

REVISED CHOICE BASED CREDIT SYSTEM (CBCS)

Based

**B. Sc. MICROBIOLOGY
SYLLABUS**

(Case 1: 3 majors with a general degree)

Under

MODIFIED NEP SCHEME: 2024-25 Onwards

Board of Studies in Microbiology (UG)
Department of Studies and Research in Microbiology
Tumkur University, Tumakuru
Karnataka, India

Tumkur



University

III BSc Programme: Course Structure for V & VI Semester Microbiology

Semester	Course title	Theory/ Practical	Course code	Course credit/Hrs per week	SEE	IA	Total marks	Total hours	Hours/week
V	Paper-V Food and Dairy Microbiology	Theory	DSC	03	80	20	100	48	03
	Paper- VI Industrial Microbiology and Microbial technology	Theory	DSC	03	80	20	100	48	03
	Practical-V	Practical	DSCP	02	40	10	50	64	04
	Skill enhancement (Bioinformatics and Intellectual property rights)	Theory	Compulsory	1	40	10	50	32	03
		Practical		1					
VI	Paper-VI (Immunology)	Theory	DSC	03	80	20	100	48	03
	Paper VIII (Medical microbiology)	Theory	DSC	03	80	20	100	48	03
	Practical-VI	Practical	DSCP	02	40	10	50	64	04

	Skill enhancement (Microbial diagnosis in Health clinics)	Theory Practical	Compulsory	1 1	40	10	50	32	03

FIFTH SEMESTER

Course Learning Objectives:

- a. To understand the sources of microbial spoilage of various foods and food borne diseases.
- b. To give knowledge about the principle of food preservation and food control.
- c. To discuss the microbial quality of milk and nutritional value of milk products.
- d. To study the production of fermented foods and their therapeutic value.
- e. To create awareness on the food hygiene and food safety.

Course Outcomes: After the successful completion of the course, the student will be able to:

- a. Understand the sources of contamination of food and impact of food borne illnesses.
- b. Develop knowledge about the various methods of food preservation and food laws.
- c. Get expertise in the microbiological analysis of milk and milk products.
- d. Demonstrate the large scale production of various fermented foods.

Unit 1: Introduction to Food Microbiology and Food Spoilage (12 hrs)

1. Food as substrate for microorganisms- pH, moisture, water activity, oxidation – reduction potential, nutrient content, inhibitory substances and biological structure, various factors affecting growth and activity of microorganisms in foods.
2. Different type of microorganisms associated with foods, general characteristics, classification, and identification.
3. Food spoilage and food poisoning- Spoilage of canned food, cereals, fruits, vegetables, meat and fish.
4. Food poisoning-Endotoxin, staphylococcal poisoning, botulism and salmonellosis, Mycotoxins produced by fungi-Aflatoxin in stored food and grains.

Unit 2: Food preservation and Food Control

(12 hrs)

1. Food preservation-Principles of food preservation Methods of food preservation-high temperature, canning, freezing, dehydration, chemical preservatives and radiation. Hydrostatic pressure, high voltage pulse, microwave processing and aseptic packaging, chemical methods of food preservation: salt, sugar, organic acids, SO₂, nitrite and nitrates, ethylene oxide, antibiotics and bacteriocin. Food sanitation and control.
2. Microbial examination of food-DMC, viable colony count, examination of fecal Streptococci.
3. Microbial food products- Single cell proteins-yeast and spirulina, Single cell fermented foods: dosa, sauerkraut, soysauce and tampeh and probiotics.
4. HACCP, FSSAI, FDA, Indices of food sanitary quality and control.

Unit 3: Introduction to Dairy Microbiology and milk spoilage (12 hrs)

1. Physical and chemical properties of milk. Types of Milk (skimmed, toned and homogenized). Concept of clean milk (as per National Dairy development Board (NDDB) norms).
2. Types of microorganisms in Milk - bacteria, fungi and yeast.
3. Sources of microbial contamination of raw milk and their relative importance in influencing quality of milk during production, collection, transportation and storage. Clean milk production and antimicrobial systems in raw milk. Microbial changes in raw milk during long storage. Microbiological grading of raw milk.
4. Spoilage of milk - Succession of microorganisms in milk leading to spoilage, Souring, lactic and fermentation Colour and flavor defects, Sweet curdling, Stormy fermentation, Ropiness and proteolysis.

