Total No. of Questions : 7]

SEAT No. :

PC4196

[Total No. of Pages : 2

[6340]-1001
M.Sc. -I
MICROBIOLOGY
MB-501-MJ : Microbial Systematics
(Credit 2023 Pattern) (Semester-I)

Time : 3 Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Q1 is compulsory.***
2) ***Solve any 5 questions from Q2 to Q7.***
3) ***Q2 to Q7 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 phylogenetic Approach in microbial systematics.

b) State any two applications of RAPD.

c) What is meant by Protein Ageing?

d) Define species Divergence.

e) What is species concept in Eukaryotes?

f) Define Neo Darwinism.

Q2) Attempt the following.

a) Explain in detail Differentiating characters among different classes of fungi. **[7]**

b) Describe Morphological and structural characters as Facets of Microbial Diversity. **[5]**

Q3) Attempt the following.

a) What is polyphasic approach in Microbial systematics Elaborate with an suitable example. **[7]**

b) Define unculturable Bacteria and explain the strategies for culture of unculturable Bacteria. **[5]**

P.T.O.

Q4) Attempt the following.

a) What is coevolution? Explain coevolution with respect to host-parasite evolution. **[7]**

b) From the given data calculate Simpson's diversity index for the river water sample. Total number of colonies is 184×10^7. **[5]**

Sr. No.	Types of Colonies	No. of Colonies
1	Pinpoint colonies	50
2	Pigmented colonies	61
3	Colonies larger than 1 mm	73

Q5) Attempt the following.

a) Explain Five kingdom classification system in Microbial systematics. **[7]**

b) Justify : Classification of Molds is chiefly based on theis Morphological characters. **[5]**

Q6) Attempt the following.

a) Enlist the culture independent Molecular methods for identifying unculturable bacteria and explain FISH and Microarray in details. **[7]**

b) What are selfish Genes? Explain in details. **[5]**

Q7) Write short notes on any two. **[12]**

a) *r* and *k* selection in Evolution

b) Metagenome Analysis

c) Role of Molecular clocks in Microbial Systematics.

■■■■

Total No. of Questions : 7]

SEAT No. :

PC4197

[Total No. of Pages : 2

[6340]-1002

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

Q1) Attempt any five of the following. **[10]**

a) Define Differentiation

b) State the functions of Mitochondria.

c) State the significance of non code.

d) Explain Vander Wall interaction

e) Enlist the properties of B form of DNA.

f) Describe the role of amino sugars.

Q2) Attempt the following:

a) Explain quarternary structure of protein with example. **[7]**

b) Describe the role of H.H equation in Buffer formulation. **[5]**

P.T.O.

Q3) Attempt the following:

a) What fraction of alanine is in the completly uncharged form at its PI? Justify your asumption. **[7]**

b) Explain any two derivatives of carbohydrates with structure. **[5]**

Q4) Attempt the following:

a) Explain organizer in vertebrates & state its role in development. **[7]**

b) Describe the floral development in Arabedopsis. **[5]**

Q5) Attempt the following:

a) Explain secretory pathway and its route in protein trafficking. **[7]**

b) What are the key factors in apoptosis. **[5]**

Q6) Attempt the following:

a) Comment on model systems in developmental systems. **[7]**

b) State the structure and functions of prostaglandins. **[5]**

Q7) Attempt the following: **[12]**

a) Comment on the role of Morphogen gradient

b) Explain the role of peroxisomes

c) State the significance of aromatic amino acids.

Total No. of Questions : 5]

SEAT No. : ____

PC4198

[Total No. of Pages :3

[6340]-1003

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) ***Q1 is compulsory.***
2) ***Solve 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.***
6) ***Use of logarithmic tables and scientific calculators is allowed.***
7) ***Assume suitable data if necessary.***

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

a) Calculate the mode for the following data:

21, 20, 22, 20, 21, 21, 20, 22, 21, 21

b) List the types of probability distributions.

c) Define type II error in statistics.

d) List any two disadvantages of using arithmetic mean.

e) What is a null hypothesis?

f) Define ordinal scale.

