

Total No. of Questions : 7]

SEAT No. :

PD-3309

[Total No. of Pages : 2

[6480]-11
M.Sc. (Part - I)
MICROBIOLOGY
MBCT 111 : Microbial Systematics
(2019 Pattern) (Semester - I) (Credit System) (Revised)

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 7 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat labelled diagram wherever necessary.*
- 6) *Use of scientific calculator is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any Five of the following :

[10]

- a) Define Alpha Diversity.
- b) What is TGGE and write its applications.
- c) Define species divergence.
- d) What are universal primers.
- e) Define sympatric speciation.
- f) What is kin selection.

Q2) Attempt the following :

- a) Explain game theory of evolution with suitable examples. **[7]**
- b) Describe morphological and ecological diversity of microorganisms. **[5]**

Q3) Attempt the following :

- a) Enlist the types of selection and explain any one type of selection using suitable examples. **[7]**
- b) Describe the five kingdom classification system. **[5]**

Q4) Attempt the following :

- a) Differentiate between species concept in prokaryotes and Eukaryotes. **[7]**
- b) The bacterial load of soil sample was found to be 10^{12} cells/gm by fluorescent microscopy. The soil sample was then heated at 90°C for one hour and examined by conventional standard plate count technique which was 10^7 CFU/gm. Describe the methodology by which this difference in count could be nullified **[5]**

P.T.O.

Q5) Attempt the following :

- a) Describe the measures and indices of diversity. [7]
- b) Enlist the culture dependent methods for identifying unculturable bacteria and explain any one in detail. [5]

Q6) Attempt the following :

- a) Define and explain genotypic approach of classification of bacteria. [7]
- b) Describe the concept of evolutionary R and K selection. [5]

Q7) Write short notes (Any Two) : [12]

- a) Host parasite coevolution
- b) Estimate of total number of species
- c) Molecular clock



Total No. of Questions : 7]

SEAT No. :

PD-3310

[Total No. of Pages : 4

[6480]-12
M.Sc (Part - I)
MICROBIOLOGY
MBCT - 112 : Quantitative Biology
(2019 Pattern) (Semester - I) (Credit System)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidate:

- 1) *Q.1 is compulsory*
- 2) *Solve any five from Q.2 to Q.7*
- 3) *Q.2 to Q. 7 carry equal marks*
- 4) *Figures to the right side indicate full marks.*
- 5) *Draw neat labeled diagrams wherever necessary*
- 6) *Use of scientific calculators, logarithmic and statistical tables is allowed.*

Q1) Attempt any five of the following :

[10]

- a) What is sample in statistics?
- b) Enlist different types of the data and explain any two.
- c) What is a histogram?
- d) Calculate the mean from the following data

Sr. No.	Bonus	No. of Persons
1	3-5	14
2	5-7	16
3	7-9	25
4	9-11	12
5	11-13	22

P.T.O.

- e) Calculate the mode from the following data.

Sr. No.	Bonus	No. of Persons
1	1100-1150	41
2	1150-1200	39
3	1200-1250	48
4	1250-1300	34
5	1300-1350	22

- f) Define: Probability

Q2) Attempt the following :

- a) The following data represents, mean days required 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) In grassland, earthworm population was found to be randomly distributed. Sample from 10 randomly located 1m² areas was calculated. The following table gives number of worm obtained from each plot. Determined whether earthworm distributed randomly or not. [7]

Area	1	2	3	4	5	6	7	8	9	10
No of earthworm	25	32	17	23	15	39	27	19	22	26

- b) Cardiac output in ml/min was recorded in a sample of 15 post cardiac surgery patients. Results are as follows. We wish to know whether sample mean is different from 5.05. Apply Rank test.

4.91,4.10,6.74,7.27,7.42, 7.50, 6.56,4.64,5.98,3.14,3.23, 5.80, 6.17, 5.39, 5.77 [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) In an experiment, the mean yield of three rice varieties with four nitrogen doses was recorded. Using ANOVA find out whether there is any significant difference in mean yield of three varieties. [7]

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

- b) Person A and B has to appear for an interview for two vacancies. Probability of selection of A is $\frac{1}{3}$ and B is $\frac{4}{5}$. What are the chances of
- i) Both selection [5]
- ii) Both rejection
- iii) Only A selection

Q6) Attempt the following :

- a) A typing school claimed that after 6 weeks typing course. They can train the students to type on an average 60 word/ min. A random sample of 15 students has been given a typing test and mean number of words/ min typed by each is given below. Test the truth in the claim made by the typing school by Sign test [7]

81, 76, 53, 71, 66, 50, 88, 73, 80, 66, 58, 70, 66, 56, 55

- 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) Explain the terms: Experiments, Independent and dependent events and mutually exclusive and non-mutually exclusive events.
- b) 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?
- c) Following table gives the number of pods per plant in four varieties of bean. Draw your conclusion about difference in mean per plant.

