



IBSC MICROBIOLOGY

2019-2020

SEMESTER-I

BATCH 2019-2022
SRI Y.N COLLEGE (A), NARSAPUR
ACCREDITED BY NAAC at "A" GRADE WITH CGPA OF 3.40
Recognised by UGC as college with 'potential for excellence'

Semester-I BSC MICROBIOLOGY – PAPER(IA)

TITLE:INTRODUCTORY MICROBIOLOGY

UNIT-I

History and milestones in microbiology.

Contributions of Anton von Leewenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Ivanowsky.

Importance and applications of microbiology.

Classification of microorganisms – Haeckel's three kingdom concept, Whittaker's five kingdom concept, three domain concept of Carl Woese.

Out line classification of bacteria as per the second edition of Bergey's manual of systematic bacteriology.

UNIT-II

General characteristics of Bacteria, Archea, Mycoplasmas, and Cyanobacteria.

Ultra structure of prokaryotic cell – variant components and invariant components.

Morphology, structure and replication of TMV and HIV.

UNIT-III

General characteristics and out line classification of fungi, algae and protozoa.

Principles of microscopy- bright field and electron microscopy(SEM and TEM).

UNIT-IV

Staining techniques – simple and differential (gram staining and spore staining).

Sterilization and disinfection techniques. Physical methods- autoclave, hot airoven, pressure cooker, laminar air flow. Filter sterilization.radiation methods- uv rays ,gama rays .


chemical methods – alcohols,aldehydes furnigants ,phenols ,halogens and hypochlorites


UNIT -V

isolation of microorganisms from natural habitats .

pure culture techniques- dilution, plating, streak plate ,spread plate ,pour plate and micro manipulator and enrichment culturing

preservation of microbial cultures – sub culturing ,overlying cultures with mineral oils , lyophilization, sand cultures , storage at low temperature


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BSC MICROBIOLOGY

BLUE PRINT (Guidelines to the paper setter)

UNITS	ESSAY QUESTIONS	SHORT QUESTIONS
UNIT-I	2	1
UNIT-II	2	2
UNIT-III	2	1
UNIT-IV	2	2
UNIT-V	2	2
TOTAL	10	8


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Semester-I BSC MICROBIOLOGY – PAPER(IA)
TITLE:INTRODUCTORY MICROBIOLOGY

TIME:3hrs

Max.Marks:75M

PART-I

SECTION-A

Answer any FIVE of the following questions, atleast 2 from each section A & B . 5X10=50M

Draw alabeled diagrams wherever necessary

1. Write about the scope and importance of microbiology?
2. Write about the contribution of the following scientist:
(A). Louis pasteur (B). Alexander fleming
3. Explain in details about ultra structure of bacterial cell?
4. Write about the out line classification of whittaker?
5. Discuss the importance and applications of microbiology?

SECTION-B

6. Write the out line classification of bacteria 2nd edition of bergey's manual of systemic bacteriology?
7. Write the structure and multiplication of T4 bacteriophage?
8. Write about the general characteristics of the following organisms.
(A). Mycoplasmas (B). cyanobacteria
9. Explain the sterilization and disinfection techniques of physical and chemical methods?
10. Write the general characteristics and classification of fungi , algae and protozoa?


PART-II

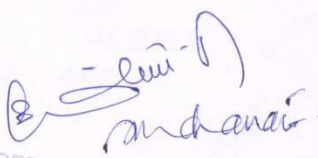
SECTION-C

Answer any FIVE of the following

5X5=25M

11. Koch postulates
12. Spontaneous generation theory
13. Cari woese classification
14. Structure of HIV
15. General characters of viruses
16. Lyophilization
17. Micromanipulator
18. Enrichment culturing


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IIBSC MICROBIOLOGY - SEMESTER-III
PRACTICAL MODEL PAPER


DATE:


Max.Marks:50

TIME:

Duration:3hrs

- | | |
|---|-----|
| 1. MAJOR | 20M |
| (Practical + procedure +result= 5+10+5) | |
| 2. MINOR | 10M |
| (Practical + procedure = 5+5 = 10) | |
| 3. SPOTTERS | 5M |
| (spotters identification) | |
| 4. RECORD | 10M |
| 5. VIVA VOCE | 5M |


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SEMESTER-II BSC MICROBIOLOGY-PAPER I(B)

TITLE: MICROBIAL BIOCHEMISTRY & METABOLISM

UNIT-I

Out line classification and general characteristics of carbohydrates (monosaccharides, disaccharides and polysaccharides).

General characteristics of amino acids and proteins.

Structure of nitrogenous bases, nucleotides, nucleic acids.

Fatty acids (saturated and unsaturated).

Lipids (phospholipids, sterols, and phospholipids).

UNIT-II

Principle and applications of calorimetry

Chromatography (paper, thin-layer and column).

