

Swami Ramanand Teerth Marathwada University

Faculty of Science B.Sc second Year syllabus.

Revised from June 2009

Subject: Microbiology

Paper No.	Title	Marks
IV	Applied Microbiology.	100
V	Immunology and Medical Microbiology.	100
VI	Practical based on paper-IV.	100
VII	Practical based on paper-V.	100

The syllabus is based on six (3 x 2) Theory periods and 8 (4x2) practical periods per batch per week. Candidates are required to pass separately in theory and practical examination.

Note: B.Sc Second year practical includes studies of growth of microorganisms. These studies needs two consecutive days for completion of practicals.

B.Sc. Second year
Subject: Microbiology / Agricultural Microbiology
Paper IV: Applied Microbiology

Max. Marks: 100

Max. Periods: 80

Unit I: Microbiology of air.

12 periods

Composition of air.

Number and kinds of microorganisms in air (Indoor, Outdoor).

Distribution and sources of air borne microorganisms.

Air as a carrier of microorganisms.

Droplet, droplet nuclei.

Techniques for microbiological analysis of air.

Significance of air flora in human health, hospitals, industries.

Air borne diseases – list of diseases caused by bacteria, fungi, viruses.

Air pollution.

Air sanitation – dust control, UV radiation, bactericidal vapors, filtration, laminar air flow system (HEPA filters)

Unit II: microbiology of water and waste water management

20 periods

Microbial communities in natural water.

Determination sanitary quality of water: bacteriological evidence of faecal pollution, indicators of faecal pollution.

Significance of index organisms. Faecal and non faecal coliforms (IMViC & elevated temperature tests.).

Bacteriological examination of water.

Presumptive, confirmed, completed test, SPC, MPN, Membrane filter technique.

Water pollution: causes hazards & control of human water borne diseases (list).

Municipal water purification methods.

Disinfection of potable water supplies.

Microbiology of Sewage: Definition of sewage, chemical composition.

Microbiology of sewage treatment: septic tank, evapotranspiration, Imhoff's tank.

Municipal sewage treatment process: primary secondary, (aerobic and anaerobic process),
chemical treatment: chlorination.

Disposal of treated sewage.

Unit III: Microbiology of soil

18 periods

Soil as an environment, soil as a culture medium.

Microbiota of soil-their activities.

Brief account of microbial interactions :Definition with examples.

Microbiological examination of soil (SPC).

Major biogeochemical cycles.

Carbon (degradation of cellulose, starch, lignin, pectin) nitrogen phosphorus, sulphur cycle.

General account of microbes used as biofertilizers, phosphate solubilizers. (*Azotobacter* /
Rhizobium)

Rhizosphere: definition, rhizosphere and non rhizosphere microflora,

R: S ratio, interactions between plant and rhizosphere flora.

Unit IV: Microbiology of milk

12 periods

Definition of and composition of milk.

Sources of microorganisms in milk.

Desirable and undesirable microorganisms in milk.

Types of microorganisms- Biochemical types, temperature characteristics

Types and pathogens (of Bovine and Human origin),

Changes in the flora of raw milk stored at room temperature,

Microbiological examination of milk- SPC, DMC, reductase tests.

Pasteurization, phosphatase test.

Unit V: Microbiology of food

18 periods

Food as a substrate for microorganisms.

Major groups of bacteria, fungi, yeast important in food microbiology.

Sources of examination of food, factors affecting kind and number of microorganisms in food.

Microbiological examination of food: general and specific methods of examination.

Principles of food preservation.

Microbiostatic and microbicidal methods: Asepsis, removal of microorganisms, anaerobic conditions, high temperature, low temperature, drying, chemical preservations, high osmotic pressure, radiation, smoking.

Microbial spoilage of foods.

Classification of foods by ease of spoilage, chemical changes caused by microorganisms in food.

Types of spoilage of canned and non canned foods with organisms involved. (Tabular form).

Food borne diseases: food infections, indicators of food pathogens associated with food, food intoxication- Staphylococcal, Clostridial, Salmonella and Mycotoxins.

B.Sc Second Year.

Microbiology / Agricultural Microbiology

Practical paper: VI

Maximum marks: 100

Time: four hours per day per batch for two consecutive days.

