

Total No. of Questions : 7]

SEAT No. :

[Total No. of Pages : 2

PE4586

[6514]-1

M.Sc. - I

MICROBIOLOGY

MB-501-MJ : Microbial Systematics

(2023 Credit Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any 5 questions from Q.2 to Q.7.*
- 3) *Question 2 to 7 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Scientific calculator is allowed.*
- 6) *Assume valuable data if necessary.*

Q1) Attempt any five of the following :

[10]

- a) Define phenetic approach in microbial systematics.
- b) State any two applications of PCR.
- c) What are selfish genes.
- d) Define microbial diversity.
- e) Define species concept in prokaryotes.
- f) What is meant by coevolution.

Q2) Attempt the following :

- a) Explain five kingdom classification system and three domain classification system in microbial systematics. **[7]**
- b) Explain behavioral and evolutionary characters as facets of microbial diversity. **[5]**

Q3) Attempt the following :

- a) What is meant by species divergence? And explain the methods of measurement of microbial diversity. **[7]**
- b) What are unculturable Bacteria. Explain strategies for culture of unculturable Bacteria. **[5]**

P.T.O.

Q4) Attempt the following :

- a) Explain in detail Lamarckism and Darwinism theory of evolution. [7]
- b) From the given data calculate Shannon diversity index for the pond water sample. Total number of colonies are 154×10^7 . [5]

Sr. No.	Types of Colonies	No. of Colonies
1	Pinpoint colonies	40
2	Pigmented colonies	53
3	Colonies larger than 1 mm	61

Q5) Attempt the following :

- a) Explain in detail role of molecular clocks and molecular distances in microbial systematics. [7]
- b) Justify : 16S rRNA is the most widely accepted molecular chronometer in bacterial taxonomy. [5]

Q6) Attempt the following :

- a) Explain the role of RFLP as a molecular method for identifying unculturable bacteria and write significance of RFLP. [7]
- b) Explain the r and k selection in theories of evolution. [5]

Q7) Write short notes on any two : [12]

- a) Game theory
- b) Metagenome Analysis
- c) Differentiating characters among different classes of fungi.



Total No. of Questions : 7]

SEAT No. :

[Total No. of Pages : 2

PE4587

[6514]-2

M.Sc. - I

MICROBIOLOGY

**MB-502-MJ : Biochemistry, Cell and Developmental Biology
(2023 Credit Pattern) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any 5 questions from Q.2 to Q.7.*
- 3) *Q.2 to Q.7 carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables and scientific calculator is allowed.*
- 7) *Assume suitable data wherever necessary.*

Q1) Attempt the following :

[10]

- a) Define H-Bond
- b) Explain determination
- c) Enlist the properties of A form of DNA.
- d) Write a short note on function of ER.
- e) State the role of mRNA.
- f) Give various application of Sugar Alcohols.

Q2) Attempt the following :

- a) Describe tertiary structure of protein with the help of example. **[7]**
- b) A glycine at pH values around PI is in Pro-electric form, Assuming $pK_{a1} \cong 2.5$ and $pK_{a3} \cong 9.5$ estimate the function of total glycine present as the "rare" uncharged form at pH 5.5. **[5]**

Q3) Attempt the following :

- a) Write a note on Ramachandran Plot. **[7]**
- b) "Why alanine is Predominantly Zwitterionic". Justify. **[5]**

P.T.O.

Q4) Attempt the following :

- a) With the help of flowchart explain the classification of lipids. [7]
- b) Describe floral development in Arabidopsis. [5]

Q5) Attempt the following :

- a) Explain the regulation of cell cycle in brief. [7]
- b) Explain cytosolic pathway and its role in protein trafficking. [5]

Q6) Attempt the following :

- a) Comment on the conserved nature of development. [7]
- b) State the structure and functions of waxes. [5]

Q7) Attempt the following : [12]

- a) Explain the role of Morphogen gradient in differentiation.
- b) Write a note on resource effect.
- c) Give significance of cot curves.



Total No. of Questions : 5]

SEAT No. :

PE4588

[Total No. of Pages : 3

[6514]-3

M.Sc. (Part - I)

MICROBIOLOGY

MB 503 MJ : Basic Quantitative Biology

(2023 Credit Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.No.2 to Q.No.5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Use of scientific calculators, log and statistical table is allowed.*

Q1) Attempt any five of the following :

[5]

- a) Calculate median from the given data :

Number of mutant cells = 10, 18, 17, 19, 10, 15, 11, 17, 12

- b) Define central limit theorem.
- c) State different ways of arranging experimental data.
- d) Define p-value.
- e) If value of mean and mean deviation is 40 & 17.14 respectively find out value of coefficient of mean deviations.
- f) Give any two names of Non Parametric test.

P.T.O.

Q2) Attempt the following.

- a) Data recorded on culm length (cms) in a wheat variety “Bansi” is given below. Calculate mean, the variance, the standard deviation and the coefficient of variation. **[6]**

culm length (cms)	50-52	53-55	56-58	59-61	62-64	65-67	68-70	71-73	74-76	77-79
No. of Plants	2	4	6	6	8	5	5	4	3	2

- b) Construct an ogive curve and calculate median from given data. **[4]**

Variable	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	4	6	10	15	11	7	3

Q3) Attempt the following :

- a) The height and the body weight of ten males are given below after treating with XYZ pharmaceutical product. Find out whether height and weight are related to XYZ or not. Give your conclusion **[6]**

Individuals	1	2	3	4	5	6	7	8	9	10
Heights (inches)	65	68	62	70	65	72	67	66	68	70
Weight (pounds)	128	140	120	152	138	160	135	130	125	165

- b) The data on the number of pods per plant are distributed as follows. Determine modal value of the given distribution graphically and verify the results by direct calculation. **[4]**

No. of pods Per plant	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Number of Plants	1	5	11	24	30	20	15	7	3

Q4) Attempt the following :

- a) The following table gives the falsality index (PI) of 11 patients. Test whether there is a significant increase on the average in PI values after seizure as compared to during seizure. (1% level of significance). **[6]**