Spectrophotometry (UV & Visible).

Centrifugation and gel electrophoresis.

UNIT-III

Properties and classification of enzymes.

Biocatalysis- induced fit and lock and key models.

Coenzymes and cofactors.

Factors affecting catalytic activity.

Inhibition of enzyme activity-competitive, noncompetitive, uncompetitive and allosteric.

UNIT-IV

Microbial nutrition- nutritional requirements and uptake of nutrients by cells.


Nutritional groups of microorganisms-autotrophs, heterotrophs, mixotrophs.


Growth media- synthetic, complex, selective, enrichment, 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.


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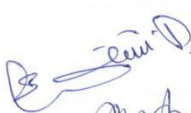
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TITLE:MICROBIAL BIOCHEMISTRY & METABOLISM

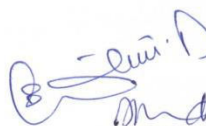
PRACTICALS

- 1.qualitative analysis of carbohydrates.
- 2.qualitative analysis of aminoacids.
- 3.colorimetric estimation DNA by diphenylamine method.
- 4.colorimetric estimation of proteins by biuret/lowry method.
- 5.paper chromatographic separation of sugars and aminoacids.
- 6.preparation of different media-synthetic and complex media.
- 7.setting and observation of winogradsky column.
- 8.estimation of CFU count by spread plate method /pour plate method.
- 9.bacterial growth curve.
- 10.factors affecting bacterial growth-Ph.
- 11.Factors affecting bacterial growth-Temperature.
- 12.factors affecting bacterial growth –salts.

SUGGESTED READING:

Berg JM, TYMOCZKO JL and Stryer (2011) BIOCHEMISTRY, W.H.Freeman and company
Caldwell, D.R.(1995), Microbial physiology and metabolism, W.C. Brown publications.Iowa, USA.
Campbell, PN and Smith AD (2011) Biochemistry illustrated, 4th ed., published by Churchill livingstone.
Elliot, W.H. and Elliot, D.C.(2001). Biochemistry and molecular biology, 2nd Edition,oxford university press, U.S.A.
Gottschalk, G. (1986). Bacterial metabolism, springer verlag, NEW YORK.
Lehninger, a.l., nelson, d.l. and COX ,M.M.(1993). PRINCIPLES OF BIOCHEMISTRY, 2nd Edition, CBS publishers and Distributors. New Delhi.
Madigan, M.T., Martink, j.m. and parker, j.(2010). Brock Biology of Microorganisms, 9th Edition, MacMillan press, England.


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TITLE: MICROBIAL BIOCHEMISTRY & METABOLISM

TIME: 3hrs

Max. Marks: 75M

PART-I

SECTION-A

Answer any FIVE of the following questions, atleast 2 from each section A & B . 5X10=50M
Draw labeled diagrams wherever necessary

1. Write about general characters and classification of carbohydrates?
2. Describe briefly about fatty acids?
3. Write about the principle and application of calometer?
4. Write about the principle and applications of paper chromatography?
5. Write the properties and classification of enzymes?

SECTION-B

6. Explain the aerobic respiration of TCA Cycle with flow chart?
7. Write an essay on nutritional requirements of bacteria?
8. What are the factors effecting bacterial growth?
9. Describe the factors that effect catalytic activity of enzyme?
10. What is the inhibition of enzyme activity and write about competitive and non competitive?


PART-II

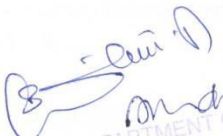
SECTION-C

Answer any five of the following

5X5=25M

11. General characteristics of amino acids
12. Spingolipids
13. Ed pathway
14. Synchronous growth
15. Group translocation
16. Cyclic photophosphorylation
17. Mixotrophs
18. Co-factors


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SEMESTER - III

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Semester-III BSC MICROBIOLOGY – PAPER(IIA)
TITLE:MICROBIAL GENETICS AND MOLECULAR BIOLOGY

UNIT-I

DNA and RNA as genetic material .
Structure and organization of prokaryotic DNA .
Extra chromosomal genetic elements plasmids and transposons .
Replication of DNA –semi conservative mechanism , enzymes involved in replications .

UNIT- II

Mutations – spontaneous and induced. Base pair change , frame shifts , deletions , inversions , tandem duplications , insertions.
Mutagens – physical and chemical mutagens .
Outlines of DNA damage and repair mechanisms.
Genetic recombination in bacteria – conjugation , transformation and transduction.

UNIT-III


Concept of gene –muton , recon and cistron .one gene one enzyme and one gene one polypeptide hypothesis.
Types of RNA and their functions .
Genetic code .
Structure of ribosomes .

