

Total No. of Questions : 7]

SEAT No. :

PD-3333

[Total No. of Pages : 2

[6480]-101

M.Sc. (Part - I)

MICROBIOLOGY

MB-501-MJ : Microbial Systematics

(2023 Pattern) (CBCS) (Semester -I)

Time : 3 Hours]

[Max. Marks : 70

Instruction to the candidates :

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

Q1) Attempt any five of the following :

[10]

- a) Define species concept in Eukaryotes.
- b) What are unculturable Bacteria?
- c) What is polyphasic Approach in Microbial systematics?
- d) Give full form of RFLP and write its one application.
- e) Write concept of Eusociality.
- f) What are selfish genes?

Q2) Attempt the following.

- a) What is meant by species divergence and explain the measurement of microbial diversity in detail. **[7]**
- b) Enlist the methods for extracting total bacterial DNA from Habitat and explain any one. **[5]**

P.T.O.

Q3) Attempt the following.

- a) What are culture independent molecular methods for identification of unculturable bacteria and explain any one in detail. [7]
- b) Justify : Why Shannon index is better than the Simpson's index for expressing bacterial diversity. [5]

Q4) Attempt the following:

- a) Explain the role of five kingdom and three domain classification system in Microbial systematics. [7]
- b) From the given data calculate the Simpson's diversity index for river water sample. Total number of colonies is 214×10^9 [5]

Sr.No	Type of colonies	Number of colonies
1	Pin point	60
2	Pigmented	71
3	Colony larger than 1mm	83

Q5) Attempt the following:

- a) What is coevolution? Explain, Coevolution with respect to host parasite evolution. [7]
- b) Discuss the importance of morphological features used in differentiation of fungi. [5]

Q6) Attempt the following:

- a) What is neodarwinism. Explain the concept of evolutionary r and k selection. [7]
- b) Explain Morphological and structural facets of microbial diversity. [5]

Q7) Write short notes (Any two)

- a) Molecular distances in Microbial systematics. [6]
- b) Great plate count anomalies. [6]
- c) Kin selection. [6]



Total No. of Questions : 7]

SEAT No. :

PD-3334

[Total No. of Pages : 2

[6480]-102

M.Sc. (Part - I)

MICROBIOLOGY

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

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Q.no. 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 calculators is allowed.
- 7) Assume suitable data wherever necessary.

Q1) Attempt any Five of the following :

[10]

- a) Enlist two storage polysaccharides and draw structure of any one.
- b) Draw structures of the amino acids which can form electrostatic bond with Arginine side chain in proteins.
- c) What is ingressation?
- d) Explain the role of waxes.
- e) Explain the role of meristems.
- f) Explain why lysine acts as helix destabilizing amino acid at neutral pH.

Q2) Answer the following :

- a) What is cytoskeleton? Discuss its biological significance. [7]
- b) Compare and contrast between c - RNA and t - RNA. [5]

Q3) Answer the following :

- a) Give an account of events which determine dorso-ventral axis formation in Drosophila. [7]
- b) In X-ray studies of crystalline peptides, linus pauling and Robert Corey found that the C-N bond in the peptide link is intermediate in length ($1.32\text{\AA}$) between typical C-N single bond ($1.49\text{\AA}$) and a C = N double bond ($1.27\text{\AA}$). What is the significance of this observation? [5]

P.T.O.

Q4) Answer the following :

- a) Give an account of patterning in organization of root apical meristem.[7]
- b) Explain the targetting of secretory proteins to ER. [5]

Q5) Answer the following :

- a) Determine the sequence of hexapeptide based on the following data.[7]
 - i) Amino acid composition was found to be:
(2Arg + Ala + Ser + Val + Tyr)
 - ii) Sanger's reagent gave DNA-A/a
 - iii) Trypsin digestion gave two peptides with amino acid composition:
(Arg + Ala + Val) and (Arg + Ser + Tyr)
 - iv) Carboxypeptidase a digestion: No digestion.
 - v) Chymotrypsin digestion: (Ala + Arg + Val + Tyr) and (Arg + Ser)
- b) Explain the role of HOX genes in Drosophila development. [5]

Q6) Answer the following :

- a) What are complex lipids? Write about various complex lipids with general structure and biological functions. [7]
- b) Describe the cell cycle and diagrammatically represent the check points of cell cycle. [5]

Q7) Answer the following (Any Two) : [12]

- a) Explain various types of isomerisms observed in sugars.
- b) Explain commonly found protein super-secondary structures.
- c) Diagrammatically illustrate the structural features of mitochondrion and chloroplast.



Total No. of Questions : 5]

SEAT No. :

PD-3335

[Total No. of Pages : 2

[6480]-103
M.Sc. (Part - I)
MICROBIOLOGY
MB 503 MJ : Basic Quantitative Biology
(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 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) Answer any Five of the following :

[5]

- a) What is a one tailed test?
- b) Calculate the mean for the following data:
110, 115, 125, 105, 100
- c) Give two advantages of sampling over census.
- d) Define the level of significance in statistics.
- e) List the types of variables.
- f) What is the probability of getting an odd number if a fair dice is thrown in the air?

Q2) Attempt the following :

- a) Frequency distribution of Birth weights in pounds (lb) for human babies born at a clinic in the year 2023 is given in the following table. Calculate the standard deviation and coefficient of variation for the data. **[6]**

Birth weight (lb)	2	3	4	5	6	7	8	9	10
Number of babies	2	5	9	15	25	22	12	1	1

- b) Four different patient samples received at a diagnostic centre are required to be sent to four different diagnostic departments according to the sample type. If the samples are sent to the departments randomly, what is the probability that none of the samples reach the correct department? **[4]**

P.T.O.

