

Total No. of Questions : 8]

SEAT No. :

P2730

[5030]-101

[Total No. of Pages : 3

M.Sc.

MICROBIOLOGY

**MB -501:Microbial Diversity & Taxonomy
(2013 Pattern)(Semester - I)(Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions:

- 1) *Attempt any five questions.*
- 2) *Attempt any 3 questions from Q.1 to Q.4 (core credits)*
- 3) *Attempt atleast 2 questions from Q.5 to Q.8 (non-core credits)*
- 4) *Figures to the right indicates marks.*
- 5) *Draw diagrams wherever necessary.*
- 6) *All questions carry equal marks.*
- 7) *Use of the logarithmic electronic pocket calculator is allowed.*
- 8) *Assume suitable data, if necessary.*

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

- a) Differentiate between species concept in eukaryotes and prokaryotes.
- b) What is a phylogenetic tree? Construct phylogenic tree considering suitable example.
- c) Discuss the concept of evolutionary r and k selection.

Q2) Attempt any two of the following: [10]

- a) Write note on expanse of microbial diversity.
- b) From the given data calculate the Shannon diversity index for the river water sample. Total number of colonies is 184×10^7 .

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

- c) Explain in brief the great plate count anomalies with suitable example.

P.T.O.

Q3) Attempt **any two** of the following: [10]

- a) Explain the characteristics of bacteria in VBNC state. How does this state influence taxonomy.
- b) Discuss in brief 3 domain classification system.
- c) Define and explain the phenetic approach of classification with suitable example.

Q4) Attempt **any two** of the following: [10]

- a) Describe the importance of protein profiling in bacterial taxonomy.
- b) Write note on estimates of total number of microbial species.
- c) Justify: “16S rRNA is the most widely accepted molecular chronometer in bacterial taxonomy”.

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

- a) Justify: “Classification of molds is chiefly based on their morphological characters”.
- b) Give silent features of zygomycetes.
- c) Give the silent features of basidiomycetes.

Q6) Attempt **any two** of the following: [10]

- a) What are the universal primers? Explain how these are applied in microbial taxonomy and diversity.
- b) Explain the need of extracting total bacterial DNA from habitat.
- c) Explain strategies used for culturing unculturable bacteria.

Q7) Attempt **any two** of the following:

[10]

- a) What is coevolution? Explain coevolution with respect to host-parasite evolution.
- b) What are secondary metabolites? Explain the diversity in evolution of secondary metabolites.
- c) Explain molecular evolution with respect to protein evolution.

Q8) Attempt **any two** of the following:

[10]

- a) What is vector? Explain use of vector in gene sequencing.
- b) Write a note on whole genome shotgun sequencing.
- c) Write note on pyro-sequencing.



Total No. of Questions : 8]

SEAT No. :

P2731

[5030]-102

[Total No. of Pages : 5

M.Sc.

MICROBIOLOGY

MB - 502 : Quantitative Biology

(2013 Pattern) (Semester - I) (Credit and Semester System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any THREE questions from 1 to 4 (Core credits).*
- 2) *Attempt any TWO questions from 5 to 8 (Non-core credits).*
- 3) *All questions carry equal marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables / Scientific Calculator is allowed.*
- 7) *Assume Suitable data if necessary.*

Q1) Attempt any two of the following:

[10]

- a) Calculate the median from following data:

Number of branches	0-3	3-6	6-9	9-12	12-15
Number of plants	4	8	22	10	2

- b) Calculate the mean deviation from the following data recorded on the length of carrots. Length (cms.) = 9.2, 9.6, 9.7, 9.8, 10, 10.2, 10.6, 11.6, 12.6, 12.7
- c) Determine the correlation coefficient from following data:

x	11	12	13	14	15	16
y	1	2	3	4	5	6

Q2) Attempt any two of the following:

[10]

- a) Write a short note on one tailed and two tailed tests.
- b) A random sample of 10 and 12 persons were fed on diet A and B respectively. The increase to the weight in pounds in a certain period is given in the following table.

P.T.O.

