

Semester – III
BIM -C301
DSC-3 MICROBIAL PHYSIOLOGY AND METABOLISM

MM : 100
Time : 3 hrs
L Credit
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Sessional : 30
ESE : 70
Pass Marks : 40

Total Hours: 60

Learning objectives:

- To understand different phases of bacterial growth and its kinetics.
- To understand how microbes do catabolism to get energy to build structure.
- To understand different metabolic pathways and enzymes involved by which energy will be generated
- To acquire knowledge of classifying enzymes and how they function.
- To understand how the nitrogen is fixed by symbiotic and non-symbiotic nitrogen fixation and genes involved in nitrogen fixation

Learning outcomes:

At the end of course student will be able to

- Calculate generation time and number of generations.
- Explain principles and mechanism of aerobic and anaerobic respiration in microorganisms.
- Explain the concept nitrogen metabolism, assimilation of nitrates, ammonia assimilation and fixation of nitrogen
- Explain the bacterial photosynthesis and also the differentiation between oxygenic and anoxygenic photosynthesis bacteria
- Classify enzymes and demonstrate the mechanism of enzymes and their functions.

UNIT-I

Bacterial Growth Curve; Synchronous growth; microbial growth kinetics in batch cultures; growth measurement: by cell mass, cell count and cell turbidity; factor affecting the growth of microorganism.

(12 Lectures)

UNIT II

Enzymes: characteristics, nomenclature, classification and application of enzymes; Factors influencing enzymatic activity; Mechanism of enzyme action; Allosteric enzymes.

(10 Lectures)

UNIT-III

General concepts of respiration and fermentation: aerobic and anaerobic respiration, fermentation: alcoholic fermentation, lactic acid fermentation

(10 Lectures)

UNIT-IV

Microbial metabolism: General strategy of metabolism, anabolism, catabolism, ATP, Phosphorylation, Oxidative phosphorylation and substrate level phosphorylation, primary metabolic pathway, secondary metabolic pathway, metabolism of carbohydrates (glycolysis, TCA cycle)

(14 Lectures)

UNIT-V

Nitrogen fixation in symbiotic and free-living microorganisms, root nodule formation, leghaemoglobin, nitrogenase enzyme; Photosynthetic bacteria and their classification.

(14 Lectures)

Suggested Reading

1. Dubey R.C. and Maheshwari, D.K. *A Textbook of Microbiology*. 3rd ed., S. Chand & Co, Ram Nagar, New Delhi, p. 1034. ISBN 81-219-2620-3
2. Dubey, R.C. and Maheshwari, D.K. *Practical Microbiology*. 2nd ed., S. Chand & Co. P Ltd, New Delhi, p. 413. ISBN: 81-219-2559-2
3. Roger Y. Stanier, John L. Ingraham. *General Microbiology*. Palgrave Macmillan, ISBN-13: 978-0333763643
4. Powar and Dagainawala. *General Microbiology Vol1 and Vol2*, Himalaya Publishing House, ISBN-13: 978-9350240892
5. M.T. Madigan, J.M. Mahinko Jack Parker Brock. *Biology of Microorganisms*, Pearson Education ISBN 978-9332586864

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DSC 3 SEMESTER II / BIM-C351 (LAB COURSE CC-03)

1. Determination of growth curve of bacteria.
2. Bacterial population count by turbidimetry method
3. Amylase production test.
4. Cellulase production test.
5. Demonstration of carbohydrate metabolism.
6. Demonstration of enzyme activity in given microorganism.
7. Detection of number of bacteria in milk by standard plate count technique.
8. Determination of quality of milk sample by MBRT (methylene blue reductase test).
9. Laboratory preparation of sauerkraut.
10. Different tools in microbiology lab (Autoclave, Laminar Air Flow, Incubator, Hot Air Oven, and Light Microscope).
11. Effect of ultraviolet radiation on bacterial growth.
12. Effect of dyes on bacterial growth.
13. Separation of leaf pigments through paper chromatography on bacterial growth.

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