

Total No. of Questions : 7]

SEAT No. :

PE-5363

[Total No. of Pages : 2

[6514]-101

First Year M.Sc.

MICROBIOLOGY

MBCT-111 : Microbial Systematics

(2019 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.No.2 to Q.No.7.
- 3) Questions 2 to 7 carry equal marks.
- 4) Draw neat and labelled diagram wherever necessary.
- 5) Figures to the right indicate full marks.
- 6) Use of logarithmic tables and scientific calculator is allowed.
- 7) Assume suitable data if necessary.

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

- a) What is PCR? Enlist Enzymes used in PCR.
- b) Name any two methods to access total number of bacteria in environment.
- c) Define 'Unculturable bacteria'.
- d) Define phenetic approach in bacterial classification.
- e) What is metagenomics?
- f) What is RISA?

Q2) Attempt the following:

- a) What is phylogenetic tree? Explain with suitable example. [7]
- b) Explain species concept in prokaryotes. [5]

Q3) Attempt the following:

- a) What is the need of extracting total DNA from a habitat? Explain any one method. [7]
- b) What is coevolution? Explain concept of evolutionary *r* and *k* selection. [5]

P.T.O.

Q4) Attempt the following:

- a) Explain 16S & RNA sequencing technique. Write its significance. [7]
- b) Given data is obtained from soil sample. The total number of calories were counted to be 171×10^6 . Find out the Simpson Index. [5]

S.NO	Type	No.of Calories
1	Umbonate	37
2	Flat raised	76
3	Convex	58

Q5) Attempt the following:

- a) Describe the characters of Neo-Lamarckism and Neo-Darwinism. [7]
- b) Describe the indices of diversity used in bacterial taxonomy. [5]

Q6) Attempt the following:

- a) Explain 'Phylogenetic approach' in bacterial classification. [7]
- b) Write note on '3-domain' classification system. [5]

Q7) Write short note on (any two): [12]

- a) Sociality and multi cellularity in microorganisms
- b) Origin of life
- c) FISH



Total No. of Questions :8]

SEAT No. :

PE-5363

[Total No. of Pages : 3

[6514]-102

First Year M.Sc.

MICROBIOLOGY

MBCT-112 : Quantitative Biology
(2019 Pattern) (Semester - I)

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 Scientific calculators, logarithmic and statistical tables is allowed.

Q1) Attempt the five of the following:

[10]

- a) Define variance.
- b) What is histogram?
- c) Give importance of sampling in biostatistics.
- d) What is type-I error?
- e) Find the mode from following data:

S.No.	1	2	3	4	5	6	7	8	9	10
Weight (kg)	10	11	10	12	12	11	9	8	11	11

- f) Represent the following data by means of frequency polygon.

Plant height (cms)	No. of plants
0-6	3
6-12	12
12-18	42
18-24	51
24-30	56
30-36	48
36-42	35
42-48	15
48-54	6

P.T.O.

Q2) Attempt the following:

- a) The following data represents mean days require for flowering in two varieties of bean, G-65 and PS-16. Determine whether the two varieties are significantly different or not. [7]

	G-65	PS-16
n	30	35
mean	32	38
variance	9.62	14.23

- b) Write a note on: P value and significance level. [5]

Q3) Attempt the following:

- a) What is the probability that a bulb will last between 780 and 850 hours? [7]
- b) Explain parametric and non-parametric tests. [5]

Q4) Attempt the following:

- a) In a cross between black male and grey female *Drosophila*, the offspring obtained were 25 black and 35 grey. By Chi-square test, find out whether it matches with expected ratio 1:1. [7]
- b) If a single die is rolled, what is the probability of getting 1 or 2? [5]

Q5) Attempt the following:

- a) From the data given below, find out whether the means of the three samples differ significantly or not using ANOVA test. [7]

Sample 1	Sample 2	Sample 3
20	19	13
10	13	12
17	17	10
17	12	15
16	9	5

- b) From a pack of 52 cards, one card is drawn at random. What is the probability that it is either a king or a queen? [5]

Q6) Attempt the following:

- a) In F_2 generation, Mendel obtained 621 tall plants and 187 dwarf plants out of the total of 808. Test whether these two types of plants are in accordance with the Mendelian monohybrid ratio of 3:1. [7]
- b) A bag contains five white and three black balls. Two balls are drawn at random one after other without replacement. Find the probability of both black. [5]

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

- a) Following table gives the number of pods per plant. Draw your conclusion on the differences in the mean number of pods per plant of the varieties of blackgram.

Plots	A	B	C	D
1	50	50	55	50
2	56	53	52	45
3	55	45	49	50
4	57	50	52	41
5	52	50	50	45

- b) Explain the terms: Experiments, independent and dependent events and mutually exclusive and non mutually exclusive events.
- c) A book contains 100 misprints distributed randomly on its 100 pages. What is the probability that the page observed randomly contain at least 2 misprints? Assuming Poisson distribution.



Total No. of Questions : 7]

SEAT No. :

PE-5364

[Total No. of Pages : 2

[6514]-103

First Year M.Sc.