Type of Diet	Increase to weight in pounds											
Diet A	10	6	16	17	13	12	8	14	15	9		
Diet B	7	13	22	15	12	14	18	8	21	23	10	17

Test whether the diet A and B differ significantly as regards their effect on increase in weight (table value of t for 20 d.f. at 5% l.o.s. is 2.086).

- c) Data on two sets of results with regard to number of flowers per plant is given. Analyze the data using appropriate test and give your inference on difference in mean number of flowers (table value of z at 5% l.o.s. is 1.96).

	Set 1	Set 2
n	52	55
Mean	15.55	10.05
Variance	6.3	7.8

Q3) Attempt any two of the following: **[10]**

- a) In a radio listeners survey 120 persons were interviewed and their opinion about preference to Hindi or English music were asked. The results are as follows.

Type of Music	Hindi	English
I	13	45
II	39	23

Test whether the preference for music type is dependent on language (tabulated chi square at 5% l.o.s. for 1 d.f. is 3.84).

- b) The data recorded on five self fertilized F_1 plants segregating for yellow and green seed color are given below. Test the homogeneity of four plants for the 3:1 ratio (tabulated chi square at 5% l.o.s. for 5 d.f. is 11.07).

Plants	Yellow Seeds	Green Seeds
1	46	12
2	25	8
3	23	8
4	25	10
5	35	12

- c) An engineer is concerned with the possibility that too many changes are being made in the setting of automatic lathe. The following are mean diameters (in inches) of 15 successive shafts turned on the lathe: 0.271, 0.268, 0.259, 0.261, 0.257, 0.266, 0.26, 0.258, 0.265, 0.262, 0.263, 0.276, 0.274, 0.273, 0.272. Test the null hypothesis of randomness against the alternate hypothesis there is a frequency alternating pattern (At 5% l.o.s. lower critical value is 3 and upper critical value is 13).

Q4) Attempt any two of the following: **[10]**

- a) Data recorded on dwarf plants are given below. Calculate the Geometric mean.

Dwarf plants	8	12	15	21	35
No. of plants	201	206	310	390	400

- b) Write a short note on standard error and confidence interval.
- c) The ratio of male and the female births is expected to be 1:1. It was found in one village that male children born were 52 and the female were 48. Test that whether these figures fits in the given ratio (tabulated chi square at 5% l.o.s. for 1 d.f. is 3.84).

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

- a) Which are different measurement scales? Explain them in brief.
- b) Draw the frequency polygon from following data:

Number of grains	Number of plants
17-20	6
20-23	10
23-26	17
26-29	22
29-32	14
32-35	8

- c) Seasonal averages of nitrate content (mg/l) of water in three ponds are given in the following table. Represent the data by multiple bar diagram.

Ponds	Summer	Monsoon	Winter
Pond 1	0.45	1.10	0.64
Pond 2	0.69	1.24	0.86
Pond 3	1.22	1.46	0.62

Q6) Attempt any two of the following: **[10]**

- A firm manufactured articles of which 1% are defective. These articles are packed in boxes each containing 5. Find out the probability of boxes which are free from defective articles.
- A traffic police records an average of three road accidents per week. The number of accidents is distributed according to a poisson distribution. Calculate the probability of exactly one accident in any week.
- IQ of children forms a normal distribution with arithmetic mean of 100 and a variance of 100. Among 500 children, randomly chosen, how many are expected to have IQ in the range of 100 to 110.

Q7) Attempt any two of the following: **[10]**

- Explain the concept of Factorial design.
- Explain the phases of Clinical trial.
- Two samples are drawn from two normal populations. From the following data test whether the samples have the same variances at 5% level using F test / Variance ratio test.

Sample - I	60	69	66	55	82	80	77	
Sample - II	83	61	73	80	62	59	81	86

Q8) Attempt any two of the following:

[10]

- a) Write a short note on exponential model.
- b) You sampled 1000 individuals from a large population for the AB blood group, which can easily be measured since co-dominance is involved (i.e. you can detect the heterozygotes). They are typed accordingly:

Blood type	Genotype	No. of individuals
A	AA	490
AB	AB	420
B	BB	90

Find out the Genotypic and allele frequency.

