

Day 1- Introduction Class (Syllabus & Questions discussion)

15 December 2024

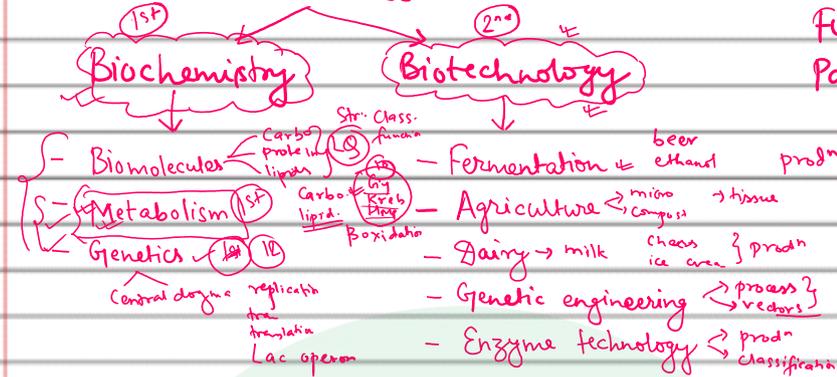
Microbiology

2081 → notes PDF

1st → 2nd

Hamromaster live online class

B.Sc. 2nd Year Microbiology (MB 201)



Full marks = 100

Pass marks = 35

Website = hamromaster.com

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Description of the Course

Course Title: Biochemistry and Microbial Biotechnology

by Sushmita Shrestha

Full Marks: 100
Course No: MB 201 (Major)
Pass Marks: 35
Nature of the Course: Theory
Year: II
Total Lecture Hours: 150

Course Contents

Living cell and understanding of its biochemical functions- 15 hrs

Origin of biochemistry and its relationship with other sciences, biochemical explanation of living things, the elements of life, chemical elements present in living organisms, organic compounds found in living cells, water: the solvent for life, cell bio membranes- structure and functions.

Macromolecules and biomolecules of living cells- 20 hrs

Introduction, functions, classification, structure, important properties of carbohydrates, amino acids, proteins, lipids, and nucleic acids
Enzymes: nomenclature, classification, functions of enzymes, co-enzymes, cofactor and isozymes, enzyme kinetics, factors affecting the regulation of enzymes.

Microbial metabolism- 20 hrs

Concept of exergonic and endergonic reactions, heterotrophic and autotrophic metabolism, the role of ATP intermediary metabolism, heterotrophic generation of ATP in various pathways of carbohydrate metabolism, lipid metabolism, protein metabolism.

Microbial genetics- 20 hrs

Structure, types, and functions of DNA and RNA, replication of DNA, transcription, and translation, regulation of gene expressions, lac operon, genetic code.

Concept of biotechnology- 5 hrs

Definition and history, scope and importance, risk, and hazards of biotechnology.

Fermentation process- 15 hrs

Introduction, the solid-state fermentation, submerged state fermentation, fermentation industries, beer, ethanol, acetic acids, fermentor designs.

Agricultural microbial biotechnology- 15 hrs

Introduction biofertilizer and composting, plant tissue culture, micropropagation, and

Agricultural microbial biotechnology- 15 hrs

Introduction, biofertilizer and composting, plant tissue culture, micropropagation, and disease-free plants, the general concept of cell fusion, and embryo transfer.

Biotechnology in dairy industry- 12 hrs

Milk and milk products: cheese, yogurt, ice-cream production, sour milk, skimmed milk, dry powder milk, pasteurization process of milk.

Methods in genetic engineering- 12 hrs

Introduction, the outline of gene cloning, gene cloning procedure, vectors used in recombinant DNA technology, applications, and possible hazards of genetic engineering.

Enzyme technology- 16 hrs

Introduction, source of enzymes, selection of the source of enzymes, the advantage of microbial enzymes, production and purification of protease, amylase, chitinase, and pectinase.