MICROBIOLOGY

MBCT-113 : Biochemistry and Metabolism

(2019 Pattern) (Semester - I)

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) Draw neat labelled diagram wherever.
- 5) Figures to right indicate full marks.
- 6) Use of log-table or non-programmable electronic calculator is allowed.

Q1) Answer the following.

[10]

- a) Name two essential amino acids.
- b) What is the principle of Affinity Chromatography?
- c) Define cell determination and cell differentiation.
- d) Define endocytosis with example.
- e) What is the partial double bond nature of peptide bond?

Q2) Attempt the following.

[12]

- a) Derive Henderson-Hasselbalch equation and give its significance. [7]
- b) Define pI value. Calculate pI of Ala, His, Glu and Lys using the data of pKa value (α -COOH = 2.34) (α -NH₃- 9.6) (γ -COOH = 4.25) (ϵ -NH₃= 11) (Imidazole group = 6) [5]

Q3) Attempt the following.

[12]

- a) Explain principle and application of Real-Time PCR. [7]
- b) Determine composition of a protein from the following information. [5]
 - i) Molecular mass by gel filtration = 200 kD.
 - ii) Molecular mass by SDS-PAGE = 100 kD.
 - iii) Molecular mass by SDS-PAGE and 2 mercapto ethanol = 40 kD and 60 kD.

P.T.O.

- Q4)** Attempt the following. [12]
- a) Comment on different model systems used to study developmental biology. [7]
 - b) Explain Gastrulation process in *Xenopus*. [5]
- Q5)** Attempt the following. [12]
- a) Describe structure and functions of Golgi body. [7]
 - b) Explain import of protein into the nucleus. [5]
- Q6)** Attempt the following. [12]
- a) Explain Sanger sequencing method of DNA sequencing. [7]
 - b) Describe tertiary structure of protein with example. [5]
- Q7)** Attempt any two of the following. [12]
- a) Write short note on Hox code. [6]
 - b) Explain cyclin dependent regulation of cell cycle. [6]
 - c) Explain transport of hydrolases to lysosomes. [6]



Total No. of Questions : 5]

SEAT No. :

PE-5365

[Total No. of Pages : 2

[6514]-104

First Year M.Sc.

MICROBIOLOGY

**MBET-115 : Fungal Systematics and Extremophiles
(2019 Pattern) (Semester - I)**

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) *Q No. 2 to Q.No. 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) Define Extremophiles.
- b) Enlist two important commercial aspects of Halophiles.
- c) What are antifreeze proteins?
- d) Write two characteristics of Psychrophiles.
- e) Define pH range for alkalophiles.
- f) Write two characteristics of Thermophiles.

Q2) Attempt the following.

- a) Write a note on enrichment and isolation of Methanogens.

[6]

- b) Justify : Ascomycetes can be exploited in various fields.

[4]

Q3) Attempt the following.

- a) Write a note on applications of Acidophiles.

[6]

- b) Explain general characteristics observed in Basidiomycota.

[4]

P.T.O.

Q4) Attempt the following.

- a) If a group of scientist want to study the bacteria present in hot water spring. How should they carry out enrichment of sample and isolation of bacteria. **[6]**
- b) Justify : Diversified nature of Extremophiles. **[4]**

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

- a) Explain the importance of Morphological characters in fungal differentiation and classification.
- b) Explain properties and applications of methanogens.
- c) Describe the mechanism for enrichment and isolation of Halophiles.



Total No. of Questions : 5]

SEAT No. :

PE-5366

[Total No. of Pages : 2

[6514]-105

First Year M.Sc.

MICROBIOLOGY

**MBET-116 : Experimental Design and Quantitative
Approaches for Biologist
(2019 Pattern) (Semester - I)**

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) *Q No. 2 to Q.No. 5 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of scientific calculator is allowed.*
- 6) *Assume suitable data, if necessary.*

Q1) Attempt any five of the following.

[5]

- a) When sample is evenly spaced after random start point, the sampling technique is known as _____.
- b) What is the basic approach for cohort study?
- c) In case control study _____ is considered as unit of study.
- d) What is stochastic model?
- e) What is linear model?
- f) Enlist design of experiments in Agriculture.

Q2) Attempt the following.

- a) What are the cyclic processes of model construction.
- b) Write in detail concept of mathematical modelling.

[6]

[4]

P.T.O.

Q3) Attempt the following.

- a) Enlist various epidemiological methods. Comment on experimental / interventional studies. **[6]**
- b) Describe design of experiment with one example. **[4]**

Q4) Attempt the following.

- a) Enlist various clinical trials. Discuss in detail controlled and uncontrolled trials. **[6]**
- b) Describe in detail survey designs. **[4]**

Q5) Answer the following. **[10]**

- a) Distinguish between deterministic model and stochastic model.
- b) What are data analysis methods? Describe any two in brief.
- c) Discuss non-probability sampling methods.



Total No. of Questions : 5]

SEAT No. :

PE-5367

[Total No. of Pages : 2

[6514]-106

First Year M.Sc.

