INDUSTRIAL MICROBIOLOGY (Elective), 2020-21

Note : 1. A student who has passed the + 2 examination under 10+2+3 system of education of a recognized University/Board/Council or any other examination recognized by the Panjab University as equivalent thereto shall be eligible to offer the subject of Microbiology at the B.Sc. level, if he/she has passed the +2 examination with Physics, Chemistry, Mathematics, Biology as his/her subjects.

2. Only such colleges which have all necessary infrastructure or equipment and staff shall admit students to the subject of Microbiology. The infrastructure must be approved by the University as per usual practice.

Scheme of Examination	Duration	Marks

B.Sc. FIRST YEAR EXAMINATION, 2019-20

Semester I

THEORY	**6 hrs.**	**75 (33+33+9*)**	**33+9a**	**î**
IMB 101: Fundamentals of Microbiology (I)	**3 hrs.**	**37.5 (33+4.5*)**		
IMB 102: Microbial Genetics and Molecular Biology	**3 hrs.**	**37.5 (33+4.5*)**		
PRACTICAL				
One Practical pertaining to the entire syllabus included in Theory Papers ON 2	**3 hrs**	**25 (22+3*)**		

INDUSTRIAL MICROBIOLOGY (Elective)
B.Sc. 1 year Examination
Semester I
PAPER IMB 102: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

Max Marks: 37.5
Theory- 33 Marks
Internal Assessment: 4.5
Time-3 hours

Instructions for paper setters and candidates

1. The number of hours for theory and practical per week shall be 5 hours and 4 hours respectively.

2. There will be nine questions in all carrying equal marks. The first question will be compulsory and will be of short answer type

3. The remaining eight questions, two questions will be set from each Unit. The candidate will be required to attempt five questions in all including the first question and selecting one questions from each Unit in each paper.

Objectiaand st ç $ ᴰ ll rom each

INDUSTRIAL MICROBIOLOGY (Elective)
B.Sc. 1 year Examination
Semester II
PAPER IMB 201: FUNDAMENTALS OF MICROBIOLOGY (II)

Max Marks: 37.5
Theory- 33 Marks
Internal Assessment: 4.5
Time-3 hours

Instructions for paper setters and candidates

1. The number of hours for theory and practical per week shall be 5 hours and 4 hours respectively.

2. There will be nine questions in all carrying equal marks. The first question will be compulsory and will be of short answer type

3. The remaining eight questions, two questions will be set from each Unit The candidate will be required to attempt five questions in all including the first question and selecting one questions from each Unit in each paper.

Objective: To make the students aware with the history and basics of Microbiology along with the introduction of concept of various ongoing reactions within the microbial life

Unit-I

Diversity of Microbial world: Microbial classification and taxonomy, Characteristics and Ultra-structure of Microbes: Bacteria, Algae, Fungi, Actinomycetes, Mycoplasma ,Viruses Techniques for determining microbial taxonomy

Fermentation technology: Types of fermentation: solid state, submerged, anaerobic and aerobic, Immobilized cell bioreactors, Immobilized enzyme bioreactors, Downstream processing

Unit-II

Microbi

INDUSTRIAL MICROBIOLOGY (Elective)
B.Sc. 1 year Examination
Semester II
PAPER IMB 202: FUNDAMENTALS OF MICROBIAL BIOCHEMISTRY

Max Marks: 37.5
Theory- 33 Marks
Internal Assessment: 4.5
Time-3 hours

Instructions for paper setters and candidates

1. The number of hours for theory and practical per week shall be 5 hours and 4 hours respectively.

2. There will be nine questions in all carrying equal marks. The first question will be compulsory and will be of short answer type

3. The remaining eight questions, two questions will be set from each Unit. The candidate will be required to attempt five questions in all including the first question and selecting one questions from each Unit in each paper.

Objective: To provide the in-depth knowledge of the nature and functions of various macromolecules including enzymes and their role in physiological reactions and their regulation.

Unit-I

Enzymes: Classification, thermodynamics of enzyme catalysis, competitive, uncompetitive and noncompetitive inhibition, Isozymes, factors contributing to catalytic efficiency of enzymes (mode of catalysis). First order and second order kinetics, covalent modifications

Unit-II

Carbohydrates: Classification and properties of carbohydrates. Chemical structure and properties of starch, cellulose, glycogen.