Unit 4: Milk preservation and fermented milk products (12 hrs)

1. Methods of preservation of milk and milk products, Pasteurization, sterilization and dehydration.
2. Microbiological analysis of milk. Rapid platform tests-organoleptic, Clot on boiling (COB), titratable acidity alcohol test, DMC, sedimentation test and pH. Standard plate count,

Reductase test- MBRT, Resazaurin test, Brucella ring test and tests for mastitis, Somatic cell count.

3. Fermented Milk Products- Yogurt-Types & production, Cheese-types and production- Cheddar & Cottage, Cultured Butter milk, acidophilus milk, Kumiss,kefir,
4. An account on condensed and dried milk.
5. Genetic Engineering and Dairy industry.

FIFTH SEMESTER

Course Learning Objectives:

- a. To study microorganisms of industrial importance and design of various fermenters.
- b. To understand the composition of fermentation media and fermentation process.
- c. To discuss the role of upstream and downstream processing in product recovery.
- d. To demonstrate the microbial production of industrial products and their uses.
- e. To realize the role of microbiologist in QC and job opportunities in industries.

Course Outcomes: After the successful completion of the course, the student will be able to:

- a. Explore various microorganisms in the commercial production of industrial products.
- b. Get expertise in formulating the fermentation media for industrial production.

- c. Employ an ideal method of downstream processing for recovery of fermented products.
- d. Acquire the knowledge in the production and uses of diverse fermented products.

Paper VI-Industrial Microbiology and Microbial technology-Theory paper 48 hrs

Unit 1: Introduction to Industrial microbiology (12 hrs)

1. History, scope, growth and development of industrial microbiology.
2. Isolation and screening of industrially important microorganisms.
3. Strain Improvement methods.
4. Concept and examples of Microorganisms classified as Generally Regarded as Safe (GRAS)
5. Culture Collections of industrially important microorganisms
6. Maintenance of Stock culture.
7. Patents and patent regulation.

Unit 2: Upstream processing(12hrs)

1. Types of industrial fermentation processes: Batch continuous, surface, submerged, and SSF.
2. Fermentor: Basic structure, construction and various types-typical stirred aerated fermentor, tower fermentor, airlift ferment or and bubble cap fermentor.
3. Media components and formulation, crude media components, antifoam agents, precursors, inducer and inhibitors and buffering agents.
4. Sterilization of media and raw materials and maintenance of sterility at critical points during fermentation.
5. Inoculum preparation.
6. Process parameters-aeration, agitation, temperature regulation, foam regulation and pH regulation.

Unit 3:Down stream processing (12 hrs)

1. Role and importance of downstream processing in industrial Microbiological processes.
2. Physico-chemical basis of bio separation processes. Cell disruption methods for intracellular products removal (flocculation, sedimentation, centrifugation and filtration methods. Membrane based separations (Micro & ultra filtration) theory, design, and configuration of membrane. precipitation methods (with salts, organic solvents and polymers), aqueous two phase extraction.

3. Purification and concentration methods of byproduct chromatographic techniques affinity column, HPLC, ion exchange and GLC. Electrophoresis of proteins and nucleic acids, 1D, 2D gels, Distillation, Dialysis, crystallization, evaporation.

Unit 4: Microbial technology (12 hrs)

1. Production of chemicals-Fermentative production of Alcohol-Industrial alcohol and alcoholic beverages-beer and wine
2. Organic acids – citric acid,
3. Vitamins- B 12
4. Antibiotics-Penicillin
5. Enzymes- amylase.
6. Production of vaccines- hepatitis B and hormones – human insulin.
8. Mushroom cultivation
9. Immobilization of enzymes and cells and its applications