Patient No.	1	2	3	4	5	6	7	8	9	10	11
During seizure	0.45	0.54	0.48	0.62	0.48	0.60	0.45	0.46	0.35	0.40	0.44
After seizure	0.60	0.65	0.63	0.78	0.63	0.80	0.69	0.62	0.68	0.50	0.57

- b) Write a short note on level of significance with appropriate example. **[4]**

Q5) Attempt the following :

- a) The following table shows the results of an experiment with the patients on the effects of two supposedly soporific drugs A and B in production sleep. Additional hours of sleep gained by the use of the two tested drugs. (1% level of significance) **[6]**

Patient	1	2	3	4	5	6	7	8	9	10
Drug A	0.7	-1.6	-0.2	-1.2	-0.1	3.4	3.7	0.8	0.0	2.0
Drug B	1.9	1.1	0.1	0.1	-0.1	4.4	5.5	1.6	4.6	3.4

- b) Write a short note on Hypothesis, its types & errors in Hypothesis with example. **[4]**

x x x

Total No. of Questions : 5]

SEAT No. :

PE4589

[Total No. of Pages : 2

[6514]-4

M.Sc. - I

MICROBIOLOGY

MB-510(A)-MJ : Microbial Extremophiles

(2023 Credit Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat labelled diagram wherever necessary.*

Q1) Attempt any five of the following.

[5]

- a) Give any two examples of halophiles.
- b) Write characteristics of xerophiles.
- c) Give two applications of thermophiles.
- d) Enlist two habitats of alkaliphiles.
- e) Define Piezophiles.
- f) Define extremophiles.

Q2) Attempt the following.

- a) Explain different microbial forms of extremophiles in various habitats.**[6]**
- b) Describe any two adaptive mechanism of halophiles. **[4]**

P.T.O.

Q3) Attempt the following.

- a) Explain the biotechnological applications of extremophiles. [6]
- b) Write a note on adaptation of thermophiles. [4]

Q4) Attempt the following.

- a) Explain cellular adaptive mechanisms observed in acidophiles. [6]
- b) Write a note on enrichment and isolation of barophiles. [4]

Q5) Attempt any two of the following. [10]

- a) Explain properties of thermophiles.
- b) Write short note on recent development in extremophilic bacteria.
- c) Explain in detail sample collection and isolation methods for xerophiles.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE4590

[6514]-5

M.Sc.- I

MICROBIOLOGY

**MB 510 (B) MJ: Microbial Communication, Membrane Transport
and Signal Transduction Approaches for Biologist
(2023 Pattern) (Semester-I) (Credit System) (Theory)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is Compulsory.*
- 2) *Solve Any Three questions from Q.2 to Q.5*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat and labelled diagrams wherever necessary.*

Q1) Solve Any Five of the following:

[5]

- a) What is quorum sensing?
- b) Give two examples of microorganisms which produce biofilms
- c) What is chemotaxis?
- d) Which microorganisms produce slime?
- e) What are myxobacteria?
- f) What is passive diffusion?

Q2) Attempt the following:

- a) Explain in detail mechanism of quorum sensing in myxobacteria. **[6]**
- b) Explain the life cycle of Dictyostelium discoideum. **[4]**

P.T.O.

Q3) Attempt the following:

- a) Explain in detail ion mediated transport. [6]
- b) Write note on liposome model membrane. [4]

Q4) Attempt the following:

- a) Explain the regulation of signaling pathway in detail. [6]
- b) Write note on composition and structure of membrane. [4]

Q5) Attempt any two of the following : [10]

- a) Write note on P type ATPases.
- b) Write note on voltage gated ion channel.
- c) Explain the applications of biofilm produced by bacteria.



Total No. of Questions : 5]

SEAT No. :

PE4591

[Total No. of Pages : 3

[6514]-6

M.Sc. (Part - I)

MICROBIOLOGY

**MB 510(C) MJ : Advanced Quantitative Biology
(2023 Pattern) (Credit System) (Semester - I)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat and labelled diagrams wherever necessary.*
- 6) *Use of logarithmic tables and scientific calculator is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any five of the following :

[5]

- a) Give an two assumptions of ANOVA test.
- b) Define : Multiple linear regression.
- c) Give importance of F test.
- d) What is mean by rank correlation Coefficient?
- e) What is the difference between Null and alternative hypothesis.
- f) Give importance of parametric tests.

Q2) Attempt the following.

- a) Cardiac output in ml/min was recorded in a sample of 15 post cardiac surgery patients. Result are as follows. We wish to know whether sample means is different from 5.05. Apply Rank test. **[6]**
4.91, 4.10, 6.74, 7.27, 7.42, 7.50, 6.56, 4.64, 5.98, 3.14, 3.23, 5.80, 6.17, 5.39, 5.77.

P.T.O.

- b) From the data given below, with the help of ANOVA find out whether the means of three samples differ significantly or not. [4]

Sample I	Sample II	Sample III
20	19	13
10	13	12
17	17	10
17	12	15
16	09	5

Q3) Attempt the following :

- a) In a cross between black male and grey female *Drosophila*, the off spring obtained were 25 black and 35 grey. By Chi-square test, find out whether it matches with expected ratio 1:1. [6]
- b) What is Run test? Explain with suitable examples of test. [4]

Q4) Attempt the following :

- a) In an experiment, the mean yield of three rice varieties with four nitrogen doses was recorded. Using ANOVA find out whether there is any significant difference in mean yield of three varieties. [6]

Nitrogen Dose Kg/ha	Varieties		
	I	II	III
0	4.50	5.01	6.11
30	4.30	6.17	6.92
60	5.60	6.37	7.27
90	5.21	6.48	7.86

- b) Write a note on “Wilcoxon’s sign rank test”. [4]

Q5) Attempt any two of the following :

[10]

- a) A typing school with 6th weeks typing course and the students to type on an average 60 word/min. A random sample of 15 students given test and mean no. of word/min types by each is given below. Test the truth of the school claimed by sign test.