Lipids: Classification and properties of lipids, structure and functions of microbial Lipids. Degradation of lipids by alpha, beta and omega oxidation, lipid peroxidation

Unit-III

Metabolism: Metabolic pathways, biochemical reactions, energy metabolites, Carbohydrate metabolism: Biosynthesis and degradation of carbohydrates, glycolysis; Krebs cycle, enzymes of Krebs cycle, regulation of Krebs cycle

Unit-IV

Amino Acids: Structure & classification of amino acids. Amino Acids: Structure of amino acids, classification of essential amino acids based on polarity, zwiter ionic property, Synthesis of peptides. Biosynthesis and degradation of nucleic acids

RECOMMENDED BOOKS

1. **G.J. Tortora, B.R. Funke and C.L. Case (2009) Microbiology: An introduction (Benjamin/ Cummings publishing company, Inc).**
2. **S.C. Prescott and C.G.Dunn (2012) Industrial microbiology (McGraw- Hill).**
3. **S.S. Purohit (2003) Microbiology: Fundamentals and applications (Agrobios, India)**
4. **A.L. Lehninger, D.L Nelson and M.M. Cox (2005) Principles of Biochemistry (W. H. Freeman, USA).**
5. **L. Stryer, J. M. Berg and J.L. Tymoczko (2001) Biochemistry (W.H. Freeman and Company, New York).**
6. **L.E.Casida (2010) Industrial Microbiology (New age Publication, New Delhi)**
7. **B. Simon ,G. Caroline and N. Jane (2008) Microbiology (Garland Science pub., London)**

INDUSTRIAL MICROBIOLOGY
B.Sc. 1 year Examination
Semester II

Max. Marks- 25 Marks
Practical-22 Marks
Internal assessment- 3 marks
Time-3 hours

PRACTICALS

1. **Enumeration of microorganisms total vs viable counts**
2. **Measurement of microbial growth – standard plate count.**
3. **Identification of isolated bacteria: Staining : simple, negative**
4. **Gram staining and spore staining**
5. **Metabolic characteristics: IMVIC Tests**
6. **Separation of amino acids by thin layer chromatography**
7. **Estimation of alkaline phosphatase activity**
8. **Measurement of celluloses by reducing sugar assay test**
9. **Estimation of Proteins by Lowry Method**

B.Sc. 2

INDUSTRIAL MICROBIOLOGY (Elective)
B.Sc. 2 year Examination
Semester III

Max. Marks- 25 Marks

INDUSTRIAL MICROBIOLOGY
B.Sc. 2 YEAR EXAMINATION
SEMESTER-IV
PAPER-IMB-401: FOOD MICROBIOLOGY

Max Marks: 37.5
Theory- 33 Marks
Internal Assessment: 4.5
Time-3 hours

Instructions for paper setters and candidates

1. The number of hours for theory and practical per week shall be 5 hours and 4 hours respectively.

2. There will be nine questions in all carrying equal marks. The first question will be compulsory

B.Sc. 2 YEAR EXAMINATION
SEMESTER-IV
Paper-IMB-402: MICROBIAL TECHNOLOGY

Max Marks: 37.5
Theory- 33 Marks
Internal Assessment: 4.5
Time-3 hours

Instructions for paper setters and candidates

1. **The number of hours for theory and practical per week shall be 5 hours and 4 hours respectively.**

2. **There will be nine questions in all carrying equal marks. The first question will be compulsory and will be of short answer type**

3. **The remaining eight questions, two questions will be set from each Unit. The candidate will**

INDUSTRIAL MICROBIOLOGY (Elective)
B.Sc. 3rd year Semester V
PAPER IMB-502: BIOFERTILIZERS

Max Marks: 37.5
Theory- 33 Marks
Internal Assessment: 4.5
Time-3 hours

Instructions for paper setters and candidates

1. **The number of hours for theory and practical per week shall be 5 hours and 4 hours respectively.**
2. **There will be nine questions in all carrying equal marks. The first question will be compulsory and will be of short answer type**
3. **The remaining eight questions, two questions will be set from each Unit The candidate will be required to attempt five questions in all including the first question and selecting one questions from each Unit in each paper.**

Unit-IV

Fermenters used in Microbiology: Principal types of Fermentation – Introduction, Factors involved in fermenter design, differences between biochemical and chemical process, classification of biochemical reactions, rate process, operational consideration, local conditions within a fermenter, Fermenter configurations, the batch fermenter, continuous stirred tank fermenter, the tubular fermenter, the fluidized bed fermenter, solid state fermenter, Principal operating characteristics of fermenters, Computer control of fermentation process., Introduction - Computer hardware and software, Harward Graphics, LOTUS and DOS, Computer application in fermentation technology, Justification and planning.

Unit –IV

Bitechnology programmes and regulation: Role of International organizations in biotechnology, Government programmes for biotechnology development, governmental regulations of recombinant DNA research. Regulation for disposal of biohazardous materials, patenting. biotechnological processes and products, Mycotoxins, hazards in the production of fungal products. Health hazards during microbial spoilage, carcinogenic, mutagenic, teratogenic biologicals.

RECOMMENDED BOOKS

1. **Statistics by D.N. Elhance.**
2. **Statistics by Mishra and Mishra.**