Q2) Attempt the following:

a) Percent seed germination was studied for seeds of a plant variety at various incubation temperatures. Determine the standard deviation from the following data: **[6]**

Incubation temperature (°C)	15-20	20-25	25-30	30-35	35-40	40-45	45-50
Percent seed germination	30	40	90	100	80	30	10

P.T.O.

b) The shelf of a library has the following biology books:

Four Biochemistry books, two Genetics books and one Quantitative Biology book. If three books are selected at random from the shelf, find the probability that two Biochemistry and one Genetics books are selected. **[4]**

Q3) Attempt the following:

a) Effect of a siderophore preparation was checked on the shoot length of ten saplings each of two Indian varieties of wheat, 15 days post applications. Using the shoot length data in the following table, determine which wheat variety shows more consistent results. **[6]**

Sapling No.	1	2	3	4	5	6	7	8	9	10
Shreshth variety shoot length (cm)	15	12	15	13	10	18	16	8	14	9
Aditya variety shoot length (cm)	10	13	11	12	15	15	12	10	8	11

b) Calculate the mean for the following frequency distribution of marks obtained by students on a test evaluated out of maximum 50 marks: **[4]**

Marks obtained	0-10	10-20	20-30	30-40	40-50
Number of students	10	15	20	20	10

Q4) Attempt the following:

a) If a rare infectious disease occurs at the rate of 2 per 10^6 people every year, assuming Poisson distribution, what is the probability that in Pune (Population about 8 million, i.e, 8×10^6): **[6]**

i) at least 5 cases occur in a given year

ii) no cases occur in a given year

b) The distribution of mango fruits on trees in an orchard is given below. Represent the data in graphical form as a histogram. **[4]**

No. of fruits on a tree	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of trees	4	8	16	21	30	35	22	7	3	1

Q5) Attempt the following:

a) Bacterial viable cell count was determined by sampling milk stored at room temperature every hour over a period of 10 hours. Calculate the correlation coefficient from the following data: **[6]**

Room temperature (°C)	18	25	25	32	35	20	30	13	30	30
Number of bacteria (cfu/ml)	20	25	33	35	40	26	30	15	25	37

b) Write a note on the t - test and its types. **[4]**

Total No. of Questions : 5]

SEAT No. :

PC4199

[Total No. of Pages : 2

[6340]-1004

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) ***Show neat and labelled diagrams wherever necessary.***

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

a) Which are the different group of extremophiles?

b) What is the special feature of extremophiles?

c) What is the source for isolation of halophiles?

d) Give the two applications of thermophiles.

e) Give the classification of barophiles.

f) What is the habitat for psychrophiles?

Q2) Attempt the following :

a) Give the examples of acidophiles and mechanism of adaptation by acidophilic microorganisms. **[6]**

b) Write short note on oligophiles. **[4]**

Q3) Attempt the following :

a) Give the biotechnological applications of extremophiles. **[6]**

b) Write short note on mechanism of adaptation by alkaliphiles. **[4]**

P.T.O.

Q4) Attempt the following :

a) Explain the diversity of extremophiles. **[6]**

b) Explain the properties and mechanism of adaptation by xerophiles. **[4]**

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

a) Write short note on recent development in extremophiles.

b) Write short note on source and properties of piezophiles.

c) Mention the steps for enrichment and isolation of thermophiles.

Total No. of Questions : 5]

SEAT No. :

PC4200

[Total No. of Pages : 2

[6340]-1005

M.Sc. - I

MICROBIOLOGY

MB-512-MJ : Microbial Communication Membrane Transport and Signal Transduction Approaches for Biologist

(2023 Credit Pattern) (Semester - I)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any 3 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 primary active transport?

b) What are liposomes?

c) What is signal transduction?

d) Give any two features of Dictyostelium discoideum.

e) Give two examples of ligand gated ion channels.

f) Give two features of myxobacteria.

Q2) Attempt the following :

a) Explain in detail mechanism of quorum sensing in gram positive bacteria. **[6]**

b) Explain the life cycle of myxobacteria. **[4]**

Q3) Attempt the following :

a) Explain in detail signals involved in biofilm formation and their dispersal. **[6]**

b) Write a note on applications of biofilm in pathogenic environment. **[4]**

P.T.O.

Q4) Attempt the following :

a) Explain in detail the molecular mechanism of quorum sensing in slime molds. **[6]**

b) Write a note on facilitated transport mechanism. **[4]**

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

a) Write a note on V type ATPASES.

b) Write a note on ionophores.

c) Write a note on organization of biofilm in detail.