- c) Explain in brief Deterministic Vs Stochastic model.



Total No. of Questions : 8]

SEAT No. :

P2732

[5030]-103

[Total No. of Pages : 2

M.Sc.

MICROBIOLOGY

**MB - 503 : Cell Organization and Biochemistry
(2013 Pattern) (Semester - I) (CSS Pattern)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Q.1 to Q.3 is compulsory.*
- 2) *Attempt at least two from Q.4 to Q.8*
- 3) *All questions carry equal marks.*
- 4) *Draw neat-labeled diagrams wherever necessary.*
- 5) *Use of logarithmic tables and scientific calculators is allowed.*
- 6) *Assume suitable data if necessary.*
- 7) *Figures to the right indicate full marks.*

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

- a) Explain Edman-degradation reaction. State its significance.
- b) Explain why, RNA, and not DNA, is hydrolyzed under basic pH conditions? What is the global charge of the trinucleotide ApGpUpC at neutral pH?
- c) What are tautomers? Give their implication in pairing of bases.

Q2) Attempt any two of the following: **[10]**

- a) Explain the retrieval pathway of residential ER protein back to ER.
- b) Write a note on confocal Microscopy.
- c) Explain structure and function of Golgi apparatus.

Q3) Attempt any two of the following: **[10]**

- a) Explain the process of commitment.
- b) Diagrammatically illustrate the anterioposterior body axis formation in *Drosophila*.
- c) Write a note on Hox code.

P.T.O.

- Q4)** Attempt any two of the following: [10]
- Explain C-signal transduction circuit in Myxobacteria with diagram.
 - Explain the mechanism of quorum sensing. Add a note on Quorum sensing molecules in different types of bacteria.
 - Explain the significance of biofilm formation.
- Q5)** Attempt any two of the following: [10]
- Write a note on bicarbonate buffer system.
 - Explain concept of buffer, strength of buffer and buffer value.
 - How does stereochemistry affects the interactions of organic molecules?
- Q6)** Attempt any two of the following: [10]
- What is mutarotation? Explain with examples.
 - Draw the structure of triglyceride and enlist the functions.
 - Write a short note on terpenes.
- Q7)** Attempt any two of the following: [10]
- Explain uv induced changes in vitamin D and its role in metabolism.
 - Explain the function of iron as a cofactor.
 - What is the coenzyme form of folic acid? Explain its function.
- Q8)** Attempt any two of the following: [10]
- Draw the structure of three major sex hormones and state their functions.
 - Justify:- “Insulin counters high blood glucose”.
 - Explain coordination between hypothalamus and pituitary gland.

Total No. of Questions : 8]

SEAT No. :

P2733

[5030]-201

[Total No. of Pages : 2

M.Sc.

MICROBIOLOGY

MB-601:Instrumentation and Molecular Biophysics

(2013 Pattern)(Semester - II) (Credit-system)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any THREE questions from 1 to 4 (Core credits)*
- 2) *Attempt any TWO questions from 5 to 8 (Non-core credits)*
- 3) *All questions carry equal marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables/Scientific Calculator is allowed.*
- 7) *Assume Suitable data if necessary.*

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

- a) Write a short note on Ion Exchange chromatography.
- b) Explain with suitable example, how fractionation is carried out in differential centrifugation.
- c) A protocol calls for centrifugation at 6000 x g. What r.p.m. should be used with an SS-34 rotor (maximum radius of 10.7 cm) to attain this g force?

Q2) Attempt any two of the following: [10]

- a) Diagrammatically explain components of Fluorescence spectroscopy.
- b) Diagrammatically explain any two analyzers used in Mass spectroscopy.
- c) If concentration of light absorbing substance is 6 g dm^{-3} , the molecular mass of the same substance is 510, path length of cuvette is 2 cm and transmission value is 70%. Calculate the molar extinction coefficient.

Q3) Attempt any two of the following: [10]

- a) Explain Direct lattice and Reciprocal lattice.
- b) What is the principle of NMR spectroscopy? Explain the term spin-spin coupling.
- c) Write a short note on Nuclear Overhauser Effect Spectroscopy.