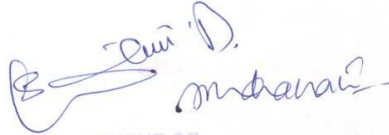
UNIT-IV

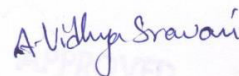
Types of genes structural , constitutive , regulatory.
Protein synthesis – transcription and translation .
Regulation of gene expression in bacteria – lac operon

UNIT-V

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


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SEMESTER –III PRACTICALS BSC MICROBIOLOGY –PAPER (IIA)

TITLE: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

PRACTICALS

1. Study of different types of DNA and RNA using micrographs and models /schematic representation
2. Study of semi-conservative replication of DNA through micrograph / schematic representation
3. Estimation of DNA using UV-spectrophotometer
4. Resolution and visualization of DNA by agarose gel electrophoresis
5. Resolution and visualization of proteins by polyacrylamide gel electrophoresis (SDS-PHAGE)
6. Problems related to DNA and RNA characteristics , transcription and translation
7. Induction of mutations in bacteria by UV-Light
8. Instrumentation in molecular micro biology – ultra centrifuge , Transilluminator , PCR

SUGGESTED READING:

Crueger.W. and Crueger . a (2000). Biotechnology : a text book of industrial microbiology , prenticehall of India pvt.ltd; NEW DELHI

Freifelder , D.(1990) microbiology genetics .Narosa publishing house , new delhi

Freifelder , D . (1997) Essential of molecular biology . Narosa publishing house , new delhi


Glzer , A.N. and Nikaido , h. (1995). Microbial biotechnology – fundamentals of applied microbiology .W.H.Freeman and company . new York

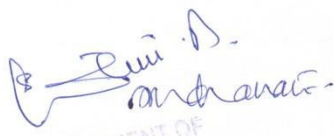
Glick , B.P and pasternack . J. (1998) . molecular biotechnology , ASM Press , Washington D.C., USA

Kanna , N . (2003) . handbook of laboratory culture media ,reagents , satins and buffers . Panima publishing co., new delhi

Lewin , b.(2000) genas VIII oxford university press , England

Maloy , S.R, Cronan , J.E and feifelder . D. (1994) . Microbiology genetics jones and Barlet publisher , London


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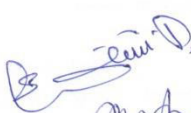
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Semester-III BSC MICROBIOLOGY – PAPER(IIA)
TITLE: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

TIME: 3hrs

Max. Marks: 75M

PART-I

SECTION-A

Answer any **FIVE** of the following questions, atleast 2 from each section A & B. 5x10=50M
Draw labeled diagrams wherever necessary

1. Explain the replication of DNA – semi conservative mechanism?
2. Explain the spontaneous and induced mutations?
3. Describe the physical and chemical mutagens?
4. Write the principles of genetic engineering?
5. Write the structure and organization of prokaryotic DNA?

SECTION-B

6. Explain regulation of gene expression in bacteria lac operon?
7. Write brief account on gene transfer in bacteria?
8. What is mutation? Write different kinds of mutation?
9. Write an account of replication DNA and the enzymes involved during the process?
10. Write any two experiments that can give proof for DNA as a genetic material?


PART-II


SECTION-C

Answer any **FIVE** of the following questions

5X5=25M

11. Write a note on plasmids and transposons
12. Write short note on transcription
13. What is a genetic code and its properties?
14. Write account on restriction endonucleases
15. Write about applications of genetic engineering
16. Write short note on lac operon
17. Write short note on one gene one polypeptide hypothesis
18. Write short note on regulatory genes


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IIBSC MICROBIOLOGY - SEMESTER-III
PRACTICAL MODEL PAPER


DATE:

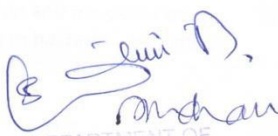
TIME:

Max.Marks:50

Duration:3hrs

- | | |
|---|-----|
| 1. MAJOR
(Practical + procedure +result= 5+10+5) | 20M |
| 2. MINOR
(Practical + procedure = 5+5 = 10) | 10M |
| 3. SPOTTERS
(spotters identification) | 5M |
| 4. RECORD | 10M |
| 5. VIVA VOCE | 5M |


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SEMESTER - IV

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SEMESTER-IV BSC MICROBIOLOGY-PAPER (IIB)

TITLE:IMMUNOLOGY AND MEDICAL MICROBIOLOGY

UNIT-I

Types of immunity – innate and acquired: active and passive; humoral and cell-mediated immunity.

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

Cells of immune system.

Identification and function of B and T Lymphocytes , null cells, monocytes, macrophages, neutrophils basophils and eosinophils.

UNIT-II

Antigens – types, chemical nature, antigenic determinants, haptens.

Factors affecting antigenicity.

Antibodies – basic structure, types, properties and functions of immunoglobulins.