80, 75, 50, 70, 64, 54, 89, 79, 80, 67, 54, 72, 66, 50, 51

- b) Following are the yield of the wheat of three different varieties. Analyze the data using Turkey's test.

Varieties		
V_1	V_2	V_3
79	94	80
77	91	80
87	83	86
85	88	85
78	85	82

- c) The value of same 15 students in two subjects A and B are given below, the two numbers in a bracket denotes the rank for A and B subject of each student.

(1, 10) (2, 7) (3, 2) (4, 6) (5, 4) (6, 8) (7, 3) (8, 1) (9, 11) (10, 15) (11, 9)
(12, 5) (13, 14) (14, 12) (15, 13)

Calculate Spearman's rank correlation coefficient.

x x x

Total No. of Questions : 5]

SEAT No. :

PE4592

[Total No. of Pages : 2

[6514]-7

M.Sc. (Part - I)

MICROBIOLOGY

MB 510(D) MJ : Experimental Design and Quantitative Approaches
for Biologist

(2023 Pattern) (Credit System) (Semester - I) (Theory)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Q.2 to Q.5 carry equal marks.
- 4) Figures to the right indicate full marks.
- 5) Use of scientific calculator is allowed.
- 6) Assume suitable data, if necessary.

Q1) Attempt any five of the following :

[5]

- a) Write an equation for linear function.
- b) Write one example of imaginary number.
- c) Define decimal reduction time.
- d) Find $\frac{dy}{dx}$ for the given function $y(fx) = 3x^7 + 2x^5 + x^2 + 5$.
- e) Case control and cohort study are _____ type of epidemiological study methods.
- f) Enlist types of experimental designs.

Q2) Attempt the following.

- a) If the most resistant culture of Bacillus steriothermophilus containing 1×10^{12} CFU/ml is heated at 121°C for 15 minutes. How many bacteria remain at the end of 15 minutes? Also add a note on 12D concept. [6]
- b) Enlist various epidemiological methods. Comment on experimental/interventional studies. [4]

P.T.O.

Q3) Attempt the following :

a) Given $f(x) = \frac{1}{2}x^3 - 3x + 7$ [6]

Find

i) $f(1)$

ii) $f(-1)$

iii) $f(2)$

iv) $f\left(-\frac{2}{3}\right)$

b) Write major differences between case control and cohort studies. [4]

Q4) Attempt the following :

a) Describe in detail Fractional factorial design. [6]

b) If population of bacterial culture is increased from one thousand to one billion. Calculate doubling time of the culture. [4]

Q5) Attempt any two of the following : [10]

a) If $f(x) = 2x^2 - 3x$ evaluate $f(x + h) - f(x)$.

b) Enlist various clinical trials. Discuss in detail controlled and uncontrolled trials.

c) Describe in detail non-random methods of sampling.

x x x

Total No. of Questions : 5]

SEAT No. :

PE4593

[Total No. of Pages : 2

[6514]-8
M.Sc. (Part - I)
MICROBIOLOGY
MB-541-RM : Research Methodology
(2023 Pattern) (Semester - I) (Credit System)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Attempt any five of the following. **[5]**

- a) Define sampling.
- b) What is bibliography?
- c) What are different types of research?
- d) Give difference between mono-disciplinary and inter-disciplinary research.
- e) What is plagiarism?
- f) Give importance of research report.

Q2) Attempt the following.

- a) Describe briefly the research process and its stages. **[6]**
- b) What is research design? Explain any one type of research design. **[4]**

Q3) Attempt the following.

- a) Explain research report writing in detail. **[6]**
- b) Write a note on data presentation. **[4]**

P.T.O.

Q4) Attempt the following.

- a) What is data processing? Explain its operation in detail. [6]
- b) What is stratified random sampling design? Explain with a suitable example.[4]

Q5) Write short notes on any two of the following. [10]

- a) Copyright
- b) Budget and justification of project proposal
- c) Scientific poster preparation



Total No. of Questions : 7]

SEAT No. :

PE4594

[Total No. of Pages : 2

[6514]-21

M.Sc. - I

MICROBIOLOGY

**MB - 551MJ : Molecular Biology - I
(2023 Credit Pattern) (Semester - II)**

Time : 3Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any five questions from Q.2 or Q.7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Scientific calculator is allowed.*
- 6) *Assume suitable data if necessary.*

Q1) Attempt any five of the following.

[10]

- a) What is C-Value paradox and what are pseudo genes?
- b) What is Kozak sequence and state the role of 16s rRNA in translation?
- c) Give the Long form of CRISPR-cas and state its application.
- d) Give two examples each of Blunt end REs and cohesive end REs.
- e) Which plasmid is used for Blue White Screening and why?
- f) What are polygenic disease, give two examples.

Q2) Attempt the following.

- a) Describe the structure of RNA polymerase. What is abortive initiation and describe any one method of transcription termination. **[7]**
- b) Explain Non Homologous End Joining. **[5]**

Q3) Attempt the following.

- a) Explain mRNA Splicing with a neat labelled diagram. **[7]**
- b) Explain Activity gel assay with an example. **[5]**

P.T.O.

Q4) Attempt the following.

- a) Give the application of following enzymes in RDT and their reactions catalysed. [7]
 - i) Alkaline phosphatase
 - ii) Poly nucleotide Kinase
 - iii) DNA Lisase
- b) Explain clone by clone strategy in human genome project and give applications of human genome project. [5]

Q5) Attempt the following.

- a) “mi RNA - A signature of cancer diagnostics”- Justify. [7]
- b) Explain detection of RNA signatures of Antibiotic Resistance in bacteria. [5]

Q6) Attempt the following.

- a) Explain Yeast - 2 - hybrid assay with a neat labelled diagram. [7]
- b) Below are given the fragments generated after Restriction digestion of the given plasmid. [5]

Draw the map of this plasmid using this data.

Sal I → 2.30 kb, 0.25 kb, 1.80 kb.

