



‘समानो मन्त्रः समितिः समानी’

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2023

CC11-MICROBIOLOGY

INDUSTRIAL MICROBIOLOGY

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

1. Answer any **five** of the following: 1×5 = 5
 - (a) Define lyophilization.
 - (b) State the difference between solid-state and submerged fermentations.
 - (c) Name a microbial strain producing Vitamin B12.
 - (d) What is the function of a sparger?
 - (e) What is spray drying?
 - (f) What is sulphite waste liquor?
 - (g) Name one microorganism used in the production of protease.
 - (h) What is ale?

2. Answer any **three** of the following: 5×3 = 15
 - (a) Discuss about the measurement and control of pH and foaming during fermentation. 2½+2½
 - (b) Write down the process of isolation and maintenance of an industrially important microbes. 2+3
 - (c) Write a note on advantages and disadvantages of enzyme immobilization.
 - (d) How does solvent extraction used during down-stream processing?
 - (e) With the help of a suitable flowchart describe the microbial production of citric acid.

3. Answer any **two** of the following: 10×2 = 20
 - (a) What is alginate? How is it used for enzyme immobilization? Write a note on applications of immobilization. 2+4+4
 - (b) With a flowchart, describe the production of a protease. Also mention the applications of proteases. 7+3
 - (c) Discuss the composition of media, fermentation conditions, downstream processing of penicillin. Name two industrially important micro-organisms used for the production of lipases. 8+2
 - (d) With a labelled diagram, describe the construction of an aerobic fermenter. State the limitations and advantages of stirred tank bioreactor. 7+3

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CC12-MICROBIOLOGY

IMMUNOLOGY

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

1. Answer any **five** of the following: 1×5 = 5
 - (a) What are “Bence-Jones” protein?
 - (b) What is the use of aminopterin in HAT medium?
 - (c) What is allotype?
 - (d) What is meant by GALT?
 - (e) What are professional phagocytes?
 - (f) What is cytokine storm?
 - (g) What are haptens?
 - (h) Write down the full form of ‘SCID’ mice.

2. Answer any **three** of the following: 5×3 = 15
 - (a) What are autoimmune diseases? Describe one systemic autoimmune disease. 1+4
 - (b) Explain how antigens are processed and presented on the surface of MHC molecule. 5
 - (c) What is ELISPOT? Explain in detail. 1+4
 - (d) Describe briefly the mechanism involved in IgE-mediated hypersensitivity. 5
 - (e) How is nude mice different from SCID mice? Write a note on Chediak-Higashi Syndrome. 1+4

3. Answer any **two** of the following: 10×2 = 20
 - (a) What stimulates VDJ recombination? Explain the mechanism of VDJ recombination. 3+7
 - (b) Explain the structure and function of Thymus with the help of suitable diagram. Write a note on CALT. 7+3
 - (c) Explain the principle of immunoelectron microscopy. Explain Rocket immunoelectrophoresis with suitable example. 5+5
 - (d) Write a note on adjuvants. Explain the different characteristics of an antigen. 3+7

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UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 5th Semester Examination, 2023

DSE-P1-MICROBIOLOGY

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

**The question paper contains two parts DSE1-Paper-I and DSE1-Paper-II.
The candidates are required to answer any *one* from the two parts.
Candidates should mention it clearly on the Answer Book.**

DSE1-PAPER-I

INSTRUMENTATION AND BIOTECHNIQUES

1. Answer any *five* of the following: 1×5 = 5
 - (a) What is meant by resolution of a microscope?
 - (b) Define hyperchromicity.
 - (c) What do you understand by R_f value in TLC?
 - (d) What is an auxochrome? Give an example.
 - (e) Define the isoelectric point of a protein.
 - (f) Name a dye used in SDS-Page for the visualisation of a protein.
 - (g) Define optical density.
 - (h) What is sedimentation coefficient?

2. Answer any *three* of the following: 5×3 = 15
 - (a) State the principle and applications of differential centrifugation. 5
 - (b) Explain the principle and applications of size-exclusion chromatography. 5
 - (c) Write a short note on Thin Layer Chromatography (TLC). 5
 - (d) Describe analysis of biomolecules using UV-visible spectrophotometry.
 - (e) What is Zymography? Explain its types and applications. 5

3. Answer any *two* of the following: 10×2 = 20
 - (a) Describe the principle of discontinuous gel electrophoretic. How Can you determine the molecular weight of a monomeric protein with the help of SDS-PAGE? 6+4
 - (b) Describe the working principle of Phase-Contrast Microscope with a proper ray diagram. Mention the applications of Phase-Contrast Microscope. 7+3

- (c) Explain the working principle of affinity chromatography with the help of a suitable diagram. Write down its applications. 7+3
- (d) Write notes on: 5+5
- (i) Dark field microscopy
 - (ii) Colorimetry.