P.T.O.

Q4) Attempt any two of the following: [10]

- a) Give the differences between Rate Zonal and Isopycnic centrifugation.
- b) Write a short note on Infrared spectroscopy.
- c) Explain any one method of crystallization of proteins.

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

- a) Write a short on motifs and domains.
- b) Explain in brief the cis/trans isomers of peptide group.
- c) Describe tertiary structure of fibrous protein with one example.

Q6) Attempt any two of the following: [10]

- a) Comment on OMIM database.
- b) Write a short note on pair wise sequence alignment.
- c) Write a short note on GENE BANK.

Q7) Attempt any two of the following: [10]

- a) Comment on the use of magnetotactic bacteria in the synthesis of nanoparticles.
- b) Discuss the role of plants in the nanoparticle synthesis.
- c) Explain the significance of Atomic Force Microscopy in nanobiotechnology.

Q8) Attempt any two of the following: [10]

- a) Explain any one commonly occurring secondary structure in protein.
- b) Write a short note on Homology modeling.
- c) Write the protocol for the synthesis of biogenic nanoparticles.



Total No. of Questions : 8]

SEAT No. :

P2734

[5030]-202

[Total No. of Pages : 3

M.Sc.

MICROBIOLOGY

MB - 602 : Virology

(2013 Pattern) (Semester - II) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any THREE questions from 1 to 4 (Core credits).*
- 2) *Attempt any TWO questions from 5 to 8 (Non-core credits).*
- 3) *All questions carry equal marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables / Scientific Calculator is allowed.*
- 7) *Assume Suitable data if necessary.*

Q1) Attempt any two of the following:

[10]

- a) Discuss the fate of virus containing positive sense ssRNA.
- b) Explain the significance of envelope proteins with suitable example.
- c) Elaborate on negative sense RNA as genome of viruses and explain the replication of these RNAs.

Q2) Attempt any two of the following:

[10]

- a) Enlist various serological methods and describe any one method in detail for detection of viruses.
- b) In an animal infectivity assay, virus to be assayed is tenfold diluted and a fixed volume is inoculated in the test units. Following data is obtained. Calculate LD50 value using cumulative values.

P.T.O.

Virus Dilution	Test Unit	
	Dead	Live
10^{-1}	7	0
10^{-2}	5	2
10^{-3}	1	6
10^{-4}	0	7
10^{-5}	0	7
10^{-6}	0	7

- c) Explain the genome packaging of viruses.

Q3) Attempt any two of the following: **[10]**

- a) Describe the criteria to differentiate virus orders, families, genus and species with examples.
- b) Mention the current status of ICTV classification with suitable example.
- c) Give examples of classification of viruses based on transmission vectors.

Q4) Attempt any two of the following: **[10]**

- a) Explain *in ovo* technique for cultivation of viruses.
- b) Describe the different capsid symmetry in viruses.
- c) Mention the mechanism of viroid infection with examples.

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

- a) Explain genome organization of M13.
- b) Explain life cycle of T odd phages.
- c) Comment on Phage therapy for poultry diseases.

Q6) Attempt any two of the following: **[10]**

- a) Explain modern approaches of virus control using Ribozymes.
- b) Explain the mechanism of action of antiviral nucleotide analogues.
- c) Explain the concept of 'Edible viral vaccines' with example.

Q7) Attempt any two of the following: **[10]**

- a) Explain the pathogenesis and treatment of Herpes simplex virus.
- b) Explain pathophysiology of diseases caused by Prions.
- c) Explain infectivity assay of plant virus.

Q8) Attempt any two of the following: **[10]**

- a) Explain the histological and cytological changes that occur in viruses infected Plants.
- b) Explain transmission of plant viruses through nematodes.
- c) Explain methods of prevention of crop losses due to virus infection.



Total No. of Questions : 8]

SEAT No. :

P2735

[5030]-203

[Total No. of Pages : 2

M.Sc.