Hha III → 2.10 kb, 1.55kb, 0.70 kb

Sal I + Hha III → 1.10 kb, 1.20 kb, 0.75 kb, 0.70kb, 0.35 kb, 0.25 kb

Q7) Write short notes. (any 2)

- a) Protein Microarray and its applications in diagnostics [6]
- b) RNA editing & si RNA [6]
- c) Nucleotide Excision Repair and Photoreactive repair. [6]



Total No. of Questions : 7]

SEAT No. :

PE4595

[Total No. of Pages : 2

[6514]-22

M.Sc. - I

MICROBIOLOGY

**MB - 552 - MJ : Enzymology, Bioenergetics and Metabolism
(2023 Credit Pattern) (Semester - II)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q. 1 is compulsory.*
- 2) *Solve any five questions from Q.2 to Q.7.*
- 3) *Q.2 to Q.7 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat labelled diagrams wherever necessary.*
- 6) *Use of logarithmic tables and scientific calculator is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Solve any Five of the following :

[10]

- a) Write down equation of Eadie-HoFstee Plot.
- b) Define enzyme specific activity.
- c) Define K_m .
- d) Name two hormones produced by anterior pituitary gland.
- e) What are the sources of vitamin K?
- f) Write down two irreversible reactions of glycolysis.

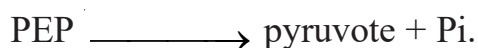
Q2) Attempt the following.

- a) Justify During uncompetitive inhibition, both V_m & K_m decreases. **[7]**
- b) Define co-operativity with respect to allosteric enzyme. Describe different types of cooperativity exhibited by allosteric enzymes. **[5]**

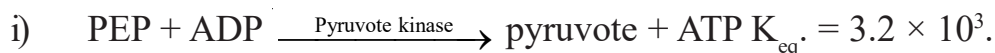
P.T.O.

Q3) Attempt the following :

- a) Calculate ΔG° of hydrolysis of [7]



Given :



- b) Explain steps involved in de novo synthesis pathway of pyrimidines. [5]

Q4) Attempt the following :

- a) Describe in details role of TCA cycle in generating biosynthesis of intermediates. [7]

- b) Explain regulation of gluconeogenesis. [5]

Q5) Attempt the following :

- a) Discuss role of insulin in glucose metabolism. [7]

- b) Write role of vitamin D in metabolism. [5]

Q6) Attempt the following :

- a) Discuss steps involved in sterol biosynthesis pathway. [7]

- b) Outline the biosynthesis of Histidine Family of amino acids. [5]

Q7) Write short note on any two of the following : [12]

- a) Phosphatidyl inositol as signaling molecule.

- b) Glycogen breakdown

- c) Folic acid structure.

x x x

Total No. of Questions : 5]

SEAT No. :

PE4596

[Total No. of Pages : 2

[6514]-23

M.Sc. (Part - I)

MICROBIOLOGY

**MB-553-MJ : Laboratory Techniques and Instrumentation
(2023 Credit Pattern) (Semester - II)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from question 2 to question 5.*
- 3) *Question 2 to 5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat labelled diagrams wherever necessary.*
- 6) *Use of logarithmic tables and scientific calculators is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any five of the following.

[5]

- a) Define partition coefficient.
- b) Give any two applications of Infrared spectroscopy.
- c) What is the principle of ultrafiltration in sample preparation.
- d) What is Hypochromic shift?
- e) Write any two applications of Mass spectrometry.
- f) What is supercritical fluid?

Q2) Attempt the following.

- a) Describe the principle, working and application of gelfiltration chromatography. **[6]**
- b) Explain any two applications of Affinity chromatography. **[4]**

Q3) Attempt the following.

- a) Explain principle and working of IR spectroscopy. **[6]**
- b) How is fluorescence spectroscopy used in binding and folding studies of protein? **[4]**

P.T.O.

Q4) Attempt the following.

- a) Describe different ionization techniques used in mass spectrometry. [6]
- b) A gas chromatography analysis was performed on a mixture of two compounds, caffeine and theobromine, using 30.0 cm packed column with ov-1 stationary phase. The results are as follows. [4]

	Retention time	Base width
Air (unretained)	1.5 min	
Caffeine	8.5 min	0.60 min
Theobromine	9.8 min	0.70 min

Calculate the selectivity factor (α) for the separation of these two compounds.

Q5) Write a short notes on any two.

[10]

- a) Significance of capillary electrophoresis
- b) Flow cytometry
- c) 2D gel electrophoresis



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

PE4597

[6514]-24

M.Sc.-I

MICROBIOLOGY

MB560MJ: Molecular Biology Tools and Applications

(2023 Credit Pattern) (Semester-II)

Time :2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is Compulsory.*
- 2) *Solve Any three questions from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Draw neat labelled diagram wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Attempt any five of the following.

[5]

- a) Poly(3-hydroxybutyric acid) is synthesized from_____
- b) Name one un-conventional bacterial cell factory.
- c) What is yeast two hybrid used for?
- d) What is DMS foot printing used for?
- e) Give one applications of DNA micro array.
- f) What is protein foot printing assay used for?

Q2) Attempt the following.

- a) Explain EMSA in detail.

[6]

- b) Short note on measuring transcription rates.

[4]

Q3) Attempt the following.

- a) Explain oligo arrays in detail.

[6]

- b) Short note on DNA finger printing assay.

[4]

P.T.O.

Q4) Attempt the following.

- a) Elaborate on synthesis of biopolymer-Gum using RDT. [6]
- b) Give RDT process involved in Hybrid Human Mouse monoclonal antibodies. [4]

Q5) Answer any two of the following. [10]

- a) Short note on peptide antibiotics synthesis using RDT.
- b) Give the importance of Pichia Pastori's For production of high quality protein drug.
- c) Short note on yeast two hybrid.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE4598

[6514]-25

M.Sc. (Part - I)

MICROBIOLOGY

**MB-561-MJ : Nitrogen Metabolism, Respiration and Photosynthesis
(2023 Credit Pattern) (Semester - II)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat labelled diagrams wherever necessary.*

Q1) Solve any five of the following.