Total No. of Questions : 5]

SEAT No. :

PC4201

[Total No. of Pages : 2

[6340]-1006
M.Sc. - I
MICROBIOLOGY
MB-510(C)-MJ : Advanced 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 3 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 calculators is allowed.***
7) ***Assume suitable data if necessary.***

Q1) Attempt the following : (Any five) **[5]**

a) Enlist any two non-parametric tests.
b) What is mean by multiple linear regression?
c) Mention importance of Null hypothesis.
d) What is Tukey's test?
e) What is mean by F test?
f) Give importance of rank test.

Q2) Attempt the following :

a) In a pharma company, monthly sales revenue in lakhs of randomly selected sample from two states of India are given below. Using mann whitney test find out whether two samples are drawn from identical population or not. **[6]**

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

b) Explain in detail spearman's rank correlation coefficient. **[4]**

P.T.O.

Q3) Attempt the following :

a) Four different drugs have been developed for the care of one disease; these drugs are tested on patients of three different hospitals. The number of cases recovered per 100 patients is given below. Analyze by ANOVA. **[6]**

	Drugs			
Hospitals	A	B	C	D
H_1	24	20	24	17
H_2	20	25	30	9
H_3	13	18	31	13

b) Explain in detail the comparative account of parametric and non parametric tests. **[4]**

Q4) Attempt the following :

a) In F2 generation Mendel obtained 621 tall and 187 dwarf plant, suggest whether this ratio are in accordance with the Mendel monohybrid ratio or they deviate from this ratio by chi-square. **[6]**

b) Describe post hoc analysis with suitable examples. **[4]**

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

a) Following are the ranks obtained by 10 students in 2 subject in English and Marathi. With the help of rank correlation coefficient find out to what extent knowledge of two students in two subjects are related.

Marathi	1	2	3	4	5	6	7	8	9	10
English	2	4	1	5	3	9	7	10	6	8

b) Two random samples are drawn from normal population as follows :

Number	1	2	3	4	5	6	7	8
Sample 1	9	9	11	11	13	15	12	14
Sample 2	8	10	14	12	10	09	10	

Whether the two population have same variance or not by using F test (5% level of significance)

c) Attack rate among the vaccinated and non-vaccinated against a disease are given below. Prove the protective value of vaccine by chi-square test.

	Attached	Non-attached
Vaccinated	20	90
Non vaccinated	46	78

Total No. of Questions : 5]

SEAT No. :

PC4202

[Total No. of Pages : 2

[6340]-1007

M.Sc. (Part - I)

MICROBIOLOGY

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

(2023 Credit Pattern) (Semester - I)

Time : 2 Hours] *[Max. Marks : 35*

Instructions to the candidates:

1) ***Question 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) ***Assum suitable data, if necessary.***

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

a) Using listing method, describe the following set

The set of all integers less than 50.

b) In epidemiology, when study proceeds backward from effect to cause, it is called _____.

c) Find $\frac{dy}{dx}$ for the given function $y(fx) = 6x^5 + 3x^4 + 3x^2 + 5$.

d) The principal objective of the sampling is to get maximum information about _____

e) Find domain and range of the following function $F(x) = x^2 + 2$.

f) Enlist various designs of experiments in Agriculture.

Q2) Attempt the following :

a) Describe in detail full factorial design. **[6]**

b) Bacillus cerevs divides after every 45 minutes. You inoculated 100 bacterial cells, how many bacteria will be there after 6 hours. **[4]**

P.T.O.

Q3) Answer the following :

a) Enlist various sampling methods. Describe in detail any one. Add a note on sampling error. **[6]**

b) Describe in detail various random sampling methods. **[4]**

Q4) Attempt the following :

a) You determine that coconut cream pie has 3 million staph aureus cells in it. You estimated that food preparer did not wash his hands and probably inoculated cream with 500 staph aureus. He also forgot to refrigerate it. If the pie was made 6hrs. ago. How many generations have occurred. **[6]**

b) Describe briefly survey design. **[4]**

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

a) If a bacterial culture having 1×10^{10} CFU/ml is heated for 27 mins. What will be the find count of bacteria after 27 mins. Also find 1D value.

b) Discuss in detail randomized control trials.

c) Enlist epidemiological study designs. Describe in detail retrospective study.

Total No. of Questions : 5]

SEAT No. : ____

PC4203

[Total No. of Pages : 2

[6340]-1008
M.Sc. - I
MICROBIOLOGY
MB-541-RM: Research Methodology
(Credit 2023 Pattern) (Semester - I)

Time : 2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 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) What is data Processing?

b) Define sampling.

c) Define Citation.

d) Compare mono-disciplinary and trans-disciplinary research.

e) Explain the term copyright.

f) What are the ethical issues of report writing?