MICROBIOLOGY

MB - 603 : Microbial Metabolism

(2013 Pattern) (Semester - II) (CSS Pattern)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Q.1 to Q.3 is compulsory.*
- 2) *Attempt at least two from Q.4 to Q.8*
- 3) *All questions are compulsory.*
- 4) *All questions carry equal marks.*
- 5) *Draw neat-labeled diagrams wherever necessary.*
- 6) *Use of logarithmic tables and scientific calculators is allowed.*
- 7) *Assume suitable data if necessary.*
- 8) *Figures to the right indicate full marks.*

Q1) Attempt any two of the following:

- a) Draw the secondary plots in case of uncompetitive inhibition to find out value of K_i . **[5]**
- b) Explain the concept of allosterism giving suitable example. **[5]**
- c) How will you construct purification chart of an enzyme. **[5]**

Q2) Attempt any two of the following:

- a) State the laws of thermodynamics. **[5]**
- b) Explain the concept of high energy compounds. **[5]**
- c) Give the Gibb's free energy equation for determination of free energy of hydrolytic reactions. **[5]**

Q3) Attempt any two of the following:

- a) Describe the components of mitochondrial ETC. **[5]**
- b) Explain in brief process of NO_3 respiration. **[5]**
- c) Write a note on chemiosmotic hypothesis. **[5]**

P.T.O.

Q4) Attempt any two of the following:

- a) Explain the process of active transport using F-type ATPase. [5]
- b) Describe architecture of biological membrane. [5]
- c) Write a note on model membranes. [5]

Q5) Attempt any two of the following:

- a) Describe the properties of Nitrogenase enzyme. [5]
- b) Outline the pathway of Arginine biosynthesis. [5]
- c) Describe any two reactions involved in assimilation of ammonium. [5]

Q6) Attempt any two of the following:

- a) Write note on Rubisco. [5]
- b) Describe the process of noncyclic photophosphorylation in purple nonsulphur bacteria. [5]
- c) Differentiate between ETC of photosynthetic plants & photosynthetic bacteria. [5]

Q7) Attempt any two of the following:

- a) Describe the steps involved in starch biosynthesis. [5]
- b) Write a note on photorespiration. [5]
- c) Describe the C₄ Pathway. [5]

Q8) Attempt any two of the following:

- a) What are Dolichols? Explain their functions. [5]
- b) Write a note on fatty acyl CoA synthetase complex. [5]
- c) Give the pathway for biosynthesis of phosphatidylcholine. [5]



Total No. of Questions : 8]

SEAT No. :

P2736

[5030]-301

[Total No. of Pages : 2

M.Sc.

MICROBIOLOGY

MB - 701 : Immunology

(2013 Pattern) (Semester - III) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from 1 to 4 (Core credits).*
- 2) *Attempt any two questions from 5 to 8 (Non-core credits).*
- 3) *All questions carry equal marks.*
- 4) *Draw neat-labeled diagrams wherever necessary.*
- 5) *Use of logarithmic tables and scientific calculators is allowed.*
- 6) *Figures to the right indicate full marks.*

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

- a) Explain the role of Toll-like receptors (TLRs) in innate immune mechanisms.
- b) Explain the structure of TCR-CD₃ complex.
- c) Describe in brief the characters of cytokine receptor families.

Q2) Attempt any two of the following: **[10]**

- a) Diagrammatically represent regulation of alternative complement pathway.
- b) Justify, "The mechanism of central tolerance induction is clonal deletion".
- c) Comment on role of T cells in immune regulation.

Q3) Attempt any two of the following: **[10]**

- a) Describe the ELISPOT assay, giving its applications.
- b) Describe use of animal models for study of AIDS.
- c) Explain culturing of anchorage-dependent cells *in vitro*.

P.T.O.

