFERENCE BOOKS:

1. Smith, J.E. (1996). Biotechnology, Cambridge University Press.
2. Snyder, L. and Champness, W. (1997). Molecular Genetics of Bacteria. ASM press,
3. Strickberger, M.W. (1967). Genetics. Oxford & IBH, New Delhi.
4. Verma, P.S. and Agarwal, V.K. (2004). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand & Co. Ltd., New Delhi.



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM
B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

B Sc	Semester: IV	Credits: 4
Course: 4	Immunology and Medical Microbiology	Hrs/Wk: 4

Aim and objectives of Course:

- To study types of immunity, immune organs, cells, antibodies and antigen-antibody interactions.
- To learn diagnostic and pathogenesis of various diseases. Antimicrobial defense and different toxins and vaccines.

Learning outcomes of Course: Up on completion of the course students able to

1. Explain Non-specific body defence and the immune response
2. Develop knowledge on disease transmission and control
3. Demonstrate on collection and handling of laboratory specimens
4. Develop an information making personal health decision in regard to infectious diseases.
5. Student can safeguard himself & society and can work diagnostics and hospitals.

UNIT I:

Immune System: Concept of Innate and Adaptive immunity Primary and secondary organs of immune system - thymus, bursa fabricus, bone marrow, spleen, lymph nodes. 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: Characteristics of antigen (Foreignness, Molecular size, Heterogeneity and solubility) Haptens. Antibodies - basic structure and types and functions (Immune complex formation and elimination - Agglutination, Precipitation, Neutralization, Complement fixation, Phagocytosis) Generation of Humoral Immune Response (Plasma and Memory cells) Generation of Cell Mediated Immune Response MHC- Functions of MHC I & II molecules Hypersensitivity- definition and types (in brief) Autoimmunity (in brief)

UNIT III:

Microbes in Health and Disease: 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. Fungal diseases - Candidiasis. Protozoal diseases - Malaria. Viral Diseases – Corona virus and AIDS

UNIT IV:

Principles of Diagnosis: General principles of diagnostic microbiology- Collection, transport of clinical samples, Identification by Culturing & Biochemical characteristics (IMViC), Identification by molecular assays (PCR, RT-PCR, DNA probes), Identification by serological tests (ELISA, Immunofluorescence, Agglutination based tests, Complement fixation)

UNIT V:

Prevention and Treatment: Vaccines Monoclonal antibodies- Production and application Antimicrobial agents- General modes of action of antibacterial (Penicillin), antifungal (Amphotericin), antiviral (Amantadine) agents Interferons Tests for antimicrobial susceptibility (Disc diffusion) Antibiotic resistance in bacteria.



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM
B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

RECOMMENDED TEXT BOOKS:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
2. 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.
3. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition Wiley-Blackwell Scientific Publication, Oxford.
4. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

REFERENCE BOOKS:

1. Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
2. Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Microbiology. 4th edition. Elsevier Publication.
3. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM

B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

B Sc	Semester: IV	Credits: 1
Course: 4(L)	Immunology and Medical Microbiology Lab	Hrs/Wk: 2

List of the Experiments:

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
6. Antibacterial sensitivity by Kirby-Bauer method
7. Determination of Minimal Inhibitory Concentration (MIC) 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.
10. Phenol coefficient test
11. Isolation of Normal flora of human body (Hands, Feet, Nostrils, Teeth Surface) by swab method.
12. Evaluation of Hand Sanitizer Effectiveness by Filter Paper Disc Method & thumb impression method.

RECOMMENDED TEXT BOOKS & REFERENCE BOOKS:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication.
2. 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.
3. Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology. 11th edition Wiley-Blackwell Scientific Publication, Oxford.
4. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
4. Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
5. Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Microbiology. 4th edition. Elsevier Publication.
6. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education.