Q2) Attempt the following.

a) Describe Scientific Presentation skills and its significance. **[6]**

b) Describe in detail various types of research. **[4]**

Q3) Attempt the following.

a) What is a Copyright? Describe plagarism in detail. **[6]**

b) Explain the process of writing the scientific report. **[4]**

P.T.O.

Q4) Attempt the following.

a) "Descriptive research design answers who, what, why and how questions". Discuss. **[6]**

b) Which rules are required to be followed for making any scientific Poster? **[4]**

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

a) Time frame and work plan of a project. Proposal.

b) Importance of literature review in research.

c) Presentation skills.

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Total No. of Questions : 7]

SEAT No. : [ ]

PC4204

[Total No. of Pages : 2

[6340]-2001

M.Sc. - I

MICROBIOLOGY

MB 551 MJ : Molecular Biology - I

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

Time : 3 Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Question 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) ***Scientific calculator is allowed.***
6) ***Assume suitable data if necessary.***

Q1) Attempt any five of the following. **[10]**

a) Enlist enzymes involved in DNA replication and give the reaction catalysed by any two.

b) Draw the structure of prokaryotic and Eukaryotic promoter.

c) Waht is Ribosome binding site in prokaryotes known as? Give its role in initiation of translation.

d) Enlist the proteins involved in spliceosome mechanism and name the RNA they process.

e) Give the use of Alkaline phoshatase and terminal transferase in RdT.

f) Draw a neat labelled diagram of colony hybridization.

Q2) Atempt the following.

a) Enlist different types of DNA repair and explain any one. **[7]**

b) Describe the role of attenuators in operon during transcription. **[5]**

Q3) Attempt the following.

a) Write a short note on CRISPR - cas system. **[7]**

b) Describe Chip assay. **[5]**

P.T.O.

Q4) Attempt the following.

a) Explain the principle and working of Blue script vectors. **[7]**

b) State the two approaches adopted for human genome project and explain any one. **[5]**

Q5) Attempt the following.

a) Enlist four polygenic diseases and explain the technique used for their detection. **[7]**

b) Write a short note on use of mi RNA in cancer diagnostics. **[5]**

Q6) Attempt the following.

a) What are cloning and expression vectors, explain with one example each. **[7]**

b) Given below are the fragments generated after RE with EcoRI, BamHI, PstI and all three together of pBBR607 plasmid. Using this data construct a restriction map for this plasmid. **[5]**

E.coRI & PstI $\rightarrow$ 2.14kb, 0.46kb.

E.coRI & BamHI $\rightarrow$ 2.4 kb, 0.2kb

E.coRI + PstI + BamHI $\rightarrow$ 1.9kb, 0.5kb 0.2kb

Q7) Write short notes (any 2).

a) Far western assay and its applications. **[6]**

b) Yeast 2 Hybrid assay and its applications. **[6]**

c) SiRNA and miRNA **[6]**

Total No. of Questions : 7]

SEAT No. : ____

PC4205

[Total No. of Pages : 2

[6340]-2002

M.Sc. - I

MICROBIOLOGY

MB-552-MJ : Enzymology, Bioenergetics and Metobolism

(2023 Credit Pattern) (Semester - II)

Time : 3 Hours] ***[Max. Marks : 70***

Instructions to the candidates:

1) ***Question No. 1 is compulsory.***
2) ***Solve any five questions from Q.2 to Q.7.***
3) ***Questions 2 to 7 carry equal marks.***
4) ***Figures to the right side indicate full marks.***
5) ***Draw neat labelled diagrams wherever necessary.***
6) ***Use of logarithmic tables and scientific calculator is allowed.***
7) ***Assume suitable data necessary.***

Q1) Solve any five of the following : **[10]**

a) Write down equation of Lineweaver - Burk plot.

b) Enlist four high energy compounds.

c) Define Vmax.

d) Define endocrine glands.

e) Name two hormones produced by posterior pitutory gland.

f) Write sources of vitamin B_{12}.

Q2) Attempt the followings :

a) Describe steps involved in king Altman approach to derive velocity equation for two substrate enzyme catalysed reactions. **[7]**

b) In single substrate enzyme catalysed reaction show that km is the substrate concentration. When velocity is equal to Vm/2. **[5]**

P.T.O.