Types of antigen – antibody reactions – agglutinations, precipitation, neutralization, complement fixation, blood groups.

Labeled antibody based techniques – ELISA, RIA and immunofluorescence. polyclonal and monoclonal antibodies – production and applications.

Concept of hypersensitivity and autoimmunity.

UNIT-III

Normal flora of human body.

Host pathogen interactions: infection, invasion, pathogen, pathogenicity, virulence and opportunistic infection.

General account on nosocomial infection.

General principles of diagnostic microbiology – collection, transport and processing of clinical samples.

General methods of laboratory diagnosis – cultural, biochemical serological and molecular methods.


UNIT-IV

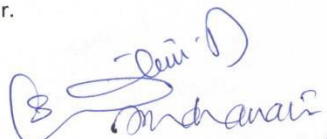
Antibacterial agents – penicillin, streptomycin and tetracycline.

Antifungal agents – amphotericin b, griseofulvin.

Antiviral substances – amantadine and acyclovir.

Tests for antimicrobial susceptibility.


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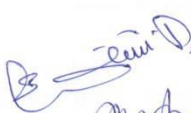
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SEMESTER-IV BSC MICROBIOLOGY-PAPER (IIB)

TITLE:IMMUNOLOGY AND MEDICAL MICROBIOLOGY

PRACTICALS

- 1.Identification of human blood groups.
- 2.separate serum from the blood sample (demonstration).
- 3.Estimation of blood haemoglobin.
- 4.Total leukocyte count of the given blood sample.
- 5.Differential leukocyte count of the given blood sample.
- 6.Immunodiffusion by ouchterlony method.
- 7.Identify bacteria (e. coli, pseudomonas, staphylococcus, bacillus) using laboratory strains on the basis of cultural, morphological and biochemical characteristics; IMVIC, urease production and catalase tests.
- 8.Isolation of bacterial flora of skin by swab method.
- 9.Antibacterial sensitivity by Kirby bauer method.
- 10.Study symptoms of the diseases with the help of photographs,anthrax, polio, herpes, chicken pox, HPV warts, dermatomycoses (ring worms).
- 11.Study of various stages of malarial parasite in RBCs using permanent mounts.

SUGGESTED READING

Abbas AK, Lichtman AH, Pillai S,(2007) **CELLULAR AND MOLECULAR IMMUNOLOGY**, 6th edition saunders publications, Philadelphia.


Antharayan R and paniker C.K.J.(2009) **Text book of microbiology**. 8th edition, university press publication.

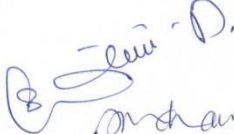
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Semester-IV BSC MICROBIOLOGY – PAPER(IIB)
TITLE:IMMUNOLOGY AND MEDICAL MICROBIOLOGY

TIME:3hrs

Max.Marks:75M

PART-I

SECTION-A

Answer any **FIVE** of the following questions, atleast 2 from each section A & B . 5X10=50M

Draw labeled diagrams wherever necessary

1. Explain the humoral cell mediated immunity?
2. Write the types of innate immunity and acquired immunity?
3. Explain the primary and secondary lymphoid organs?
4. Explain the types of antigens?
5. Write a monoclonal antibodies applications?

SECTION-B

6. General account of nosocomial infection?
7. Explain the antibacterial agents – penicillin, streptomycin?
8. Brief account on antibiotic resistance in bacteria?
9. Explain the normal flora of human body?
10. Explain the concept of hypersensitivity and auto immunity?


PART-II

SECTION-C

Answer any five of the following questions

5X5=25M

11. Write a short note on B and T- lymphocytes
12. Write about functions of immunoglobulins
13. What is meant by immunofluorescence
14. Write an passive immunity
15. Write antifungal agents
16. Write a short note on tetracycline
17. Write a short note on vaccination
18. What is MALT?


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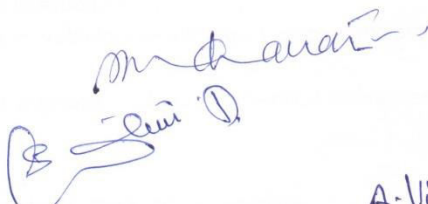
Max.Marks:50

TIME:

Duration:3hrs

- | | |
|---|-----|
| 1. MAJOR | 20M |
| (Practical + procedure +result= 5+10+5) | |
| 2. MINOR | 10M |
| (Practical + procedure = 5+5 = 10) | |
| 3. SPOTTERS | 5M |
| (spotters identification) | |
| 4. RECORD | 10M |
| 5. VIVA VOCE | 5M |


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SEMESTER-V

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TITLE:ENVIRONMENTAL & AGRICULTURE MICROBIOLOGY

UNIT-I

Terrestrial environment:soil profile and soil microflora
Aquatic environment:microflora of fresh water and marine habitats
Atmosphere:aeromicroflora of fresh water and marine habitats

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 faecal coliforms. (b)membrane filter technique. Microbial interaction-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 & 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,frankia,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.