- Q4)** Attempt any two of the following: [10]
- With the help of diagrams, explain role of adhesion molecules in immune activation.
 - Describe cytokine mediated regulation of immune responses, giving suitable examples.
 - Explain assay methods to evaluate phagocytic cell function.
- Q5)** Attempt any two of the following: [10]
- How tumors escape host defense mechanisms?
 - What are tumor vaccines? Explain giving examples.
 - Discuss use of immune adjuvants in prevention and treatment of tumors.
- Q6)** Attempt any two of the following: [10]
- How host immune system responds to extracellular bacterial pathogens?
 - Explain the pathophysiology in cutaneous leishmaniasis.
 - Describe immuno-prophylaxis of tuberculosis.
- Q7)** Attempt any two of the following: [10]
- Explain the mechanism of symptoms development in systematic lupus erythomatosus.
 - How T cell deficiency disorders are diagnosed?
 - Discuss the immuno-therapeutic approaches for rheumatoid arthritis.
- Q8)** Attempt any two of the following: [10]
- Discuss evolution of cellular defenses in lower invertebrate species.
 - Justify, “To defend against life threats in terrestrial environment, functional and inducible specific humoral factors appeared during course of evolution of immune system among vertebrate species”.
 - Discuss the complexity of immune system among different species of vertebrates.



Total No. of Questions : 8]

SEAT No. :

P2737

[5030]-302

[Total No. of Pages : 2

M.Sc.

MICROBIOLOGY

MB - 702 : Molecular Biology - I

(2013 Pattern) (Semester - III) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from 1 to 4 (Core credits).*
- 2) *Attempt any two questions from 5 to 8 (Non-core credits).*
- 3) *All questions carry equal marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Figures to the right indicates full marks.*
- 6) *Use of logarithmic tables / Scientific Calculator is allowed.*
- 7) *Assume suitable data if necessary.*

Q1) Attempt any two of the following:

[10]

- a) State the principle of epitope tagging. Give its applications.
- b) Explain Phage display system.
- c) Explain activity gel assay with example.

Q2) Attempt any two of the following:

[10]

- a) Explain the role of cAMP and CAP in regulation of lac operon.
- b) Explain the difference between T7 RNA polymerase synthesis and switching of sigma factor in SPO1 infection in *B. subtilis*.
- c) Explain control of trap operon by attenuation.

Q3) Draw neat well labeled diagram of any two of the following:

[10]

- a) t-RNA processing.
- b) r-RNA processing.
- c) Splicing by spliceosome.

P.T.O.

Q4) Attempt any two of the following: [10]

- a) Explain Expressed Sequence tags with Example.
- b) Explain with suitable example the significance of non coding RNA.
- c) If *E. coli* mutant strain synthesizes β -galactosidase, without showing effect of presence or absence of inducer. What genetic defects might be responsible for their phenotype.

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

- a) Justify "Insertion sequences is an integral part of Tn".
- b) Explain Ty elements in yeast.
- c) What are the controlling elements in Tn5.

Q6) Attempt any two of the following: [10]

- a) Explain MALDI as a tool in Proteomics.
- b) Explain how SDS Gel electrophoresis play a vital role in proteomics.
- c) How would you deduce the structure of newly identified protein using mass spectrometry.

Q7) Attempt any two of the following: [10]

- a) Explain Hot start PCR is different from normal PCR.
- b) Explain the principle of DNA microarray. Give its applications.
- c) Explain with examples molecular diagnostic tools used in detection of cancer.

Q8) Write short notes on any two of the following: [10]

- a) TnA.
- b) Nested PCR.
- c) Enlist applications of proteomics.



Total No. of Questions : 8]

SEAT No. :

P2738

[5030]-303

[Total No. of Pages : 2

M.Sc.

MICROBIOLOGY

**MB - 703 : Industrial Waste Water Treatment
(2013 Pattern) (Semester - III)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any Three from Q.1 to Q.4.*
- 2) *Attempt any two from Q.5 to Q.8*
- 3) *All questions carry equal marks.*
- 4) *Draw neat labelled diagram wherever necessary.*
- 5) *Use of logarithmic tables and scientific calculators is allowed.*
- 6) *Assume suitable data if necessary.*
- 7) *Figures to the right indicate full marks.*

Q1) Attempt any two:

[10]

- a) Explain TOC method of measurement of organic matter. What is the relationship between BOD, COD and TOC.
- b) Describe Respirometric determination of BOD.
- c) Discuss the determination of Total Solid content from waste water.

