Course: MICROBIOLOGY PG

Semester	1
Paper Number	MMCB4112
Paper Title	BOINSTRUMENTATION AND BIOENERGETICS
No of credits	6
Non composite/composite	Composite
No. of periods assigned	6
Course description/objective	• To physico-chemical techniques and bioinstrumentation • To know energy metabolism processes • To know the bioinstrumentation techniques
Reference List	Lehninger Principles of Biochemistry, Nelson & Cox. Biochemistty, Voet and Voet. Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14th edition. Prentice Hall International Inc. Moat AG and Foster JW. (2002). Microbial Physiology. 4th edition. John Wiley & Sons. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India Gottschalk G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education
Evaluation	Theory: 70 (60 End sem + 10 CIA) Practical: 30 (10 End sem + 20 CIA) **Question Paper format: theory end semester** **Module 1: 30 marks** SHORT QUESTION: FROM **7** QTNS **ANSWER 5 (EACH 2 MARKS)** = 5X2=10 LONG QUESTION: FROM **6** QTNS **ANSWER 4 (EACH 5 MARKS)**= 4X5=20 **Module 2: 30 marks** SHORT QUESTION: FROM **7** QTNS **ANSWER 5 (EACH 2 MARKS)** = 5X2=10 LONG QUESTION: FROM **6** QTNS **ANSWER 4 (EACH 5 MARKS)**= 4X5=20 Viva: End sem 10 marks

BIOINSTRUMENTATION & BIOENERGETICS

THEORY 70

MODULE 1Bioinstrumentation 35 MARKS

Physico-chemical techniques: Centrifugation: Basic principle, types and application of preparative centrifuge. Chromatography: Principle and application of partition, gel filtration and affinity chromatography. Introduction to HPLC. Electrophoresis: Types, principle and application.Viscosity: Introduction to viscosity and principle of Ostwald viscometer

Microscopy and application-Basic idea of light diffraction, polarization, fluorescence.Basic principle and applications of bright-field, dark-field, phase contrast, DIC microscopy. Introduction to Confocal, evanescent field, Super-resolution and Electron microscopy

Spectroscopic methods: Basicsof UV-Visible, Fluorescence,IRspectroscopy (**RM**)

- **MODULE 2**

Energymetabolism35MARK S (**KS+AB**)

Photosynthesis: Energy consideration in photosynthesis, light and dark reaction, electron carriers in photosynthesis, Organization of photosystem I and II, cyclic and non-cyclic flow of electrons, Z scheme, Hill reaction, photolysis of water. Bacterial photosynthesis: scope, electron carriers, Photosynthetic reaction center, cyclic flow of electrons, bacterial photophosphorylation in various groups of phototrophic bacteria, electron donors other than water in anoxygenic photosynthetic bacteria.

Chemolithotrophy- Basic mechanism of ATP synthesis, Reverse and forward electron flow.Chemolithotrophic bacteria- Different types namely ammonia oxidizers, methanogens, nitrite oxidizers, hydrogen oxidizers, iron oxidizers and Sulphur oxidizers.

Degradation of carbohydrate: Glucose Metabolism– EMP pathway, hexose monophosphate pathway, Entner-Doudoroff pathway, Phosphoketolase(PK) pathway, TCA cycle, gluconeogenesis, Feeder pathways for glycolysis.

Degradation of proteins and amino acids: protein turnover; flow of nitrogen into biosynthesis and catabolism of amino acids (with reference to representative examples phenylalanine, tyrosine, tryptophan, arginine, alanine, glycine, glutamic acid, glutamine); central role of glutamine. **Degradation of nucleic acids:** metabolism of purines and pyrimidines; urea cycle and the excretion of nitrogen.

Degradation of Fatty acid: Oxidation of fatty acids, β oxidation; biosynthesis of fatty acids and cholesterol (outline); ketone bodies. Integration of metabolism and metabolic regulation with reference to metabolic pool.

Metabolism of energy reserve compounds: Polyglycans, Poly- and β-hydroxybutyrate, nitrogenous and non-nitrogenous compounds- synthesis and degradation in bacterial cells.

Electron transport chain and oxidative phosphorylation: Aerobic and anaerobic respiration (electron transport, oxidative phosphorylation, regulation of ATP production); Fermentation- homolactic, heterolactic, mixed acid, Cori cycle.

PRACTICAL: 30 MARKS20CIA+ 10 END SEM

1. TLC and Column chromatographic assays(RM)
2. Use of differential centrifugation to purify cell extracts(RM)
3. Separation of proteins using SDS-PAGE(RM)
4. Getting acquainted with a compound microscope-Basics of lightmicroscopy(RM)
5. Use of UV-Vis spectrophotometer in biology(SSC)
6. photosynthesis assay(AB)

7. problems of Bioenergetics(AB)

Reference:

Lehninger Principles of Biochemistry, Nelson &
Cox.Biochemistty, Voet and Voet.
Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms.14th edition. Prentice Hall International Inc.
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