MICROBIOLOGY

**MBET-117 : Microbial Communication, Membrane
Transport and Signal Transduction
(2019 Pattern) (Semester - I)**

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) *Q No. 2 to Q.No. 5 carry equal marks.*
- 4) *Draw neat labelled diagram whenever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Attempt any five of the following.

[5]

- a) What is the role of a sensor Kinase in bacterial signal transduction?
- b) What is model membrane?
- c) What is the main function of ligand-gated ion channels?
- d) Which part of a phospholipid is hydrophobic?
- e) How do biofilms impact on water treatment systems?
- f) What is the first developmental stage in the life cycle of *Dictyostelium discoideum*?

Q2) Attempt the following.

- a) Discuss the structure and organization of biofilms. What signals are involved in their formation maturation and dispersal. **[6]**
- b) Explain the role of autoinducers in quorum sensing in Gram-Negative bacteria explain with example. **[4]**

P.T.O.

Q3) Attempt the following.

- a) Describe the role of P-type, V-type and F-type ATPase in active transport across membrane. How do they differ in their mechanisms and functions? **[6]**
- b) What are the environmental and medical implications of biofilm formation? **[4]**

Q4) Attempt the following.

- a) Discuss the structure and organization of biofilm and give application of biofilms in both pathogenic and non-pathogenic environments. **[6]**
- b) Explain how chemotaxis in bacteria is regulated by signal transduction pathways. **[4]**

Q5) Attempt any two. **[10]**

- a) Compare the quorum sensing molecules used by Gram-positive and Gram-Negative.
- b) Describe the role of the bacterial two-component signalling system in environmental sensing.
- c) Explain the different types of solute transport across membrane, including passive diffusion.



Total No. of Questions : 7]

SEAT No. :

PE-5368

[Total No. of Pages : 2

[6514]-201

First Year M.Sc.

MICROBIOLOGY

**MBCT-121 : Instrumentation and Molecular Biophysics
(2019 Pattern) (Semester - II)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question No.1 is compulsory.*
- 2) *Solve any five question from Q.No.2 to Q.No.7.*
- 3) *Question 2 to 7 carry equal marks.*
- 4) *Draw neat labelled diagram whenever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of lagorithmic tables and scientific calculators is allowed.*
- 7) *Assume suitable data whenever necessary.*

Q1) Attempt the following (Any Five):

[10]

- a) Define Selectivity
- b) Write a short note on Atomic Orbital.
- c) Comment on hypochromic shift.
- d) Explain chemical shift.
- e) Describe Reciprocal Lattice.
- f) Define Radioactivity.

Q2) Attempt the following :

- a) Describe the principle and application of FPLC. **[7]**
- b) A UV radiation was subjected on a solution of 0.5 m concentration of an absorbing substance. The radiation intensity was reduced to one fourth of initial value after passing through the 10 cm length of solution. Calculate molar extinction coefficient of the substance. **[5]**

P.T.O.

Q3) Attempt the following:

- a) Describe the principle and working of IR spectroscopy and add a note on application. [7]
- b) Write a note on FACS. [5]

Q4) Attempt the following:

- a) Describe various methods of crystallization of protein. [7]
- b) Explain the relaxation parameters in NMR. [5]

Q5) Attempt the following:

- a) Explain the effects of Radiation on Biological System. [7]
- b) State the principle and working of Confocal Microscopy. [5]

Q6) Attempt the following:

- a) Enlist application of GC-MS and Explain its working using a suitable diagram. [7]
- b) Describe Lambert and Beers law and state the significance of Molar Absorptivities. [5]

Q7) Attempt the following: [12]

- a) Write a note on PFGE.
- b) Explain the mechanism of Ion Fragmentation.
- c) Write a short note on Immuno Electrophoresis.



Total No. of Questions : 7]

SEAT No. :

PE-5369

[Total No. of Pages : 2

[6514]-202

First Year M.Sc.

MICROBIOLOGY

MBCT-122 : Molecular Biology
(2019 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.No. 2 to Q.No.7.
- 3) Questions 2 to 7 carry equal marks.
- 4) Draw neat labelled diagrams wherever necessary.
- 5) Figures to the right side indicate full marks.

Q1) Answer any five of the following: [10]

- a) What is Spliceosome and what is it used for?
- b) List four properties of a probe.
- c) What is genomic DNA library made from and what is it used for?
- d) What is gene annotation and name two software used for annotation?
- e) What are miRNAs and what are they used for in diagnosis?
- f) Give reactions catalysed by polynucleotide kinase.
- g) What are expressed sequence tags and what are they used for?

Q2) Answer the following;

- a) Write in brief about tRNA processing. [7]
- b) Write a short note on micro RNA. [5]

Q3) Answer the following;

- a) Explain construction of cDNA libraries. [7]
- b) Write a short note on Blue script vectors and their applications in RDT. [5]

Q4) Answer the following;

- a) Briefly explain the outcome of Drosophila genome project and comparative genomics of it with Human genome. [7]
- b) Enlist applications of genome projects. [5]

P.T.O.