Q3) Attempt the following :

- a) Represent the following data regarding COVID-19 cases detected in the month of March 2019, at a COVID-19 testing centre in pune, by a less than and more than O give curve. [6]

Number of days	0-5	5-10	10-15	15-20	20-25	25-30
Number of COVID-19 cases	7	10	20	13	12	19

- b) Adding bran to the diet has been shown to benefit diverticulitis patients. The effect of intake of two bran varieties was tested in diverticulitis patients by determining their transit time through the alimentary canal. With the results shown in the following table. Test if the outcomes of the two treatments are significantly different using the t-test. [4]

	No. of patients	Mean transit time (hrs)	Variance
Transit time of course bran (Treatment A)	15	68.40	271.4
Transit time of fine bran (Treatment B)	12	83.42	310.99

Q4) Attempt the following :

- a) If a fair dice is thrown thrice, find the probability distribution of getting the number four. Also, find the mean and the variance of the distribution. [6]
- b) Write a short note on type I and type II errors in statistics. [4]

Q5) Attempt the following :

- a) If the side effects from a medicine occur in 0.2% of patients using poisson distribution determine the probability when: [6]
- none suffer from side effects
 - more than three suffer from side effects
- b) The number of pods on each tea plant in a field is given in the adjoining frequency distribution table determine the mode from the given data.[4]

No. of pods on a plant	0-10	10-20	20-30	30-40	40-50	50-60
No. of plants	8	16	36	34	10	6



Total No. of Questions : 5]

SEAT No. :

PD-3336

[Total No. of Pages : 2

[6480]-104
M.Sc. (Part-I)
MICROBIOLOGY
MB 510(A) MJ: Microbial Extremophiles
(2023 Pattern) (Semester - I) (Credit System)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidate:

- 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) Which are the different classes of xerophiles?
- b) Give the two special features of extremophiles.
- c) What is the source for isolation of halophiles?
- d) Give the two applications of alkaliphiles
- e) Give the classification of piezophiles.
- f) What is the habitat for oligophiles?

P.T.O.

Q2) Attempt the following :

- a) Give the examples of alkaliphiles and mechanism of adaptation by alkaliphiles. **[6]**
- b) Write short note on thermophiles **[4]**

Q3) Attempt the following :

- a) Give the biotechnological applications of acidophiles and halophiles. **[6]**
- b) Write short note on mechanism of adaptation by Psychrophiles **[4]**

Q4) Attempt the following :

- a) Explain the diversity of xerophiles. **[6]**
- b) Explain the properties and mechanism of adaptation by piezophiles. **[4]**

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

- a) Write short note on recent development in alkaliphiles.
- b) Write short note on properties of acidophiles.
- c) Mention the steps for enrichment and isolation of psychrophiles.



Total No. of Questions : 5]

SEAT No. :

PD-3337

[Total No. of Pages : 2

[6480]-105

M.Sc. (Part - I)

MICROBIOLOGY

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

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.no. 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to 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 signaling pathway?
- b) What is active transport?
- c) Give two examples of bacteria which produce slime.
- d) What are ion pumps?
- e) Which are the three types of ATPases in transport mechanism?
- f) What is chemotaxis?

Q2) Attempt the following :

- a) Explain in detail secondary active transport mechanism. **[6]**
- b) Explain the bacterial two-component systems in signaling pathways. **[4]**

Q3) Attempt the following :

- a) Explain in detail mechanism of biofilm formation. **[6]**
- b) Write a note on application of biofilm in non-pathogenic environment. **[4]**

Q4) Attempt the following :

- a) Explain in detail the ion-mediated transport mechanism. **[6]**
- b) Write a note on second messengers in transport mechanism. **[4]**

P.T.O.

Q5) Attempt any Two of the following :

[10]

- a) Write a note on membrane dynamics.
- b) Write a note on signal transduction pathway in bacteria.
- c) Write a note on passive diffusion mechanism.



Total No. of Questions : 5]

SEAT No. :

PD-3338

[Total No. of Pages : 3

[6480]-106
M.Sc.-I
MICROBIOLOGY
MB 510 (C) MJ: Advanced Quantitative Biology
(Group - II)Major Elective Theory
(2023 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.*

Q1) Attempt any five of the following :

[5]

- a) Give any two differences between parametric and non-parametric tests.
- b) Define multiple linear regression.
- c) Give significance of Chi-square test.
- d) Give any two assumptions of ANOVA.
- e) What are the merits of rank correlation coefficient?
- f) Name any two post-hoc tests.

P.T.O.

Q2) Attempt the following :

- a) Hutchinson observed the following results in F₂ generation. Using Chi-square test check whether the two attributes are independent or not.[6]

	Corolla Colour		
Leaf shape	Yellow	White	Total
Narrow	717	249	966
Broad	236	80	316
Total	953	329	1282

- b) Two random samples are drawn from two normal populations are : [4]

Number	1	2	3	4	5	6	7	8
Sample I	9	9	11	11	13	15	12	14
Sample II	8	10	14	12	10	9	10	–

Obtain the estimates of variance of the population using F test to check whether the two populations have same variance.

- Q3)** a) Four different drugs have been developed for the cure of a certain disease. These drugs are tried on patients of three different hospitals. The number of cases of recovery from the disease per 100 people is given below. Carry out Analysis of Variance and interpret your results. [6]

Hospital	Drugs			
	A	B	C	D
H1	24	20	24	17
H2	20	25	30	9
H3	13	18	31	13

- b) In a pharmaceutical company, the monthly sales revenues (in lakhs rupees) of a randomly selected sample of salesmen from two states in India are given below. Check whether the two samples are drawn from identical populations using Mann-Whitney U-test. [4]

State A	41	29	50	40	52	55	46	36	39	46	57	--	--
State B	21	50	55	59	40	35	40	30	60	24	19	30	51

- Q4) a) A sleeping drug and a neutral control preparation were tested on 20 individuals. The results are given below. Using sign test check the difference between drug and control. [6]