Q3) Attempt the followings :

a) What are coupled reactions? Discuss their significance. **[7]**

b) Calculate ΔG^{o} for pyruvate reduction by lactate dehydrogenase using following data. **[5]**

Given :

i) Pyruvate + $2H^{+}$ + $2e^{-} \rightarrow$ Lactate $E° = -0.19V$

ii) NAD^{+} + $2H^{+}$ + $2e^{-} \rightarrow$ NADH $E° = -0.32V$

Q4) Attempt the followings :

a) Discuss in detail reactions carried out by PDC (Pyruvate dehydrogenase complex). **[7]**

b) Discuss in detail β-oxidation of saturated fatty acids. **[5]**

Q5) Attempt the followings :

a) Enlist hormones released by adrenal gland. Add note on role of adrenal gland hormones. **[7]**

b) Explain role of vitamin K in metabolism. **[5]**

Q6) Attempt the followings :

a) Draw glyoxylate cycle and explain role of glyoxylate cycle in metabolism. **[7]**

b) Outline the biosynthesis of glufamate family of amino acids. **[5]**

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

a) Alkinson's energy charge and its role in regulation of metabolism.

b) Regulation of glycolysis.

c) Eicosanoids as signaling molecules.

Total No. of Questions : 5]

SEAT No. :

PC4206

[Total No. of Pages : 2

[6340]-2003

M.Sc. - I

MICROBIOLOGY

MB 553MJ : 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 question 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 calculator are allowed.***
7) ***Assume suitable data if necessary.***

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

a) Define partition Coefficient.

b) State the principle of ultra-filtration.

c) Enlist factor affecting column efficiency.

d) Explain hypochromic shift.

e) Give any two applications of Immuns electrophoresis.

f) Types of Ionization techniques.

Q2) Attempt the following:

a) Describe the principle and application of Affinity chromatography with suitable diagram. **[6]**

b) Justify "Gas chromatography" seperation are generatly characterised as having higher efficiency than HPLC seperations. **[4]**

P.T.O.

Q3) Attempt the following:

a) State the principle and application of UV/visible spectroscopy. **[6]**

b) Enlist and explain any two applications of FTIR. **[4]**

Q4) Attempt the following:

a) Describe Van Deemter equation and explain how "A" term of Van Deemter equation contributes to band Broadening. **[6]**

b) Gas chromatography was used to seperate two bioactive compounds, quercetin and ephedreine. A 40.0 cm packed column with OV-1 stationary phase yielded the following results. **[4]**

	Retention time	Base width
Air (unretained)	1.9 min	
Quercetin	10. min	0.76 min
Ephedrin	10.9 min	0.82 min

Calculate the relative retention (selectivity) factor for the two compounds.

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

a) Significance of capillary Electrophoresis

b) FRET

c) Flow cytometry

Total No. of Questions : 5]

SEAT No. : ____

PC4207

[Total No. of Pages : 2

[6340]-2004

M.Sc. - I

MICROBIOLOGY

MB - 560 - MJ : Molecular Biology Tools and Applications

(Credit 2023 Pattern) (Semester - II)

Time :2 Hours] ***[Max. Marks : 35***

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
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) Solve any five of the following. **[5]**

a) DNase foot printing is used to determine interaction between which two molecules?

b) What is supershift assay used for?

c) What does in situ mean?

d) Give one commercial application of aminoacids.

e) Name the microbial source for gum production.

f) What are monoclonal antibodies?

Q2) Attement the following.

a) Describe oligo arrays and give its applications. **[6]**

b) Describe DMS foot printing. **[4]**

Q3) Attempt the following.

a) Explain commercial production of amino acids using RDT. **[6]**

b) Explain use of RDT in gum production. **[4]**

P.T.O.

Q4) Attempt the following.

a) Explain use of RDT in production of human monoclonal antibodies. **[6]**

b) Explain filter binding assay and give its applications. **[4]**

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

a) Short note on phage dispaly assay.

b) Unconventional microbial systems.

c) Short note on microarray technology.