	Varieties			
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



Total No. of Questions : 7]

SEAT No. :

PD-3311

[Total No. of Pages : 3

[6480]-13

M.Sc. (Part - I)

MICROBIOLOGY

MBCT-113 : Biochemistry and Metabolism

(2019 Pattern) (Semester - I) (Credit System) (Revised)

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 calculators is allowed.*
- 6) *Draw Neat labelled diagrams wherever necessary.*

Q1) Attempt any five of the following:

[10]

- a) Classify Alanine and glycine based on properties of their 'R' group.
- b) Which technique retains biological activity of proteins during separation under the influence of electric current and why?
- c) What is the organisation of shoot apex?
- d) Enlist the modifications of protein that occur in Golgi apparatus.
- e) Name the phase of cell cycle in which DNA doubles and chromosome replicates. Which is the next phase of cell cycle?
- f) Draw resonance forms of peptide bond.

P.T.O.

Q2) Attempt the following :

- a) With a suitable example describe tertiary structure of protein. [7]
- b) Write short note on : Gastrulation in *Drosophila melanogaster*. [5]

Q3) Attempt the following :

- a) Explain the role of MPF (Mitosis Promoting Factor) in development. [7]
- b) The following reagents are used in Protein biochemistry. [5]
 - i) CNBr
 - ii) β -Mercapto ethanol
 - iii) Trypsin
 - iv) Urea
 - v) Dansylchloride
 - vi) Chymotrypsin
 - vii) Ninhydrin
 - viii) Phenyl isothiocyanate

Which one is the best suited for accomplishing each of the following task.

- I) Identification of N-terminal residue of a peptide.
- II) Reversible denaturation of a protein devoid of disulfide bonds. Which additional reagent would you need if disulfide bonds are present?
- III) Hydrolysis of peptide bonds on the carboxyl side of aromatic residues.
- IV) Cleavage of peptide bonds on the carboxyl side of Methionine.
- V) Hydrolysis of peptide bonds on the carboxyl side of lysine and Arginine residues.

Q4) Attempt the following :

- a) Discuss the Structure and Functions of Actin Filament. [7]
- b) Distinguish between lysosomes and peroxisomes. [5]

Q5) Attempt the following

- a) Explain pyrosequencing Method of DNA. [7]
- b) Enlist and Explain any one Method for N-terminal determination of proteins. [5]

Q6) Attempt the following

- a) Discuss ion exchange chromatography with respect to
 - i) Principle
 - ii) Exchanger
 - iii) Buffer
 - iv) Elution [7]
- b) Protein A and B having a molecular weight of 16500 and 35400 move 1.3 cm and 4.6 cm respectively. When electrophoresed through a gel. What is the molecular weight of protein which moves 2.8 cm. [5]

Q7) Attempt any two of the following :

- a) Explain Structure and Functions of Mitochondria. [6]
- b) Describe ABC model system of Arabidopsis of flower development. [6]
- c) Explain Real - Time PCR. [6]



Total No. of Questions : 5]

SEAT No. :

PD-3312

[Total No. of Pages : 2

[6480]-14

M.Sc. (Part - I)

MICROBIOLOGY

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

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) Name at least four sources, from Where there is a high probability to isolate thermophiles.
- b) Give two examples of halophiles.
- c) Draw structure of Zygosporangium.
- d) Give two examples of methanogens.
- e) Enlist four characters on the basis of which fungi are differentiated.
- f) Write the role of bacteriorhodopsin.

Q2) Attempt the following :

- a) Write a note on morphology & characteristic of basidiomycetes. **[6]**
- b) If a group of scientist, wants to isolate bacteria from a sample, collected from 'dead sea' how should they proceed for the same? **[4]**

Q3) Attempt the following :

- a) Write a note on adaptations observed in Thermophiles. **[6]**
- b) Give significance of Oomycetes. **[4]**

P.T.O.

Q4) Attempt the following :

- a) Explain different kinds of sexual spores found in different classes of fungi. [6]
- b) Justify, How the acidophiles survive at acidic conditions. [4]

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

- a) Diagrammatically represent life cycle of Chytridiomycetes.
- b) Draw and explain general structure of Ascomycetes.
- c) Scientists have collected a sample from 'Antartica' south pole How should they proceed to enrich the sample and isolate micro-organisms from the same.



Total No. of Questions : 5]

SEAT No. :

PD-3313

[Total No. of Pages : 2

[6480]-15

M.Sc. (Part - I)

MICROBIOLOGY

**(MBET - 116) - Experimental Design and Quantitative
Approaches for Biologists**

(2019 Pattern) (Credit System) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

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

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

- a) Evaluation of the immunisation coverage of children is carried out by ____.
- b) The ____ sampling may be convenient and economical.
- c) The numbers 1,2,3,4 so on are called ____ .
- d) Use the listing method to describe the following set. The set of all integer's less than 5 and greater than -2.
- e) In ____ studies, the disease is described by time, place and person.
- f) In epidemiology, ____ study proceeds backwards from effect to cause.