Sr.No	1	2	3	4	5	6	7	8	9	10
Drug	9.0	10.6	7.5	5.4	6.1	10.2	7.9	8.4	9.7	7.1
Control	9.4	8.6	7.3	5.1	5.4	9.0	6.9	8.7	7.9	6.5

Sr.No	11	12	13	14	15	16	17	18	19	20
Drug	7.1	9.6	10.5	7.2	5.4	6.0	10.0	7.8	8.2	9.6
Control	6.5	9.4	8.5	7.2	5.1	5.4	9.0	6.8	8.5	6.4

- b) Ratio of male and female birth in universe is constant. In a village, It was found that male births were 52 and female births were 48. Using Chi-square test check whether the difference is due to chance. [4]

- Q5) a) What is Post-hoc analysis? Add a note on its significance. [6]

- b) Three machines are used to pack a certain insecticides into bags. A random sample of 8 bags in drawn and their contents are found to weigh (in kgs) as follows. [4]

Machine 1	50	52	49	44	46	45	51	49
Machine 2	44	48	51	49	45	46	49	50
Machine 3	49	46	47	50	50	48	45	46

Use 5% level of significance to test the null hypothesis that the amount of insecticide packaged by three machines is the same using Kruskal- wallis test.



Total No. of Questions : 5]

SEAT No. :

PD-3339

[Total No. of Pages : 2

[6480]-107

M.Sc. (Part - I)

MICROBIOLOGY

MB-510(D)MJ : Experimental Design and Quantitative
Approach For Biologists

(2023 Pattern) (CBCS) (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 Q2 to Q5.
- 3) Question no 2 to 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) In _____ random sampling, the population is divided into number of Sections called strata.
- b) What are the three tools of disease measurement in epidemiology.
- c) Case control and Cohort studies are _____ type of epidemiological studies.
- d) $\frac{8}{3}$, $\frac{-5}{7}$, $\frac{0}{3}$ and 6 all are _____ numbers.
- e) Find the domain and range of g., where

$$g(x) = \frac{x+3}{x-2}$$

- f) For $R = R_0 \cdot 2^{-ht}$ equation slope will be _____.

P.T.O.

Q2) Attempt the following :

- a) Discuss in detail Randomized control trials and Enlist different types of randomized control trials. [6]
- b) Find the equation of a circle with its center at $(2, -3)$ and its radius equals to 5. [4]

Q3) Attempt the following.

- a) Describe different sampling methods used in biostatistics. [6]
- b) If $f(x) = 2x^2 - 3x$, evaluate $f(1 + h)$ and $f(x + h) - f(x)$ [4]

Q4) Attempt the following

- a) Explain Full Factorial Design. [6]
- b) If a cell divides every 30 minutes. What the number of cells that would be formed after 50 hrs. [4]

Q5) Attempt the following.

- a) Describe in detail principles of randomization, replication and local control. [6]
- b) If a bacterial culture having 1×10^{10} CFU/ml is heated for 45°C for 27 minutes. What will be the final count of bacteria ($9D = 27\text{mins.}$) Also find 1D Value. [4]



Total No. of Questions : 5]

SEAT No. :

PD-3340

[Total No. of Pages : 2

[6480]-108

M.Sc. (Part - I)

MICROBIOLOGY

MB541RM : 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 Q2 to Q5.*
- 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) What are the different types of research?
- b) Enlist the sampling methods.
- c) Define research.
- d) Explain the term plagiarism.
- e) What is report writing?
- f) How is mono-disciplinary different from interdisciplinary research?

Q2) Attempt the following :

- a) Describe briefly the research process and its stages. **[6]**
- b) Describe the literature review. Explain the process of writing a review on the selected research topic. **[4]**

P.T.O.

Q3) Attempt the following.

- a) Explain different steps in scientific powerpoint presentation. [6]
- b) Explain the necessity of research report writing. [4]

Q4) Attempt the following

- a) Explain different methods for the data presentation. [6]
- b) Describe the different sampling methods used in the research process.[4]

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

- a) Scientific Poster Preparation
- b) Copyright
- c) Budget and justification of Project Proposal



Total No. of Questions : 7]

SEAT No. :

PD-3341

[Total No. of Pages : 2

[6480]-201

M.Sc. (Part - I)

MICROBIOLOGY (Theory)

MB-551-MJ : Molecular Biology - I

(2023 Pattern) (Credit System) (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 and labelled diagrams wherever necessary.
- 6) Use of scientific calculators is allowed.

Q1) Answer any five of the following :

[10]

- a) Enlist any four modifications of Histone proteins.
- b) Which RNA polymerase transcribes mRNA and rRNA in eukaryotes.
- c) What are RF1 and RF2 and what is their role in translation?
- d) Are bacterial mRNAs spliced? Give the reason for the same.
- e) Give the enzymatic action of Alkaline phosphatase and its application in RDT.
- f) What does Ti and Ri stand for and what are they used for?
- g) What is the principle of DNA microarray based on and which other technique is based on the same principle?

Q2) Answer the following :

- a) Explain transcription initiation in eukaryotes. **[7]**
- b) Describe DNA Recombination in eukaryotes. **[5]**

P.T.O.

Q3) Answer the following :

- a) Explain in brief the CRISPR-cas system. [7]
- b) Write a short note on RNA editing. [5]

Q4) Answer the following :

- a) Explain in brief the construction of cDNA libraries. [7]
- b) Describe far-western technique. [5]

Q5) Answer the following :

- a) Justify ! Micro RNA detection can be used as a signature of cancer diagnostics. [7]
- b) Write a short note on tRNA processing. [5]

Q6) Answer the following :

- a) Explain translation initiation and elongation in prokaryotes. [7]
- b) From the given data construct a map of plasmid DNA for PstI, Eco RI and BantiI. [5]

Restriction Enzymes	Fragment sizes
PstI + Eco RI	2.14 kb, 0.46 kb
EcoRI + Bam HI	2.4 kb, 0.2 kb
PstI + EcoRI + BaniHI	1.94 kb, 0.46 kb, 0.2 kb

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

- a) Puromycin translation assay
- b) Northern Blotting
- c) Role of DNA ligase, polynucleotide kinase and T4 DNA polymerase



Total No. of Questions : 7]

SEAT No. :

PD-3342

[Total No. of Pages : 2

[6480]-202

M.Sc. (Part - I)

MICROBIOLOGY

**MB - 552 - MJ : Enzymology, Bioenergetics & Metabolism
(2023 Pattern) (Credit System) (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 and labelled diagrams wherever necessary.*
- 6) *Use of scientific calculators is allowed.*

Q1) Answer any Five of the following.

