

B. Sc (CBCS) Microbiology – II Year
Semester-III – Paper-III
BS304-DSC-1C: MICROBIAL PHYSIOLOGY

Theory syllabus

Credits – 4

UNIT – I

1. Microbial nutrition - Nutritional groups of microorganisms - autotrophs, heterotrophs, mixotrophs, methylotrophs. Nutritional requirements and uptake of nutrients by cells
2. Microbial growth – Growth curve, different phases of growth in batch cultures.
3. Factors influencing microbial growth, Synchronous, continuous, biphasic growth. Methods for measuring microbial growth – Direct microscopy, viable count estimates, turbidometry, biomass.

UNIT – II

1. Phototrophy – Diversity of phototrophic organisms. Photosynthetic apparatus in prokaryotes. Outlines of oxygenic and anoxygenic photosynthesis in bacteria.
2. Photosynthetic pigments and their light absorption, photochemistry of PSI and PSII
3. Modes of CO₂ fixation (Calvin cycle, reverse TCA cycle and HP pathway)

UNIT – III

1. Aerobic respiration - Glycolysis, HMP pathway, ED pathway, TCA cycle, electron transport, oxidative and substrate-level phosphorylation. Anaplerotic reactions. β -oxidation of fatty acids.
2. Glyoxylate cycle. Anaerobic respiration (nitrate, sulphate respiration).
3. Fermentations - Common microbial fermentations with special reference to alcohol and lactic acid fermentations.

UNIT – IV

1. Anaerobic respirations – Sulphate, nitrate, carbonate respirations and their ecological significance.
2. Fermentations – Fermentation types, alcohol, lactate, propionate, mixed acid and butanol fermentations and their industrial importance.
3. Concept of primary and secondary metabolism.



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Practical syllabus

Credits – 1

1. Study and plot the growth curve of *E. coli* by turbidometric method.
2. Effect of temperature on growth of *E. coli*.
3. Effect of pH on growth of *E. coli*.
4. Effect of osmotic pressure (salt and sugar concentration) on bacterial growth.
5. Setting and observation of Winogradsky column.
6. The oligodynamic action of heavy metals on bacterial growth.
7. Biochemical tests - Indole test, Methyl red test, Voges Proskauer test, Citrate test
Carbohydrate fermentation & Gas production, Amylase test, H₂S production test, Nitrate reductase test, Starch hydrolysis, catalase test.

References:

1. Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14th edition. Prentice Hall International Inc.
2. Moat AG and Foster JW. (2002). Microbial Physiology. 4th edition. John Wiley & Sons.
3. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India.
4. Gottschalk G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag.
5. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press.
6. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.

