

M.Sc. (P) Microbiology Exam-2017-18
SEMESTER-I
Paper- I General Microbiology

Min. pass marks: 36

Duration: 3 hours

Max. marks: 100

Note: Attempt any five questions, taking atleast one question from each unit. Each question carries equal marks.

UNIT I

History- Contribution of Antonie Von Leeuwenhoek, Joseph Lister, Paul Ehrlich, Edward Jenner, Louis Pasteur, Robert Koch, Martinus Beijerinck, Sergei Winogradsky, Alexander Fleming, Selman Waksman; the spontaneous generation controversy; Scope of Microbiology. Microbial diversity (functional and genetic)
Classification up to class level and distinctive characters of major groups : Viruses, Bacteria, Fungi, Algae and Protozoa.

UNIT II

Principles, Function & application of Microscopy: Light, dark field, phase contrast, fluorescence interference, confocal and electron (transmission and scanning) microscopy.
Stains and Staining techniques: Simple, Gram, Capsule, Endospore, Flagella, Acid fast staining.
Determination of biomass, growth and microbial activity.

UNIT III

Culture Disinfection, Sterilization: Principles and Methods of sterilization- Physical and Chemical methods.
Isolation Techniques: Streak plate, pour plate and spread plate method. Enrichment and Selection techniques, single cell isolation, bait techniques, trophic grouping and types of media.

UNIT IV

Growth Curve -Environmental factors affecting growth and Nutrition: Types of bacteria on the basis of energy and nutritional requirement.

Unit V

Major characteristics of bacteria. Morphological, Biochemical, Cultural, Physiological. Metabolic, antigenic, genetic and ecological.

Recommended Books

1. Prescott, L.M., J.P Harley and D.A Klein, 2007. Microbiology VII Ed. Mc Grow Hill,
2. Davis R.Y. E.A. Adeberg and J.L. Ingram, 1991 General Microbiology
3. Stainer .General Microbiology, V Ed., Printice Hall of India Pvt,Ltd. New Delhi
4. Ronald M. Atlas 1997. Principles of Microbiology. II Ed. Mc Graw Hill Pub.
5. Alexopoulos CJ et al, Introductory Mycology 4th Edition
6. Woese, C, R 1981 Archeabacteria , *Sci. Am.* 244:98-122
7. Salle A.J., Fundamental Principles of Bacteriology.

8. Pelczar M.J., Chan E.C.S. & Kreig N.R., Microbiology: Concepts and Application, Tata McGraw Hill.
9. Stainier RY, Ingraham JL, Wheelis ML & Painter PR General Microbiology. Publisher: MacMillan.
10. Madigan M.T., Martinko J.M. and Parker J., Brock Biology of Microorganisms: Prentice-Hall, Inc USA.
11. Atlas R.M., Principles of Microbiology, Wm C. Brown Publishers.

SEMESTER-I

Paper- II Microbial Physiology

Min. pass marks: 36

Duration: 3 hours

Max. marks: 100

Note: Attempt any five questions, taking atleast one question from each unit. Each question carries equal marks.

UNIT-I

Cellular environment, Structure of water and its properties; Acid base concept and buffers; pH and pH indicators, Solutions, Redox, potential, Hydrogen bonding; Hydrophobic, Electrostatic and Vander Waal forces. Scope and importance of biochemistry.

UNIT- II

Microbial growth and growth synchronization: cell membrane and cell wall, their structure, synthesis and regulation in bacteria, transport mechanisms in microbial cells. Microbial metabolism and fuelling reactions. Biochemistry of bioluminescence, chemotaxy and magnetotaxy in bacteria.

UNIT- III

Optical methods: Colorimetry, photometry, nephelometry, VIS, UV VIS and infra red spectrophotometry. Flame photometry, Photo spectrofluorimetry, Mossbauer spectroscopy, ESR and NMR.

UNIT- IV

Basic principles and applications of Chromatography (paper, thin layer, column, gel filtration, ion-exchange and affinity chromatography); GLC, HPLC. Centrifugation techniques. Principles and applications of electrophoresis for protein and DNA; Iso-electric focusing and 2D gel electrophoresis.

UNIT- V

Biological nitrogen fixation, nitrogen fixing organisms, difference in symbiotic and nonsymbiotic fixation. The enzyme. Alternative nitrogenases. Oxygen protection mechanisms. Sources of energy and reducing power, nif gene organization and regulation.

Recommended Books:

1. Wilson K. and Walker J. (2008). Principles and Techniques of Biochemistry and Molecular Biology. Cambridge University Press.
2. Nelson D and Cox MM. (2009). Principles of Biochemistry. W.H. Freeman and Company, New York.
3. Talaro K. P. & Talaro A. (2006). Foundations in Microbiology. McGraw-Hill College Dimensi.