[10]

- a) What are unsaturated fatty acids? Give two examples.
- b) Give two examples of sugar acids?
- c) Define Gibb's free energy.
- d) Enlist different methods used for purification of an enzyme.
- e) Give the significance of Atkinsons energy charge.
- f) Name the coenzyme form of flavin & its function in TCA cycle.

Q2) Answer the following :

- a) A crude cell free extract of skeletal muscle contains 32 mg protein/ms. Ten microliters of the extract catalysed a reaction at a rate of 0.14 μ mole/min. under standard optimum conditions. Fifty milliliters of extract were fractionated by ammonium sulfate precipitation. The fraction precipitating between 20% & 40% saturation was redissolved in 10ml. This solution was found to contain 50 mg protein / ml. Ten microliters of this purified fraction catalysed reaction at a rate of 0.65 μ mole/min. [7]
Calculate
 - i) Percent recovery of the enzyme in purified fraction.
 - ii) Degree of purification obtained by fractionation.
- b) Draw the secondary plot for uncompetitive inhibitor.

[5]

P.T.O.

Q3) Answer the following :

- a) Describe in detail structure and function of sphingolipid. [7]
- b) Write in detail the Hill plot. [5]

Q4) Answer the following :

- a) Describe in detail steps involved in beta oxidation process. [7]
- b) Write a note on role of Vitamin D in metabolism. [5]

Q5) Answer the following :

- a) What are allosteric enzymes? Compare and contrast between KNF & MWC model. Derive kinetic equation for MWC model. [7]
- b) Write a note on phospholipids. [5]

Q6) Answer the following :

- a) What is glycogen? Explain in detail the regulation of its synthesis & breakdown. [7]
- b) Outline Arginine synthesis pathway. [5]

Q7) Write short note on Any Two of the following : [12]

- a) Atkinsons energy change.
- b) Phosphatidylinositol as a signaling molecule.
- c) Secondary plot for non competitive inhibition.



Total No. of Questions : 5]

SEAT No. :

PD-3343

[Total No. of Pages : 2

[6480]-203
M.Sc. (Part - I)
MICROBIOLOGY
MB 553 MJ : Laboratory Techniques and Instrumentation
(2023 Pattern) (Credit System) (Semester - II) (Theory)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. No. 1 is compulsory.*
- 2) *Solve any Three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 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 calculators is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any Five of the following :

[5]

- a) Define Retention factor.
- b) Enlist any two detectors used in Gas chromatography.
- c) Give any two applications of FTIR.
- d) What is the principle of dialysis in sample preparation.
- e) Define molar absorptivity.
- f) Define Fluorescence.

Q2) Attempt the following :

- a) Describe the principle, instrumentation and application of HPLC with suitable diagram. **[6]**
- b) Describe the principle of Isoelectric focusing. **[4]**

Q3) Attempt the following :

- a) Explain the principle, instrumentation and application of UV - vis spectroscopy. **[6]**
- b) Explain any two mass analyzers used in mass spectrometry. **[4]**

P.T.O.

Q4) Attempt the following :

- a) Explain ultrafiltration and centrifugal vacuum concentration techniques used in sample preparation. **[6]**
- b) The absorbance A of 2×10^{-5} M solution of amino acid tryptophan at wavelength of 280 nm is 0.50. The pathlength of the cuvette is 1 cm. What is molar absorption coefficient ϵ ? **[4]**

Q5) Write a short note on any two :

[10]

- a) Fast protein liquid chromatography
- b) FRET
- c) Native PAGE



Total No. of Questions : 5]

SEAT No. :

PD-3344

[Total No. of Pages : 2

[6480]-204

M.Sc. (Part - I)

MICROBIOLOGY (Theory)

**MB-560 MJ: Molecular Biology Tools and Applications
(2023 Pattern) (Semester - II) (CBCS)**

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) Solve any FIVE of the following: [5]

- a) EMSA is used to determine the interaction between which two molecules?
- b) What is filter binding assay used for?
- c) Name two membranes used in blotting assays.
- d) What are peptide antibodies.
- e) Name the natural source for rubber production.
- f) What are anti-cancer antibodies?

Q2) Attempt the following :

- a) Describe phage display assay and give its applications. [6]
- b) Give the difference between genomic array and cDNA arrays. [4]

P.T.O.

Q3) Attempt the following :

- a) Explain commercial production of ascorbic acid using RDT. [6]
- b) Explain use of RDT in rubber production. [4]

Q4) Attempt the following :

- a) Explain use of RDT in production of anti-cancer antibodies. [6]
- b) Explain super shift assay. [4]

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

- a) Short note on STS (Sequence tagged sites)
- b) Short note on measuring transcription rates.
- c) Short note on DNase foot printing.



Total No. of Questions : 5]

SEAT No. :

PD-3345

[Total No. of Pages : 2

[6480]-205
M.Sc. (Part - I)
MICROBIOLOGY
MB - 561 - MJ : Nitrogen Metabolism, Respiration and
Photosynthesis
(2023 Pattern) (Credit System) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Q. No. 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Q. No. 2 to 5 carry equal marks.
- 4) Figures to the right indicated full marks.
- 5) Draw neat and labelled diagrams wherever necessary.