Total No. of Questions : 5]

SEAT No. : ____

PC4208

[Total No. of Pages : 2

[6340]-2005

M.Sc. - 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) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***
3) ***Question No. 2 to 5 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Show 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. **[5]**

a) Define nitrogen fixation and give examples of microorganisms fixing nitrogen.

b) What is cyclic photophosphorylation? Give the examples of bacteria in cyclic photophosphorylation.

c) Explain what are methanogens with examples.

d) Explain what are sulphur oxidiser bacteria with examples.

e) Explain what is photosynthesis with reaction involved.

f) Explain what are an oxygenic photosynthetic bacteria with examples.

Q2) Attempt the following.

a) Explain the non-cyclic photophosphorylation with schematic representation. **[6]**

b) Write short note on nitrogenase enzyme. **[4]**

Q3) Attempt the following.

a) Explain the amino acid degradation with schematic representation. **[6]**

b) Write short note on photolithotrophs. **[4]**

P.T.O.

Q4) Attempt the following.

a) Explain the ammonia assimiliation in detail. **[6]**

b) Explain the photosystem I cycle in detail. **[4]**

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

a) Write short note on respiration in chemolithotrophs.

b) Explain the energy generation in respiration.

c) Write short note on mechanism of methanogens.

Total No. of Questions : 5]

SEAT No. : ____

PC4209

[Total No. of Pages : 2

[6340]-2006

M.Sc. - I

MICROBIOLOGY

MB - 562 MJ : Molecular Biophysics

(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 Q.2 to Q.5.***
3) ***Question No. 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) Define the term 'Shielding' in NMR spectroscopy.

b) Define the 'Voxel' as used in confocal microscopy.

c) Enlist the applications of radioisotopes in medicine.

d) Define half life of radioactive isotope.

e) Enlist the applications of x-ray crystallography in scientific research.

f) Define Bravais lattices.

Q2) Attempt the following.

a) Explain autoradiography technique with respect to principle, procedure and application. **[6]**

b) Compare Direct lattice and Reciprocal lattice. **[4]**

Q3) Attempt the following.

a) Explain the basic principle and instrumentation of NMR spectroscopy with a suitable diagram. **[6]**

b) Write a short note on confocal microscopy. **[4]**

P.T.O.

Q4) Attempt the following.

a) Justify the importance of electron density map obtained in X-ray crystallography. **[6]**

b) i) Calculate the decay constant, K, of ^{32}P. The half life of ^{32}P is 14 days.

ii) Calculate the half life of ^{131}I. The decay constant, K, for ^{131}I is 0.0866/day.

[4]

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

a) Miller indices

b) Detectors used in confocal microscope

c) Spin - Spin coupling

✪ ✪ ✪

Total No. of Questions : 5]

SEAT No. :

PC4210

[Total No. of Pages : 2

[6340]-2007

M.Sc. - I

MICROBIOLOGY

MB 563 MJ : Bioinformatics

(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 question 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 Refseq database?

b) Name any two protein structure databases.

c) Define molecular phylogeny.

d) What is the full form of VPGMA?

e) What is the EXPASY database used for?

f) Define bioinformatics.

Q2) Attempt the following:

a) Give the types of sequence alignments. Explain any one in detail. **[6]**

b) Write a short note BLAST and its applications. **[4]**

P.T.O.

Q3) Attempt the following:

a) Describe the phylogenetic analysis approaches in detail. **[6]**

b) Write a short note on DDBJ database. **[4]**

Q4) Attempt the following:

a) What are nucleotide sequence databases. Explain any one in detail. **[6]**

b) Explain how BLAST can be used for sequence similarity searches. **[4]**

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

a) Character based molecular phylogeny

b) NJ method of phylogenetic analysis

c) Nucleotide sequence alignment approaches

Total No. of Questions : 7]

SEAT No. :

PC-4211

[Total No. of Pages : 2

[6340] - 3001
M.Sc. II
MICROBIOLOGY
MB-601 MJ: 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 indicate full marks.***
5) ***Use of logarithmic table or scientific calculators is allowed.***
6) ***Assume suitable data if necessary.***
7) ***Question 2 to 7 carry equal marks.***

Q1) **Attempt any five of the following :** **[10]**

a) What are oncogenes?

b) What is the function of an adapter protein in cell signalling?

c) What are transgenic animals?

d) What is Hodkin's lymphoma? Enlist any two traits of it.

e) Define cytotoxicity assay.

f) What are immunological adjuvants?