Pedagogy: Lectures, Seminars, Industry Visits, Debates, Quiz and Assignments

COURSE TITLE	PRACTICAL COURSE ON Food and Dairy Microbiology and Industrial Microbiology and Microbial technology
COURSE	DISCIPLINE SPECIFIC COURSE PRACTICAL
COURSE CODE	MBDSCP-3
COURSE CREDITS	02
CONTACT HOURS	4 Hr/Week
DURATION OF EXAM	03Hrs
FORMATIVE ASSESSMENT MARKS	10
SUMMATIVE ASSESSMENT MARKS	40
TOTAL MARKS	50

Practicals –PaperV/Paper VI

Food and Dairy Microbiology and Industrial Microbiology and Microbial technology

1. Isolation and enumeration of bacteria from spoiled vegetables/fruits.
2. Preparation of fermented foods-Sauerkraut & Tampeh.
3. Bacterial examination of milk/food by SPC
4. DMC & MBRT for milk
5. Estimation of Fat content in milk by Gerber's method
6. Production and estimation of Lactic acid from milk

7. Production and detection of Aflatoxins in food from fungi by paper chromatography/TLC and bioassay of aflatoxins.
8. Study of food borne pathogens-*Clostridium*, *Staphylococcus*, and *Salmonella*
8. Production of wine from grapes
9. Estimation of alcohol content by specific gravity method
10. Estimation of Citric acid by Titrimetric method
11. Role of yeasts in bread making and bromothymol test
12. Mushroom Cultivation.
14. Charts on the different types of fermenters
 - a) Typical stirred aerated fermenters
 - b) Tower fermentor
 - c) Air lift fermentor
 - d) Bubble cap fermentor
15. Visit to an Food/ Dairy/ Beverage industry

SIXTH SEMESTER

Course Learning Objectives:

- a. To equip students to develop diagnostic skills
- b. To understand the properties, structure and function of immunoglobulins.
- c. To study the antigen-antibody reactions and their significance in disease diagnosis.
- d. To discuss the hypersensitivity reactions and autoimmune diseases.

- e. To demonstrate various immunotechniques and create awareness on immunoprophylaxis.

Course Outcomes: After the successful completion of the course, the student will be able to:

- a. Understand the role of immune system in combating infectious diseases.
- b. Practice the serological methods to detect antigen and antibody in the samples.
- c. Get hands on experience in disease diagnosis using immunotechniques.
- d. Gain knowledge about types, mechanism and impact of hypersensitivity reactions.

Paper VII-IMMUNOLOGY-Theory paper (48 hrs)

Unit I Introduction to Immune System(12 hrs)

1. Historical perspective of immunology. Immunity: definition and types- innate and acquired immunity, active and passive immunity.
2. Primary and secondary immune response. Cell mediated immune response, antibody mediated immune response.
3. Cells of immune system: B and T lymphocytes, natural killer (NK) cells, granulocytes (neutrophils, eosinophils and basophils), monocytes and macrophages, dendritic cells and mast cells.
4. Organs of immune system: Primary lymphoid organs- bone marrow and thymus and secondary lymphoid organs- spleen and lymph nodes. Lymphoid tissues- MALT and GALT. Lymphatic network.

Unit II Antigen and Antibody (12 hrs)

1. Antigen- definition, properties and types. Immunogenicity, antigenicity, epitopes, paratope, haptens.
2. Properties of a good antigen: Degree of foreignness, molecular weight and degradability. Adjuvants and their importance.
3. Antibody: Definition and basic structure of typical antibody, Classes, properties and functions of different antibodies (IgG, IgA, IgM, IgD and IgE). Antigenic determinant on immunoglobulins: Isotype, allotype and idiotype.
4. Monoclonal and polyclonal antibodies.

Unit III Antigen-antibody reactions (12 hrs)

1. Definition, salient features and stages of antigen-antibody reactions. Antibody affinity, antibody avidity and cross reaction, prozone phenomenon,
2. Human blood types and Rh factors.
3. Agglutination reactions: Widal test and hemagglutination. Immunoprecipitation: Radial (Mancini method) and double (Ouchterlony method) immunodiffusion. Immunoelectrophoresis.

Flocculation: VDRL test. Complement mediated opsonization and complement fixation test. Complement and complement pathways.