Q1) Solve any Five of the following :

[5]

- a) Give the applications of methanogenic bacteria.
- b) What is electron transport chain?
- c) Explain what are denitrifying bacteria with examples.
- d) Explain what are sulphur oxidising bacteria with examples.
- e) What are electron donors in an oxygenic photosynthetic bacteria?
- f) What is biological nitrogen fixation?

Q2) Attempt the following :

- a) Explain the respiration in nitrate reducing bacterial with energy generation.**[6]**
- b) Write short note on properties and regulation of glutamate dehydrogenase enzyme. **[4]**

Q3) Attempt the following :

- a) What is photophosphorylation? Explain any one of the photophosphorylation mechanism. **[6]**
- b) Write a short note on the importance of nitrogen fixing bacteria in agriculture. **[4]**

P.T.O.

Q4) Attempt the following :

- a) Explain the amino acid degradation in detail. [6]
- b) Explain the role of cytochromes in electron transport chain. [4]

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

- a) Plant photosynthesis.
- b) Ammonification.
- c) Mechanism of chemolithotrophic bacteria.



Total No. of Questions : 5]

SEAT No. :

PD-3346

[Total No. of Pages : 2

[6480]-206

M.Sc. - I

MICROBIOLOGY

MB 562 MJ : Molecular Biophysics

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

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.No. 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Q.2 to 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) Enlist applications of confocal microscopy in biological research.
- b) What are radioactive isotopes?
- c) Define the term 'Pixels' as used in confocal microscopy.
- d) Explain the principle behind NMR spectroscopy.
- e) Enlist the applications of radioisotopes in agriculture.
- f) What is the Ewald sphere?

Q2) Attempt the following :

- a) Describe the instrumentation of X-ray crystallography. Account for the role of goniometer. **[6]**
- b) Justify: Nuclear overhauser effect is helpful in protein structure determination. **[4]**

Q3) Attempt the following :

- a) Explain measurement of radioactivity using scintillation counters. **[6]**
- b) Mn^{54} has a half-life of 314 days. Calculate the decay constant in terms of days^{-1} and sec^{-1} . **[4]**

P.T.O.

Q4) Attempt the following :

- a) State the approach to determine the structure using 2D-NMR. [6]
- b) Explain any two methods of protein crystallization. [4]

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

- a) Autoradiography
- b) Electorn density maps
- c) Types of quenching



Total No. of Questions : 5]

SEAT No. :

PD-3347

[Total No. of Pages : 2

[6480]-207

M.Sc. (Part - I)

MICROBIOLOGY

MB-563-MJ : Bioinformatics

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

Time : 2 Hours]

[Max. Marks : 35

Instruction to the candidates :

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

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

- a) Give one example each of a protein and a nucleic acid sequence database.
- b) What is maximum parsimony in molecular phylogeny?
- c) What is the full form of EBI information resource?
- d) Which type of data is stored in db EST database?
- e) Define multiple sequence alignment.
- f) What is multiple sequence alignment?

Q2) Attempt the following:

- a) Differentiate between local and global pairwise sequence alignments. **[6]**
- b) Justify : BLAST can be used as a sequence similarity search tool. **[4]**

P.T.O.

Q3) Attempt the following:

- a) Describe in detail the different forms of biological data used in bioinformatics, along with examples of their different file formats? [6]
- b) Explain the purpose and features of the proteomes database. [4]

Q4) Attempt the following:

- a) Describe the features and significance of the PDB database. [6]
- b) Give a brief account of the steps involved in phylogenetic analysis. [4]

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

- a) Uni Prot KB
- b) EMBL
- c) Pair wise sequence alignment



Total No. of Questions : 7]

SEAT No. :

PD-3348

[Total No. of Pages : 2

[6480]-301
M.Sc.-II
MICROBIOLOGY
MB-601MJ: Immunology
(2023 Pattern) (Semester - III) (Credit System)

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) *Draw neat and well labelled diagrams wherever necessary*
- 4) *Figures to the right indicates full marks.*
- 5) *Use of logarithmic tables or scientific calculators is allowed.*
- 6) *Assume suitable data if necessary.*
- 7) *Q. 2 to Q. 7 carry equal marks.*

Q1) Attempt any five of the following :

[10]

- a) What are cell adhesion molecules?
- b) What is immune tolerance?
- c) Define functional assay.
- d) Define syngenic mice
- e) What is metastasis?
- f) What are biological response modifiers?

P.T.O.

Q2) Attempt the following :

- a) What are pattern recognition receptors? Describe it with a suitable example. [7]
- b) Write a note on T-cell mediated suppression of immune response. [5]

Q3) Attempt the following :

- a) Explain the ELISPOT assay. [7]
- b) 'Expression of TH1 cytokines inhibits the expression of TH2 cytokines and vice-versa'. Justify the statement. [5]

Q4) Attempt the following :

- a) Explain JAK/STAT pathway. [7]
- b) How does the concept of immunoediting contribute to the escape of tumours from host defence mechanism? [5]

Q5) Attempt the following :

- a) Discuss the regulation of classical pathway of complement activation system. [7]
- b) What are tumour markers? Explain their significance in the diagnosis of cancer. [5]

Q6) Attempt the following :

- a) Write a note on animal models used in autoimmunity [7]
- b) What is neoplasm? Discuss the cellular transformations occurring during the neoplastic growth. [5]

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

- a) Discuss MTT assay
- b) Explain the immune network theory
- c) What is TCR-CD3 complex? Explain it with a neat and well labelled diagram.



Total No. of Questions : 7]

SEAT No. :

PD-3349

[Total No. of Pages : 2

[6480]-302
M.Sc.-II
MICROBIOLOGY
MB-602MJ: Molecular Biology - II
(NEP 2023 Pattern) (Semester - III) (CBCS)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidate:

- 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) *Draw neat labelled diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic table and scientific calculator is allowed.*
- 7) *Assume suitable data wherever necessary.*

Q1) Attempt any five of the following :

[10]

- a) What is gene aging?
- b) Define the concept of epigenetics.
- c) What are transposons? Give 2 examples
- d) Define SINES
- e) Write 2 applications of zinc finger nucleases
- f) What is metabolon?