DSE1-PAPER-II

PLANT PATHOLOGY

1. Answer any *five* of the following: 1×5 = 5
 - (a) What is epidemic disease? Give examples.
 - (b) What is necrosis?
 - (c) Define the term 'damping-off'.
 - (d) What is Horizontal resistance?
 - (e) What is hypertrophy?
 - (f) What are sclerotia?
 - (g) What are obligate saprotrophs? Give examples.
 - (h) What is an obligate parasite? Give examples.

2. Answer any *three* of the following: 5×3 = 15
 - (a) Discuss the role of quarantine in plant disease management.
 - (b) Define pathotoxin. Describe their characteristics features with suitable examples.
 - (c) Differentiate between SAR and ISR.
 - (d) State Koch's postulates. In which case it is not accepted?
 - (e) Give an outline of classification of plant diseases.

3. Answer any *two* of the following: 10×2 = 20
 - (a) Discuss the role of phytoalexins in plant defence mechanism. Give a brief account on mode of action of systemic fungicides.
 - (b) Discuss in brief the biochemical defence mechanism in host plant after pathogenic infection.
 - (c) Describe the different types of induced structural defence mechanisms in host plants. 10
 - (d) Illustrate the pre-penetration mechanism of infection during host-parasite interaction with diagram. 10

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DSE-P2-MICROBIOLOGY

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.***The question paper contains two parts DSE2-Paper-III and DSE2-Paper-IV.****The candidates are required to answer any *one* from *two* parts.****Candidates should mention it clearly on the Answer Book.**

DSE2-PAPER-III

ADVANCES IN MICROBIOLOGY

1. Answer any *five* of the following: 1×5 = 5
 - (a) Define pangenome.
 - (b) What is Genomic island?
 - (c) What is quorum sensing?
 - (d) State the two types of metagenomics.
 - (e) What is metabolomics?
 - (f) What is HGT?
 - (g) Define epiphytic fitness.
 - (h) Name one autoinducer in gram-negative bacteria.

2. Answer any *three* of the following: 5×3 = 15
 - (a) What is pathogenicity island? State its characteristics. 1+4
 - (b) What is operon? What is the significance of 16S rDNA sequence in microbial genome? 1+4
 - (c) Discuss importance of biofilm in terms of health care and antimicrobial resistance. $2\frac{1}{2}+2\frac{1}{2}$
 - (d) Write down the concept of synthetic biology.
 - (e) What is metagenomics? How does it become important in study of bacterial diversity? 1+4

3. Answer any *two* of the following: 10×2 = 20
 - (a) With suitable diagram discuss epiphytic fitness and its various mechanism in plant pathogens. 10

- (b) What is genome pool? Write the concept of core, flexible and unique genome pool. With a well-labelled diagram discuss the bacterial virulence factors. 2+3+5
- (c) Write notes on the following: 5+5
- (i) Biofilm formation
- (ii) Type III Secretion system.
- (d) Discuss the salient features of sequenced microbial genomes. What was the first genome to be sequenced? 8+2

DSE2-PAPER-IV

MICROBIAL BIOTECHNOLOGY

1. Answer any *five* from the following questions: 1×5 = 5
- (a) Which element is responsible for Minamata disease?
- (b) Name one methanogenic bacteria.
- (c) What is Microfiltration?
- (d) Which is first recombinant vaccine?
- (e) Name two microorganisms involved in biogas production.
- (f) What is biosensor?
- (g) What is biopesticide?
- (h) Expand VAM.
2. Answer any *three* of the following questions: 5×3 = 15
- (a) Describe the process of biodiesel production and mention the role of microorganisms involved in the process. 3+2
- (b) Describe the process of microbial production of Streptokinase. 5
- (c) Explain genetically engineered microbes and mention their applications. 2+3
- (d) What are Xenobiotic compounds? Explain biodegradation pathway of petroleum hydrocarbon. 2+3
- (e) What is PGPR? State its role in promoting growth in plants. 1+4
3. Answer any *two* of the following questions: 10×2 = 20
- (a) Schematically represent different steps of bioethanol production. Explain in detail the role of microbes in bioethanol production. 6+4
- (b) What is immobilised cell culture? Mention the advantages of immobilised cell culture. Mention the applications of Affinity Chromatography. 2+4+4
- (c) Write down the general mechanism of RNAi. State its applications in silencing genes and Drug resistance. 4+6
- (d) Give a detailed account of scope and applications of microbial biotechnology in human therapeutics. Write a note on different types of Mycorrhizae. 6+4

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