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM
B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

B Sc	Semester: IV	Credits: 4
Course: 5		Hrs/Wk: 4

Aim and objectives of Course:

- To study role of microorganisms in nutrient cycling, microorganism in waste treatment and degradation of xenobiotics
- To determine the potability of drinking water
- To study concepts of screening and strain improvement, media, Fermentation, assays with examples of industrially important processes

Learning outcomes of Course: Up on completion of the course students able to

- Understand fundamental concept in soil microbial diversity, basic concept of biogeochemical cycles and plant growth promotion and plant diseases
- Understands the role of microorganisms in treatment of solid and liquid waste.
- Acquire knowledge on application of microorganisms in agro – environmental fields.
- Get basic information design of fermenter, fermentation processes and Single cell proteins.
- Self-reliance in the industrial application of Microbiology in life and industry.
- Entrepreneurship can be established with the gained knowledge.

UNIT I:

Microbial Ecology: 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

UNIT II:

Microorganisms in Environment: 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: Industrial important Microorganisms- Yeasts & Moulds , Bacteria , Actinomycetes . Screening techniques. Strain improvement techniques.

UNIT IV:

Fermentation processes: Design of fermented (for control of pH, temperature, dissolved oxygen, foaming and aeration) Types of fermentation processes - solid state, liquid state, batch, fed-batch, continuous. Fermentation media (Carbon source, nitrogen source, minerals, vitamins & growth factors, Buffers, Precursors, Antifoam agents, water, oxygen) Examples of Crude media; molasses, corn- steep liquor, sulphite waste liquor, whey. Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

UNIT V:

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



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM
B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

RECOMMENDED TEXT BOOKS:

- 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



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM

B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

B Sc	Semester: IV	Credits: 1
Course: 5(L)	Microbial Ecology and Industrial Microbiology Lab	Hrs/Wk: 2

List of the Experiments:

1. Microbial fermentation for the production and estimation of ethanol
2. Isolation of amylase producing microorganisms from soil
3. Isolation of food spoilage microorganisms from spoiled food sample.
4. MPN test
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
9. Preparation of yoghurt.
10. Crowded plate technique
11. Isolation of microorganism from soil
12. Isolation of microorganism from different water samples

REFERENCE BOOKS:

1. Martin A. (1977). **An Introduction to Soil Microbiology**. 2nd edition. John Wiley & Sons Inc. New York & London. 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, New Delhi
5. Frazier WC and Westhoff DC. (1992). **Food Microbiology**. 3rd edition. Tata McGraw- Hill Publishing Company Ltd, New Delhi, India.
6. Jay JM, Loessner MJ and Golden DA. (2005). **Modern Food Microbiology**. 7th edition, CBS Publishers and Distributors, Delhi, India



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM

B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

MODEL QUESTION PAPER (Semester End)

B. Sc DEGREE EXAMINATIONS

SEMESTER - I

Course 1: INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY

Time : 3Hrs

Max. Marks:75

Section-A

Answer any *five* of the following questions 5x5=25M

Draw labelled diagrams wherever necessary

1.Thymus

థైమస్

2.Macrophage

మాక్రోఫేజ్

3.Hypersensitivity reactions

తీవ్రసున్నితత్వప్రతిచర్యలు

4.MHC molecules

ఓంహెచ్సీఅణువులు

5.Nosocomial infections

6నోసోకోమియల్ ఇన్ఫెక్షన్లు

6. ELISA

ఎలిసా

7. Corona virus

కరోనావైరస్

8. Interferons

ఇంటర్ఫెరాన్స్



Section-B

Answer all of the following questions 5X10=50M

Draw labelled diagrams wherever necessary

9. a). Explain types of immunity

రోగనిరోధకశక్తిని వివరించండి

Or

b). Write structure and functions of cells of immune system?

రోగనిరోధకవ్యవస్థయొక్క కణాల నిర్మాణం మరియు విధులను వ్రాయాలా?

10.a). Explain antibody structure and types

యాంటీబాడీ నిర్మాణం మరియు రకాలను వివరించండి

Or

b). Write cell mediated immune response

సెల్మధ్యవర్తిత్వ రోగనిరోధక ప్రతిస్పందన రాయాలా?