(Based on theory paper IV)

- Q-1 Microbial sampling of air from various sources. Indoor / outdoor.
OR
Qualitative analysis of water.
OR
MPN (Most probable number). 15.
- Q-2 Determination of R: S ratio.
OR
Isolation of *Azotobacter*.
OR
Isolation of Rhizobium from root nodules of leguminous plant.
OR
Phosphate solubilizing bacteria (PSB). 15.
- Q-3 Bacteriological examination of milk by Direct Microscopic count
(DMC) / Standard plate Count (SPC).
OR
Isolation of coliphage from Sewage. 15.
- Q-4 Bacteriological examination of food by Direct Microscopic count
(DMC)/Standard plate Count (SPC).
OR
Demonstration of winogradsky column. 15.
- Q-5 Demonstration of (any four). 20.
- a) MBRT.
 - b) IMViC (any one).
 - c) Nitrification.
 - d) Ammonification.
 - e) Sulfate reduction.
 - f) Phosphatase test.

Approach.	:	2
Procedure.	:	2
Result and Conclusion.	:	1

Q-6 Viva Voice (V.V). 10.

Q-7 Record book (R.B). 10

Note: Distribution of marks for Question 1 to 4 will be.

Approach	:	4
Requirements	:	1
Procedure	:	3
Table viva	:	2
Result	:	3
Conclusion	:	2
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Total	:	15

**B.Sc. Second year
Microbiology
Paper V
(Immunology and Medical Microbiology)**

Max. Marks: 100

Max. Periods: 80

Unit – I **20 periods.**

Infection: - Definition, sources, modes of transmission, course of infection, aggressive factors of pathogen.

Immunity: - Definition and classification with examples.

Immune response: Humoral and Cellular. Theories of antibody production.

Unit – II **12 periods.**

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

Antibody: - Definition, structure of immunoglobulin, classification and properties of immunoglobulin classes.

Unit – III **12 periods.**

Antigen-Antibody reaction :- Mechanism and applications of the following reaction with examples- Agglutination ,precipitation, complement fixation, virus neutralization, toxin neutralization reaction. Enzyme linked immunosorbent assay (ELISA).

Unit –IV

Etiology, epidemiology, pathogenesis, symptomatology, laboratory diagnosis, treatment and prophylaxis of the following bacterial diseases.

20 periods.

- i) Tuberculosis
- ii) Typhoid
- iii) Cholera
- iv) Pyogenic staphylococcal infection.
- v) Syphilis.

Unit- V

Etiology, epidemiology, pathogenesis, symptomatology, laboratory diagnosis, treatment and prophylaxis of the following diseases.

16 periods.

- i) AIDS
- ii) Poliomyelitis
- iii) Malaria
- iv) Candidiasis
- v) Amoebic dysentriae.

**B.Sc. Second Year
Microbiology
Paper VII
(Practical)
(Based on theory paper- V)**

Marks: 100

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1. Blood staining of Leishman's / Giemsa's method.
 2. Metachromatic granule staining (any one method).
 3. Acid fast staining.
 4. Staining of blood for malarial parasites.
 5. Separation of serum and plasma.
 6. RBC counting.
 7. WBC counting.
 8. Study of haemolysin.
 9. Study of coagulase.
 10. Blood grouping.
 11. Widal test.
 12. VDRL test.
 13. Gel diffusion test.
 14. Study of morphology, cultural and biochemical characteristics of the following.
 - a) Pyogenic *Staph. aureus*.
 - b) *Salmonella sp.*
 - c) *Vibrio cholerae*
 15. Antibiotic sensitivity test for above pathogens by disc diffusion method.
 16. Haemoglobin estimation by Sahli's method.
 17. Urine examination (physical, chemical and microbiological).
 18. Determination of blood sugar, blood urea, blood cholesterol? (LDL / HDL)

N.B: visit to bacteriological, pathology laboratory / Blood bank.

Books recommended for B.Sc. II year Microbiology.

