

**C-5: MICROBIAL PHYSIOLOGY AND METABOLISM (THEORY)  
SEMESTER –III**

**HMBCR3052T**

**TOTAL HOURS: 52**

**CREDITS: 4**

**Module 1**

**Marks: 25**

**Unit 1 Effect of Environment on Microbial Growth**

**No. of Hours: 4**

Microbial growth in response to environment -Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe), barophilic.

**Unit 2 Chemoheterotrophic Metabolism - Aerobic Respiration**

**No. of Hours: 16**

Concept of aerobic respiration, anaerobic respiration and fermentation  
Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway, TCA cycle  
Electron transport chain: components of respiratory chain, comparison of mitochondrial and bacterial  
ETC, electron transport phosphorylation, uncouplers and inhibitors

**Unit 3 Chemoheterotrophic Metabolism- Anaerobic respiration**

**No. of Hours: 6**

Anaerobic respiration, comparison between aerobic and anaerobic respiration

**Module 2**

**Marks : 25**

**Unit 4 Chemolithotrophic and Phototrophic Metabolism**

**No. of Hours: 12**

Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction)  
Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria, purple bacteria and cyanobacteria

**Unit 5 Nitrogen Metabolism - an overview**

**No. of Hours: 6**

Introduction to biological nitrogen fixation, Ammonia assimilation, Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification

**Unit 6 Fermentation**

**No. of Hours: 8**

Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways), concept of linear and branched fermentation pathways

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### **HMBCR3052P**

#### **(PRACTICAL)**

**TOTAL HOURS: 39**

**CREDITS: 2**

1. Study and plot the growth curve of *E. coli* by turbidometric and standard plate count methods.
2. Calculations of generation time and specific growth rate of bacteria from the graph plotted with the given data
3. Effect of temperature on growth of *E. coli*
4. Effect of pH on growth of *E. coli*
5. Effect of carbon and nitrogen sources on growth of *E. coli*
6. Effect of salt on growth of *E. coli*
7. Demonstration of alcoholic fermentation
8. Demonstration of the thermal death time and decimal reduction time of *E. coli*.

#### **SUGGESTED READINGS**

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
6. Stanier RY, Ingraham JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press.
7. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.
8. Lehninger's Biochemistry
9. Voet & Voet. Biochemistry