4. Immunotechniques: ELISA, radioimmunoassay and immunofluorescence.

Unit IV Hypersensitive reactions(12 hrs)

1. Hypersensitivity reaction: Definition, classification and mechanism. Antibody mediated hypersensitivity: Type-I(IgE), type-II(IgG and IgM-ADCC), type-III(Antigen-antibody complex) and Cell mediated hypersensitivity type-IV(DTH).
2. Major histocompatibility complex: Structure and functions of MHC I and II molecules.
3. Autoimmune diseases.
4. Immunoprophylaxis: Vaccines- Definition and types- killed, live attenuated and toxoid with an example for each. National immunization schedule and Mission Indradhanush. A note on subunit vaccines.

SIXTH SEMESTER

Course Learning Objectives:

- a. To discuss the normal flora of human body and their significance.
- b. To study various diseases caused by bacteria and their prevalence.
- c. To understand emerging and reemerging viral infections and diseases of parasites and fungi.
- d. To gain knowledge about properties and mode of action of antimicrobial agents.
- e. To learn and practice disease diagnosis and antibiotic sensitivity among infectious agents.

Course Outcomes: After the successful completion of the course, the student will be able to:

- a. Differentiate normal microbiota of human body from pathogenic microbes.
- b. Acquire knowledge about symptoms, transmission and control of various infectious diseases.
- c. Determine the minimal inhibitory concentration of an antibiotic in disease treatment.
- d. Get practical exposure on immunological and molecular methods used in disease diagnosis.

PAPER-VIII MEDICAL MICROBIOLOGY (48 hrs)

Unit I Introduction to Medical Microbiology(12 hrs)

1. History and development of medical microbiology. Contributions of Scientists to the field of Medical microbiology.
2. Normal microflora of human skin, oral cavity, gastrointestinal tract, urogenital tract and their importance. Host-pathogen interaction: Definitions-infection, invasion, pathogenicity, virulence, attenuation, exaltation and toxigenicity. Predisposing factors for pathogenicity. Carriers and their types.
3. Infection: Types of infection, modes of transmission, portal of entry of pathogen
4. Sample collection, transport and diagnosis.

Unit II Medical Bacteriology (12 hrs)

1. Etiology, pathogenesis, symptoms, epidemiology, laboratory diagnosis, prophylaxis and treatment of the following diseases- Gonorrhoea, Syphilis, Diphtheria, Typhoid, Tetanus, Shigellosis, Cholera, Leprosy, Tuberculosis and Influenza,

Unit III Medical Virology Parasitology and Mycology(12 hrs)

1. Medical Virology: etiology, symptoms, mode of transmission, prophylaxis and treatment- Hepatitis A, B, Polio, rabies, dengue, AIDS, covid-19, Kyasanur Forest Disease (KFD) and chikungunya.
1. Disease caused by parasites: Malaria and Amoebiasis.
2. Fungal infections: Cutaneous mycoses (Tinea infections), systemic mycoses (Histoplasmosis) and opportunistic mycoses (Candidiasis).

Unit IV Antimicrobial agents(12 hrs)

1. Definition and classification of antibiotics.
2. Characteristics of antibiotics that qualify them as chemotherapeutic agents
3. Antimicrobial spectrum of antibiotics and mode of action of the following antibiotics

Antibacterial- Penicillins, Cephalosporins, Bacitracin, Polymyxins, Streptomycin, chloramphenicol, tetracycline and Vancomycin.

b) Antifungal- Nystatin and Amphotericin-B

c) Antiviral- Acyclovir and Azidothymidine

d) Synthetic Chemotherapeutic agents- Nalidixic acid.

4. A note on antimicrobial resistance (AMR).

Pedagogy: Lectures, Seminars, Industry Visits, Debates, Quiz and Assignments

COURSE TITLE	PRACTICAL COURSE ON Immunology and Medical microbiology
COURSE	DISCIPLINE SPECIFIC COURSE PRACTICAL
COURSE CODE	MBDSCP-3
COURSE CREDITS	02
CONTACT HOURS	4 Hr/Week
DURATION OF EXAM	03Hrs
FORMATIVE ASSESSMENT MARKS	10
SUMMATIVE ASSESSMENT MARKS	40
TOTAL MARKS	50