Q5) Answer the following;

- a) Explain immunoassay for protein conformation in specific disorders. [7]
- b) Write short note on detection of RNA signatures of Antibiotic resistance in Bacteria. [5]

Q6) Answer the following;

- a) Briefly explain linkers, adaptors, homopolymeric tailing. [7]
- b) Write a short note on Restriction endonucleases and methylases. [5]

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

- a) Short note on far-western and south-western techniques.
- b) Short note on bacteriophages and Ti plasmids as vectors.
- c) Short note on activity gel assay.



Total No. of Questions : 7]

SEAT No. :

PE-5370

[Total No. of Pages : 2

[6514]-203

First Year M.Sc.

MICROBIOLOGY

MBCT-123 : Enzymology, Bioenergetics & Metabolism
(2019 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.No.2 to Q.No.7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Draw neat and labelled diagram wherever necessary.*
- 5) *Use of logarithmic tables and scientific calculator is allowed.*
- 6) *Figure to the right side indicate full marks.*

Q1) Attempt any five:

[5×2=10]

- a) Define second law of thermodynamics.
- b) What are Sugar epimers? Write an example of sugar epimer.
- c) Write down two example of unsaturated fatty acid.
- d) Enlist different methods used for purification of enzyme.
- e) What are monoterpenes?
- f) Define Gibb's free energy.

Q2) Attempt the following:

- a) Describe in detail, role of TCA cycle in generating biosynthetic intermediates. **[7]**
- b) What are allosteric enzymes and write their significance in regulation? **[5]**

Q3) Attempt the following:

- a) What are coupled reactions? Discuss the significance of high energy compound in such reaction. **[7]**
- b) Calculate the ΔG for the hydrolysis of ATP at pH7 and 25°C under standard state conditions. (Such as might exist in a living cell) in which the concentration of ATP, ADP and Pi are maintained at $10^{-5}M$, $10^{-4}M$ and $10^{-3}M$ respectively. (Given $\Delta G = -7700$ cal mole). **[5]**

P.T.O.

Q4) Attempt the following:

- a) Describe in detail glyoxylate cycle and discuss the relationship between glyoxylate and TCA cycle. [7]
- b) Write short note on Enthalpy. [5]

Q5) Attempt the following:

- a) What are secondary plot? Draw secondary plot for uncompetitive inhibition to find value of k_i . [7]
- b) Write in detail β oxidation of fatty acid. [5]

Q6) Attempt the following:

- a) Describe the Koshland, Nemethy and Filmer model of allosteric enzyme. [7]
- b) The adenylate pool in a culture of lymphosarcoma cells was found to consist of 10^{-3}M ATP, $3 \times 10^{-4}\text{M}$ ADP and 10^{-4}M AMP. Calculate the energy charge of the cell. [5]

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

- a) Structure and function of sphingolipid.
- b) Regulation of glycogen synthesis.
- c) Hill's plot.



Total No. of Questions : 5]

SEAT No. :

PE-5371

[Total No. of Pages : 2

[6514]-204

First Year M.Sc.

MICROBIOLOGY

MBET-125 : Bioinformatics and Bio-Nanotechnology

(2019 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question No.1 is compulsory.*
- 2) *Solve any three questions from Q.No.2 to Q.No.5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Figure to the right side indicate full marks.*
- 5) *Draw neat and labelled diagrams wherever necessary.*

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

- a) What is a pairwise sequence alignment?
- b) Enlist any two methods used for nanoparticle characterization.
- c) Name two sequence similarity search tools.
- d) What is zeta potential?
- e) List two nucleotide sequence databases.
- f) What do you understand by the term magnetosome?

Q2) Attempt the following:

- a) Differentiate between distance-based and character-based phylogenetic analysis methods. **[6]**
- b) Justify: Bioinformatics can be used for the prediction of gene promoters. **[4]**

Q3) Attempt the following:

- a) Explain biogenic synthesis of nanoparticles with an example. **[6]**
- b) Justify: Dynamic light scattering technique can be used for characterization of nanoparticles. **[4]**

P.T.O.

Q4) Attempt the following:

- a) Discuss the role of plants in the synthesis of nanoparticles. **[6]**
- b) Describe the role of the BLAST tool in bioinformatics. **[4]**

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

- a) Multiple sequence alignment.
- b) Transmission electron microscopy.
- c) Motif searches using bioinformatics tools.



Total No. of Questions : 5]

SEAT No. :

PE-5372

[Total No. of Pages : 2

[6514]-205

First Year M.Sc.

MICROBIOLOGY

MBET-126 : Molecular Biology Tools & Applications

(2019 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) What are Oligo arrays?
- b) Define Hybridoma technology.
- c) What are secondary metabolites?
- d) Enlist methods used to study protein DNA interaction.
- e) What are the three main types of biopolymers?
- f) Define FISH.

