MMB - C103
MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY

L T Credit
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Learning objectives:

- To understand howmicrobes carryout catabolism to get energy and metabolism to build structures.
- To understand different metabolic pathway and enzyme involved by which energy will be generated
- To acquire knowledge of classifying enzyme and how they functions.
- 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

- Explain principles and mechanism of aerobic and anaerobic respiration in microorganisms.
- differentiate between phosphorylation, substrate level phosphorylation and oxidative phosphorylation
- Explainthe 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 enzyme and demonstrate the mechanism of enzymes and their functions.
- describe the process of nitrogen fixation

UNIT – I

Carbohydrate Metabolism- Oxidation–reduction reactions; anabolism, catabolism, ATP (phosphorylation, oxidative phosphorylation, substrate level phosphorylation),metabolic pathways- glycolysis, pentose phosphate pathway, EntenerDoudoroff pathway, TCA cycle, Glyoxalate cycle.

(13 Lectures)

UNIT – II

Enzymes- Classification, enzyme components, mechanism of enzyme action, types of mechanisms, allosteric enzymes and their mechanism of action.

(8 Lectures)

UNIT – III

Nitrogen Metabolism and Nutrient Transport: Assimilation of nitrates, ammonia assimilation; amino acid biosynthesis- glutamate family, serine family, aspartate family, histidine biosynthesis; nutrient uptakes of solutes into cells, active transport and group translocation; transport of iron.

(10 Lectures)

UNIT – IV

Bacterial Photosynthesis: Classification of photosynthetic bacteria, oxygenic and anoxygenic photosynthetic bacteria, phytosynthetic pigments, bacteriochlorophyll, bacterirhodopsin, phycobilins; metabolism in phytosynthetic bacteria; phytosynthetic electron transport system; mechanism of photosynthesis, cyclic and non-cyclic photophosphorylation, dark reaction (Calvin–Benson cycle).

(14 Lectures)

UNIT – V

Nitrogen Fixation: Symbiotic nitrogen fixation systems- root nodulating symbiotic bacteria, process of root nodule formation, leghemoglobulin; free-living and associative N_2 fixing bacteria, metabolism of N_2 fixation, (anaerobic microorganisms, cyanobacteria, free-living aerobic and symbiotic microorganisms); genetics of nitrogen fixing bacteria, *nif* genes and their regulation, nitrogen fixation mechanisms, nitrogenase types– structure and function; alternative nitrogenase, substrates for nitrogenase, actinorhizal nodules, oxygen protection in nodules.

(15 Lectures)

Suggested Reading

1. Roger Y. Stanier, John L. Ingraham. General Micobiology, Palgrave Macmillan, **ISBN-13:** 978-0333763643
2. 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
3. Powar and Daginawala. General Microbiology Vol1 and Vol2, Himalaya Publishing House,**ISBN-13:** 978-9350240892
4. M.T.Madigan, J.M.Mahinko Jack Parkar Brock: Biology of Microorganisms, Pearson Education ISBN 978-9332586864

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