

॥ अंतरी पेटवू ज्ञानज्योत ॥



NAAC Accredited

NORTH MAHARASHTRA UNIVERSITY,
Jalgaon 425 001

Syllabus for S.Y. B.Sc.

MICROBIOLOGY.

(W.E.F. JUNE, 2003)

॥ अंतरी पेटयु ज्ञानज्योत ॥
NORTH MAHARASHTRA UNIVERSITY, JALGAON.

CORRECTIONS.

S.Y.B.Sc. Microbiology.

Microbiology Paper-III : General Microbiology.

Unit	Number of periods allotted	Number of Marks allotted
I : Microbial diversity.	(Instead of-10) 12	12
II : Microbial associations.	10	12
III : Microbial nutrition & growth.	(Instead of-15) 18	16
IV : Bacterial physiology.	(Instead of-08) 10	12
V : Microbial enzymes.	(Instead of-20) 22	20
VI : Microbiology of air & water.	(Instead of-12) 15	12
VII: Infection and Immunity.	(Instead of-15) 17	16
	Total period =104	Total marks=100

Microbiology Paper-IV : Genetics & Industrial Microbiology.

Unit	Number of periods allotted	Number of Marks allotted
I : Microbial Genetics.	(Instead of-25) 30	26
II : Genetics and phylogenetic approaches to taxonomy.	(Instead of-10) 12	16
III : Bacteriophage Genetics.	(Instead of-10) 12	16
IV : Industrial Fermentation.	(Instead of-33) 36	26
V : Classical Fermentation.	(Instead of-12) 14	16
	Total period =104	Total marks=100

In examination structure for S.Y.B.Sc. Microbiology
Total Marks shown 160 and in Point No.3 it occurs 160,
please read as 150.

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

SYLLABUS FOR S.Y.B.Sc. MICROBIOLOGY.

(W. E. From June, 2003)

Microbiology Paper III: General Microbiology

Unit I : Microbial diversity:	10	
	Ref. No.	Pages
a) Concept of Biodiversity		
b) Major groups of microbes with general characteristics, medical, agricultural and industrial significance - Virus	1	224 - 235
- Algae	1	164 - 176
- Fungi & Yeast	1	88 - 92, 106-111,
	1	14 - 122
- Actinomyces	1	78 - 80
- Archaeobacteria	1	74 - 78
- Rickettsia and Mycoplasma	1	53 - 58, 61 - 65
- Lichens and Mycorrhiza	1	142 - 157
Unit II : Microbial associations:	10	
a) Types of Symbiosis - Mutualistic and parasitic	2	559- 565
b) Establishment of Symbiosis	2	565 - 566
c) Symbiotic relationship between following-		
- Legume - rhizobium	2	408 - 413
- Mycorrhizas	2	568 - 569
- Ruminant symbiosis	2	581 - 583
- Lichens	2	570 - 574
- Bacterial bioluminescence	2	448 - 451
Unit III: Microbial nutrition & growth :	15	
a) Cellular transport of nutrients	2	197 - 201
- Passive diffusion	3	381 - 382
- Facilitated diffusion	3	382 - 383
- Group translocation (PTS)	3	388 - 393
- Active transport	3	383 - 388
b) Diauxic growth	1	422 - 425
c) Continuous Culture & its applications	1	425 - 432
- Chemostat & Turbidostat	3	475 - 488
d) Synchronous culture & its applications	2	190 - 195
Unit- IV: Bacterial physiology:	08	
a) Concept of metabolism		
b) Energy yielding pathways with energetics		
- Glycolysis	2	87 - 92
- Krebs's cycle & Glyoxylate bypass	3	417 - 426