Q2) Attempt the following :

- a) Enlist various epidemiological studies and also add a note on advantages and disadvantages cause control studies. **[6]**
- b) Find the equation of a circle with its centre at a point (b,c) and its radius equal to 9. **[4]**

Q3) Attempt the following :

- a) Describe in brief different types of samples used in biostatistics. **[6]**
- b) Discuss types of experimental designs. **[4]**

P.T.O.

Q4) Attempt the following :

- a) Explain Fractional factorial design. [6]
- b) If a bacterial population increases from 10^2 to 10^9 in 9 hours. Calculate no generations per hour. [4]

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

- a) Least square analysis
- b) Bias removal
- c) Controlled and Uncontrolled trials.



Total No. of Questions : 5]

SEAT No. :

PD-3314

[Total No. of Pages : 2

[6480]-16

M.Sc. (Part - I)

MICROBIOLOGY

**MBET - 117 (MBTE - 13) : Microbial Communication,
Membrane Transport and Signal Transduction
(2019 Pattern) (Credit System) (Semester - I)(Revised)**

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) *Figures to the right side indicate full marks.*
- 5) *Draw neat and labelled diagrams wherever necessary.*
- 6) *Use of logarithmic tables and scientific calculators is allowed.*

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

- a) What are biofilms?
- b) What is the role of pst A cells in Dictyostelium?
- c) Draw structure of acylated homoserine lactone.
- d) Enlist secondary messengers of Dictyostelium?
- e) What is active transport?
- f) What are liposomes?

Q2) Attempt the following :

- a) Describe the mechanism of communication in myxobacteria. **[6]**
- b) Justify that 'lipid composition governs the fluidity of biological membranes' **[4]**

Q3) Attempt the following :

- a) Explain the molecular mechanism of quorum sensing in Gram Positive bacteria. **[6]**
- b) Justify that 'Na⁺- k⁺ ATPase plays important role in transport of glucose across intestinal epithelium'. **[4]**

P.T.O.

Q4) Attempt the following :

- a) Justify that 'Dictyostelium' can be used as a model to study cellular differentiation. [6]
- b) A researcher was working with mouse intestinal leucine transporter. Measurements of the rate of uptake of L-leucine and D-leucine with and without Na⁺ in the assay buffer. The results are given in the table. What can you conclude about the properties and mechanism of leucine transporter? [4]

	Up take in presence of Na ⁺		Uptake in absence of Na ⁺	
Substrate	V _{max}	k _t	V _{max}	k _t
L - leucine	420	0.24	23	0.24
D-leucine	310	4.7	5	4.7

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

- a) Explain with suitable example the working of a ligand gated ion channel.
- b) What are model membranes? give their significance.
- c) Describe the advantages and disadvantages of biofilm formation.



Total No. of Questions : 7]

SEAT No. :

PD-3315

[Total No. of Pages : 2

[6480]-21

M.Sc.

MICROBIOLOGY

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

Time : 3 Hours]

[Max. Marks : 70

Instruction 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 diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic table and scientific calculation is allowed.*
- 7) *Assume suitable Data wherever necessary.*

Q1) Attempt any five of the following

[10]

- a) Define Resolution.
- b) Explain molecular vibrations.
- c) Write the significance of Molar Absorptivities.
- d) Comment on Spin-Spin coupling.
- e) Explain the term Direct Lattice.
- f) What is Radio activity.

Q2) Attempt the following.

- a) Explain super critical fluid chromatography. **[7]**
- b) Write a note on van demeter equation and Describe the factors responsible in Band Broadening. **[5]**

P.T.O.

Q3) Attempt the following.

- a) Describe the principle and application of fluorescence spectroscopy. [7]
- b) The Transmittance of a 0.010M solution of a compound in a 1.00 cm pathlength cell is $T = 20.8\%$. Find the absorbance [A] and the molar Absorptivity. [5]

Q4) Attempt the following.

- a) Enlist the properties and application of X-Ray. [7]
- b) Explain correlation spectroscopy. [5]

Q5) Attempt the following.

- a) Explain the principle and Instrumentation of confocal microscopy. [7]
- b) Comment on the application of Auto radiography. [5]

Q6) Attempt the following.

- a) Explain any two mass analyses used in mass spectroscopy with suitable diagram. [7]
- b) Write a note on Electron Density Map. [5]

Q7) Attempt the following. [12]

- a) Write a short note on Radio traces in Biology.
- b) Explain Immuno Electrophoresis.
- c) State the principle of liquid scintillation counting.



Total No. of Questions : 7]

SEAT No. :

PD-3316

[Total No. of Pages : 2

[6480]-22

M.Sc. (Part - I)

MICROBIOLOGY

BOUT-122 : Molecular Biology

(2019 Pattern) (CBCS) (Credit System) (Semester - II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

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

Q1) Answer any five :

[10]

- a) What is the role of miRNA in cancer?
- b) What is gene annotation?
- c) Give the significance of klenow enzyme.
- d) Comment on expression vectors.
- e) Write difference between SiRNA and miRNA.
- f) Give diagrammatic representation of rRNA processing.