11. a). Explain causal organism, pathogenesis, epidemiology, prevention and control of tuberculosis

కారణజీవి, వ్యాధికారక, ఎపిడెమియాలజీ, నివారణ మరియు నియంత్రణ గురించి వివరించండి

Or

b). Explain normal flora of human body

మానవశరీరం యొక్క సాధారణవృక్షజాలం గురించి వివరించండి?

12. a). Write a note on collection and transportation of clinical samples

క్లినికల్ సాంకేతికత సేకరణ మరియు రవాణాపై గమనిక రాయాలా

Or

b). Explain methods for identification of clinical samples by serological tests?

సెరోలాజికల్ ప్రోటోకాల్ ద్వారా క్లినికల్ సాంకేతికత సామగ్రిని గుర్తించే పద్ధతులను వివరించండి?

13. a). Write a note on vaccines

వ్యాక్సిన్లపై గమనిక రాయాలా

Or

b). Explain the tests for antimicrobial susceptibility

యాంటీమైక్రోబయల్ సెఫ్టికేసంపరీక్షలు ఏమిటో వివరించండి



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM
B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

MODEL QUESTION COURSE
Semester End Examination - Practical

Time: 3hrs

Max. Marks: 50M

INTRODUCTION TO MICROBIOLOGY AND MICROBIAL DIVERSITY LAB

Major Experiment

1X20=20M

1. Write down principle, procedure, do gram staining to given bacterial sample and report

Minor Experiment

1X10=10M

2. Write down Principle, procedure and perform spread plate method

3. Identification of spotters

5X2=10M

- A. Autoclave
- B. Alexander Fleming
- C. Inoculating loop
- D. Cyanobacteria
- E. Streak plate technique

4. Viva-Voce

05M

5. Record

05M

Total Marks

50M



Section-A

Answer any *five* of the following questions 5x5=25M

Draw labelled diagrams wherever necessary

1. Structure of Saturated & unsaturated fatty acids
సంతృప్త మరియు అసంతృప్తకొవ్వు అమ్లాల నిర్మాణం
2. Draw labeled diagram of nucleotide
న్యూక్లియోసైడ్ యొక్క లేబుల్ చేయబడిన చిత్రం గీయండి
3. Lock and key model
4. Write about coenzymes and cofactors
కోఫైటర్లు మరియు సహకారాల గురించి వ్రాయండి
5. Write about applications of spectrometer.
స్పెక్ట్రోమీటర్ యొక్క అనువర్తనాల గురించి వ్రాయండి
6. Effect of temperature on Growth of bacteria
7. Alcohol fermentation
ఆల్కహాల్ ఫీర్మెంటేషన్ ప్రక్రియ
8. Electron transport chain
ఎలక్ట్రాన్ వాణాగోలుసు.



Section-B

Answer all of the following questions

5X10=50M

Draw labelled diagrams wherever necessary

9. a) Explain classification of Carbohydrates.

కార్బోహైడ్రేట్ల వర్గీకరణను వివరించండి.

Or

b) Explain the structure of protein.

ప్రోటెయిన్ల నిర్మాణాన్ని వివరించండి

10. a) Explain Enzyme Classification along with example for each class.

ఎంజైమ్స్ వర్గీకరణను వివరించండి. ప్రతి తరగతికి ఉదాహరణ వ్రాయండి .

Or

b) Explain competitive, noncompetitive, and uncompetitive enzyme inhibition.

పోటీ, పోటీలేనిది, మరియు పోటీపడని ఎంజైమ్ ఇన్హిబిషన్ వివరించండి

11. a) Write principle and application of Paper chromatography.

పేపర్ క్రోమాటోగ్రఫీ యొక్క సూత్రం మరియు అనువర్తనాన్ని వ్రాయండి

Or

b) Write principle and applications of colorimeter.