1. General microbiology Vol. I and II. Powar C.B and Daginawala H.F.
2. Bacterial genetics Braun, Warner W.B., Saunders Co. Philadelphia.
3. Microbiology, Davis, Dulbecco. Eisen Harper and Row. Maryland.
4. Microbial and Molecular genetics. Finacham J.R.S. English University press. London.
5. Molecular biology of the Gene, James D. Watson, W.A. Benjamin Inc. New York.
6. Biochemistry- Lehninger.
7. Text book of Biochemistry- West and Toad Oxford and IBH.
8. Outline of Biochemistry- Cohn and Stump. Willey's Estern Ltd. New Delhi.
9. Biochemistry – L. Stryer, W.H. Freeman and Co. New York.
10. Text book of Biochemistry. A.H.Rose Butter worths London.
11. Molecular biology. David Freifelder, Marosa Publishing House. New Delhi.
12. Elementary Microbiology Vol. I and II. Dr. H.A. Modi. Akta Prakashan. Nadiad.
13. Text book of Biochemistry. O.P. Agrawal.
14. Text book of Microbiology. R. Anantnarayanan C. K., Jayaram Panikar. Orient Longman, Mumbai.
15. Medical Bacteriology. N.C. Dey and T.K. Dey. Allied Agency. Culcutta.
16. Medical Microbiology. Cruickshank. Rober Dugid and others. Churchill Livingstone, New York.
17. Basic Immunology- Joshi and Osarano. Agrobotanical publishers. Ltd. Bikaner.
18. Text book of Immunology. B.S. Nagoba, D.V. Vedpathak. Paras Medical publishers, Hyderabad.
19. Text book of Immunology and Medical Microbiology. M.K Ranjekar, M.A. Bhate and H.G. Shete.
20. Essentials of Immunology. Ivan M. Roit. Blackwell scientific Ltd.

Question paper pattern
Faculty of Science B.Sc. Second Year

Subject: Microbiology / Agricultural Microbiology

Title: Applied Microbiology

Paper: VI

Time: Three Hours

Max. Marks: 100

N.B. I) Attempts all questions.

II) Represent your answer with graph, scheme and diagrams if necessary.

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|-----|--|----|---------------|
| Q-1 | Answer the following question
(Unit I) | OR | (1×20 marks) |
| | Answer the following question
(Unit I) | | (2×10 marks) |
| Q-2 | Answer the following question
(Unit II) | OR | (1×20 marks) |
| | Answer the following question
(Unit II) | | (2×10 marks) |
| Q-3 | Answer the following question
(Unit III / IV) | OR | (1×20 marks) |
| | Answer the following question
(Unit III / IV) | | (2×10 marks) |
| Q-4 | Answer the following question
(Unit V) | OR | (1×20 marks) |
| | Answer the following question
(Unit V) | | (2×10 marks) |
| Q-5 | a) Multiple choice question. (All Units) | | (10 x1 marks) |
| | b) Write Notes on (any two). (All Units). | | (2x5 marks). |
| | i) | | |
| | ii) | | |
| | iii) | | |
| | iv) | | |

Question paper pattern
Faculty of Science B.Sc. Second Year
Subject: Microbiology

Title: Immunology and Medical Microbiology

Paper: VII

Time: Three Hours

Max. Marks: 100

N.B. I) Attempts all questions.

II) Represent your answer with graph, scheme and diagrams if necessary.

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|-----|--|----|---------------|
| Q-1 | Answer the following question
(Unit I) | OR | (1×20 marks) |
| | Answer the following question
(Unit I) | | (2×10 marks) |
| Q-2 | Answer the following question
(Unit II / III) | OR | (1×20 marks) |
| | Answer the following question
(Unit II /III) | | (2×10 marks) |
| Q-3 | Answer the following question
(Unit IV) | OR | (1×20 marks) |
| | Answer the following question
(Unit IV) | | (2×10 marks) |
| Q-4 | Answer the following question
(Unit V) | OR | (1×20 marks) |
| | Answer the following question
(Unit V) | | (2×10 marks) |
| Q-5 | a) Multiple choice question. (All Units) | | (10 x1 marks) |
| | b) Write Notes on (any two). (All Units). | | (2x5 marks). |
| | i) | | |
| | ii) | | |
| | iii) | | |
| | iv) | | |