[5]

- a) Define photosynthesis with the reaction involved.
- b) What is non-cyclic photophosphorylation? Give the examples of bacteria in non-cyclic photophosphorylation.
- c) Explain what are photoautotrophs with examples.
- d) What is protein turnover?
- e) What are photolithotrophs? Give two examples.
- f) What is amino acid degradation?

Q2) Attempt the following.

- a) Explain the cyclic photophosphorylation with schematic representation.**[6]**
- b) Write short note on glutamine synthetase enzyme. **[4]**

Q3) Attempt the following.

- a) Explain the biological nitrogen fixation with schematic representation.**[6]**
- b) Write short note on methanogens. **[4]**

P.T.O.

Q4) Attempt the following.

- a) Explain the properties and regulation of glutamate synthetase in detail.[6]
- b) Explain the photosystem II cycle in detail. [4]

Q5) Write a short note on any two of the following. [10]

- a) Respiration in sulphur oxidising bacteria.
- b) Properties and regulation of nitrogenase enzyme.
- c) Anoxygenic photosynthetic bacteria.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE4599

[6514]-26

M.Sc. (Part - I)

MICROBIOLOGY

**MB-562-MJ : Molecular Biophysics
(2023 Credit Pattern) (Semester - II)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Attempt any five of the following.

[5]

- a) Give one application of NMR in proteomics.
- b) What is alfa and beta spin in NMR.
- c) Give one application of X-ray crystallography in proteomics.
- d) The heights of the peaks in the Electron density map are roughly proportional to _____.
- e) Radioactivity or radioisotopes can be detected by _____.
- f) GFP stained images can be viewed under _____ Microscope.

Q2) Attempt the following.

- a) Give the basic principal of NMR and briefly explain how protein structure is determine using NMR. **[6]**
- b) What are Radiations & Radioactive isotopes, give their types and units of estimation. **[4]**

P.T.O.

Q3) Attempt the following.

- a) What is crystallization of proteins and briefly explain in process. [6]
- b) Write a note on Liquid Scintillation Counting. [4]

Q4) Attempt the following.

- a) Give the principle of confocal microscopy and draw the ray diagram for it. [6]
- b) Write a note on Fourier Transform and Inverse Fourier. [4]

Q5) Write a short note on any two of the following. [10]

- a) Nuclear over hauser.
- b) Effect of Radiation on a biological systems.
- c) Multichannel images in confocal microscope.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

PE4600

[6514]-27

M.Sc.- I

MICROBIOLOGY

MB-563-MJ: Bioinformatics

(2023 Pattern) (Semester-II) (Credit System)

Time :2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is Compulsory.*
- 2) *Solve Any Three questions from Q.2 to Q.5*
- 3) *Questions Q.2 to Q.5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat and labelled diagrams wherever necessary.*
- 6) *Use of logarithmic tables and scientific calculator is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any FIVE of the following:

[5]

- a) List any four biological databases.
- b) Give the full form of MCBI.
- c) What is pairwise sequence alignment.
- d) Define bioinformatics.
- e) What is the Genpept database for?
- f) Name two sequence similarity search tools.

Q2) Attempt the following:

- a) Describe protein databases with an example. Give their significance in bioinformatics. **[6]**
- b) Explain distance based phylogenetic analysis. **[4]**

P.T.O.

Q3) Attempt the following:

- a) What is FASTA? Give its significance in bioinformatics. [4]
- b) Explain multiple sequence alignment in detail. [6]

Q4) Attempt the following:

- a) Contrast between distance-based and character-based phylogenetic analysis methods. [6]
- b) What type of databases are UniRef and UniParc? What are they used for? [4]

Q5) Attempt any TWO of the following: [10]

- a) Write a note on UniProtKB
- b) Write a note on nucleotide sequence databases.
- c) What is molecular phylogeny? Which methods can be used for phylogenetic analysis?



Total No. of Questions : 7]

SEAT No. :

PE4601

[Total No. of Pages : 2

[6514]-31

M.Sc. - II

MICROBIOLOGY

MB - 601 - MJ : Immunology

(2023 Pattern) (Credit System) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q. 1 is compulsory.*
- 2) *Solve any five questions from Q.2 to Q.7.*
- 3) *Question 2 to 7 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of logarithmic tables or scientific calculator is allowed.*
- 6) *Assume suitable data if necessary.*
- 7) *Draw neat labelled diagrams wherever necessary.*

Q1) Attempt any Five of the following :

[10]

- a) Write two characteristics features of GPCR.
- b) What are biological response modifiers?
- c) Write two applications of MTT assay.
- d) What is malignancy?
- e) What is peripheral tolerance?
- f) Give two examples of immune adjuvants.

Q2) Attempt the following.

- a) Describe the various steps in TCR – CD3 activation pathway. **[7]**
- b) Explain quantification of cytokines by ELISPOT assay. **[5]**

P.T.O.

Q3) Attempt the following :

- a) Explain the escape mechanisms of tumors from the host defense. [7]
- b) Justify : T cells can mediate suppression of immune responses. [5]

Q4) Attempt the following :

- a) Discuss how alternative complement pathway is regulated. [7]
- b) Explain the various cytokine receptor families. [5]

Q5) Attempt the following :

- a) Explain the various approaches in cancer immuno therapy. [7]
- b) Explain the animal models used to study AIDS. [5]

Q6) Attempt the following :

- a) Explain various animal models used to study autoimmunity. [7]
- b) Explain the JAK – STAT pathway. [5]

Q7) Attempt any two of the following : [12]

- a) What is lymphoma? Explain its characteristics.
- b) Explain Niel Jerne's Network theory.
- c) Write a note on Tumor Vaccines.

x x x

Total No. of Questions : 7]

SEAT No. :

PE4602

[Total No. of Pages : 2

[6514]-32

M.Sc. - II

MICROBIOLOGY

MB-602-MJ : Molecular Biology - II

(2023 Credit Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q1 is compulsory.*
- 2) *Attempt any five from Q2 to Q7.*
- 3) *Q2 to Q7 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat and labelled diagrams wherever necessary.*

Q1) Attempt any five of the following.