Q2) Attempt the following :

- a) Describe activity gel assay in detail. [7]
- b) Explain any two methods used for designing probes. [5]

P.T.O.

Q3) Attempt the following :

- a) Describe protein micro array system. [7]
- b) Justify : 'RNA interference technique can be used in gene silencing. [5]

Q4) Attempt the following :

- a) Explain Human Genome Project in detail. [7]
- b) Describe construction of cDNA library. [5]

Q5) Attempt the following :

- a) Comment on use of immunoassay. [7]
- b) A pre mRNA molecule produced from a coding gene has 300 bases long exon I followed by 150 bases intron I, 40 bases exon II, 100 bases intron II, 60 bases exon III and 200 bases adenylated tail. [5]
 - i) Draw the diagram of pre mRNA molecule.
 - ii) Determine the size of full mature mRNA.

Q6) Attempt the following :

- a) Explain the use of adapters and linkers in genetic engineering. [7]
- b) Describe RNA splicing. [5]

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

- a) Comparative Genomics.
- b) RNA signatures of antibiotic resistance.
- c) FISH technique.



Total No. of Questions : 7]

SEAT No. :

PD-3317

[Total No. of Pages : 2

[6480]-23

M.Sc. (Part - I)

MICROBIOLOGY

**MBCT-123 : Enzymology, Bioenergetics and Metabolism
(2019 Pattern) (Semester - II) (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 diagrams wherever necessary.*
- 7) *Assume suitable data, if necessary.*

Q1) Attempt any five:

[10]

- a) Define Gibb's free energy.
- b) Write significance of enzyme inhibitors.
- c) Write any two Names of sugar derivatives.
- d) Name any two methods of enzyme purification.
- e) What are sugar epimers?
- f) Write significance of phospholipids.

Q2) Attempt the following :

- a) Describe TCA cycle in detail. **[7]**
- b) Explain King Altman approach. **[5]**

P.T.O.

Q3) Attempt the following :

- a) Explain concept of allosterism with suitable examples. [7]
- b) Describe the process of cellulose breakdown. [5]

Q4) Attempt the following :

- a) Explain kinetics of non-competitive inhibitors in detail. [7]
- b) Describe regulation of glycolysis. [5]

Q5) Attempt the following :

- a) Explain microbial synthesis of Alginate in detail. [7]
- b) Describe Monod model of allosteric Enzyme. [5]

Q6) Attempt the following :

- a) Describe gluconeogenesis process in detail. [7]
- b) Explain structure and function of phospholipids. [5]

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

- a) Isomerism in sugars.
- b) Significance of Enzyme inhibitors.
- c) Hill plot.



Total No. of Questions : 5]

SEAT No. :

PD-3318

[Total No. of Pages : 2

[6480]-24

M.Sc. (Part - I)

MICROBIOLOGY

**MBTE-125 : Bioinformatics and Bionanotechnology
(2019 Pattern) (Semester - II) (Credit System)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from 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 epitope prediction?
- b) Define a nanoparticle.
- c) Enlist two structure databases used in bioinformatics.
- d) Give the applications of atomic force microscopy.
- e) What are protein sequence databases?
- f) Name any two magnetotactic bacteria.

Q2) Attempt the following :

- a) Contrast between pairwise and multiple sequence alignment approaches.
[6]
- b) Justify : Molecular markers like rRNA and mitochondrial DNA can be used for phylogenetic analysis.
[4]

P.T.O.

Q3) Attempt the following.

- a) Enlist the different nanoparticle characterization techniques. Describe any one technique in detail. **[6]**
- b) Justify : Size and shape affect nanoparticle properties. **[4]**

Q4) Attempt the following

- a) Explain how scoring matrices can be used for sequence alignments. **[6]**
- b) Describe the different properties of nanoparticles. **[4]**

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

- a) Scanning electron microscopy
- b) Needleman-Wunsch algorithm in bioinformatics.
- c) EDAX analysis.



Total No. of Questions : 5]

SEAT No. :

PD-3319

[Total No. of Pages : 2

[6480]-25
M.Sc. (Part - I)
MICROBIOLOGY
MBET - 126 - MJ : Molecular Biology Tools and Applications
(2019 Pattern) (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) *Draw neat and labelled diagrams wherever necessary.*
- 5) *Figures to the right indicates full marks.*

Q1) Attempt any Five of the following :

[5]

- a) What is CRISPR?
- b) Define peptide antibiotics.
- c) What is EMSA?
- d) What are the sources of biopolymers?
- e) What are cDNA arrays?
- f) What are human mouse monoclonal antibodies?

Q2) Answer the following :

- a) Explain protein - protein interaction using yeast two hybrid assay. **[6]**
- b) Write a note on Hybridoma Technology. **[4]**

Q3) Answer the following :

- a) What are biopolymers? Explain any one in detail. **[6]**
- b) Write a note on methyl Interference Assay. **[4]**

Q4) Answer the following :

- a) Explain in detail protein foot printing. **[6]**
- b) Write a note on peptide antibiotics. **[4]**

P.T.O.