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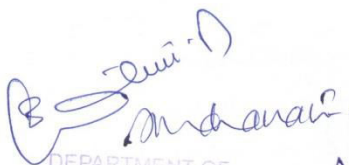
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UNITS	ESSAY QUESTIONS	SHORT QUESTIONS
UNIT-I	2	1
UNIT-II	2	2
UNIT-III	2	1
UNIT-IV	2	2
UNIT-V	2	2
TOTAL	10	8

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ENVIRONMENTAL & AGRICULTURAL MICROBIOLOGY

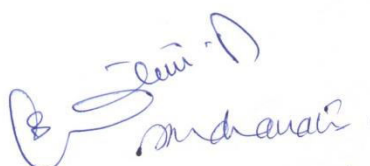
PRACTICALS

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 microflora 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 action mycetes 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 II & 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 Thomas learning.
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Maier RM, Pepper IL and Gerba CP. (2009) **Environmental Microbiology.** 2nd edition. Academic press. OKafor, N(2011). **Environmental Microbiology of aquatic & waste systems.** 1st edition, springer, new York.
Subba rao NS. (1999). **SOIL MICROBIOLOGY.** 4TH edition. OXFORD & IBH publishing Co. New Delhi.

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Semester-V BSC MICROBIOLOGY – PAPER(V)
TITLE:ENVIRONMENTAL & AGRICULTURE MICROBIOLOGY

TIME:3hrs

Max.Marks:75M

PART-I

SECTION-A

Answer any **FIVE** of the following questions, atleast 2 from each section A & B . 5X10=50M
Draw alabeled diagrams wherever necessary

1. Briefly explain the soil profile and soil microflora?
2. Explain the microorganisms in cycle of carbon and phosphorous?
3. Discuss the role of bacteria in the biodegradation of environmental pollutants like solid waste disposal?
4. Write an essay on plant growth promoting microorganisms?
5. Explain the symptoms caused by bacteria and viruses during diseases development in plants?

SECTION-B

6. Explain the aquatic environment in microflora of fresh water and marine habitats?
7. Write an essay on microbial interaction?
8. What do you mean by sewage? explain the various methods involved in sewage treatment?
9. Define biological nitrogen fixation? Write about symbiotic nitrogen fixation?
10. Write about bio fertilizers with a special reference to rhizobium?

PART-II

SECTION-C

Answer any five of the following questions

5x5=25M

11. Phosphate solubilizing microorganisms
12. Biofertilizers
13. Carbon cycle
14. Microorganisms of water
15. Sanitary land fills
16. Plant disease caused by bacteria
17. Plant growth promoting microorganisms
18. Primary treatment

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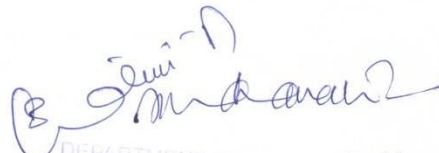
Max.Marks:50

TIME:

Duration:3hrs

- | | |
|---|-----|
| 1. MAJOR
(Practical + procedure +result= 5+10+5) | 20M |
| 2. MINOR
(Practical + procedure = 5+5 = 10) | 10M |
| 3. SPOTTERS
(spotters identification) | 5M |
| 4. RECORD | 10M |
| 5. VIVA VOCE | 5M |


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Semester-V BSC MICROBIOLOGY – PAPER(VIA)

TITLE:FOOD AND INDUSTRIAL MICROBIOLOGY

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 (actinomyces griseus).

Outlines of isolation and screening and strain improvement of industrially important microorganisms.

UNIT-IV


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


Basic concepts of design of fermenter. 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.


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FOOD & INDUSTRIAL MICROBIOLOGY

PRACTICALS

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

SUGGESTED READING

Adams MR and Moss MO.(1995). **Food microbiology**. 4th edition, NEW AGE international(P) limited publishers, New Delhi, india.

Banwart JM. (1987). **Basic food microbiology**, 1st edition. CBS Publishers and Distributors, Delhi, India.

Casida LE.(1991). **Industrial microbiology**.1st edition. Wiley Eastern limited. Cruger W and Cruger A . (2000). **Biotechnology:A textbook of industrial microbiology**. 2nd edition panima publishing company , New Delhi .Frazier WC and Westhoff DC. (1992). **Food microbiology**. 3rd edition. Tata mcgraw- hill publishing company ltd, new delhi, india.

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Patel AH. (1996).**Industrial Microbiology**.1st Edition. MacMillan IndiaLimited Publishing Company Ltd. New Delhi, India.