4. Potter GWH and Potter GW (1995). Analysis of Biological Molecules: An Introduction to Principles, Instrumentation and Techniques, Kluwer Academic Publishers.
5. Voet D and Voet JG. (2003). Biochemistry. John Wiley and sons New York.
6. White A, Handler P, Smith El, Hill R and Lehman J. (1983). Principles of Biochemistry. Tata McGraw Hill.
7. Zubay G (2000). Biochemistry. W. C. Brown, New York.
8. Berg J, Tymoczko J, Stryer L (2001). Biochemistry. W. H. Freeman, New York.
9. Moat AG and Foster J W (2003). Microbial Physiology. John Wiley and Sons, New York.
10. Robert K., Murray M.D., Granner D.K., Mayes P.A. and Rodwell V.I. Harper's Biochemistry. McGraw-Hill/Appleton and Lange.

Paper- III Microbial Genetics

Min. pass marks: 36

Duration: 3 hours

Max. marks: 100

Note: Attempt any five questions, taking atleast one question from each unit. Each question carries equal marks.

UNIT-I

Introduction to Molecular Biology, Structure and organization of genomes. Law of DNA constancy, Cot curve and C value paradox, DNA renaturation kinetics and T_m value determination and interpretation, Repetitive DNA, Satellite DNA, Selfish DNA.

UNIT-II

Nucleic Acids : Types and topology. DNA replication; Mechanism and enzymology. Differences in prokaryotes and eukaryotes.

UNIT-III

Techniques in molecular biology: Methods of DNA –sequencing, DNA finger printing, Nucleic Acid hybridization, Southern and Northern Hybridization, PCR, c-DNA and genomic Library.

UNIT-IV

Protoplast fusion techniques, Fusion proteins: Method, Application and Problems in expression of fusion proteins.

UNIT-V

Central Dogma : Mechanism and regulation of transcription and reverse of mRNA. Translation regulation of transcription. Difference in transcription and translation in prokaryotes and eukaryotes.

Reference Books:

1. Concepts of genetics by klug and cummings
2. Genetics: From Genes to Genomes by Leland Hartwell, Leroy E. Hood, Michael L. Goldberg
3. Genetics: Analysis and Principles (3rd Edition) by Brooker
4. Gene cloning by T.A.Brown
5. Genetic Engineering by Nicoll

Paper- IV Biostatistics & Computer Applications SEMESTER-I

Min. pass marks: 36

Duration: 3 hours

Max. marks: 100

Note: Attempt any five questions, taking atleast one question from each unit. Each question carries equal marks.

UNIT-I

Definition of statistics and scope of statistics in bioresearch.

Symbols, notations and terminology of statistics, mathematics and computer applications.

Sampling Techniques: Quantity, frequency and number of samples, type of samplers, place and time of sampling, choice of analytical methods, precision and accuracy.

UNIT-II

Sampling and estimation of population parameters: Random sampling. Sampling size in random sampling stratified two stage Cluster and Sequential sampling. Bias in sampling. Presentation of research results. Graphic presentation and methods of least squares.

UNIT-III

Summarizing data: Central tendency and dispersion.

Variance and coefficient of variation, Standard deviation, Standard error.

Confidence intervals. Normal distribution and its properties.

UNIT-IV

Testing of hypothesis: Some basic concepts, Errors in hypothesis testing; critical region, Students t-test for the significance of population mean and the difference between two population means; Paired t-test.

The analysis of variance. One way and nested ANOVA, Assumptions of ANOVA.

UNIT-V

Probability: Mathematical, Statistical and Axiomatic Definitions; Addition and multiplication. Theorems; Probability Distribution Function-Binomial, Poisson and Normal; Area under Normal Probability Distribution Curve.

Recommended Books:

1. Biostatistics-A foundation for Health Science, Daniel WW, John Wiley (1983).
2. Statistical Methods, Medhi J, Willey Eastern Limited, (1992).

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Practical List

Major Exercise

1. Techniques of pure culture isolation-pour plate, spread plate, streaking.
2. Determination of blood group.
3. Determination of Rh factor.
4. Estimation of haemoglobin content.
5. Triple Sugar Iron Test.
6. IMVIC Test
7. H₂S Production
8. MR – VP test

Minor Exercise

1. Gram Staining of bacteria.
2. Simple staining of bacteria.
3. Negative staining of bacteria.
4. Differential staining of bacteria.
5. Staining of endospore.
6. Litmus Milk Test
7. Catalase Milk Test
8. Isolation of Microbial colony from Soil
9. Isolation of Microbial colony from Water
10. Isolation of Microbial colony from Air
11. Isolation of Microbial colony from Milk
12. Isolation of Microbial colony from food Samples
13. Isolation of Microbial colony from Rhizosphere.
14. Isolation of Microbial colony from Phyloplanes.

Preparations

1. Preparation of Basic Liquid Medium (Broth)
2. Preparation of Basic Potato Dextrose Agar
3. Preparation of Basic Nutrient Agar.
4. Preparation of Basic Peptone Water.