P.T.O.

Q2) Attempt the following :

- a) Explain the alternative splicing mechanism. [7]
- b) What are the applications of polymerase chain reaction (PCR) in Molecular Diagnostics. [5]

Q3) Attempt the following :

- a) Describe the Gal 4 UAS system in D.melanogaster with the applications. [7]
- b) Write a short note on composite transposons. [5]

Q4) Attempt the following :

- a) What is DNA imprinting? Give 2 examples and explain. [7]
- b) What are the advantages of next generation sequencing? Give example of any one method. [5]

Q5) Attempt the following :

- a) Explain in detail the reverse transcription PCR, its types and applications. [7]
- b) Write a note on Ac-Ds system in maize. [5]

Q6) Attempt the following :

- a) What are the Ty elements? Explain with examples. [7]
- b) What are the steps involved in studying structural and functional proteomics? [5]

Q7) Write a short note on any 2: [12]

- a) TnA
- b) GC-MS in metabolite study
- c) mAB in GM tobacco



Total No. of Questions : 5]

SEAT No. :

PD-3350

[Total No. of Pages : 2

[6480]-303

M.Sc.-II

MICROBIOLOGY

**MB 603 MJ: Clinical Microbiology
(2023 Pattern) (Semester - III) (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) *Draw neat labelled diagrams wherever necessary.*
- 4) *Figures to the right indicate 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) Enlist steps of microbial pathogenesis.
- b) What are virulence factors.
- c) Define epidemiology.
- d) Write two therapeutic agents for Helicobacter Pylori.
- e) What are the methods used for handling and disposal of infectious materials.
- f) Which disease caused by Mycobacterium leprae.

P.T.O.

Q2) Attempt the following :

- a) Explain general characters & prophylaxis of tuberculosis. [6]
- b) Describe pathogenesis of Candida auris [4]

Q3) Attempt the following :

- a) Discuss pathogenicity island with suitable example. [6]
- b) Describe general characters of HPV. [4]

Q4) Attempt the following :

- a) Describe pathogenesis and clinical manifestations of Helicobacter Pylori. [6]
- b) Explain susceptible exposed Infectious recovered (SEIR) model. [4]

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

- a) Tuberculin test for Mycobacterium tuberculosis.
- b) Host-mediated pathogenesis.
- c) Structure of Human Papilloma Virus (HPV)



Total No. of Questions : 5]

SEAT No. :

PD-3351

[Total No. of Pages : 2

[6480]-304

M.Sc. (Part - 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) *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) What is Primary Cell Line?
- b) What is the use of CO₂ incubator in cell culture methods.
- c) What is transformed cell line?
- d) Define continuous cell line.
- e) What is the use of trypsin in cell culture.
- f) Name any two animal cell lines.

Q2) Attempt the following :

- a) Describe anchorage dependent cell lines. **[6]**
- b) What is the role of serum in cell culture techniques? **[4]**

P.T.O.

Q3) Attempt the following :

- a) Explain the steps in preparation of an established cell line. [6]
- b) Describe methods of preservation of cell lines. [4]

Q4) Attempt the following :

- a) Describe use of Flow cytometry in cell culture methods. [6]
- b) Comment on artificial media in cell culture methods. [4]

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

- a) Methods of cell isolation.
- b) pH maintenance in cell culture media.
- c) Applications of cell culture techniques.



Total No. of Questions : 5]

SEAT No. :

PD-3352

[Total No. of Pages : 2

[6480]-305

M.Sc. (Part - II)

MICROBIOLOGY

MB-611 MJ : Bioremediation and Biomass Utilization
(2023 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 FIVE of the following:

[5]

- a) Define Biomass.
- b) Xenobiotic.
- c) What is meant by attenuation?
- d) Give any two advantages of silage.
- e) Which derivative of cellulose is used in lab media for screening of cellulose producers?
- f) Give any two disadvantages of bioremediation.

Q2) Attempt the following :

- a) Enlist types of bioremediation? Explain in-situ bioremediation in detail.**[6]**
- b) With suitable example explain use of gene manipulation for pesticide degradation. **[4]**

P.T.O.

Q3) Attempt the following.

- a) What is composting? Explain role of microbes in this process. [6]
- b) Add a note on cellulosomes. [4]

Q4) Attempt the following

- a) How alcohol production is improvised by manipulating amylases? [6]
- b) Give process of invert sugar production in industry. [4]

Q5) Add a short note on any two of the following : [10]

- a) Production of silage.
- b) Role of Laccase in biodegradation.
- c) Components of lignocellulose.



Total No. of Questions : 5]

SEAT No. :

PD-3353

[Total No. of Pages : 2

[6480]-306
M.Sc. (Part - II)
MICROBIOLOGY
MB - 612 - MJ : Microbial Virus Technology
(2023 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 5 carry equal marks.*
- 4) *Draw neat and labelled diagrams wherever necessary.*
- 5) *Figures to the right side indicates full marks.*

Q1) Solve any Five of the following :

[5

- a) Define : Lysogeny.
- b) Give two examples of therapeutic use of bacterio phages.
- c) Enlist two physical methods for concentration of phages.
- d) What is lytic cycle.
- e) Name the media used in virus isolation.
- f) Name the bacteriophages used in medical wastewater treatment.

Q2) Attempt the following :

- a) Discuss the use of bacteriophages as biocontrol of biofilms on medical devices. **[6]**
- b) Comment on kinetics of bacteriophages. **[4]**

Q3) Attempt the following :

- a) Comment on use of bacteriophages in medical wastewater decontamination. **[6]**
- b) Comment on mycoviruses - host interaction mechanisms. **[4]**

P.T.O.