Q2) Answer the following:

- a) Explain DOT blot and SLOT blot in detail. [6]
- b) Explain polyketide antibiotics. [4]

Q3) Answer the following:

- a) Explain Electrophoretic mobility shift assay. [6]
- b) Describe in detail synthesis of valine aminoacid. [4]

Q4) Answer the following:

- a) Write a note on phage display system and give its applications. [6]
- b) Write an account on un-conventional microbial systems. [4]

P.T.O.

Q5) Attempt any two of the following:

[10]

- a) Explain DNase binding assay.
- b) Write applications of monoclonal antibodies.
- c) Write short note on sequence tagged sites.



Total No. of Questions : 5]

SEAT No. :

PE-5373

[Total No. of Pages : 2

[6514]-206

First Year M.Sc.

MICROBIOLOGY

MBET-127 : Nitrogen Metabolism, Respiration and
Photosynthesis

(2019 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) Give two examples of sulphur oxidising bacteria.
- b) What is anaerobic respiration?
- c) Give two examples of nitrate reducing bacteria.
- d) Give two examples of C₄ plants.
- e) Give two properties of nitrogenase enzyme.
- f) Define photorespiration.

Q2) Attempt the following:

- a) Explain in detail with diagram non-cyclic flow of electrons in photosynthesis. [6]
- b) Explain the organization of photosystem-I. [4]

Q3) Attempt the following:

- a) Explain in detail biosynthesis of pyrimidine bases. [6]
- b) Write a note on photolysis of water in photosynthesis. [4]

P.T.O.

Q4) Attempt the following:

- a) Explain in detail ammonia assimilation. [6]
- b) Write note on biochemistry of biological nitrogen fixation. [4]

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

- a) Write a note on C3 plants in photosynthesis.
- b) Explain the regulation of nitrogenase enzyme
- c) Explain in detail the z scheme in photosynthesis.



Total No. of Questions : 7]

SEAT No. :

PE-5374

[Total No. of Pages : 2

[6514]-301

S.Y. M.Sc.

MICROBIOLOGY

MBCT-231 : Immunology

(2019 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Attempt any five of the following:

[10]

- a) What is receptor dimerization?
- b) What is immunological tolerance?
- c) Write down any two roles of TLR1 and TLR2.
- d) Define Knockout mouse.
- e) What are phagocytic assays?
- f) Enlist the characteristics of GPCR.

Q2) Attempt the following:

- a) Explain the JAK/STAT pathway. **[7]**
- b) Discuss the immune therapy for cancer treatment. **[5]**

Q3) Attempt the following:

- a) Discuss the T-cell receptor in details. **[7]**
- b) Write a note on the regulation of immune response by antigen antibody complex. **[5]**

P.T.O.

Q4) Attempt the following:

- a) Explain the cytotoxic assay for cytokines. [7]
- b) Discuss the concept of immunosurveillance theory. [5]

Q5) Attempt the following:

- a) Explain the regulation of alternative pathway of complement activation system. [7]
- b) Write a note on immuno adjuvant and tumor vaccine therapy. [5]

Q6) Attempt the following:

- a) Discuss the use of animal models in auto immune disorders. [7]
- b) Write a note on lymphoma. [5]

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

- a) Discuss the role of adhesion molecules in immune activation.
- b) Explain the cytokine mediated cross regulation of T_H subsets.
- c) Write a note on the escape mechanisms of tumour from host defence mechanism.



Total No. of Questions : 7]

SEAT No. :

PE-5375

[Total No. of Pages : 2

[6514]-302

S.Y. M.Sc.

MICROBIOLOGY

MBCT-232 : Molecular Biology

(2019 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Attempt any five of the following:

[10]

- a) What is SNP? Give any one example in Prokaryotes.
- b) Define Longevity.
- c) Write any two applications of studying proteome.
- d) What is genetic trade off?
- e) Define epigenetics. Give one example.
- f) Give two examples of yeast transposons.

Q2) Attempt the following:

- a) What is gene therapy? Give its applications to cure various diseases.

[7]

- b) What are the ethical issues of genetically modified organisms?

[5]

Q3) Attempt the following:

- a) Explain the concept of metabolomics with special reference to global biochemical network.
- b) What are the steps involved in analysis of the protein structure.

[7]

[5]

P.T.O.

Q4) Attempt the following:

- a) Write the significance of alternative gene expression. [7]
- b) How does genomic variation affect gene aging? [5]

Q5) Attempt the following:

- a) What are non-replicative transposons? Explain with examples. [7]
- b) What are disadvantages of genetically modified organisms. [5]

Q6) Attempt the following:

- a) What are the methods to detect SNP in prokaryotes? [7]
- b) What are the characteristics of transposons in maize? [5]

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

- a) LINES
- b) TnA
- c) Ty element



Total No. of Questions : 7]

SEAT No. :

PE-5376

[Total No. of Pages : 2

[6514]-303
S.Y. M.Sc.
MICROBIOLOGY
MBCT-233 : Clinical Microbiology
(2019 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Attempt any five of the following.