Q2) Attempt any two:

[10]

- a) Give significance of flocculation process in waste water treatment.
- b) Describe flotation and give its significance.
- c) Describe membrane filtration process.

Q3) Attempt any two:

[10]

- a) Describe composting process of sludge.
- b) Explain Trickling Filter / Activated Sludge combined treatment process.
- c) Briefly explain anaerobic suspended Growth processes.

P.T.O.

Q4) Attempt any two: [10]

- a) Define COD. Give Flow Chart of COD estimation.
- b) Explain Flow equalization process.
- c) Explain disinfection with chlorine dioxide.

Q5) Attempt any two: [10]

- a) Describe the characteristic of Textile waste.
- b) Elaborate on variation in effluent treatment from different food processing industry with suitable examples.
- c) How is color removed from paper and pulp industry effluent.

Q6) Attempt any two: [10]

- a) What is significant impact? How is it determined.
- b) What is EIA? Explain the need for it to be introduced.
- c) Explain Phase II, study of EIA.

Q7) Attempt any two: [10]

- a) Describe the principle elements of Rotating Biological contactor reactor.
- b) Discuss measures for controlling membrane Fouling in MBR.
- c) Explain working of SAFF Reactors.

Q8) Attempt any two: [10]

- a) Justify :- MBBR is most effective and efficient waste water treatment system.
- b) Describe biological treatment of dairy waste.
- c) Discuss, Identity, Predict and Judgement with respect to EIA study.



Total No. of Questions : 8]

SEAT No. :

P2739

[5030]-401

[Total No. of Pages : 2

M.Sc.

MICROBIOLOGY

**MB - 801 : Pharmaceutical & Medical Microbiology
(2013 Pattern) (Semester - IV) (Credit and Semester System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from 1 to 4 (Core Credits).*
- 2) *Attempt any two questions from 5 to 8 (Non-Core Credits).*
- 3) *All questions carry equal marks.*
- 4) *Draw neat-labeled diagrams wherever necessary.*
- 5) *Use of logarithmic tables and scientific calculators is allowed.*
- 6) *Figures to the right indicate full marks.*

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

- a) What is a "Candidate drug"? Explain the steps in selection of a candidate drug.
- b) Explain in brief, principles and tools of rational drug discovery.
- c) How toxicity testing of a candidate drug is carried out?

Q2) Attempt any two of the following: [10]

- a) Explain Stokes method for susceptibility testing of clinical isolates.
- b) Discuss the CLSI guidelines for susceptibility testing, giving its significance in anti-infective drug discovery.
- c) Describe the susceptibility testing methods used for clinical isolates of *Mycobacterium tuberculosis*.

Q3) Attempt any two of the following: [10]

- a) Giving suitable examples, explain docking mechanisms of bacterial pathogens.
- b) Describe *in vitro* and *in vivo* assay systems for cholera toxin.
- c) How bacterial pathogens overcome specific humoral defenses of host?

P.T.O.

- Q4)** Attempt any two of the following: [10]
- What is the objective and outcome of phase IV clinical trial?
 - Discuss the advantages and disadvantages of using liquid media for MIC determination?
 - Explain evasive mechanisms of bacterial pathogens.
- Q5)** Attempt any two of the following: [10]
- Explain laboratory methods to study interactions among anti-infectives, when used in combination.
 - List the drugs targeting cell wall biosynthesis in bacteria. Diagrammatically illustrate the mechanism of action for any one.
 - Explain the principle and use of microcalorimetric technique to evaluate activity of anti-infective agents.
- Q6)** Attempt any two of the following: [10]
- How adverse drug reactions are classified?
 - Justify, “Drug combination therapy is more associated with risks than benefits”.
 - Explain the *in vivo* and *in vitro* tests for carcinogenicity.
- Q7)** Attempt any two of the following: [10]
- How pharmacopeia help in maintaining uniformity and standards in pharmaceutical industry.
 - What are ADME studies? How these are useful in development of a candidate drug?
 - What are targeted drug delivery systems? Explain with suitable examples.
- Q8)** Attempt any two of the following: [10]
- Give the mechanism and significance of resistance development by ESBL producers.
 - What will be the defensive strategies in biological warfare?
 - Explain epidemiology of avian influenza?