Q4) Attempt the following :

- a) Explain morphology and classification of bacteriophages. [6]
- b) Enlist & Explain various enumeration, a isolation method for isolation of bacteriophages. [4]

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

- a) ICTV system of classification.
- b) Host - range of bacteriophages.
- c) Characterization techniques for mycoviruses.



Total No. of Questions : 5]

SEAT No. :

PD-3354

[Total No. of Pages : 2

[6480]-307

M.Sc. (Part - II)

MICROBIOLOGY

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

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q.No.1 is compulsory.*
- 2) *Solve any three questions from Q.No.2 to Q.No.5.*
- 3) *Draw neat labeled diagrams wherever necessary.*
- 4) *Figures to the right side indicates full marks.*
- 5) *Use of logarithmic tables/scientific calculator is allowed.*
- 6) *Assume suitable data if necessary.*
- 7) *Q.No. 2 to Q.No. 5 carry equal marks.*

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

- a) Define antimicrobial susceptibility.
- b) What are the methods used for handling and disposal of infections materials.
- c) Enlist classes of parasites.
- d) Which are the morphological forms of Chlamydiae species.
- e) Write a two concentration methods for stool examination.
- f) Who is the definitive host of Taenia saginata.

Q2) Attempt the following.

- a) Explain pathogenesis of Listeria monocytogens. **[6]**
- b) Describe effects of parasites on human organs and tissues. **[4]**

P.T.O.

Q3) Attempt the following.

- a) Explain social and ethical implications of Biological weapons. [6]
- b) Describe diagnostic methods for Schistosoma haematobium. [4]

Q4) Attempt the following:

- a) Explain etiology and pathogenesis of Burkholderia cepacia. [6]
- b) Describe Gross examination of stool sample for parasites. [4]

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

- a) Antimicrobial stewardship.
- b) Host response to parasite infections.
- c) Zoonoses.



Total No. of Questions : 7]

SEAT No. :

PD-3355

[Total No. of Pages : 2

[6480]-401

M.Sc. (Part - II)

MICROBIOLOGY

MB-651MJ : Pharmaceutical Microbiology

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

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Q.1 is compulsory.
- 2) Solve any five questions from Q2 to Q7.
- 3) Q2 to Q7 carry equal marks.
- 4) Figures to the right indicate full marks.
- 5) Use of logarithmic tables & scientific calculator is allowed.
- 6) Draw Neat & labelled diagram wherever necessary.
- 7) Assume suitable data if necessary.

Q1) Solve any five of the following :

[10]

- a) Define Drug Enlist any two characteristic of Ideal drug.
- b) Write in short Pharmacovigilance.
- c) What is Pharmacopeia? What is addendum in pharmacopeia?
- d) What is absorption of drug? Enlist various factors influencing drug absorption through GIT.
- e) What is first pass effect?
- f) What is drug likeness? How it is assessed?

Q2) Attempt the following :

[12]

- a) What is drug discovery. Enlist the phases involved in drug discovery. Discuss key steps involved in Rational drug design. **[7]**
- b) What is medicinal chemistry? Write significance of medicinal chemistry in detail. **[5]**

P.T.O.

- Q3) Attempt the following. [12]**
- a) What are the methods of drug design? Explain Role of Molecular cloning in drug designing. [7]
 - b) Write aims & objectives of clinical trial - I [5]
- Q4) Attempt the following [12]**
- a) Explain five systems of AYUSH in detail. [7]
 - b) Enlist different drug authorities. Explain in detail Role of FDA in drug development. [5]
- Q5) Attempt the following [12]**
- a) What are the mechanisms of drug transport through biological membranes. Explain any two drug transport mechanisms in detail with diagram [7]
 - b) What is bioavailability of drug? Explain the effect of following on bioavailability of drug.
 - i) First pass effect
 - ii) Routes of Administration of drug. [5]
- Q6) Attempt the following [12]**
- a) Describe toxicity testing of drug write in detail design of Acute Toxicity study & advantages. [7]
 - b) A pain relieving medication has LD_{50} of 250 mg/kg and ED_{50} of 10 mg/kg. Calculate the therapeutic index (TI) and discuss whether the drug is safe for use. [5]
- Q7) Write short notes on (Any two) [12]**
- a) Hydrolysis Reactions of Phase - I metabolism of drug with examples.
 - b) Blood Brain Barrier
 - c) CLSI guidelines.



Total No. of Questions : 7]

SEAT No. :

PD-3356

[Total No. of Pages : 2

[6480]-402
M.Sc. (Part - 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. No. 1 is compulsory.*
- 2) *Solve any five questions from Q.2 to Q.7.*
- 3) *Q. No. 2 to 7 carry equal marks.*
- 4) *Figures to the right indicates full marks.*
- 5) *Draw neat and labelled diagrams wherever necessary.*

Q1) Attempt any Five of the following :

[10]

- a) What is Newtonian fluid?
- b) What is aeration number?
- c) What is bio - mining?
- d) What is immobilisation?
- e) Explain the role of baffles in fermentor.
- f) What is KLa?

Q2) Attempt the following :

- a) Explain the batch fermentor with advantages and disadvantages. **[7]**
- b) Explain the effect of rheology on heat and oxygen transfer. **[5]**

Q3) Attempt the following :

- a) Explain the immobilised enzymes for bioconversions. **[7]**
- b) Write a note on procedure for obtaining patents. **[5]**

Q4) Attempt the following :

- a) Explain the continuous stirred tank reactor in detail. **[7]**
- b) Write a note on incubation centre. **[5]**

P.T.O.

Q5) Attempt the following :

- a) Explain two methods for determining $K_L a$ value. [7]
- b) Explain the role of fungi in agriculture. [5]

Q6) Attempt the following :

- a) Explain the microbial extraction and recovery of gold from their ores.[7]
- b) Write a note on oxygen transfer rate in fermentor. [5]

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

- a) Explain the flow pattern with impellers.
- b) Write a note on air life reactor.
- c) Write a note on types of biosensors.