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Semester-V BSC MICROBIOLOGY – PAPER-(VI)
TITLE:FOOD AND INDUSTRIAL MICROBIOLOGY

TIME:3hrs

Max.Marks:75M

PART-I

SECTION-A

Answer any **FIVE** of the following questions, atleast 2 from each section A & B . 5X10=50M
Draw labeled diagrams wherever necessary

1. Write about the microorganisms of food spoilage and their sources?
2. What are food borne diseases? Explain the source of infection and detection?
3. Write an essay on food preservations?
4. Describe the commercial production of any two mushrooms?
5. Describe the various method involved in strain improvement?

SECTION-B

6. Describe the characteristic features of four industrially important microorganisms?
7. Discuss various steps in industrial production of penicillin?
8. Explain commercial production of industrial alcohol using molasses as raw material?
9. Write about the design of fermentor?
10. Define fermentation? Explain the various types of fermentation?

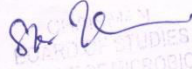
PART-II

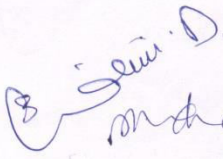
SECTION-C

Answer any five of the following questions

5x5=25M

11. Spoilage of fruits
12. Yoghurt
13. Beer production
14. Botulism
15. Fermentation media
16. SCP
17. Vitamin B12
18. Batch fermentation


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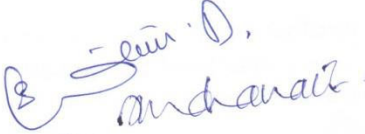
Max.Marks:50

TIME:

Duration:3hrs

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|---|-----|
| 1. MAJOR | 20M |
| (Practical + procedure +result= 5+10+5) | |
| 2. MINOR | 10M |
| (Practical + procedure = 5+5 = 10) | |
| 3. SPOTTERS | 5M |
| (spotters identification) | |
| 4. RECORD | 10M |
| | |
| 5. VIVA VOCE | 5M |


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SEMESTER -VI

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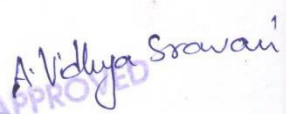
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Year	Semester	Paper	Title	Hours	Marks	Credits
III	VI	VII (A)	Microbial Biotechnology	3	100	03
			Practical	2	50	02
		** VIII-A	Cluster Elective-A			
			VIII-A-1 : MICROBIAL DIAGNOSIS IN HEALTH CLINICS	3	100	03
			VIII-A-2 : MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES	3	100	03
			VIII-A-3: BIOFERTILIZERS AND BIOPESTICIDES	3	100	03
			VIII-A-1 : Practical	2	50	02
			VIII-A-2 : Practical	2	50	02
			VIII-A-3: Practical	2	50	02


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IIIBSC MICROBIOLOGY- PAPER(VIA)

MBT- 701 MICROBIAL BIOTECHNOLOGY

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


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UNITS	ESSAYS	SHORTS
UNIT-I	2	1
UNIT-II	2	2
UNIT-III	2	1
UNIT-IV	2	2
UNIT-V	2	2
TOTAL	10	8


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MBP- 701 MICROBIAL BIOTECHNOLOGY

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 or lipase producing bacteria
5. Study of algal Single Cell Proteins

SUGGESTED READING

Crueger W, Crueger A (1990) **Biotechnology: A text Book of Industrial Microbiology** 2nd edition
Sinauer associates, Inc.

Demain, A. L and Davies, J. E. (1999). **Manual of Industrial Microbiology and Biotechnology**,
2nd Edition, ASM Press.

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

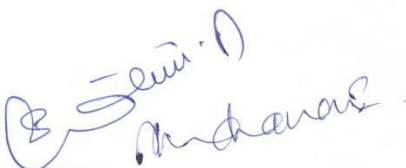
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edition, Mc Graw Hill Publishers.

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Swartz, J. R. (2001). **Advances in Escherichia coli production of therapeutic proteins.**
Current Opinion in Biotechnology, 12, 195–201.


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IIIBSC MICROBIOLOGY- PAPER(VIA)


PRACTICALS MODEL PAPER

TIME: 3hrs

Max. marks:50

I.MAJOR	20M
II.MINOR	10M
III.SPOTTER	5M
IV.RECORD	10M
V.VIVA VOCE	5M


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IIIBSC MICROBIOLOGY- PAPER(VIA)

MBT- 801 A1: MICROBIAL DIAGNOSIS IN HEALTH CLINICS

UNIT- I

Study of Bacterial,(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, MacConkey agar, Distinct colony properties of various bacterial pathogens.


UNIT- IV


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

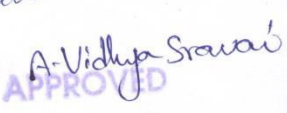
Typhoid, Dengue and HIV, Swine flu.

