

Swami Ramanand Teerth Marathwada University Nanded.
Faculty of Science Subject: Microbiology

B.Sc Second year

SEMESTER III

Paper VI: Applied Microbiology

Maximum Marks: 50

Periods: 45

Unit-I Air Microbiology

10

Definition and composition of air, sources of microorganisms in air, significance of microorganisms in air (beneficial and harmful), droplet, droplet nuclei and aerosol, enumeration of microorganisms in air, control of microorganisms in air.

Unit-II Water Microbiology

12

Types of water, Sources of microorganisms in water, Index of water pollution, Different indicator microorganisms, coliform bacteria, Microbial examination of water, water borne diseases.

Unit- III Sewage Microbiology

13

Definition of sewage, composition and strength of sewage (BOD and COD), Microbiology of sewage, Domestic sewage treatment, Municipal sewage treatment, (Primary, secondary, Tertiary sewage treatment), Composting.

Unit-IV Milk Microbiology

10

Definition and composition of milk, sources of contamination of milk , desirable and undesirable changes in milk, milk born diseases, Microbial examination of milk, pasteurization of milk, Application of microorganisms in dairy industry (examples and microflora).

References:-

- 1) Air microbiology an environment and Health Prospective by Aithal, Wakte & Manwar. Cinnamonteal print and publishing Margao,Goa -403601.
- 2) Fundamental principles of bacteriology by A. J. Salle.
- 3) Fundamentals of Microbiology by Martin Frobisher.
- 4) General microbiology by Stanier, Ingraham,Wheelis,Pinter: Macmillan press Ltd. London.
- 5) General Microbiology Vol. II by Power C.H and H.F. Dagainawala. Himalaya Publishing House, Mumbai.
- 6) Microbiology by Pelczar and Crick.
- 7) Text book of Microbiology by Dubey and Maheshwari.
- 8) Text book of Applied Microbiology by Dr. B. M. Sandikar.

Paper VII: Immunology

Maximum Marks: 50

Periods: 45

Unit- I Infection, Immunity and Immune response. 13

Infection- definition, types of infections, sources, modes of transmission, Microbial pathogenicity, aggressive factors of pathogens.

Immunity- definition and classification with suitable examples.

Unit- II Antigens, Antibodies and Immune Response 12

Antigen: Definition, general properties, antigen specificity, bacterial antigens with reference to *S. typhi*.

Antibody: Definition, properties, structure of immunoglobulin, immunoglobulin classes.

Immune response: Definition, types and mechanism- Humoral and cellular, list of effector molecules. Theories of antibody production.

Unit –III Antigen antibody reactions 10

Mechanism and applications of the following reaction with suitable examples- Agglutination, precipitation, complement fixation, virus neutralization, toxin neutralization reaction,

Principle and applications of recent techniques: Enzyme linked immunosorbent assay, Radioimmunosay, Immunofluorescence test.

Unit-IV Hypersensitivity 10

Defination, classification on the basis of time (Delayed and immediate) and mechanism (Type I, II, III and IV) with one example of each.

References:

- 1) Basic Immunology by Joshi and Osarano. Agrobotanical publishers Ltd. Bikaner.
- 2) Elementary Microbiology Vol.I and II Dr. A.H Modi. Akta Prakashan. Nadiad.
- 3) Medical Microbiology. N.C.Dey and T.K. Dey. Allied agency, Culcutta.
- 4) Microbiology by Davis, Dulbecco, Eisen Harper and Row Maryland.
- 5) Molecular biology by David Frifelder, Narosa Publishing house, New Delhi.
- 6) Immunology by B.S.Nagoba and D.V.Vedpathak. BI publications, New Delhi.
- 7) Text book of Microbiology by R. Anantharayanan, C.K. Jayaram Panikar, Orient Longman, Mumbai.

SEMESTER – IV

Paper VIII: Food, Soil Microbiology and Microbial Ecology

Maximum Marks: 50

Periods: 45

Unit-I Food microbiology

12

Definition and composition of food, Sources of contamination in food, Factors affecting kind and number of microorganisms in food. Significance of microorganisms in food, Spoilage and its types (Different types of spoilages with suitable examples).

Preservation of food, food poisoning (Botulinum, Staphylococcal intoxication and Salmonellosis)

Unit –II Soil microbiology and carbon cycle

11

Definition and composition of soil, types of soil, signification of microorganisms in soil, soil as culture medium.

Carbon cycle (with respect to cellulose and starch),

Unit –III Elemental transformation in soil

13

Nitrogen cycle,

Sulfur cycle,

Phosphorus cycle.