Q5) Attempt any two of the following :

[10]

- a) Explain how transcription rate is measured.
- b) Describe in detail synthesis of ascorbic acid.
- c) Describe DOT blot in detail.



Total No. of Questions : 5]

SEAT No. :

PD-3320

[Total No. of Pages : 2

[6480]-26

M.Sc. (Part - I)

MICROBIOLOGY (Theory)

**MBET-127 : Nitrogen Metabolism, Respiration and
Photosynthesis**

(2019 Pattern) (Semester - II) (Credit System)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

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

Q1) Solve any five of the following:

[5]

- a) What is photosynthesis and give the reaction of photosynthesis.
- b) What is respiration and give the reaction of respiration.
- c) Give two examples of methanogenic bacteria.
- d) Give two examples of C₃ plants.
- e) Explain what is electron transport chain.
- f) Give two examples of nitrogen fixing bacteria.

Q2) Attempt the following :

- a) Explain in detail with diagram cyclic flow of electrons in photosynthesis. **[6]**
- b) Explain the regulation of glutamate synthetase. **[4]**

P.T.O.

Q3) Attempt the following :

- a) Explain in detail biosynthesis of purine bases. [6]
- b) Write a note on Hill reaction in photosynthesis. [4]

Q4) Attempt the following :

- a) Explain the properties and regulation of glutamate dehydrogenase. [6]
- b) Write note on biochemistry on methanogens. [4]

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

- a) Write note on C4 plants in photosynthesis.
- b) Explain the regulation of photosynthesis.
- c) Explain the energy generation in electron transport chain.



Total No. of Questions : 7]

SEAT No. :

PD-3321

[Total No. of Pages : 2

[6480]-31
M.Sc.-II
MICROBIOLOGY
MBCT-231: Immunology
(2019 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) Q. 2 to Q. 7 carry equal marks.*
- 4) Draw neat and labelled diagrams wherever necessary.*
- 5) Figures to the right indicate full marks.*
- 6) Use of logarithmic tables or scientific calculators is allowed.*
- 7) Assume suitable data if necessary.*

Q1) Attempt any five of the following :

[10]

- a) Draw a neat and well labelled diagram of TCR-CD3 complex.
- b) Enlist the types of biological response modifiers.
- c) What is Janus Kinase?
- d) Define inbred animals.
- e) Define cytotoxic assay.
- f) What is malignant tumour?

P.T.O.

Q2) Attempt the following :

- a) Discuss the structure and function of BCR in details. [7]
- b) Write a note on functional assays for phagocytes. [5]

Q3) Attempt the following :

- a) Discuss the Ras/MAP Kinase pathway. [7]
- b) Explain the immune network theory. [5]

Q4) Attempt the following :

- a) Discuss the role of Tregs in immune tolerance. [7]
- b) Write a note on the classification of tumours based on their histological origin. [5]

Q5) Attempt the following :

- a) Explain the mechanism of immunological tolerance. [7]
- b) Explain the host immune response against tumour. [5]

Q6) Attempt the following :

- a) Discuss the role of experimental animals in immunological research. [7]
- b) Write a note on the components of signal transduction. [5]

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

- a) Discuss the families of cytokine receptors
- b) Explain ELISPOT assay
- c) Describe the approaches in cancer immunotherapy



Total No. of Questions : 7]

SEAT No. :

PD-3322

[Total No. of Pages : 2

[6480]-32
M.Sc. - II
MICROBIOLOGY
MBCT 232 : Molecular Biology
(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 7 carry equal marks.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat labelled diagrams wherever necessary.*
- 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 SNP? Give any 1 example in Eukaryotes.
- b) Define gene aging.
- c) Write any two applications of studying metabolome.
- d) What is genetic trade off?
- e) Define epigenetics. Give one example.
- f) Give 2 examples of retrotransposons.

Q2) Attempt the following :

- a) What is gene augmentation? Give its applications in early detection of diseases and prevention. **[7]**
- b) What are the social issues of genetically modified organisms. **[5]**

Q3) Attempt the following :

- a) Explain the concept of proteomics with special reference to analysis & characterisation of protein. **[7]**
- b) What are the steps involved in studying protein interaction. **[5]**

Q4) Attempt the following :

- a) Explain the concept of many proteins from one gene in detail. **[7]**
- b) How to study coding sequences in a genome. **[5]**

P.T.O.