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


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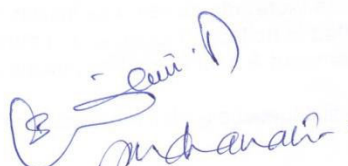
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UNITS	ESSAYS	SHORTS
UNIT-I	2	1
UNIT-II	2	2
UNIT-III	2	1
UNIT-IV	2	2
UNIT-V	2	2
TOTAL	10	8



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MBP- 801 A1: MICROBIAL DIAGNOSIS IN HEALTH CLINICS

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

SUGGESTED READING

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

Brooks G.F., Carroll K.C., Butel J.S., Morse S Medical.A.
Microbiology. 26th edition. McGraw Hill Publication

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

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

TilleP (2013) **Diagnostic Bailey's Microbiology** and, 13th edition, Scott's Mosby
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 Fermenter(identification of diagrams of various types of Fermentors and labelling 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

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IIIBSC MICROBIOLOGY- PAPER(VIA)

CLUSTER PAPER -801A

MBT- 801 A1: MICROBIAL DIAGNOSTICS AND HEALTH CLINICS

Model Question Paper

Time: 3Hrs

Section-A

Max.Marks:75

Answer any **FIVE** of the following questions, atleast two from each section A & B
Draw labeled diagrams wherever necessary **5 x 10=50 marks**

1. What is tuberculosis? Describe the characters of the causal agent and discuss the pathogenesis of the disease?
2. Describe the various methods used to collect samples?
3. Write Grams staining and Giems-staining techniques for examination of clinical samples?
4. Explain serological methods for identification of pathogens ?
5. How the tests for antimicrobial drug susceptibility are beneficial / Describe serial dilution method?

Section-B

6. Describe the causal agent, labortary diagnosis, prevention and treatment of influenza?
7. Describe various methods of transport of clinical samples to laboratory and storage?
8. Write composition and preparation of culture media for identification of pathogens?
9. Describe the casual agent, laboratory diagnosis, and prevention & treatment of typhoid?
10. Write an account of disc diffusion tests for antimicrobial drug susceptibility?

Section-C

5X5=25

Answer any **FIVE** of the following

11. Aspergillosis
12. Malaria
13. Transport media
14. Ziehl-Neelson staining
15. Serial dilution
16. ELISA
17. Dengue
18. MIC

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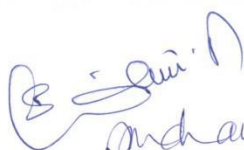
PRACTICALS MODEL PAPER

TIME: 3hrs

Max. marks:50

I.MAJOR20M
II.MINOR10M
III.SPOTTER5M
IV.RECORD10M
V.VIVA VOCE5M

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IIIBSC MICROBIOLOGY- PAPER(VIA)

MBT- 801-A2: MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES

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.

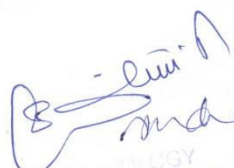
UNIT –IV

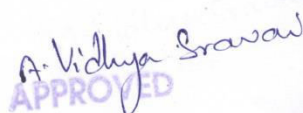
Enrichment culture technique, Detection of specific microorganisms - on XLD agar, *Salmonella Shigella* Agar, Manitol salt agar, EMB agar, McConkey Agar, Saboraud Agar
Ascertaining microbial quality of milk by MBRT, Rapid detection methods of microbiological quality of milk at milk collection centres (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.

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UNIT-III	2	1
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UNIT-V	2	2
TOTAL	10	8

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MBP- 801-A2: MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACEUTICAL INDUSTRIES

Microbiological laboratory safety- General rules & Regulations.

1. 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

Baird RM, Hodges NA and Denyer SP (2005) Handbook of Microbiological Quality control in Pharmaceutical and Medical Devices, Taylor and Francis Inc.

Garg N, Garg KL and Mukerji KG (2010) Laboratory Manual of Food Microbiology I K International Publishing House Pvt. Ltd.

Harrigan WF (1998) Laboratory Methods in Food Microbiology, 3rd ed. Academic Press

Jay JM, Loessner MJ, Golden DA (2005) Modern Food Microbiology, 7th edition. Springer

Laboratory Exercises in Microbiology, George.A.Wistreich & Max.D.Lechtman, 3rd Ed, Glencoe press, London.

Manual of diagnostic microbiology, Dr.B.J.Wadher & Dr.G.L.Bhoosreddy, Firs.Ed., Himalaya publishing house, Nagpur.