[10]

- a) What is biofilm formation?
- b) Give two examples of bacterial endotoxin.
- c) What genes are involved in virulence?
- d) Which are the morphological forms of *Ascaris lumbricoides*.
- e) What are the different diagnostic methods for HIV detection?
- f) State the infection in which sulfur granules are involved?

Q2) Attempt the following.

- a) Describe in-vivo assay and in-vitro assay for diphtheria toxoid. **[7]**
- b) Explain any one epidemiological model for disease prediction. **[5]**

Q3) Attempt the following.

- a) Explain in-vivo assay and in-vitro assay for tetanus toxoid. **[7]**
- b) Describe general characters of *Helicobacter Pylori*. **[5]**

P.T.O.

Q4) Attempt the following.

- a) Discuss the pathogenesis mechanism of *Candida albicans*. [7]
- b) Describe clinical manifestation of infection with dermatophyte fungus *Trichophyton mentagrophytes*. [5]

Q5) Attempt the following.

- a) Explain the general characters and prophylaxis of *Hepatitis B*. [7]
- b) Describe pathophysiology of oncoviruses. [5]

Q6) Attempt the following.

- a) How the *Campylobacter Jejuni* can be cultured and diagnosed in the laboratory? [7]
- b) Explain pathogenesis of *Entamoeba histolytica*. [5]

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

- a) Specific and non specific humoral factors
- b) Diagnostic test for dermatophytic fungi
- c) Structure of H1N1



Total No. of Questions : 5]

SEAT No. :

PE-5377

[Total No. of Pages : 2

[6514]-304
S.Y. M.Sc.
MICROBIOLOGY
MBET-235 : Cell Culture Techniques
(2019 Pattern) (Semester - III)

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) *Q No. 2 to Q.No. 5 carry equal marks.*
- 4) *Draw neat labelled diagram 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) Write the role of serum in the animal cell culture medium.
- b) What are anchorage dependent cell cultures?
- c) What are immunomodulators?
- d) How does pH affect the growth of cells in animal cell culture.
- e) What are secondary cell cultures?
- f) List two media used in animal cell culture.

Q2) Attempt the following.

- a) Write the applications of primary lymphoid cell culture. **[6]**
- b) Write the use of trypsinisation process in cell culture technique. **[4]**

P.T.O.

Q3) Attempt the following.

- a) Explain the difference between monolayer culture and suspension culture. [6]
- b) Write the application of immunomodulators. [4]

Q4) Attempt the following.

- a) Explain characteristics of continuous cell lines and write its application. [6]
- b) What are established cell lines? [4]

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

- a) Suspension cell cultures
- b) Hybrid lymphoid cell lines
- c) Properties of transformed cells



Total No. of Questions : 5]

SEAT No. :

PE-5378

[Total No. of Pages : 2

[6514]-305

S.Y. M.Sc.

MICROBIOLOGY

**MBET-236 : Bioremediation and Biomass Utilization
(2019 Pattern) (Semester - III)**

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

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

- a) Define Biomass.
- b) Give any two examples of organisms used in production of bioethanol.
- c) Enlist plasmids used to construct superbug.
- d) Give any two advantages of bioremediation.
- e) Give any three examples of Xenobiotic compounds.
- f) Which derivative of cellulose is used for screening of cellulose producers?

Q2) Attempt the following.

- a) Discuss Xylene degradation pathway. **[6]**
- b) Explain how gene alteration is used for degradation of aromatic compound. **[4]**

Q3) Attempt the following.

- a) How alcohol production is altered by manipulating amylases. **[6]**
- b) Add a note on low ethanol wines. **[4]**

P.T.O.

Q4) Attempt the following.

- a) Explain how prokaryotic cellulose genes can be used for gene cloning. [6]
- b) How superbug was created? [4]

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

- a) Advantages of *Zymomonas Mobilis* over *S. cerevisiae* for ethanol production
- b) Resistance of Xenobiotic to microbial degradation
- c) Industrial production of fructose from starch



Total No. of Questions : 5]

SEAT No. :

PE-5379

[Total No. of Pages : 2

[6514]-306

S.Y. M.Sc.

MICROBIOLOGY

MBET-237 : Microbial Virus Technology

(2019 Pattern) (Semester - III)

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) *Q No. 2 to Q.No. 5 carry equal marks.*
- 4) *Draw neat labelled diagrams wherever necessary.*
- 5) *Figures to the right side indicate full marks.*

Q1) Solve any five of the following.

[5]

- a) Define : MoT.
- b) What is latent period in one step growth curve.
- c) Write two examples of algal viruses.
- d) Enlist the methods for isolation of bacteriophages.
- e) Give two characteristics of mycoviruses.
- f) What is Phage typing?

Q2) Attempt the following.

- a) What is phage lysine therapy? Explain with example.
- b) Comment on the use of bacteriophages.

[6]

[4]

Q3) Attempt the following.

- a) Discuss the use of techniques for characterization of mycoviruses.
- b) Explain growth kinetics of bacteriophages.

[6]

[4]

P.T.O.

Q4) Attempt the following.