కలర్ మీటర్ సూత్రం మరియు అనువర్తనాన్ని వ్రాయండి

12. a) Explain nutritional classification of bacteria.

బాక్టీరియా యొక్క పోషక వర్గీకరణను వివరించండి

Or

b) Explain different method for measuring microbial growth.

సూక్ష్మజీవుల పెరుగుదలను కొలిచే వివిధ పద్ధతులను వివరించండి

13. a) Explain the significance of TCA cycle along with diagram.

రేఖాచిత్రంతోపాటు TCA చక్రం యొక్క ప్రాముఖ్యతను వివరించండి

Or

b) Give outlines of Oxygenic and Anoxygenic Bacterial Photosynthesis.

ఆక్సిజనికారియం అనాక్సిజనికారియం లోలోసింథసిస్ యొక్క బాహ్య రూపాలను ఇవ్వండి



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B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

MODEL QUESTION COURSE
Semester End Examination - Practical

Time: 3hrs

Max. Marks: 50M

MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY LAB

Major Experiment

1X20=20M

1. Estimate the amount of protein present in given test sample by biuret method and write down principle, procedure and report

Minor Experiment

1X10=10M

2. Write down Principle, procedure and perform paper chromatography to separate the mixture of compounds in given test sample?

3. Identification of spotters

5X2=10M

- A. Bacterial growth curve
- B. Structure of ribose sugar
- C. Lock and key model
- D. Synchronous culture growth
- E. Gel electrophoresis unit

4. Viva-Voce

05M

5. Record

05M

Total Marks

50M



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM

B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

MODEL QUESTION PAPER (Semester End)

B. Sc DEGREE EXAMINATIONS

SEMESTER - III

Course 3: MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Time : 3Hrs

Max. Marks:75

Section-A

Answer any *five* of the following questions 5x5=25M

Draw labelled diagrams wherever necessary

1. Central dogma

సెంట్రల్ డాగ్మా

2. RNA as genetic material

జన్యుపదార్థంగా ఆర్ఎన్ఎ

3. Muton, Recon, Cistron

ముటన్, రీకాన్, సిప్రాన్

4. Genetic code

జన్యుకోడ్

5. UV rays as mutagens.

మ్యుటేషన్లలో UV కిరణాల ప్రాత

6. Conjugation in bacteria

బ్యాక్టీరియాలో సంయోగం

7. PCR

పీసీఆర్

8. Plasmid vectors

ప్లాస్మిడ్ వెక్టర్స్

Section-B

Answer all of the following questions

5X10=50M

Draw labelled diagrams wherever necessary

9. a). Explain Watson and crick model of DNA with a neatly labeled diagram

చక్కగా లేబుల్ చేసిన రేఖాచిత్రంతో DNA యొక్క వాట్సన్ మరియు క్రిక్ మోడల్ ను వివరించండి

Or

b). Define RNA. Write about different types of RNA

RNA ను నిర్వచించండి. వివిధ రకాల RNA గురించి వ్రాయండి



10. a). Explain DNA as genetic material with an experimental proof

ప్రయోగాత్మక రుజువుతో DNA ను జన్యు వదార్థంగా వివరించండి

Or

b). Explain the proof of semi conservative replication of DNA (Meselson & Stahl experiment).

DNA

యొక్క సెమీ కన్జర్వేటివ్ రిప్లికేషన్ యొక్క రుజువును వివరించండి (మెసెల్సన్ & స్టాల్ ప్రయోగం)

11. a). Explain important steps in Protein Synthesis with a diagram

రేఖాచిత్రంతో ప్రోటీన్ సంశ్లేషణలో ముఖ్యమైన దశలను వివరించండి

Or

b). Explain the functioning of lac operon.

లాక్స వెరాన్సని తీరును వివరించండి

12. a). Explain different types of chromosomal aberrations & point mutations.

వివిధ రకాలైన క్రోమోజోమ్ ఉల్లంఘనలు మరియు పాయింట్ మ్యూటేషన్లను వివరించండి

Or

b). Explain Generalized & Specialized transduction.