Textbooks

1. Nelson DL and Cox MM (2004). Lehninger Principles of Biochemistry, 5th Edition. Freeman Publication.
2. Stryer L (1995). Biochemistry, 4th Edition. W.H. Freeman Company, New York.
3. Creuger W and Creuger A (2000). Biotechnology. A textbook of Industrial Microbiology. Sinauer Associates.
4. Smith JE (1996). Biotechnology, 3rd Edition. Cambridge University Press.
5. Cassida LE Jr (1996). Industrial Microbiology, New Age Int. Publishers.

Reference books

1. Rao KR (1986). Textbook of Biochemistry, 3rd Edition. Prentice-Hall of India.
2. Rao RAVSS (1993). A Textbook of Biochemistry, UBSPD Co.
3. Jain JL (2004). Fundamentals of Biochemistry. S Chand and Company Ltd.
4. Dubey RC (2001). Textbook of Biotechnology. S Chand and Company Ltd.

Microbiology, chapter-wise topics for last hour revision

1. Living cell and understanding of its biochemical functions → 5 marks or 2.5 marks

- Water is solvent for life. (5)
- application of biochemistry → (Subject)
- organic compounds found in living cell. (lipid, protein) (5)
- structure and function of cell membrane. (5)
- buffer

2. Macromolecules and biomolecules of living cell (10 marks + 5 marks + 2.5 marks)

- Introduction, functions, classification, structure and properties of:
 - a) carbohydrates
 - b) lipids
 - c) amino acids or proteins } 10

- Selivanoff's test (2.5)
- Ninhydrin reaction
- denaturation of protein
- saponification, etc. (Nucleic acid)

{ By: }
{ Sushmita }

3. Microbial metabolism (10 marks + 5 + 2.5 marks)

- Glycolysis
 - Krebs cycle
 - HMP Pathway
- } 10 (ED)

- Krebs cycle ✓ (10) (ED) →
- HMP Pathway ✓
- β -oxidation of lipid ✓
- calculation of ATP production ✓
- oxidative and substrate level phosphorylation } 5 or 2.5
- exergonic and endergonic reaction ✓

4. Microbial genetics (10 + 5 + 2.5 marks)

- DNA replication ✓
- Transcription ✓
- Translation ✓
- Lac operon (and gene regulation) } 10
- genetic code ✓
- DNA polymerase ✓
- central dogma ✓
- structure of DNA } 5 or 2.5
- Structural types of RNA (mRNA, tRNA, rRNA)

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5. Fermentation process (10 or 5 + 2.5 marks)

- Beer production ✓
- Ethanol production, vinegar (acetic acid) fermentation } 10 prodⁿ
- solid state and submerged stage fermentation } diff.
- well labelled diagram of fermenter ✓
- microorganisms involved in fermentation ✓

5. Concept of biotechnology (5 or 2.5 marks)

- scope and application ✓
- risks and hazards ✓
- importance ✓

7. Agricultural microbial biotechnology (5 + 2.5) (10 sometimes)

- biofertilizer ✓ (nos) → fixation
- micro propagation ✓ → pres
- composting ✓ → prod

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- micro propagation ¹⁰ ₁₀ ¹⁰ ₁₀
- composting ₁₀
- microbes used as biofertilizer ₁₀
- techniques of plant tissue culture _{How to do?}
- hormones used in plant tissue culture.

8. Biotechnology in dairy industry (10 or 5+2.5)

- production of cheese ₁₀
- production of ice cream ₁₀
- Yoghurt production ₁₀
- pasteurization of milk ₁₀ _{temp time}
- composition of milk _{Water carb. protein}
- microbes used.

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9. Methods in genetic engineering (5+2.5 marks)

- vectors used in recombinant DNA technology (RDT) _(Sometimes 10)
- Gene cloning ₁₀ _{procedure}
- risks and hazards & applications ₅ _{or 2.5}

10. Enzyme technology (10 or 5 + 2.5 marks)

- sources of enzyme
- production & purification of: protease & amylase (method) (procedure)
- advantages / application of enzymes (chitinase, pectinase)

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Question Pattern

Question's Type	Total questions	To be attempted	Marks
Long answer question	6	4	$4 \times 10 = 40$
Short answer question	10	8	$8 \times 5 = 40$
Very short answer question	10	8	$8 \times 2.5 = 20$
			Total = 100

TRIBHUVAN UNIVERSITY

2079

Bachelor Level (4 yrs.)/ II Year /Sc. & Tech. Full Marks: 100
Biochemistry and Microbial Biotechnology (MB.201) Time: 3 hrs.