Q2) **Attempt the following** :

a) Describe the role of cell adhesion molecules in T-cell activation. **[7]**

b) Write a note on regulation of immune response by an antigen. **[5]**

Q3) **Attempt the following :**

a) Explain TCR-CD3 activation pathway. **[7]**

b) 'The loss of contact inhibition in transformed cells contributes to the invasive properties of malignant tumours.' Justify the statement. **[5]**

Q4) **Attempt the following :**

a) What are cell analysis methods? Explain the tritiated thymidine (^{3}H-thymidine) uptake assay. **[7]**

b) Explain the use of inbred animals in Immunological research. **[5]**

Q5) **Attempt the following :**

a) Discuss the role of Treg in immune regulation. **[7]**

b) Explain functional assay for phagocytes. **[5]**

Q6) **Attempt the following :**

a) Write a note on experimental animals used in AIDS. **[7]**

b) What is Lymphoma? Explain it with its different types. **[5]**

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

a) Discuss the immune adjuvant and tumour vaccine therapy.

b) Explain ELISPOT assay.

c) What are TLRs? Explain their different types with their ligands.

Total No. of Questions : 7]

SEAT No. :

PC4212

[Total No. of Pages : 2

[6340]-3002

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) ***Question 1 is compulsory.***
2) ***Attempt any five questions from question 2 to question 7.***
3) ***Questions 2 to 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 trade-off mechanism? Give one example.

b) What is gene augmentation?

c) Define LINES.

d) Write two applications of conditional gene knockouts.

e) What are transposons? Give 2 examples.

f) Define Metabolomics.

Q2) Attempt the following.

a) How are many proteins formed from one gene? **[7]**

b) What are the advantages of polymerase chain reaction (PCR) in disease diagnosis. **[5]**

P.T.O.

Q3) Attempt the following.

a) Describe the GFP gene system in Monkey with the applications. **[7]**

b) Write a note on IS elements. **[5]**

Q4) Attempt the following.

a) Explain SNP with special reference to human diseases. **[7]**

b) What is the principle and advantages of pyrosequencing method. **[5]**

Q5) Attempt the following.

a) Explain in detail the real time PCR and its applications. **[7]**

b) Write a note on P elements in Drosophila. **[5]**

Q6) Attempt the following.

a) What are the steps involved in studying proteome using mass spectrometry. **[7]**

b) What is the role of transposable elements in human evolution? **[5]**

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

a) T_n5

b) NMR in metabolite study

c) Metabolism with examples

Total No. of Questions : 5]

SEAT No. :

PC4213

[Total No. of Pages : 2

[6340]-3003
S.Y.M.Sc.
MICROBIOLOGY
MB 603 MJ : 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. No. 2. to Q. No. 5.***
3) ***Q. No. 2 to Q. No.5 Carry equal marks.***
4) ***Draw neat labelled diagrams wherever necessary.***
5) ***Figures to 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) What is meant by microbial pathogenicity?

b) Enlist bacterial virulence factors.

c) Which genes are involved in virulence.

d) Which bacteria causes peptic ulcers?

e) Write two methods for diagnosis of tuberculosis.

f) What is Ghon Complex?

Q2) Attempt the following :

a) Explain the factors involved in host susceptibility. **[6]**

b) Explain any one epidemiological model for disease prediction. **[4]**

P.T.O.

Q3) Attempt the following :

a) Explain host-mediated pathogenesis in detail. **[6]**

b) Describe general steps for disposal of infectious material. **[4]**

Q4) Attempt the following :

a) Describe pathogenesis of Mycobacterium leprae. **[6]**

b) Give the general characters of Candida auris. **[4]**

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

a) Pathogenicity island.

b) Formation of Granuloma in tuberculosis.

c) Structure of Human Papilloma virus (HPV).

Total No. of Questions : 5]

SEAT No. :

PC-4214

[Total No. of Pages : 2

[6340] - 3004
M.Sc. (Part - II)
MICROBIOLOGY
MB-610 MJ: Cell Culture Techniques
(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) ***Question 2 to 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) **Attempt any five of the following :** **[5]**

a) What is organ culture?

b) What is the role of serum in animal cell culture medium?

c) Write two buffers used in cell culture media.

d) Name two animal cell lines.

e) What is monolayer culture?

f) Write two applications of cell culture techniques.

Q2) **Attempt the following** :

a) How does environmental conditions affect cell growth in cell culture. **[6]**

b) Explain methods to obtain continuous cell lines. **[4]**

P.T.O.