Unit V: Microbial enzymes:	20	
a) Nature & structural properties	1	645 - 649
	3	139 - 144
b) Mechanism of enzyme action	1	655 - 658
- Energy of Activation, Catalytic site		
- Interaction of Substrate & enzymes		
c) Nomenclature & Classification of Enzymes	1	653 - 655
d) Enzyme kinetics	1	658 - 664
- Michaelis - Menten Model		
- Derivation of Michaelis - Menten equation		
- Application of Michaelis - Menten equation		
e) Factors affecting enzyme activity	1	664 - 667
- Enzyme concentration		
- Substrate concentration		
- Temperature & pH		
- Activators		
 Unit- VI: Microbiology of air and water:	 12	
a) Microflora of air & water	7;8	724-725; 698-699
b) Enumeration of bacteria in air	7	725 - 727
c) Concept of aerosols and droplet nuclei	7	728 - 729
d) Indicators of water pollution	7	707 - 711
e) Bacteriological examination of potable water	3	20 -24
 Unit- VII: Infection and Immunity:	 15	
a) Normal microbiota of human body	9	574 - 576
b) Infection – types, mechanism and mode of transmission	9	64 - 70
c) Antigen and antibodies – properties and types	9	80 - 91
d) Specific and non-specific immune response	10	697 - 723
e) Types of immunity	9	71 - 91

Microbiology Paper IV: Genetics & Industrial Microbiology

Unit I: Microbial genetics	25	
	Ref. No.	Pages
a) Nucleic acids	3	94 - 112
- DNA & its structure (B -form)		
- Forms of DNA		
- Palindromic DNA		
- Satellite DNA		
- RNA & its types		
- Comparative account of DNA & RNA	3	113- 116
b) Concept of gene	3	180-184
c) Genetic code & its properties	3	280-295
d) DNA replication	3	151-156
- Modes of replication		
- Meselson - Stahl's experiment		
- Outline of replication		
e) Mutations	3	193-213
- Types of mutation		
- Spontaneous mutation (Fluctuation test & replica plate technique)	8	629-632
- Induced mutation (UV rays, Base analogues & alkylating agents)	3	206-213

Unit II: Genetic and phylogenetic approaches to taxonomy: 10

a) Genetic approach	}	7	442-443
- DNA base composition		1	15-18
- DNA hybridization			
- Nucleic acid sequencing (DNA sequencing & RNA sequencing)		2	315-328
b) Phylogenetic approach - 16S r- RNA - cataloguing			

Unit III: Bacteriophage genetics: 10

a) Twort - deHerelle phenomenon	}	5	
b) Lytic & Lysogenic cycle			
c) T ₄ phage mutants (Rapid lysis, conditional Lethal, Host range)			

Unit IV: Industrial Microbiology: 33

a) Primary & Secondary screening	}	4	55 - 63
b) Fermentor & its parts			
c) Fermentation media			
- Composition, raw materials, sterilization, screening, buffers & antifoam agents		4	117-134
d) Stock culture & inoculum preparation		4	114-116 136-141
e) Detection & assay of fermentation products		4	77 - 113
- Physical, Chemical and biological assay			
f) Recovery and purification of fermentation products		6	
- Cell removal by precipitation, filtration & centrifugation			
- Cell disruption - Physical & Chemical methods			
- Product extraction by liquid - liquid extraction & solvent recovery			
- Absorption & ion exchange chromatography			
- Drying & crystallization			

Unit V: Classical Fermentation: 12

a) Antibiotics - Penicillin	4	223- 247
b) Solvent - ethanol	4	299-303
c) Organic acid - vinegar	4	333-343
	7	802-828

References

1. Modi, H. A (1995, 1996). Elementary Microbiology, Vol. 1, 2 Ekta Prakashan, Ahmedabad
2. Stanier, R. Y. Ingraham, J. L, Wheelis, M. L. and Painter, P. R. (1993). General Microbiology, 5th edition, The Macmillan Press Ltd., London (ISBN 0-333-41768 - 2)
3. Powar, C. B & Dagainwalla, H. F (1990). General Microbiology, Vol. II, Himalaya Publishing House, Bombay (ISBN - 81 - 7040 - 051 -1 & 81 - 7040 - 235 - 2)
4. Casida, L.E.(1991) Industrial microbiology, Wiley eastern Ltd., New Delhi.(ISBN - 0-85226-101-2)
5. Hayes, W (1984) Genetics of bacteria & their viruses, CBS Publ. Pvt. Ltd., New Delhi
6. Stanbury, P.F., Whitaker, A. and Hall, G.(1995) Principles of fermentation technology, 2nd edn., Aditya Books, New Delhi or Pergamon Press, New York.
7. Frobisher, M Hinsdall, F. D, Crabtree, K. T, Goodheart, C. R,(1974), Fundamentals of Microbiology 9th ed., W. B. Saunders Company, U. S. A. (ISBN-0-7216-39922-4)
8. Salle, S. J. (1974), Fundamental Principles of Bacteriology, Tata Mcgraw Hill Publ. Co. Ltd., New Delhi (ISBN - 0 - 07 - 099562 -1)
9. Ananthanarayanan, R. and Jayaram Panicker, C.K. (1990) Textbook of Microbiology, 4th edn., Orient Longman (ISBN- 0-86311 194- 7)
10. Prescott, L. M., Harley, J. P., Klein, D. A. (2000) Microbiology, 5th edn., W. M. C Brown Publishers, England (ISBN - 0 - 697 - 16888 - 3)