సాధారణ మరియు ప్రత్యేకమైన ట్రాన్స్ డక్షన్స్ వివరించండి

13. a). Write the basic steps involved in Gene Cloning.

జీన్ క్లొనింగ్ లో పాల్గొన్న ప్రాథమిక దశలను వ్రాయండి.

Or

b). What are the application of genetic engineering in Agriculture, Medicine & Industry.

వ్యవసాయం, మందులు, మరియు పరిశ్రమలలో జన్యు ఇంజనీరింగ్ కు అనువర్తనం ఏమిటి.



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B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

MODEL QUESTION COURSE
Semester End Examination - Practical

Time: 3hrs

Max. Marks: 50M

MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Major Experiment

1X20=20M

1. Estimate the amount of DNA by spectrophotometer and write down principle, procedure and report

Minor Experiment

1X10=10M

2. Write down Principle, procedure and perform induction of mutations in bacteria by UV light

3. Identification of spotters

5X2=10M

- A. pBR322
- B. Structure of DNA polymerase
- C. Structure of tRNA
- D. PCR
- E. Griffith Experiment

4. Viva-Voce

05M

5. Record

05M

Total Marks

50M



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MODEL QUESTION PAPER (Semester End)

B. Sc DEGREE EXAMINATIONS

SEMESTER - IV

Course 4: IMMUNOLOGY AND MEDICAL MICROBIOLOGY

Time : 3Hrs

Max. Marks:75

Section-A

Answer any *five* of the following questions 5x5=25M

Draw labelled diagrams wherever necessary

1. Thymus

థైమస్

2. Macrophage

మాక్రోఫేజ్

3. Hypersensitivity reactions

తీవ్రసున్నితత్వప్రతిచర్యలు

4. MHC molecules

ఓంహెచ్సీఅణువులు

5. Nosocomial infections

6నోసోకోమియల్ ఇన్ఫెక్షన్లు

6. ELISA

ఎలిసా

7. Corona virus

కరోనావైరస్

8. Interferons

ఇంటర్ఫెరాన్స్



Section-B

Answer all of the following questions 5X10=50M

Draw labelled diagrams wherever necessary

9. a). Explain types of immunity

రోగనిరోధకశక్తిని వివరించండి

Or

b). Write structure and functions of cells of immune system?

రోగనిరోధకవ్యవస్థయొక్క కణాల నిర్మాణం మరియు విధులను వ్రాయాలా?

10.a). Explain antibody structure and types

యాంటీబాడీ నిర్మాణం మరియు రకాలను వివరించండి

Or

b). Write cell mediated immune response

సెల్-మీడియేటెడ్ ఇమ్యూన్ రిస్పాన్స్ ప్రతిస్పందన రాయాలా?

11. a). Explain causal organism, pathogenesis, epidemiology, prevention and control of tuberculosis

కారణజీవి, వ్యాధికారక, ఎపిడెమియాలజీ, నివారణ మరియు నియంత్రణ గురించి వివరించండి

Or

b). Explain normal flora of human body

మానవ శరీరం యొక్క సాధారణ వృక్షజాలం గురించి వివరించండి?

12. a). Write a note on collection and transportation of clinical samples

క్లినికల్ సాంకేతికత సేకరణ మరియు రవాణాపై గమనిక రాయాలా

Or

b). Explain methods for identification of clinical samples by serological tests?

సెరోలాజికల్ టెస్ట్ల ద్వారా క్లినికల్ సాంకేతికతను గుర్తించే పద్ధతులను వివరించండి?