Total No. of Questions : 5]

SEAT No. :

PD-3357

[Total No. of Pages : 2

[6480]-403

M.Sc. (Part - II)

MICROBIOLOGY (Theory)

**MB-660-MJ : Quality Assurance and Validation in the
Pharmaceutical Industry and Development of Anti-infectives
from Plants**

(2023 Pattern) (Semester -IV) (Credits 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) Q.2 to Q.5 carry equal marks.*
- 4) Draw neat labelled diagrams wherever necessary.*
- 5) Figures to the right side indicate full marks.*

Q1) Attempt any five of the following:

[5]

- a) Which ISO is related to Quality management?
- b) Define MBC.
- c) Which guideline is used for antimicrobial action testing?
- d) Write any two safety tests for new drugs.
- e) Give names of any two diffusion methods in susceptibility testing.
- f) Write any two anti-viral drugs.

Q2) Attempt the following:

- a) Write few safety measures taken in pharma industry for microbiology laboratory. **[6]**
- b) Explain MBC in detail. **[4]**

P.T.O.

Q3) Attempt the following:

- a) Write down the susceptibility testing for Anti-viral agents. [6]
- b) Write a short note on factors affecting susceptibility testing. [4]

Q4) Attempt the following:

- a) Write a short note on QA and quality management of US certification in pharmaceutical industry. [6]
- b) Explain E-test. [4]

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

- a) Explain susceptibility testing for Anti-protozoal agents.
- b) Explain in detail test for detection of endotoxins.
- c) Write a short note on GMP in pharmaceutical industry.



Total No. of Questions : 5]

SEAT No. :

PD-3358

[Total No. of Pages : 2

[6480]-404

M.Sc. (Part - II)

MICROBIOLOGY

MB-661-MJ : Advances in Microbial Technology

(2023 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q2 to Q5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Use of scientific calculators is allowed.*

Q1) Solve any five of the following :

[5]

- a) Give example of primary and secondary metabolite.
- b) What is fed-batch culture?
- c) Define mixed growth non-associated product.
- d) State difference between liquid surface culture and liquid suspended culture.
- e) What parameters are considered while choosing the microbial strain for solid state fermentation.
- f) Write down formula for yield coefficient in a batch culture.

Q2) Attempt the following :

- a) Describe the kinetics of fed batch culture. **[6]**
- b) What are non-growth associated products? Describe with examples. **[4]**

P.T.O.

Q3) Attempt the following :

- a) Describe the types of reactors used in solid state fermentation process.[6]
- b) Give the significance of yield coefficient and maintenance coefficient in batch culture. [4]

Q4) Attempt the following :

- a) Compare and contrast liquid state and solid state fermentation process.[6]
- b) What is significance of growth rate and specific growth rate in batch culture. [4]

Q5) Write short notes on Any four of the following : [10]

- a) Applications of solid state fermentation.
- b) Continuous culture.
- c) Secondary metabolites.
- d) Classification of liquid fermentation.
- e) Aeration and agitation in solid state fermentation.
- f) Characteristics of microbial growth in batch fermentation.



Total No. of Questions : 5]

SEAT No. :

PD-3359

[Total No. of Pages : 2

[6480]-405

M.Sc. (Part - II)

MICROBIOLOGY

**MB-662 MJ : Industrial Wastewater Treatment and
Industrial Vaccine Production**

(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 side 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) Give significance of screening in waste water treatment.
- b) Enlist two examples of excipients used in vaccine Production.
- c) Define : Mean cell Retention time in activated sludge treatment.
- d) Name the viruses used in production of live attenuated vaccines.
- e) What is F/M ratio.
- f) State True/False - Aluminum salts used as adjuvants in vaccine production.

Q2) Attempt the following :

- a) Explain in detail Activated Sludge Treatment. **[6]**
- b) Justify : "Use of excipients & adjuvants in vaccine production increases the effect of vaccines." **[4]**

P.T.O.

Q3) Attempt the following :

- a) Explain in detail characteristics and treatment method of paper & pulp industrial effluent. [6]
- b) Describe Aerobic & Anerobic treatment of wastewater. [4]

Q4) Attempt the following :

- a) Explain the Pilot & larage scale Production of Rotavirus vaccine. [6]
- b) What will be the Sludge Volume Index (SVI) if 250ml of sludge collected in 30 min. on drying weight 800 mg? [4]

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

- a) Idiotype vaccines
- b) Nanofiltration method for wastewater treatment
- c) Next generation vaccines



Total No. of Questions : 5]

SEAT No. :

PD-3360

[Total No. of Pages : 2

[6480]-406

M.Sc. (Part - II)

MICROBIOLOGY (Theory)

MB-663-MJ : Biosafety, Bioethics and Intellectual Property Rights

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

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) Q.1 is compulsory.
- 2) Attempt any Three questions from Q2 to Q5.
- 3) Q2 to Q5 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) What is the significance of the Paris convention?
- b) Name any two universal ethical principles.
- c) Give the full form of RDAC committee.
- d) What is euthanasia?
- e) Define geographical indication. Give an example.
- f) What is a biosafety cabinet?

Q2) Attempt the following :

- a) Justify : Good laboratory practices play a significant role in biosafety.[6]
- b) Explain any two types of IPRs with examples. [4]

P.T.O.

Q3) Attempt the following :

- a) Elaborate on any four bioethical issues in health care with examples. **[6]**
- b) Give a brief account the importance of risk assessment and risk management in biosafety. **[4]**

Q4) Attempt the following :

- a) Describe in detail biological waste management for biosafety practices. **[6]**
- b) Briefly explain the biosafety levels for biocontainment. **[4]**

Q5) Write a short note on Any two of the following : **[10]**

- a) CDSCO regulatory body
- b) GATT agreement
- c) Bioethical issues in research.