Q5) Attempt the following :

- a) What are replicative transposons. Explain with example. [7]
- b) What are advantages of transgenic animals and plants. [5]

Q6) Attempt the following :

- a) What are the methods to detect SNP in Eukaryotes. [7]
- b) What are the characteristics of transposons in drosophila. [5]

Q7) Write a short note on any Two :

[12]

- a) SINES
- b) ALU element
- c) Mu transposons



Total No. of Questions : 7]

SEAT No. :

PD-3323

[Total No. of Pages : 2

[6480]-33

M.Sc. (Part - II)

MICROBIOLOGY

MBCT-233 : Clinical Microbiology

(2019 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 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) Attempt any five of the following:

[10]

- a) What is mean by microbial adhesin?
- b) What are tetanus toxoid?
- c) Enlist various methods for H₁N₁ detection.
- d) Which are the morphological forms of Entamoeba histolytica.
- e) What are the diseases caused by c. Jejuni?
- f) What are oncoviruses? Give two examples.

Q2) Attempt the following :

- a) Describe the mechanism of bacterial invasion. [7]
- b) Explain the bacterial resistance to phagocytosis. [5]

P.T.O.

Q3) Attempt the following.

- a) Explain invivo assay and invitro assay for cholera toxin. [7]
- b) Suggest treatment and precautionary measures for H1 N1 swine flu. [5]

Q4) Attempt the following.

- a) Discuss in detail adhesion and colonization mechanism in bacterial pathogenesis. [7]
- b) Describe general charactes of Ebola virus. [5]

Q5) Attempt the following.

- a) Explain morphological and detail life cycle of Ascaris lumbricoides. [7]
- b) Describe pathophysiology of Actinomyces bovis. [5]

Q6) Attempt the following.

- a) Describe the different methods for handling and disposal of infectious materials. [7]
- b) Explain tuberculin test for Mycobacterium tuberculosis. [5]

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

- a) Pathogenicity island.
- b) Susceptible exposed infectious recovered (SEIR) model.
- c) Structure of HIV.



Total No. of Questions : 5]

SEAT No. :

PD-3324

[Total No. of Pages : 2

[6480]-34

M.Sc. - II

MICROBIOLOGY

MBET 235 : Cell Culture Techniques

(2019 Pattern) (Semester - III) (Credit System) (Revised)

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) *Figures to the right side 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 the role of serum in the animal cell culture medium?
- b) What are cell lines?
- c) Give two examples of immunomodulators.
- d) Mention two media used in animal cell culture.
- e) How CO_2 levels affect the cell growth in animal cell culture?
- f) What are secondary cultures.

Q2) Attempt the following :

- a) Explain the use of hybrid lymphoid cell lines in immunological studies.[6]
- b) Write applications of immuno modulators in immunological studies.[4]

Q3) Attempt the following :

- a) Describe in detail cloned lymphoid cell lines. [6]
- b) Differentiate between anchorage independent & anchorage dependent cell cultures. [4]

Q4) Attempt the following :

- a) What are primary cell culture? Write it's applications. [6]
- b) Explain the factors affecting cells in culture. [4]

P.T.O.

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

[10]

- a) Monolayer culture.
- b) Suspension cell culture.
- c) Characteristics of transformed cells.



Total No. of Questions : 5]

SEAT No. :

PD-3325

[Total No. of Pages : 2

[6480]-35

M.Sc. (Part - II)

MICROBIOLOGY

MBET-236: Bioremediation and Biomass Utilization
(2019 Pattern) (CBCS) (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) *Questions 2 to 5 carry equal marks.*
- 4) *Draw neat and labelled diagrams wherever necessary.*
- 5) *Figures to the right side indicate full marks.*

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

- a) Define Xenobiotics.
- b) Give advantages of silage.
- c) Give advantages of using biomass as energy resource.
- d) Give any two disadvantages of bioremediation.
- e) Enlist microbes used for producing isopropanol.
- f) Draw structure of Xylene.

Q2) Attempt following :

- a) Discuss naphthalene degradation pathway. **[6]**
- b) Describe gene manipulation for pesticide degradation with the help of suitable example. **[4]**

Q3) Attempt following :

- a) How yeast transcription is altered to improve alcohol yield? **[6]**
- b) Add a note on cellulosomes. **[4]**

P.T.O.

Q4) Attempt following :

- a) Explain aromatic compound degradation by ortho-cleavage pathway[6]
- b) Explain screening of prokaryotic cellular producers. [4]

Q5) Write short note on Any Two of following. [10]

- a) Enzyme Systems for degradation of Xenobiotics
- b) n-Octane degradation pathway.
- c) Improvisation of silage production.



Total No. of Questions : 5]

SEAT No. :

PD-3326

[Total No. of Pages : 2

[6480]-36

M.Sc. - II

MICROBIOLOGY

**MBET 237 : Microbial Virus Technology
(2019 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) *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 lytic cycle.
- b) Give two examples of therapeutic use of bacteriophage.
- c) Enlist the physical methods for concentration of phage.
- d) What is burst size of bacteriophage.
- e) Enlist two characteristics of mycoviruses.
- f) Define : Lysogeny

Q2) Attempt the following :

- a) Comment on use of phages in prophylaxis of infectious diseases. [6]
- b) Discuss the use of phages in pathogen control in poultry. [4]

Q3) Attempt the following :

- a) Explain virus-host interaction mechanisms. [6]
- b) Comment on advantages of bacteriophages for treatment of bacterial infection. [4]

Q4) Attempt the following :

- a) Describe the different methods for isolation of bacteriophages from sewage. [6]
- b) Describe phage lysine therapy in detail. [4]

P.T.O.