Suggested References

1. Prescott, L. M., Harley, J. P., Klein, D. A. (1993) *Microbiology*, 2nd ed., W. M. C Brown Publishers, England (ISBN - 0 - 697 - 16888 - 3)
2. Crueger, W. and Crueger, A. (2000) *Biotechnology: A textbook of industrial microbiology*, 2nd edn., Panima Publ. Co., New Delhi (ISBN 81- 86535 - 27 - 6)
3. Prescott, S.C. and Dunn, C.G. (1983) *Industrial microbiology*, 3rd edn., International students exln., McGraw Hill Book Co. Inc., New York.
4. Leninger, A.L. (1994) *Principles of biochemistry*, 2nd edn., CBS Publ.Pvt. Ltd., New Delhi
5. Singleton, Paul (1997) *Bacteria in biology, Biotechnology & Medicine* 4th edn. John Wiley & Sons, New York (ISBN 0- 471-97534 - 6 hbk and 0- 471-97468 -4 pbk)

Microbiology Practical Course – II: Methods in microbiology

	Total no. of practical allotted
Minor staining techniques (any one method) -	
- Cell wall (Ringen et al./ Chance's method)	01
- Capsule (Hiss's / Maneval's method)	01
- Metachromatic granules (Albert's / Neisser's method)	01
Major staining techniques -	
- Nuclear material staining (Feulgen's method)	01
- Flagella (Bailey's & Loeffler's method)	02
Detection of activity of following enzymes	
- Amylase, gelatinase, catalase and coagulase	02
Cultivation of actinomycetes / fungi by slide culture technique	01
Microscopic examination of Rhizobia (bacteroid forms) from root nodule of legume plant.	01
6. Isolation of mutants by replica plate technique	01
7. Screening of antibiotic & acid producing microorganisms	01
9. Estimation of acetic acid from vinegar by titrimetric method	01
10. Estimation of penicillin by chemical assay method	01
11. Determination of amylase activity of any sample by spectrophotometric method.	01
12. Isolation of DNA from bacteria	01
13. Determination of potability of water by MPN	01
14. Determination of microbial flora of air (hospital, etc.)	01
Total no. of practicals	18

Examination Structure for S. Y. B.Sc. Microbiology

1. Term end topics for microbiology paper III are Unit I to IV and for Microbiology paper IV are Unit I to III.
2. There will be six questions in each of these courses. Marks for each question should be according to following pattern -

Q1. Solve any 4		16
4+4+4+4+4+4	= 24	
Q2. Solve any 2		16
8+8+8	= 24	
Q3. Solve any 2		18
9+9+9	= 27	
Q4. Solve any 4		16
4+4+4+4+4+4	= 24	
Q5. Solve any 2		16
8+8+8	= 24	
Q6. Solve any 2		18
9+9+9	= 27	
	<hr/>	
	= 160	<hr/>
		100

3. The total marks including options for each paper will not exceed 160.
4. The weightage of marks to various topics will be given according to the number of lectures given in the syllabus.
5. There will be three questions in each of the term. Two questions will carry 16 marks each & third will carry 18 marks.
6. The practical examination will be conducted for two days. The duration of examination will be 3.00 hrs for each day.
7. All the practical courses will be divided as follows-

The division of marks will be as follows-

- | | | |
|-----------------------------|---|----------|
| a) Experiment 1 (Major) | : | 20 marks |
| b) Experiment 2 (Minor) | : | 10 marks |
| c) Experiment 3 | : | 20 marks |
| d) Experiment 4 | : | 20 marks |
| e) Spotting (5 Spots) | : | 10 marks |
| f) Oral | : | 10 marks |
| g) Journal (neatly written) | : | 10 marks |