Immunology and Medical Microbiology

1. Determination of blood groups.
2. Demonstration of precipitation reaction- Ouchterlony double diffusion.
3. Demonstration of single radial immunodiffusion.
4. Widal test
5. VDRL test.
6. Coagulase test
7. Differential count of WBC.
8. Identify bacteria (*Escherichia coli*, *Staphylococcus aureus*, *Bacillus* sp.) using laboratory strains on the basis of cultural, morphological and biochemical characteristics: IMViC, TSI, nitrate reduction, urease production and catalase tests.
9. Detection of Glucose in Urine sample
10. Study of bacterial flora of skin by swab method.
11. Study of composition and use of important differential media for identification of bacteria: EMB agar, mannitol salt agar, deoxycholate citrate agar, blood agar and TCBS agar.
12. Perform antibacterial sensitivity by Kirby-Bauer method.
13. Study of various stages of malarial parasite in RBCs using permanent mounts.
14. Material/Microscopic observation/display of photographs of human pathogens as per theory syllabus- *Mycobacterium tuberculosis*, *Treponema pallidum*, *Salmonella typhi*, Hepatitis B virus, HIV, *Candida albicans*, *Tinea*, *Plasmodium*.
15. Dental caries susceptibility test.
16. Visit to pharmaceutical industry/Pathology laboratory.

Text Books / References

FIFTH SEMESTER

SEC-2: BIOINFORMATICS AND INTELLECTUAL PROPERTY RIGHTS

SKILL PAPER-2 32 (2hrs./week)

Unit I Bioinformatics 16 hrs.

Introduction to bioinformatics. Basic concepts of genomics, transcriptomics, proteomics. Biological databases: Types and importance. Mode of data storage: FASTA, Genbank and Uniprot. Data submission and retrieval from NCBI, EMBL, DDBJ, Uniprot and PDB. BLAST: Types and algorithm. Substitution matrices: PAM and BLOSUM matrices. Multiple sequence alignment: Methods and tools- ClustalW and T-Coffee. Significance of

alignments: E value and scores diversity of genomes (viral, prokaryotic and eukaryotic genomes). Phylogenetic analysis: Types of phylogenetic trees, different approaches of phylogenetic tree construction- UPGMA, Neighbour joining, maximum parsimony, maximum likelihood. Concept of genome annotation. Methods and tools of gene identification: GenScan, Grail, GeneID and Glimmer.

Unit II Intellectual Property Rights 16 hrs.

Introduction to intellectual property: Patents and their types, trademarks, copyright and related rights, industrial design and rights, traditional knowledge, geographical indications, importance of IPR, patentable and non patentable inventions, patenting life-legal protection of biotechnological inventions. World Intellectual Property Rights Organization (WIPO). Grant of patent and patenting authorities. Types of patent applications: ordinary, conventional, divisional and patent of addition. An introduction to patent filing procedures. Patent licensing and agreement. Patent infringement: Meaning, scope, litigation, case studies. Rights and duties of patent owner.

Text Books / References

1. Attwood T. K. and Parry-Smith D. J. Introduction to Bioinformatics. Pearson Edu.
2. Bare Act, (2007). Indian Patent Act 1970 Acts & Rules, Universal Law Publishing Co. Pvt. Ltd., New Delhi.
3. Baxevanis A. D., Ouellette B. F. F. Bioinformatics: A practical guide to the analysis of genes and proteins (John Wiley and Sons).
4. Goel, D. and Prashar, S. (2013). IPR, Biosafety and Bioethics. Pearson.
5. Lesk M. A. Introduction to Bioinformatics. Oxford Publication, 3rd International Student Edition
6. Mittal, D. P. (1999). Indian Patents Law, Taxmann, Allied Services (p) Ltd.
7. Rastogi S.C., Mendiratta N. and Rastogi P. Bioinformatics: methods and applications, genomics, proteomics and drug discovery, 2nd ed. Prentice Hall India Publication
8. Singh, K. K. (2015). Biotechnology and Intellectual Property Rights: Legal and Social Implications, Springer India.