Microbiology - A laboratory manual, Cappuccino & Sherman, 6th Ed, Pearson

Education Pharmaceutical Microbiology –Purohit
Pharmaceutical Microbiology –W.B. Hugo

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III BSC MICROBIOLOGY - PAPER (VIA)

CLUSTER PAPER - 801 A2

MBT -801 A2: MICROBIAL QUALITY CONTROL IN FOOD AND PHARMACUTICAL INDUSTRIES

Time : 3 Hrs

Section - A

Max. Marks : 75

Answer any **FIVE** of the following questions, atleast two from each section A & B
5 x 10 = 50 Marks

Draw labeled diagrams wherever necessary

1. Discuss Bio-safety in microbiology and biomedical laboratories ?
2. Describe the various culture and microscopic methods to enumerate the microorganisms ?
3. What are Nucleic acid probes and what are they used for ?
4. Write enrichment culture techniques ?
5. Discuss various Hazard analysis of critical control points (HACCP) ?

Section - B

6. How to discard bio-hazardous waste ?
7. Write biochemical methods for endotoxin and sterility tests for pharmaceutical products ?
8. Define PCR ? Write the detection and diagnosis of infectious diseases ?
9. Discuss rapid detection methods of microbiological quality of milk ?
10. Write BIS Standards for drinking water ?

Section - C

Answer any **FIVE** of the following

5 x 5 = 25

11. Disinfection
12. MPN
13. Biosensors
14. EMB Agar
15. Nucleic Acid Probes
16. Gen Diffusion
17. Sterility testing
18. MBRT

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PRACTICALS MODEL PAPER

TIME: 3hrs

Max. marks:50

I.MAJOR20M
II.MINOR10M
III.SPOTTER5M
IV.RECORD10M
V.VIVA VOCE5M

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IIIBSC MICROBIOLOGY- PAPER(VIA)

MBT- 801-A3: BIOFERTILIZERS AND BIOPESTICIDES

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, 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 -II

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

UNIT -III

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


UNIT -IV

Importance of mycorrhizal inoculum, types of mycorrhizae and associated plants, Mass inoculum production of VAM, field applications of Ectomycorrhizae and VAM.

UNIT -V

General account of microbes used as bioinsecticides and their advantages over synthetic pesticides. *Bacillus thuringiensis* - production, Field applications.

Viruses -NPV/ cultivation and field applications.


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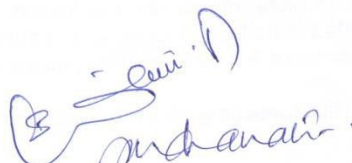
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MBP- 801-A3: BIOFERTILIZERS AND BIOPESTICIDES

1. Isolation of *Rhizobium* from root nodules.
3. Isolation of phosphate solubilizers from soil
4. Staining and observation of VAM
3. A visit to biofertilizer production unit.

SUGGESTED READINGS


Agarwal SK (2005) **Advanced Environmental Biotechnology**, APH publication.

Kannaiyan, S. (2003). **Bioetchnology of Biofertilizers**, CHIPS, Texas.

Mahendra K. Rai (2005). **Hand book of Microbial biofertilizers**, The Haworth Press, Inc. New York. Reddy, S.M. et. al. (2002). **Bioinoculants for sustainable agriculture and forestry**, Scientific Publishers.

Saleem F and Shakoori AR (2012) **Development of Bioinsecticide**, Lap Lambert Academic Publishing GmbH KG

Subba Rao N.S (1995) **Soil microorganisms and plant growth** Oxford and IBH publishing co. Pvt. Ltd. NewDelhi.


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CLUSTER PAPER -801C

MBT- 801 A3: BIOFERTILIZERS AND BIOPESTICIDES

Time:3Hrs

Section-A

Max.Marks:75

Answer any **FIVE** of the following questions, atleast two from each section A & B

5 x 10=50 marks

Draw labeled diagrams wherever necessary

1. Write an account on microbes used as biofertilizers for various crops and their advantages?
2. Explain Isolation mass multiplication of *Azospirillum* and field application?
3. Describe isolation, mass multiplication field application of phosphate solubilizing microbes?
4. Explain various types of mycorrhizae?
5. Discuss *Bacillus thuringiensis* production and field applications?

Section-B

6. Describe mass multiplication of cyanobacteria and field application in rice cultivation?

7. Describe isolation mass multiplication field application of azatobacter?
8. Describe various phosphate solubilizing microbes and its importance?
9. Explain the mass produvtn of VAM and field applications?
10. How NPV cultivated and its applications in field applications?

Section -c

Answer any **FIVE** of the following questions 5x5=25

11. Rhizobium
12. Frankia
13. Azolla
14. Bioinsecticides
15. Ectomycorrhizae
16. Biofertilizers
17. Sedarophores
18. Cyanobacteria

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PRACTICALS MODEL PAPER

TIME: 3hrs

Max. marks:50

I.MAJOR20M
II.MINOR10M
III.SPOTTER5M
IV.RECORD10M
V.VIVA VOCE5M

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