[10]

- a) What are metabolons?
- b) What is structural genomics?
- c) Mention two examples of GMOs.
- d) What is gene therapy. Give an example.
- e) Define 'gene aging'.
- f) What is DNA imprinting?

Q2) Attempt the following.

- a) What is a single nucleotide polymorphism? Give example. **[7]**
- b) Explain the genetics of aging with example. **[5]**

Q3) Attempt the following.

- a) What is the science of metabolomics? Give an example. **[7]**
- b) What are the steps involved in functional proteomics? **[5]**

P.T.O.

Q4) Attempt the following.

- a) What are the steps involved and methods used in the separation and detection of metabolites? [7]
- b) Write a short note on SINES. [5]

Q5) Attempt the following.

- a) What is the significance of GFP gene in the GM monkey? [7]
- b) What are the applications of GM plants? [5]

Q6) Attempt the following.

- a) What is the role of transposons in human evolution. [7]
- b) Write systematically the steps involved in the purification of proteins from biological systems. [5]

Q7) Write a short note on any two of the following. [12]

- a) IS elements.
- b) Tn 10
- c) Ty elements in yeast



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages : 2

PE4603

[6514]-33

M.Sc.-II

MICROBIOLOGY

**MB603MJ : Clinical Microbiology
(2023 Credit Pattern) (Semester-III)**

Time :2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is Compulsory.*
- 2) *Solve Any three questions from Q.2 to Q.5*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Draw neat labelled diagram wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables, scientific calculator is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any five of the following **[5]**

- a) Write any two characteristics of bacterial endotoxins.
- b) What is host mediated pathogenesis.
- c) Define epidemic
- d) Enlist any two virulence factor of Helicobacter Pylori and its role.
- e) What are pathogenicity islands?
- f) What is Ghon complex?

Q2) Attempt the following

- a) Explain in detail mechanisms of host-mediated pathogenesis. **[6]**
- b) Explain SIR model for disease prediction **[4]**

Q3) Attempt the following

- a) Explain pathogenicity islands using suitable examples. **[6]**
- b) Describe categorization of biomedical waste based on color-coded containers as per biomedical waste management guidelines. **[4]**

P.T.O.

Q4) Attempt the following

- a) Describe pathogenesis of candida auris [6]
- b) Write a detailed note on formation of granuloma in tuberculosis. [4]

Q5) Write a short note on any two [10]

- a) Factors influencing host susceptibility.
- b) Structure of HPV
- c) General character of Mycobacterium leprae.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE4604

[6514]-34

M.Sc. - II

MICROBIOLOGY

**MB - 610 - MJ : Cell Culture Techniques
(2023 Pattern) (Credit System) (Semester - III)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Draw neat labelled diagrams whenever necessary.*
- 5) *Figures to the right indicates full marks.*
- 6) *Use of logarithmic tables/scientific calculator is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any five of the following :

[5]

- a) What is the use of trypsin in cell culture?
- b) Write two applications of cell culture techniques.
- c) Define : Continuous cell line.
- d) Give the significance of buffer in cell culture techniques.
- e) What is organ culture?
- f) What are the different types of cell culture media?

Q2) Attempt the following :

- a) Explain use of flow cytometry in cell culture methods. **[6]**
- b) Describe methods of preservation of cell lines. **[4]**

P.T.O.

Q3) Attempt the following :

- a) Explain cell lines in detail and their applications in cell culture technique. **[6]**
- b) Differentiate between primary cell culture and secondary cell culture. **[4]**

Q4) Attempt the following :

- a) Describe the equipments used in cell culture techniques. **[6]**
- b) Comment on major developments in cell culture technology. **[4]**

Q5) Write short notes on any two : **[10]**

- a) Animal cell lines.
- b) Cryopreservation of cells.
- c) Secondary cell culture.

x x x

Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE4605

[6514]-35

M.Sc. - II

MICROBIOLOGY

**MB-611 MJ : Bioremediation and Biomass Utilization
(2023 Credit Pattern) (Semester - III) (NEP 2020)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat labelled diagrams wherever necessary.*

Q1) Attempt any 5 of the following.

[5]

- a) Define-Biotransformation.
- b) What is mean by biostimulation?
- c) Enlist different types of biomass.
- d) What is mean by biomass densification?
- e) Give any two advantages of bioremediation.
- f) Enlist microbes involved in biomass processing.

Q2) Attempt following.

- a) What is bioremediation? Give comparative account of Ex-situ vs in situ bioremediation. **[6]**
- b) Add a note on microbes involved in biodegradation of hydrocarbons.**[4]**

Q3) Attempt the following.

- a) Describe chemical composition & properties of different biomass. **[6]**
- b) Describe Alcohol production. **[4]**

P.T.O.

Q4) Attempt the following.

- a) Describe role of any 3 key enzymes involved in biodegradation. [6]
- b) Describe advantages of using genetically engineered microbes in bioremediation. [4]

Q5) Add a short note on any 2 of the following. [10]

- a) Biomass composting.
- b) Slurry phase bioremediation.
- c) Improvisation of process of fructose production.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE4606

[6514]-36

M.Sc. - II

MICROBIOLOGY

**MB-612-MJ : Microbial Virus Technology
(2023 Pattern) (Credit System) (Semester - III)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables and scientific calculators is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Solve any five of the following.

[5]

- a) What is MoI?
- b) Name 3 different families of tailed phages.
- c) What is the role of chloroform in bacteriophage technology.
- d) Write the role of bacteriophages in recreational water decontamination.
- e) How bacteriophage can be used for biofilm control?
- f) Bacteriophage can be used as therapeutic agent. State True or False.
Support answer.

Q2) Attempt the following.

- a) Explain use of bacteriophage as therapeutic agent. **[6]**
- b) Write a note on Mycovirus-Host interaction mechanism. **[4]**

P.T.O.

Q3) Attempt the following.

- a) Describe the life cycle of mycoviruses. [6]
- b) Describe phage lysine therapy in detail. [4]

Q4) Attempt the following.