Candidates are required to give their answers in their own words
as far as practicable.

The figures in the margin indicate full marks.

NEW COURSE

SECTION "A"

Attempt FOUR questions.

4×10=40

1. What is an operon? Explain the mechanism of Lac operon in *E. coli*.
[2+8] *genetic*
2. Explain various types of cheese and microbial process of cheese
production. [4+6] *dairy*
3. Explain the steps involved in the micro-propagation of disease free
plants. [10] *agric*
4. Describe the industrial production of acetic acid. [10] *for*
5. Differentiate between heterotrophic and autotrophic metabolism.
Describe heterotrophic generation of ATP in carbohydrate
metabolism. [4+6] *met. Sol.*
6. Describe the sources and applications of microbial enzymes. [5+5] *large*

SECTION "B"

Attempt any EIGHT Questions:

8×5=40

7. Briefly describe steps of gene cloning.
8. What are the potential risks and hazards associated with GMOs?

14. Write down the use of microorganism in enzyme production with examples. Mention industrial applications of enzyme.
15. Draw a labelled diagram of stirred tank fermenter
16. Describe various techniques of milk pasteurization. .

SECTION 'C'

Attempt any EIGHT Questions.

8×2.5=20

17. Very short answer questions :

- a) Enlist various elements essential for living organism.
- b) Enlist Glycolipids.
- c) Define co-enzyme and ISO enzyme.
- d) Mention significance of TCA cycle.
- e) Write short notes on genetic code.
- f) Define bio- pesticides with examples.
- g) Define submerged state fermentation.
- h) Enlist vectors used in genetic engineering.
- i) Outline the production of sour milk.
- j) Enlist industrially important microbes and products produced by them.

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TRIBHUVAN UNIVERSITY

2080 (Regular)

Bachelor Level (4 yrs.)/ II Year /Sc. & Tech. Full Marks: 100
Biochemistry and Microbial Biotechnology (MB.201) Time: 3 hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

SECTION "A"

Attempt FOUR questions.

4×10=40

1. Define genetic code. Briefly describe the translation process in bacteria. [2+8]
2. Classify carbohydrates and mention its function. [5+5]
3. What are the differences between solid and submerged state fermentation? Briefly outline the production process of beer. [5+5]
4. Mention the sources of enzymes. What are the advantages of microbial enzymes? [5+5]
5. Briefly describe hexose monophosphate pathway and outlines its significance. [7+3]
6. Define recombinant DNA technology. Describe the vectors used in recombinant DNA technology. [3+7]

SECTION "B"

Attempt any EIGHT Questions:

8×5=40

7. Classify amino acids on the basis of polarity.
8. Write short notes on Okazaki fragments..
9. What are the advantages of biotechnology in Microbiology.

P.T.O.

10. Mention the applications of biofertilizers.
11. Outline the production process of cheddar cheese.
12. Briefly describe the production process of amylase.
13. What are the factors affecting the regulation of enzymes?
14. Mention the roles of ATP in cell.
15. What are the functions of phospholipids?
16. Mention the applications of Micropropagation.

SECTION "C"

Attempt any EIGHT Questions.

8×2.5=20

17. Very short answer questions :
- a) Define Co-enzymes.
 - b) Mention the significance of EM pathway.
 - c) Write short notes on VAM.
 - d) Enlist the functions of RNA
 - e) Mention the name of bacteria used in starter culture of yoghurt.
 - f) Enlist three restriction endonuclease enzymes used in recombinant DNA technology.
 - g) Write short notes on exergonic reaction.
 - h) Mention the functions of baffles used in fermentation tank.
 - i) What are the applications of protease enzyme in industry?
 - j) Define bivret test.