SIXTH SEMESTER

SEC-3: MICROBIAL DIAGNOSIS IN HEALTH CLINICS

SKILL PAPER-3 32 (2hrs./week)

Unit I Importance of Diagnosis of Diseases (16 hrs)

Bacterial, viral, fungal and protozoan diseases of various human body systems, Disease associated clinical samples for diagnosis. 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. Direct microscopic examination of culture. 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 - chocolate agar, BHI agar, Lowenstein-Jensen medium, MacConkey agar. Distinct colony characteristics of various bacterial pathogens.

Unit II Serological and Molecular Methods of Diagnosis(16 hrs)

Serological methods: agglutination reactions, Enzyme Linked Immunosorbant Assay (ELISA), immunofluorescence, nucleic acid based methods- polymerase chain reaction, Nucleic acid probes. Kits for rapid diagnosis of diseases: Typhoid, Dengue, HIV and Swine flu. Testing for antibiotic sensitivity in bacteria: 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.

Text Books / References

1. Ananthanarayan, R. and Paniker, C. K. J. (2009). Textbook of Microbiology, 8th edition, Universities Press Private Ltd.
2. Brooks, G.F., Carroll, K.C., Butel, J.S., Morse, S.A. and Mietzner, T.A. (2013). Jawetz, Melnick and Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
3. Collee, J. G., Fraser, A. G., Marmion, B. P., Simmons, A. (2007). Mackie and McCartney Practical Medical Microbiology, 14th edition, Elsevier.
4. Hughes, W. T., and Moffet, H. L. (2018). *Clinical Microbiology* (5th ed.). J.B. Lippincott.
5. Kenneth, J. R. (2019). *Medical Microbiology: Introduction to Infectious Diseases* (6th ed.). Prentice Hall International.
6. Peakman, M. and Vergani, D. (2009). Basic and Clinical Immunology, 2nd edition Churchill, Livingstone Publishers, Edinburgh.
7. Randhawa, V. S., Mehta, G. and Sharma, K. B. (2009). Practicals and Viva in Medical Microbiology 2nd edition, Elsevier India Pvt Ltd
8. Tille, P. (2013). Bailey's and Scott's Diagnostic Microbiology, 13th edition, Mosby.

QUESTION PAPER PATTERN OF PRACTICAL EXAMINATION

V SEMESTER

PRACTICAL-V: FOOD AND DAIRY MICROBIOLOGY AND INDUSTRIAL MICROBIOLOGY

Duration: 3 hours Max. Marks: 40

- **Demonstrate or perform the experiment A giving principle and procedure. Record the result. 10 Marks**

- **Perform or demonstrate the experiment B giving principle and procedure. Record the result.**
10 Marks
- **Conduct or identify the test C. Record and interpret the result.** **06 Marks**
- **Write critical notes on D, E and F.** **3x3=09 Marks**
- **Viva-voce** **05 Marks**

SCHEME OF PRACTICAL EXAMINATION

V SEMESTER

PRACTICAL-V: FOOD AND DAIRY MICROBIOLOGY AND INDUSTRIAL MICROBIOLOGY

Duration: 3 hours Max. Marks: 40

- **Demonstrate or perform the experiment A giving principle and procedure. Record the result.** **10 Marks**

1. (Estimation of Lactic acid / Estimation of Fat content in milk by Gerber's method/)

(Demonstration- 5 Marks, Principle and Procedure- 4 Marks and Result- 1 Mark)

- **Perform or demonstrate the experiment B giving principle and procedure. Record the result.**
10 Marks

(Estimation of citric acid by titrimetric method / Estimation of percentage alcohol in a given sample by specific gravity bottle method)

(Demonstration- 5 Marks, Principle and Procedure- 4 Marks and Result- 1 Mark)

- **Conduct or identify the test C. Record and interpret the result.** **06 Marks**

(Methylene blue reduction test / Direct microscopic count (DMC) / Detection of aflatoxin by TLC / SPC of milk)

(Conduct / Identification- 3 Marks, Result- 1 Mark, Interpretation- 2 Marks)