- a) Comment on the use of bacteriophage as pathogen control in aqua systems. [6]
- b) How mycoviruses can be used to control fungal plant pathogen? [4]

Q5) Write a short notes on any two. [10]

- a) Phage purification and environment.
- b) Pathogen control in poultry using bacteriophage Technology.
- c) Medical wastewater decontamination using bacteriophage technology.



Total No. of Questions : 5]

SEAT No. :

PE4607

[Total No. of Pages : 2

[6514]-37

M.Sc. - II

MICROBIOLOGY

**MB - 613 - MJ : Clinical Microbiology and Parasitology
(2023 Pattern) (Credit System) (Semester - III)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Draw neat labelled diagrams whenever necessary.*
- 4) *Figures to the right indicates full marks.*
- 5) *Use of logarithmic tables/scientific calculator is allowed.*
- 6) *Assume suitable data if necessary.*
- 7) *Q.2 to Q.5 carry equal marks.*

Q1) Attempt any five of the following :

[5]

- a) What is a post-transplantation infection and give its example?
- b) Define Bioethics.
- c) What are trematodes?
- d) Give any two examples of protozoan parasites.
- e) What is a nosocomial infection?
- f) Write two methods for diagnosis of Taenia Saginata.

Q2) Attempt the following :

- a) Describe pathogenesis and clinical diagnosis of Burkholderia Cepacian.**[6]**
- b) Explain the ethical implications of modern biotechnological techniques such as gene editing or cloning. **[4]**

P.T.O.

Q3) Attempt the following :

- a) Write a detail note on classification of parasites and give examples. [6]
- b) Write a note on-Biological weapons. [4]

Q4) Attempt the following :

- a) Explain pathogenesis and diagnostic methods for Listeria Monocytogenes. [6]
- b) Describe pathogenesis of Wuchereria Bancrofti. [4]

Q5) Write a short notes on any two of the following : [10]

- a) Antimicrobial susceptibility testing.
- b) Effect of parasites on organs and tissues.
- c) Pathogenesis of Schistosoma Haematobium.

x x x

Total No. of Questions : 7]

SEAT No. :

PE4608

[Total No. of Pages : 2

[6514]-41
M.Sc. (Part-II)
MICROBIOLOGY
MB-651-MJ : Pharmaceutical Microbiology
(2023 Credits Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any five questions from Q.2 to Q.7*
- 3) *Q.2 to Q.7 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat & labelled diagrams wherever necessary.*
- 6) *Use of logarithmic tables & scientific calculators is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Solve any five of the following.

[10]

- a) Define :
 - i) HITS
 - ii) Lead
- b) What are the primary objectives of preclinical studies?
- c) Enlist any two basic responsibilities of WHO.
- d) What is distribution of drug? Which factors affects the process of distribution of drug.
- e) What is medicinal chemistry? Write any one significance of medicinal chemistry.
- f) Write vision of Indian pharmacopeia.

Q2) Attempt the following

[12]

- a) Define Drug Distribution. Enlist factors affecting drug distribution process. Explain blood brain barrier in detail. **[7]**
- b) Write a note on various drug reactions which leads to toxic metabolites. Explain with any two examples of drug. **[5]**

P.T.O.

Q3) Attempt the following [12]

- a) Write aims, objectives & conduct of clinical trial phase - III [7]
- b) Write in detail therapeutic classes of drugs with examples. [5]

Q4) Attempt the following [12]

- a) What is pharmacopeia? Write vision, Mission & objectives of USP. [7]
- b) What is drug designing? Explain computer based drug design in detail. [5]

Q5) Attempt the following [12]

- a) Explain the process of drug absorption describe the effect of physicochemical properties of drug on drug absorption add a note on first pass effect. [7]
- b) What is gastric emptying? Explain the parameters used to describe gastric emptying. Describe the factors affecting gastric Emptying. [5]

Q6) Attempt the following [12]

- a) Write objectives of toxicity testing. State the guidelines used for toxicity testing. Write a note on acute toxicity testing. [7]
- b) Explain the role of CLSI in regulation of Biopharmaceuticals. [5]

Q7) Write short notes on any two of the following. [12]

- a) Reductive Reactions of Phase-I metabolism of drug with examples.
- b) Role of FDA in regulation of biopharmaceuticals.
- c) Bioavailability of drug.



Total No. of Questions : 7]

SEAT No. :

[Total No. of Pages : 2

PE4609

[6514]-42

M.Sc. - II

MICROBIOLOGY

**MB-652-MJ : Bioprocess Technology
(2023 Pattern) (Credit System) (Semester - IV)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any five questions from Q.2 to Q.7.*
- 3) *Q.2 to Q.7 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat and labelled diagrams wherever necessary.*

Q1) Attempt any five of the following.

[10]

- a) What is power number?
- b) What is Reynold's number?
- c) What is intellectual property rights?
- d) What is entrepreneurship?
- e) Write the role of impeller in fermentor.
- f) What is KLa?

Q2) Attempt the following.

- a) Explain the air-lift reactor with advantages and disadvantages. **[7]**
- b) Explain the health benefits of prebiotics. **[5]**

Q3) Attempt the following.

- a) What are biosensors? Explain the types of biosensors. **[7]**
- b) Write a note on considerations for startups. **[5]**

P.T.O.

Q4) Attempt the following.

- a) Explain the upstream and downstream process for chitinase. [7]
- b) Write a note on immobilisation of enzymes. [5]

Q5) Attempt the following.

- a) Explain two methods for determining KLa value. [7]
- b) Explain the environmental applications of fungi. [5]

Q6) Attempt the following.

- a) Explain the microbial extraction and recovery of copper from their ores.[7]
- b) Write a note on incubation centre. [5]

Q7) Attempt any two of the following. [12]

- a) Explain the role and types of spargers.
- b) Write a note on oxygen uptake rate.
- c) Write a note on Newtonian and non-Newtonian fluids.