Q3) **Attempt the following :**

a) Differentiate in normal cell lines and transformed cell lines **[6]**

b) What are the applications of immunomodulators in cell culture techniques. **[4]**

Q4) **Attempt the following :**

a) Explain different ingradients used in preparation of cell culture media.**[6]**

b) Explain MTT assay. **[4]**

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

a) Cell layer techniques and their applications.

b) Finite and continuous cell lines.

c) Cryopreservation of cell lines.

Total No. of Questions : 5]

SEAT No. : ____

PC- 4215

[Total No. of Pages : 2

[6340]-3005

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 questions from Q.No.2 to Q.No.5.***
3) ***Q.2 to Q.5 carry equal marks.***
4) ***Draw neat labelled diagrams wherever necessary.***
5) ***Figures to right indicate full marks.***

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

a) Define Biostimulation.

b) What is meant by Composting?

c) Enlist components of lignocellulose.

d) Give 2 examples of microbes used for bioethanol production.

e) Give any 2 environmental benefits of bio degradation.

f) Enlist factors affecting degradation of pollutants.

Q2) Attempt following.

a) Enlist enzymes involved in biodegradation. Explain role of any three enzymes. **[6]**

b) How Superbug was created? **[4]**

Q3) Attempt the following.

a) How genetically engineered microbes used for biodegradation of Pesticide? Explain with suitable example. **[6]**

b) Explain the role of cell surface expressed enzymes in bioremediation. **[4]**

P.T.O.

Q4) Attempt the following.

a) How yeast transcription is altered to improve alcohol yield? **[6]**

b) Add a note on sources of biomass with their classification. **[4]**

Q5) Add a short notes on any two of the following. **[10]**

a) Methanogenesis.

b) In-situ bioremediation

c) Improvization of fructose production.

Total No. of Questions : 5]

SEAT No. : ____

PC-4216

[Total No. of Pages : 2

[6340] - 3006
M.Sc. (Part - II)
MICROBIOLOGY
MB-612 MJ: Microbial Virus Technology
(2020 Pattern) (NEP) (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) ***Question 2 to 5 carry equal marks.***
4) ***Draw neat labelled diagrams wherever necessary.***
5) ***Figures to the rightside indicate full marks.***

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

a) Define : Lytic cycle.

b) Give two examples of algal viruses.

c) Enlist two sources for bacteriophages isolation.

d) What is ICTV.

e) What is MOI

f) Enlist the two methods used for bacteriophages isolation.

Q2) **Attempt the following** :

a) Discuss the morphology & system of bacteriophage classification. **[6]**

b) Explain the use of phage in pathogen control in poultry. **[4]**

P.T.O.

Q3) **Attempt the following :**

a) Comment on occurance and taxonomy of mycoviruses. **[6]**

b) Write in detail about Host-range of bacteriophages. **[4]**

Q4) **Attempt the following :**

a) Explain Morphology and classification of and isolation method for bacteriophages from sewage sample. **[6]**

b) Explain growth kinetics of bacteriophages **[4]**

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

a) Applications of mycoviruses.

b) Bacteriophages in aquatic system.

c) Plaque morphology.

Total No. of Questions : 5]

SEAT No. : ____

PC- 4217

[Total No. of Pages : 2

[6340]-3007
M.Sc. - 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. 1 is compulsory.***
2) ***Solve any three questions from Q.No.2 to Q.No.5.***
3) ***Draw neat labelled diagrams wherever necessary.***
4) ***Figures to right indicate 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) What do you mean by laboratory acquired infection.

b) What is mean by Post-transplantation infection.

c) Write a two names of biological weapons.

d) Enlist zoonotic diseases.

e) Write two methods for diagnosis of Taenia Saginata.

f) What is mean by Trematodes?

Q2) **Attempt the following :**

a) Explain etiology and pathogenesis of chlamydiae spp. **[6]**

b) Describe ethical implications of biotechnological techniques. **[4]**

Q3) **Attempt the following :**

a) Explain Host-Parasite relationships in detail. **[6]**

b) Comments on - Threads of biological weapons. **[4]**

P.T.O.

Q4) **Attempt the following :**

a) Explain etiology and diagnostic methods for Listeria monocytogens. **[6]**

b) Describe pathogenesis of Trypanosoma brucei. **[4]**

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

a) Antimicrobial susceptibility testing.

b) Microscopic examinations of stool sample for parasites.

c) Clinical diagnosis of Wuchereria bancrofti