- a) Write in detail about occurrence and taxonomy of mycoviruses. [6]
- b) Explain in detail genetic basis of lysogenic cycle of bacteriophage. [4]

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

- a) One step growth curve
- b) Bacteriophages as biocontrol agent in poultry
- c) Algal viruses



Total No. of Questions : 7]

SEAT No. :

PE-5380

[Total No. of Pages : 2

[6514]-401

S.Y. M.Sc.

MICROBIOLOGY

MBCT-241 : Pharmaceutical Microbiology

(2019 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question No.1 is compulsory.*
- 2) *Solve any five question from Q.No.2 to Q.No.7.*
- 3) *Question 2 to 7 carry equal marks.*
- 4) *Draw neat labelled diagram whenever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Attempt any 5 of the following:

[10]

- a) What is the objective of Rational Drug Design.
- b) What is the aim of Clinical Trials?
- c) What is the advantage of Molecular Modelling of a drug?
- d) What is the significance of “Pharmacovigilance” study?
- e) Define “Bioavailability” of drug.
- f) What is the role of CLSI in Pharmaceutical Industry?

Q2) Attempt the following :

- a) Explain the importance of ADME study in the development of a drug.**[7]**
- b) Write the classification of drugs based on the therapeutic classes with example. **[5]**

Q3) Attempt the following:

- a) How does pharmacopeia help in maintaining the standards in pharmaceutical industry? **[7]**
- b) How are the clinical phase trials I and II performed? **[5]**

P.T.O.

Q4) Attempt the following:

- a) What is the significance and the role of lead optimisation in the drug discovery. [7]
- b) What are the various methods of drug transport. [5]

Q5) Attempt the following:

- a) What is the role of human organs in metabolism and elimination of a drug? [7]
- b) What are the objectives of Ligand based drug designing? [5]

Q6) Attempt the following:

- a) Write a note on Biotransformation reactions of drugs. [7]
- b) Write a note on Molecular Docking. [5]

Q7) Write short notes on any 2 : [12]

- a) Significance of drug dosage.
- b) First pass effect.
- c) Fate of toxic metabolite during drug elimination.



Total No. of Questions : 7]

SEAT No. :

PE-5381

[Total No. of Pages : 2

[6514]-402

S.Y. M.Sc.

MICROBIOLOGY

MBCT-242 : Microbial Technology

(2019 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

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

Q1) Solve any five of the following:

[10]

- a) What is a biosensor?
- b) Define SOP.
- c) What is Ccrit?
- d) Define the power number.
- e) Define OUR.
- f) What is IPR.

Q2) Attempt the following;

- a) Write a note on fed-batch operations in industrial biotechnology. **[7]**
- b) Explain why the position of the impeller affects mixing efficiency in a reactor. **[5]**

Q3) Attempt the following;

- a) Write an essay on biosensors. **[7]**
- b) Discuss the agricultural and environmental applications of fungi. **[5]**

Q4) Attempt the following;

- a) Discuss in details, the industrial production of pullulan. **[7]**
- b) If the OUR exceeds the OTR, then oxygen limitation occurs. Justify. **[5]**

P.T.O.

Q5) Attempt the following;

- a) Discuss in details the industrial production of Rifamycin. [7]
- b) Write a short note on patenting. [5]

Q6) Attempt the following;

- a) Discuss in details the process of bioconversion. [7]
- b) Write a note on validation protocols. [5]

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

- a) IPR
- b) Airlift reactors
- c) Process variables



Total No. of Questions : 5]

SEAT No. :

PE-5382

[Total No. of Pages : 2

[6514]-403

S.Y. M.Sc.

MICROBIOLOGY

**MBET-244 : Quality Assurance and Validation in
Pharmaceutical Industry And Development of Anti
Infectives**

(2019 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1. is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Draw neat labelled diagram wherever necessary.*
- 5) *Figure to the right side 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) Why it is important to conduct the pyrogenicity testing of the drug?
- b) What are the objective of Good Laboratory practices with respect to pharmaceutical industry?
- c) Define MBC.
- d) Give two examples of anti-protozoan agents.
- e) What is the role of CLSI?
- f) Why Mueller-Hinton agar is used for antibiotic susceptibility testing?

Q2) Attempt the following. **[6]**

- a) Describe the gradient plate technique. Write its advantages.
- b) Explain the Good Manufacturing practices in the pharmaceutical industry **[4]**

Q3) Attempt the following

- a) Describe the susceptibility testing for antiviral agents. **[4]**
- b) What are the objectives of Quality Assurance in the pharmaceutical industry. **[4]**

P.T.O.

Q4) Attempt the following

- a) Describe the method for carrying out the sterility testing of a drug. **[6]**
- b) What are the factors affecting susceptibility testing. **[4]**

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

- a) Teratogenicity testing of a drug.
- b) Agar dilution Technique
- c) ISO certification for pharmaceutical industry



Total No. of Questions : 5]

SEAT No. :

PE-5383

[Total No. of Pages : 2

[6514]-404

S.Y. M.Sc.