Total No. of Questions : 5]

SEAT No. :

PE4610

[Total No. of Pages : 2

[6514]-43

M.Sc. (Part - II)

MICROBIOLOGY

**MB 660 MJ : Quality Assurance and Validation in the Pharmaceutical Industry and Development of Anti - Infectives from Plants
(2023 Pattern) (Semester - IV) (Credit System) (Theory)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.*
- 2) Solve any three questions from question 2 to question 5.*
- 3) Question 2 to 5 carry equal marks.*
- 4) Draw neat labelled diagrams wherever necessary.*
- 5) Figures to the right indicate full marks.*

Q1) Attempt any five of the following.

[5]

- a) Define GMP.
- b) Write any two CLSI guidelines in susceptibility testing.
- c) Name the auxotrophic mutant used in Ames test.
- d) Write any two GLP for pharmaceutical industry.
- e) Give two examples of anti - fungal agents used in susceptibility testing.
- f) Define Teratogens.

Q2) Attempt the following.

- a) Explain GMPs for pharmaceutical industry. **[6]**
- b) Write a short note on mutagenicity testing. **[4]**

Q3) Attempt the following.

- a) Define any two diffusion methods used in susceptibility testing of Anti - infectives. **[6]**
- b) Write a short note on susceptibility testing for Anti - Fungal agents. **[4]**

P.T.O.

Q4) Attempt the following.

- a) Explain sterility testing used for the safety profiling of drugs. **[6]**
- b) Justify the use of carcinogenicity testing used for safety profiling of drugs. **[4]**

Q5) Attempt any two of the following. **[10]**

- a) Write a short note on Gradient plate technique.
- b) Write a short note on susceptibility of Antimycobacterial agents.
- c) WHO certification for QA and QC in pharmaceutical industry.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE4611

[6514]-44

M.Sc. - II

MICROBIOLOGY

**MB-661-MJ : Advances in Microbial Technology
(2023 Credit Pattern) (Semester - IV)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Q.2 to Q.5 carry equal marks.
- 4) Use of scientific calculators is allowed.

Q1) Solve any five of the following. **[5]**

- a) Define primary metabolite.
- b) What is batch culture?
- c) Give two examples of growth associated products.
- d) Enlist two substrates that can be used in solid state fermentations.
- e) What criteria are considered for selecting organism for solid state fermentation.
- f) Write down formula for growth rate of microorganisms in batch culture.

Q2) Attempt the following.

- a) Describe the Kinetics of growth in Batch culture. **[6]**
- b) What are mixed growth associated products? Describe with example. **[4]**

Q3) Attempt the following.

- a) Compare and contrast liquid state fermentation and solid state fermentation. **[6]**
- b) Comment on “Water and moisture content is critical for successful solid state fermentation process”. **[4]**

P.T.O.

Q4) Attempt the following.

- a) Discuss the factors affecting solid state fermentation. [6]
- b) Give significance of yield coefficient and maintenance coefficient in batch culture. [4]

Q5) Write short notes on any four of the following. [10]

- a) Characteristics of microbial growth.
- b) Fed batch culture.
- c) Substrate utilization constant.
- d) Heat and mass transfer in solid state fermentation.
- e) Microbes used in solid state fermentation.
- f) Monod model in batch culture.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PE4612

[6514]-45

M.Sc. - II

MICROBIOLOGY

**MB-662-MJ : Industrial Wastewater Treatment and
Industrial Production of Vaccine
(2023 Pattern) (Credit System) (Semester - IV)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables & scientific calculators is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Solve any five of the following.

[5]

- a) Define : BoD.
- b) Give reason: vaccines produced through genetic engineering considered as safe.
- c) Enlist two examples of toxoid vaccines.
- d) Name the reactor used in anerobic biological treatment.
- e) Write application of next generation vaccines.
- f) What is the role of grit chamber in waste water treatment?

Q2) Attempt the following.

- a) Describe the primary, secondary & tertiary treatment of waste water and Explain one in detail. **[6]**
- b) Justify: Modern vaccines are more applicable than conventional vaccines. **[4]**

P.T.O.

Q3) Attempt the following.

- a) Write the characteristics & treatment methods of dairy effluent. [6]
- b) Explain industrial scale production of subunit vaccines. [4]

Q4) Attempt the following.

- a) Explain the reaction & kinetics of Activated sludge process. [6]
- b) Role of adjuvants & excipients in vaccine production. [4]

Q5) Write a note on any two of the following. [10]

- a) Third generation vaccines.
- b) Physico-chemical characteristics of Paper-Pulp industrial effluent.
- c) Types of vaccines.



Total No. of Questions : 5]

SEAT No. :

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PE4613

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M.Sc. - II

MICROBIOLOGY

**MB-663-MJ : Biosafety, Bioethics and Intellectual Property Rights
(2023 Pattern) (Credit System) (Semester - IV)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Attempt any three from Q.2 to Q.5.*
- 3) *Q.2 to Q.5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat and labelled diagrams wherever necessary.*

Q1) Attempt any five of the following.

[5]

- a) Define risk analysis with respect to biosafety.
- b) What is the main purpose of the IBSC committee?
- c) Define eugenics.
- d) Give the full form of FSSAI.
- e) Which universal ethical principle deals with keeping information confidential?
- f) What is a trademark?

Q2) Attempt the following.

- a) Describe in detail the roles and responsibilities of CDSCO regulatory body. **[6]**
- b) List the various types of IPRs. Explain any one IPR with examples. **[4]**

Q3) Attempt the following.

- a) Elaborate the ethical principles of privacy and justice with examples. **[6]**
- b) Justify: Timely medical surveillance can prevent medical emergencies and biohazards. **[4]**

P.T.O.

Q4) Attempt the following.

- a) Describe the roles and responsibilities of CPCB in air and water quality monitoring. **[6]**
- b) Give the importance provisions of the Cartagena Protocol. **[4]**

Q5) Write a short note on any two of the following. **[10]**

- a) WIPO convention.
- b) Bioethical issues in gene therapy.
- c) Salient features of the TRIPS agreement.