Unit –IV Microbial interaction, association and ecology.

09

Symbiosis, antibiosis, mutualism, parasitism.

Concept of population, community, Microbial succession, climax and adaptation (Phenotypic and genotypic adaptations).

Microbe –microbe interaction-Lichen

Plant-microbe interaction: Mycorrhiza, Rhizosphere.

Animal - microbe interaction: Rumen, bioluminescence

References:

- 1) A Manual of Environmental Microbiology. Second Edition .2001 by Christion J. Hurst (Chief Editor), ASM Publications.
- 2) Environmental Biology. Edited by C.F. Foster and D.A. John Wase. Ellis Horwood Ltd. Publication.
- 3) Environmental Microbiology edited by Ralph Mitchell. A John Wiley and Sons.Inc.
- 4) General Microbiology Vol. I and II by Power C.H. & H.F. Dagainawala. Himalaya Publishing House, Mumbai.
- 5) Microbiology by Pelczar and Crick.
- 6) General Microbiology by Stanier. Ingraham, Wheelis, Painter: Macmillan Press Ltd. London.
- 7) Fundamental principles of bacteriology by A.J. Salle.
- 8) **Food microbiology by Frazier.**
- 9) Soil microbiology by Subba Rao.
- 10) Soil microbiology by Alexander.
- 11) Fundamentals of Microbiology by Martin Frobisher.
- 12) Text book of Microbiology by Dubey Maheshwari.
- 13) Prescott Microbiology by Prescott, Harley and Klein (TMH Publication)

Paper IX: Medical microbiology

Maximum Marks: 50

Periods: 45

Unit-I Bacterial infection 12

Etiology, pathogenesis, Clinical features, laboratory diagnosis, epidemiology, treatment and prophylaxis of the following:

- a) Cholera
- b) Typhoid

Unit - II Bacterial infection 10

Etiology, pathogenesis, Clinical features, laboratory diagnosis, epidemiology, treatment and prophylaxis of the following:

- a) Diphtheria
- b) Pulmonary Tuberculosis
- c) Syphilis

Unit- III Viral infections 13

Etiology, pathogenesis, Clinical features, laboratory diagnosis, epidemiology, treatment and prophylaxis of the following:

- a) AIDS
- b) Hepatitis A and B only.

Unit - VI Infection by other Microorganisms 10

- a) Morphology, life cycle, pathogenicity, etiology, laboratory diagnosis, treatment and prophylaxis of Malaria.
- b) Etiology, pathogenesis, Clinical features, laboratory diagnosis and treatment of Candidiosis.

References:

1. Medical Microbiology. N.C.Dey and T.K. Dey. Allied agency, Calcutta.
2. Microbiology by Davis, Dulbecco, Eisen Harper and Row Maryland.
3. Text book of Microbiology by R. Anantharayanan, C.K. Jayaram Panikar, Orient Longman, Mumbai.
4. Medical microbiology by Chakraborty.
5. Medical Microbiology: Prep Manual for Under Graduates by Nagoba, Elsevier.

Paper X- Practical

Based on theory paper VI & VIII

Marks: 50

1. Bacteriological examination of air by solid impingement techniques.
2. Bacteriological examination of water: Quantitative analysis: MPN method
- 3) Bacteriological examination of water: Qualitative analysis: Presumptive, confirmatory, completed test,
- 4) Differentiation between fecal and non-fecal coliforms by IMViC test
- 5) Elevated temperature test (Ejeckman test).
6. Determination of R: S ratio.
7. Demonstration of Ammonification
8. Demonstration of Nitrification
9. Demonstration of Phosphate solubilization
10. Isolation and study of *Rhizobium* species from root nodules of leguminous plants.
11. Isolation and study of *Azotobacter sp.* from soil
12. Bacteriological analysis of milk: MBRT
13. Bacteriological examination of food by SPC method
14. Bacteriological examination of food by DMC method

Paper: XI Practical
Based on theory papers VII & IX

Marks: 50

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1. Blood staining by Leishman's / Giemasa's method.
 2. Metachromatic granule staining (Albert's Method)
 3. Acid fast staining.
 4. RBC counting.
 5. WBC counting.
 6. Blood grouping.
 7. Widal test: Qualitative and Quantitative by slide method.
 8. RPR test.
 9. Gel diffusion test (Demonstration).
 10. Isolation and Study of morphology, cultural and biochemical characteristics of the *Salmonella spp.*
 11. Isolation and Study of morphology, cultural and biochemical characteristics of the *Vibrio cholerae.*
 12. Antibiotic sensitivity tests for above pathogens by disc diffusion method.