

MICROBIOLOGY

B. Sc. Semester III

Paper I: Enzymology And Metabolism

UNIT I : Enzyme Introduction

- a. Definition and nature of enzyme, History in brief.
- b. Definitions of different terms used in enzymology: Holoenzyme, apoenzyme, coenzyme, cofactor, prosthetic group, multienzyme, isoenzyme, membrane bound enzymes, zymogenes, enzyme inhibitors, reversible and irreversible inhibition-types
- c. Classification and nomenclature in brief(IUB)
- d. Models of enzyme catalysed reactions-Fisher lock – key hypothesis and Koshland induced fit hypothesis.

Unit II: Enzyme Kinetics

- a. Primary concept of catalysis, activation energy, transition state, difference between chemical catalysis and biocatalysis
- b. Enzyme kinetics- Michaelis Menten equation, single substrate reaction, ES complex, MM constant, operational definition of MM constant, enzyme activity, definition of enzyme unit (IU), katal, specific activity, turn over number
- c. Enzyme regulation- allosteric site, allosteric modulators
- d. Immobilized enzyme- techniques and applications(in brief)

Unit III: Carbohydrate And Lipid Metabolism

- a. General strategies of metabolism-catabolism, anabolism, amphibolism
- b. EMP pathway (detail)
- c. HMP pathway(outline)
- d. ED Pathway(outline)
- e. PK pathway(outline)
- f. TCA cycle(deatail) with regulation, anapleortic reactions- definition and examples
- g. β -oxidation of fatty acid

Unit IV: Energy Metabolism

- a. Phosphorylation- substrate level, definition and examples, oxidative phosphorylation and electron transport chain- general features, cytochromes, NADH and succinate dehydrogenases, generation of ATP- in detail
- b. Photophosphorylation- cyclic and non cyclic photophosphorylation in detail
- c. General concept of respiration and fermentation- alcohol, lactic acid, acetone butanol and mixed acid fermentation
- d. Metabolic mill

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Paper II:- Industrial And Food Microbiology

UNIT I: General Concepts

- a. Definition and scope of industrial microbiology
- b. Classification of microorganisms on the basis of industrial application (in Table)
- c. General concepts of fermentation: definition, types of fermentation, general layout of fermentation unit, design of typical batch fermentor, different parts, fermentor types, commonly used raw materials and antifoaming agents
- d. Screening: primary screening e.g. antibiotic and vitamins, secondary screening-general considerations
- e. Tolerance studies, scale up, inoculums build up, strain development

UNIT II: Industrial production ,Biochemistry , Recovery and Uses of

- a. Microorganism as a product(biomass): Bakers Yeast
- b. Solvent: Alcohol
- c. Beverages: Beer(only introduction& types) and Wine (production process and types)
- d. Antibiotic : Penicillin
- e. Organic acid: Citric acid
- f. Amino acid: Lysine

Unit III: Milk Microbiology

- a. Definition and composition of milk
- b. Sources of microorganism in milk
- c. Testing the quality of milk: MBRT, grading of milk
- d. Pasteurization of milk- LTH, HTST, UHT, phosphatase test
- e. Milk product: Cheese, classification of cheese, cottage cheese production

Unit IV: Food Microbiology

- a. Introduction to food microbiology
- b. Classification of food on the basis of ease of spoilage
- c. Food spoilage- factors responsible for food spoilage, chemical changes due to spoilage
- d. Food preservation-high temperature(canning in detail), low temperature, preservatives and additives, radiation
- e. Food safety, Hazards-physical, biological and chemical hazards
- f. Concept of HACCP
- g. Food poisoning and food infections: Botulism, Salmonellosis
- h. Food products: Idli

Practical Course for Semester III

Marks :30

(Based on theory paper I & II)

1. *Primary screening of antibiotic producer from soil
2. Leavening capacity of yeast
3. *Production and estimation of alcohol.
4. *Immobilization of yeast cell and demonstration of yeast invertase activity
5. Production of Penicillin and Bioassay of standard penicillin
6. Production and Bioassay of amylase enzyme
7. *Gradation of milk by Methylene Blue Reduction Test (MBRT).
8. *Testing Efficacy of pasteurization- phosphatase test
9. *Demonstration of enzymes: amylase ,catalase, lipase , gelatinase, Urease
10. Sterility testing of pharmaceutical products- injectibles, eye and ear drops.
11. Microbiological analysis of finished and raw foods(SPC, CPC, YMPC)
12. * Detection of food adulteration (milk, honey, chilli powder, wheat flour)

Note:

1. Underlined experiments are treated as major experiments.
- 2.Students should perform atleast 4 major and 6 minor experiments
3. Practicals with asteric mark are compulsory.

Distribution of marks during semesterwise practical examination of

B.Sc. Microbiology Semester III

1. One major experiment ---	10
2. Two minor experiment --- 2x5=	10
3. Viva voce	5
4. Practical record	5

	30

(Duration of exam will be 5 hrs. on two successive days)

Recommended Books for Theory (Semester-III Paper I & II)

1. Principles of Biochemistry- A.L. Lehniger
1. Fundamentals of Biochemistry- J. L. Jain
2. Biochemistry- Voet and Voet.
3. Textbook of Biochemistry- S.P. Singh.
4. Biochemistry, Author- Stryer.
5. Principles of Biochemistry – Zubey, Parson and Vance.
6. Food Microbiology- Frazier and Westhoff.
7. Food Microbiology- Adams and Moss
8. Introductory Food Microbiology– H.A. Modi
9. Industrial Microbiology by G. Reed (Ed), CBS Publishers (AVI Pub. Co.)
10. Biotechnology, A textbook of industrial Microbiology by Creuger and Creuger, Sinauer associates.
11. Biotechnology-Expanding Horizon by B.D.Singh .1st ed., Kalyani Pub., Delhi.
12. textbook of Industrial Microbiology, Author- A. H. Patel.
13. Industrial Microbiology, Author- L. E. Cassida
14. Industrial Microbiology, Author- G. Reed.
15. Industrial Microbiology, Author- Agarwal And Parihar.
16. Principles of Fermentation Technology- Standbary, Whitaker and Hall.
17. Biochemistry- Powar and Chatwal.
18. Harpers Biochemistry
19. Element of Biochemistry- O.P.Agrawal
20. Bacterial Metabolism- Dolle
21. Text book of biochemistry- West and Todd
22. Industrial Microbiology- Prescott and Dunn
23. Modern industrial microbiology and biotechnology-Nduka and Okafor
24. Food safety-theory and application-Paul L. Knechtges, Jones and Bartlet Ind. Pvt. Ltd. New Delhi
25. Food fermentations: micronutrient fortification of tribal food- S.D. Patankar, Lambert academic publication, Germany
26. Biochemistry- Satyanarayan
27. Biotechnology- Satyanarayan