Q5) Write a short note on any two :

[10]

- a) Enumeration of bacteriophages
- b) Mycoviruses
- c) Lytic cycle



Total No. of Questions : 7]

SEAT No. :

PD-3327

[Total No. of Pages : 2

[6480]-41

M.Sc. (Part - II)

MICROBIOLOGY

MBCT241 : Pharmaceutical Microbiology

(2019 Pattern) (Semester - IV) (Credit System)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Solve any five equations from Q.2 to Q.7.*
- 3) *Questions 2 to 7 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 :

[10]

- a) Define "HITS".
- b) Name any 2 drugs acting on cell wall.
- c) What is the significance of mutagenicity testing of drug?
- d) What is the importance of medicinal chemistry?
- e) What is the first pass effect of drug?
- f) What is the significance of clinical phase trial III.

Q2) Attempt the following.

- a) What are the tests conducted to assess the toxicity of a drug? **[7]**
- b) Explain the concept of "Molecular Docking". **[5]**

Q3) Attempt the following.

- a) Explain the distribution of a drug in human body with an example. **[7]**
- b) Write the possible reasons that a drug can fail in FDA approval. **[5]**

P.T.O.

Q4) Attempt the following.

- a) Explain the process of drug elimination and the human organs involved in it. [7]
- b) Explain the formulation of pharmaceutical preparation as per IP with any one example. [5]

Q5) Attempt the following.

- a) What are the advantages of having pharmacopeia. [7]
- b) How does the drug get transported through the biological barriers? [5]

Q6) Attempt the following.

- a) Explain the objectives, conduct and outcome of phase I and II clinical trials of drugs. [7]
- b) Explain the "Drug Nomenclature system" with eg. [5]

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

- a) Ligand based drug design
- b) Ame's test
- c) Bioavailability of a drug



Total No. of Questions : 7]

SEAT No. :

PD-3328

[Total No. of Pages : 2

[6480]-42

M.Sc. (Part - II)

MICROBIOLOGY

MBCT-242 : Microbial Technology

(2019 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 table/scientific calculator is allowed.
- 6) Draw Neat and well labelled diagrams wherever necessary.
- 7) Assume suitable data if necessary.

Q1) Solve any five of the following :

[10]

- a) What is trade secret?
- b) Define copyright.
- c) What is enzyme immobilization?
- d) Define biosensor.
- e) What is patent?
- f) Define downstream processing.

Q2) Attempt the following :

- a) Describe the design and working principle of batch reactor. [7]
- b) What is non-Newtonian fluid? Explain its role in oxygen transfer. [5]

P.T.O.

Q3) Attempt the following.

- a) Explain the upstream processing of pullulan production. [7]
- b) Discuss the role temperature on broth rheology [5]

Q4) Attempt the following

- a) 'In a batch culture, growth rate decreases with respect to depletion in nutrients.' Justify the statement. [7]
- b) Describe the ISO certification in the form of a flowchart. [5]

Q5) Attempt the following

- a) Discuss the validation protocols in details. [7]
- b) Why two stage airlift bioreactors are used for the temperature dependent production of certain metabolites. [5]

Q6) Attempt the following

- a) Describe in detail the commercial applications of Chitinases. [7]
- b) Write a note on environmental applications of fungi. [5]

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

- a) What is $K_L a$? Discuss sulphite oxidation method for the determination of $K_L a$.
- b) Draw a flowchart for the industrial production of Chitinase.
- c) Write a note on strain development for the industrial production of Rifamycin.



Total No. of Questions : 5]

SEAT No. :

PD-3329

[Total No. of Pages : 2

[6480]-43

M.Sc. (Part - II)

MICROBIOLOGY

**MBET - 244 : Quality Assurance and Validation in
Pharmaceutical Industry and Development of Anti Infectives
(2019 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) *Questions 2 to 5 carry equal marks.*
- 4) *Draw neat and labelled diagrams wherever necessary.*
- 5) *Figures 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) Which media are used in sterility testing of drugs?
- b) What are the objectives of Good Manufacturing practices with respect to pharmaceutical industry?
- c) Define MIC.
- d) Write two examples of antifungal agents.
- e) What is the principle of E test?
- f) What is the principle of Ames test?

Q2) Attempt the following :

- a) Describe the Kirby Bauer method. Write its advantages. **[6]**
- b) Explain the measures taken to assure safety in the Microbiology Laboratory. **[4]**

Q3) Attempt the following :

- a) Describe the susceptibility testing for antimycobacterial agent. **[6]**
- b) What is the role of CLSI in the development of anti infective? **[4]**

P.T.O.