MICROBIOLOGY

**MBET-245 : Advances in Microbial Technology
(2019 Pattern) (Semester - IV)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question No.1 is compulsory.*
- 2) *Solve any three questions from Q.No.2 to Q.No.5.*
- 3) *Draw neat and labelled diagrams wherever necessary.*
- 4) *Figures to the right side 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 is mean by growth associated metabolites?
- b) Write the role of secondary metabolites.
- c) Define microbial growth rate.
- d) Write monod's equation for microbial growth.
- e) Which cells produce insulin?
- f) Define gene therapy.

Q2) Attempt the following:

- a) Explain the factors effecting on mass transfer of nutrients. **[6]**
- b) Describe production of HIV vaccine by recombinant technology. **[4]**

Q3) Attempt the following:

- a) Explain the effect of mycelia filamentous form on product yield. **[6]**
- b) Describe challenges in production of restriction endonuclease. **[4]**

P.T.O.

Q4) Attempt the following:

- a) Explain process for production of monoclonal antibody. **[6]**
- b) Describe methods of gene therapy. **[4]**

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

- a) Yield coefficient.
- b) Recombinant DNA vaccine.
- c) Lipase enzyme.



Total No. of Questions : 5]

SEAT No. :

PE-5384

[Total No. of Pages : 2

[6514]-405

S.Y. M.Sc.

MICROBIOLOGY

**MBET-246 : Industrial Waste Water Treatment and
Industrial Production of Vaccine
(2019 Pattern) (Semester - IV)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question No.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 the right side indicates full marks.*
- 6) *Use of logarithmic tables and scientific calculators is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Solve any five of the following:

[5]

- a) Define: Retention time.
- b) Give two examples of preservatives used in vaccine production.
- c) Name the reactor used in anaerobic biological treatment.
- d) Write two applications of DNA vaccines.
- e) Enlist the methods of waste water treatment.
- f) Write a role of trickling filter.

Q2) Attempt the following:

- a) Describe the pilot and large-scale production of BCG vaccines. **[6]**
- b) Explain in detail activated sludge process and its analysis. **[4]**

Q3) Attempt the following:

- a) Enlist various anaerobic process of waste water treatment. Describe one in brief. **[6]**
- b) Explain in detail the physicochemical properties of dairy effluent. **[4]**

P.T.O.

Q4) Attempt the following:

- a) Explain the role of adjuvants in vaccine production and write in detail anti-idiotypic vaccines. **[6]**
- b) Given the information below, determine the percent solids in the sample and the percent of volatile solids in the biosolids sample. **[4]**

Weight of sample and dish	Bio solids (9m)	After drying (9m)	After burning
	73.43	24.88	22.98
Weight of dish (empty)	22.28	22.28	22.28

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

- a) Hapten conjugate vaccines.
- b) Physical agents as disinfecting agents used in waste water treatment.
- c) Types of Vaccines.



Total No. of Questions : 5]

SEAT No. :

PE-5385

[Total No. of Pages : 2

[6514]-406

S.Y. M.Sc.

MICROBIOLOGY

**MBET-247 : Bioethics, Biosafety, Quality control and
Quality Assurance**

(2019 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question No. 1 is compulsory.*
- 2) *Solve any three questions from Q.No. 2 to Q.No.5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of logarithmic tables or scientific calculators is allowed.*
- 6) *Assume suitable data if necessary.*

Q1) Attempt any five of the following:

[5]

- a) List the requirements of a Biosafety level 1 laboratory.
- b) Which quality department approves or rejects starting materials and finished products?
- c) Name the biohazard group to which COVID-19 virus (SARS-CoV2) belongs.
- d) Which Indian regulatory body is involved in regulating air and water pollution?
- e) Give any two bioethical issues with respect to microbiological research.
- f) What is Quality Assurance?

Q2) Attempt the following;

- a) Describe the roles and responsibilities of the following regulatory bodies:

[6]

- i) ISO
- ii) RCGM

P.T.O.

- b) A 14 year-old girl accompanied by her mother consults a doctor with complaints of Nausea and vomiting for two weeks. After her mother leaves the consulting room, the girl admits to being sexually active and tells the doctor that she had unprotected intercourse recently and missed a period. Her parents do not know she is sexually active, and she does not want her mother to know that a pregnancy test is being done or the result of that test. The pregnancy test comes back positive. The patient, a 14-years-old girl, has requested that her mother not be told that a pregnancy test has been sent and keep the results confidential. Discuss the bioethical principle involved in this case study. [4]

Q3) Attempt the following;

- a) Explain the ethical principles of beneficence and privacy with suitable examples. [6]
- b) Justify: The Biodiversity Act 2002 is essential for conserving India's rich biodiversity. [4]

Q4) Attempt the following;

- a) Discuss the role of NABL in certifying laboratories. [6]
- b) Justify: Quality control is an integral component of the manufacturing process. [4]

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

- a) Role of SIRO in scientific and industrial research
- b) Drugs and cosmetics regulation in India
- c) Biosafety levels and biocontainment practices in laboratories