13. a). Write a note on vaccines

వ్యాక్సిన్లపై గమనిక రాయాలా

Or

b). Explain the tests for antimicrobial susceptibility

యాంటీమైక్రోబయల్ సెన్సిటివిటీ టెస్ట్ లు వివరించండి



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MODEL QUESTION COURSE
Semester End Examination - Practical

Time: 3hrs

Max. Marks: 50M

IMMUNOLOGY AND MEDICAL MICROBIOLOGY

Major Experiment

1X20=20M

1. Identify the given bacterial culture by IMViC tests and write down principle, procedure and report

Minor Experiment

1X10=10M

2. Determine the blood grouping and Rh typing and write down Principle, procedure and report

3. Identification of spotters

5X2=10M

- A. Macrophage
- B. Chickenpox virus
- C. Structure of Antibody A
- D. Schizont
- E. Spleen

4. Viva-Voce

05M

5. Record

05M

Total Marks

50M



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B.Sc Microbiology Syllabus (w.e.f: 2020-21 A.Y)

MODEL QUESTION PAPER (Semester End)

B. Sc DEGREE EXAMINATIONS

SEMESTER - IV

Course 5: MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY

Time : 3Hrs

Max. Marks:75

Section-A

Answer any *five* of the following questions 5x5=25M

Draw labelled diagrams wherever necessary

1. Mutualism

పరస్పరవాదం

2. Azatobcater

అజోటోబాక్టర్

3. Xenobiotics

జెనోబయోటిక్స్

4. Cell emplacement

సెల్ ఎంప్లాస్మెంట్

5. Crowded plate

రద్దీప్లేట్

6. Centrifugation

కేంద్రీకరణ

7. SCP

ఎస్సిపి

8. Yogurt

పెరుగు



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Section-B

Answer all of the following questions 5X10=50M

Draw labelled diagrams wherever necessary

9. a). Explain role of microorganism in nitrogen cycle
నత్రజనిచక్రంలో సూక్ష్మజీవుల పాత్రను వివరించండి

Or

b). Explain plant growth promoting microorganism
సూక్ష్మజీవులను ప్రోత్సహించే మొక్కల పెరుగుదలను వివరించండి

10. a). Explain municipal waste treatment

మున్సిపల్ వ్యర్థాలను శుద్ధిచేయండి

Or

b). Write intrinsic and extrinsic factors that affect the microbial growth in food
ఆహారంలో సూక్ష్మజీవుల పెరుగుదలను ప్రభావితంచేసే అంతర్గత మరియు బాహ్యకారకాలను వ్రాయండి

11. a). Write a note on industrially important microorganisms

పారిశ్రామికంగా ముఖ్యమైన సూక్ష్మజీవుల పై ఒక గమనిక రాయండి

Or

b). Explain methods for strain improvement
జాతి మెరుగుదల కోసం పద్ధతులను వివరించండి

12. a). Write types of fermentation processes

కీణ్య ప్రక్రియ ప్రక్రియల రకాలను వ్రాయండి

Or

b). Explain techniques involved in downstream processing
దిగువ ప్రాసెసింగ్ లో పాల్గొన్న పద్ధతులను వివరించండి

13. a). Write a note on industrial production of ethanol and its applications

ఇథనాల్ యొక్క పారిశ్రామిక ఉత్పత్తి మరియు దాని అనువర్తనాల పై ఒక గమనిక రాయండి

Or

b). Write a note on industrial production of Vitamin B12
విటమిన్ B12 యొక్క పారిశ్రామిక ఉత్పత్తి పై ఒక గమనిక రాయండి



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MODEL QUESTION COURSE
Semester End Examination - Practical

Time: 3hrs

Max. Marks: 50M

MICROBIAL ECOLOGY AND INDUSTRIAL MICROBIOLOGY

Major Experiment

1X20=20M

1. Estimate the amount of citric acid produced by fermentation and write down principle, procedure and report

Minor Experiment

1X10=10M

2. Isolate the amylase producing bacteria from soil, write down Principle, procedure and report

3. Identification of spotters

5X2=10M

A.SCP

B.spoilage vegetables by fungi

C.Yogurt

D.Ground nut rust

E. Rhizobia

4. Viva-Voce

05M

5. Record

05M

Total Marks

50M