Q4) Attempt the following :

- a) Describe the method for carrying out the pyrogenicity testing of a drug. [6]
- b) What is the role of ISO certification in pharmaceutical industry. [4]

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

- a) Carcinogenicity testing of the drug.
- b) Gradient Plate Technique
- c) Therapeutic ratio



Total No. of Questions : 5]

SEAT No. :

PD-3330

[Total No. of Pages : 2

[6480]-44

M.Sc. (Part - II)

MICROBIOLOGY

**MBET-245 : Advances in Microbial Technology
(2019 Pattern) (Credit System) (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.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) *Assume suitable data, if necessary.*
- 7) *Use of logarithmic tables / scientific calculator is allowed.*

Q1) Attempt any five of the following :

[5]

- a) What is mean by secondary metabolites?
- b) State Mathematical expression for yield coefficient.
- c) Give two examples of growth associated products.
- d) Write the function of erythropoietin.
- e) Which antigens present in HBV?
- f) What is meant by monoclonal antibody?

Q2) Attempt the following :

- a) Explain in detail the growth kinetics & product formation.
- b) Describe production of Malaria vaccine.

[6]

[4]

P.T.O.

Q3) Attempt the following :

- a) Explain the factors affecting on mass transfer of nutrients. [6]
- b) Describe general characteristics of ideal vaccine. [4]

Q4) Attempt the following :

- a) Describe production of recombinant Insulin using suitable host. [6]
- b) Describe production of lipase by recombinant technology. [4]

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

- a) Applications of monoclonal antibodies.
- b) Limitations of HIV vaccine production.
- c) Limitations of Gene Therapy.



Total No. of Questions : 5]

SEAT No. :

PD-3331

[Total No. of Pages : 2

[6480]-45

M.Sc. (Part - II)

MICROBIOLOGY

**MBET 246 : Industrial Waste Water Treatment & Industrial
Production of Vaccines**

(2019 Pattern) (Semester - IV) (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) 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) Solve any Five of the following : [5]

- a) Define : COD
- b) Write the two names of viruses used in production of live attenuated vaccines.
- c) What is the role of excipients in vaccine production.
- d) Write two disadvantages of live vaccines.
- e) Write two examples of toxoid vaccines.
- f) What is RBC in waste water treatment plant.

Q2) Attempt the following :

- a) Describe in detail secondary treatment of waste water treatment. [6]
- b) Justify: The aerobic biological treatment recommended for food industry waste water treatment. [4]

Q3) Attempt the following :

- a) Describe the various effluent treatment strategies used in paper and pulp industry. [6]
- b) Using the data provided below, determine the BOD_5 and BOD_{∞} of seed material - 90mg/l [4]
Seed material - 3ml
Sample - 100ml
Start Do - 7.6mg/l
Final Do - 2.7 mg/l

P.T.O.

Q4) Attempt the following :

- a) Explain in detail process for production of peptide vaccine. [6]
- b) How is colour removed from the effluent of textile industry. [4]

Q5) Write a short note any Two : [10]

- a) Role of vaccines in prophylaxis of various diseases
- b) Next generation vaccines
- c) Characteristics of Dairy effluent.



Total No. of Questions : 5]

SEAT No. :

PD-3332

[Total No. of Pages : 2

[6480]-46

M.Sc. - II

MICROBIOLOGY

**MBET 247 : Bioethics, Biosafety, Quality Control and
Quality Assurance**

(2019 Pattern) (Semester - IV) (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 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 any Five of the following : [5]

- a) List two examples of pathogens from biohazard group 3.
- b) Which quality department is involved in performing audits.
- c) Name the regulatory body that plays an advisory role with respect to research on Genetically Modified Organisms (GMOs)
- d) Define quality control.
- e) Which ethical principle is related to confidentiality.
- f) Name the Indian regulatory body that regulates food and water industries.

Q2) Attempt the following :

- a) Describe the roles and responsibilities of the following regulatory bodies:
 - i) IBSC
 - ii) FSSAI[6]
- b) The Tuskegee Syphilis, study, conducted in the United States from 1932 to 1972, involved the observation of untreated syphilis disease in African American men. The participants were misled about the nature of the study, believing they were receiving free healthcare when, in fact, they are deliberately left untreated to observe the progress of the disease. The participants were deceived about their diagnosis and denied access to appropriate treatment, resulting in long-term health complications and in some cases, death. The study intentionally withheld information and failed to provide proper medical care. Which ethical principle was violated in the above case? Explain how? [4]

P.T.O.

Q3) Attempt the following :

- a) Discuss the regulations outlined in the Indian Biodiversity Act, 2002. **[6]**
- b) Justify: Patient autonomy is considered a fundamental principle in ethics. **[4]**

Q4) Attempt the following :

- a) Explain the significance of validation and calibration in quality management. **[6]**
- b) Justify: Corrective and preventive actions (CAPA) comprise an important role of the quality assurance department. **[4]**

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

- a) Bureau of Indian Standards.
- b) Biological risk assessment for classification of pathogens.
- c) Air Quality Monitoring (AQM) and Water Quality Monitoring (WQM)