- **Write critical notes on D, E and F. 3x3=09 Marks**

(Cheese production / Role of yeasts in bread making and bromothymol test / Mushroom Cultivation. Fermented foods- Saurkruet & Tampeh. Study of food borne pathogens-*Clostridium*, *Staphylococcus*, and *Salmonella* Charts on the different types of fermenters-Typical stirred aerated fermenters / Tower fermentor / Air lift fermentor / Bubble cap fermentor)

(Identification- 1 Mark and Critical comments- 2 mark)

- **Viva-voce 05 Marks**

QUESTION PAPER PATTERN OF PRACTICAL EXAMINATION

VI SEMESTER

PRACTICAL-VI: IMMUNOLOGY AND MEDICAL MICROBIOLOGY

Duration: 3 hours Max. Marks: 40

- **Demonstrate or perform the experiment A giving principle and procedure. Record the result. 10 Marks**
- **Perform or demonstrate the experiment B giving principle and procedure. Record the result. 10 Marks**
- **Conduct or identify the test C. Record and interpret the result. 06 Marks**
- **Write critical notes on D, E and F. 3x3=09 Marks**
- **Viva-voce 05 Marks**

SCHEME OF PRACTICAL EXAMINATION

VI SEMESTER

PRACTICAL-VI: IMMUNOLOGY AND MEDICAL MICROBIOLOGY

Duration: 3 hours Max. Marks: 40

- **Demonstrate or perform the experiment A giving principle and procedure. Record the result. 10 Marks**

(Determination of blood group / Differential count of WBC)

(Demonstration- 5 Marks, Principle and Procedure- 4 Marks and Result- 1 Mark)

- **Perform or demonstrate the experiment B giving principle and procedure. Record the result. 10 Marks**

(Detection of Glucose in Urine sample/ Antibiotic sensitivity by Kirby-Bauer method)

(Demonstration- 5 Marks, Principle and Procedure- 4 Marks and Result- 1 Mark)

- **Conduct or identify the test C. Record and interpret the result. 06 Marks**

(Widal test / VDRL test/Slide coagulase test)

(Conduct / Identification- 3 Marks, Result- 1 Mark, Interpretation- 2 Marks)

- **Write critical notes on D, E and F. 3x3=09 Marks**

(EMB agar, mannitol salt agar, deoxycholate citrate agar, blood agar and TCBS agar/ Dental caries susceptibility test/Malarial parasite/ *Mycobacterium tuberculosis*, *Treponema pallidum*, *Salmonella typhi*, Hepatitis B virus, HIV, *Candida albicans*, *Plasmodium*)

(Identification- 1 Mark and Critical comments- 2 marks)

- **Viva-voce 05 Marks**

THEORY EXAMINATION QUESTION PAPER PATTERN FOR MAJOR SUBJECTS

(Semesters I –VI)

B.Sc. Degree Examination; 2024-25

(Semester Scheme; New Syllabus: 2024-25)

SUBJECT: MICROBIOLOGY

Paper:

Paper Code:

Time: 3 Hours Max. Marks: 80

Instructions to candidates:

- 1) All sections are compulsory
- 2) Draw neat and labelled diagrams wherever necessary.

SECTION-A

1. Answer *all* the following questions: (2×10=20)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

SECTION-B

Answer any **SIX** of the following: (**5×6=30**)

- 13.
- 14.
- 15.
- 16.
- 17.
- 18.
- 19.
- 20

SECTION -C

Answer **Any Three** of the following: (**10×3=30**)

- 21.
- 22.
- 23.
- 24.

THEORY EXAMINATION QUESTION PAPER PATTERN FOR ELECTIVE/SKILL PAPERS

(Semesters III &IV)

B.Sc. Degree Examination; 2024-25

(Semester Scheme; New Syllabus: 2024-25)

SUBJECT: MICROBIOLOGY

Paper –ELECTIVE/SKILL PAPER:

Paper Code:

Time: 2 Hours

Max. Marks: 40

Instructions to candidates:

- 1) All sections are compulsory
- 2) Draw neat and labelled diagrams wherever necessary.

SECTION-A

Answer **all** the following questions: ($2 \times 5 = 10$)

- 1.
- 2.
- 3.
- 4.
- 5.

SECTION-B

Answer **any SIX** of the following: ($5 \times 6 = 30$)

- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.