Total No. of Questions : 8]

SEAT No. :

P2740

[5030]-402

[Total No. of Pages : 2

M.Sc.

MICROBIOLOGY

MB - 802 : Molecular Biology - II

(2013 Pattern) (Semester - IV) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from 1 to 4 (Core credits).*
- 2) *Attempt any two questions from 5 to 8 (Non-core credits).*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of log tables, Scientific calculator is allowed.*
- 5) *Assume suitable data, if necessary.*
- 6) *Draw neat, labeled diagrams wherever necessary.*

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

- a) Give the protocol of Maxam Gilbert method of gene sequencing.
- b) What are conserved genes? Give their significance in eukaryotic genome.
- c) Elaborate epigenetic mechanisms of gene silencing.

Q2) Attempt any two of the following: **[10]**

- a) What are the essential features of YAC as a cloning vector.
- b) Give a flowchart for the production of BT Cotton.
- c) Give a protocol for screening gene libraries.

Q3) Attempt any two of the following: **[10]**

- a) With suitable example explain how novel antibiotics are generated through gene manipulations.
- b) What are polyhydroxyalkanoates? Give a protocol for their production through RDT.
- c) Comment on synthesis of genetically modified high quality protein drugs.

P.T.O.

Q4) Attempt any two of the following: [10]

- a) What is genotyping and phenotyping of a patient? How is it done?
- b) What is site directed mutagenesis? How is it applied for making altered proteins?
- c) What are naturally occurring biopolymers? Give protocol for the production of one such biopolymer using recombinant microbial system.

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

- a) Comment on usefulness of GM animals.
- b) What are types of gene therapy? Write applications of gene therapy.
- c) What are the disadvantages of using transgenic plants?

Q6) Attempt any two of the following: [10]

- a) Enlist xenobiotic compounds. Explain the strategies used to degrade such compounds.
- b) How is fructose synthesized from starch using recombinant microbe?
- c) What is a superbug? How is it constructed for bioremediation?

Q7) Attempt any two of the following: [10]

- a) What are the important findings of the human genome project?
- b) Elaborate *E. coli* genome project.
- c) Justify “Gene annotation is a tool is genome projects.”

Q8) Attempt any two of the following: [10]

- a) Comment on medicinal applications of genetically modified organisms.
- b) How is silage fermented from polysaccharides using GMO?
- c) What are the salient features of Rice Genome project.



Total No. of Questions : 8]

SEAT No. :

P2741

[5030]-403

[Total No. of Pages : 3

M.Sc.

MICROBIOLOGY

MB - 803 : Microbial Technology

(2013 Pattern) (Semester - IV) (Credit System)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Attempt any three questions from 1 to 4 (Core credits).*
- 2) *Attempt any two questions from 5 to 8 (Non-core credits).*
- 3) *All questions carry equal marks.*
- 4) *Draw neat diagrams wherever necessary.*
- 5) *Figures to the right indicate full marks.*
- 6) *Use of logarithmic tables / Scientific Calculator is allowed.*
- 7) *Assume Suitable data if necessary.*

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

- a) With the help of a diagram, describe the construction of a CSTR. State the situations in which such a bioreactor is used.
- b) Delineate the advantages and limitations of Batch and Fed Batch fermentation processes.
- c) Describe the construction of Air lift bioreactor. State the situations in which air lift bioreactor is used.

Q2) Attempt any two of the following: **[10]**

- a) What is KLa? Explain its significance in determining aeration rate and how it is measured.
- b) What is NP? Explain its significance in determining power requirements of an bioreactor.
- c) Explain the basic principles of various biosensors.

Q3) Attempt any two of the following: **[10]**

- a) Describe the production of protease using immobilized cells.
- b) Production of Pullulan from Beet Molasses and Synthetic Medium by *Aureobasidium pullulans* was examined in this study.

P.T.O.

Results obtained are as shown in figure,

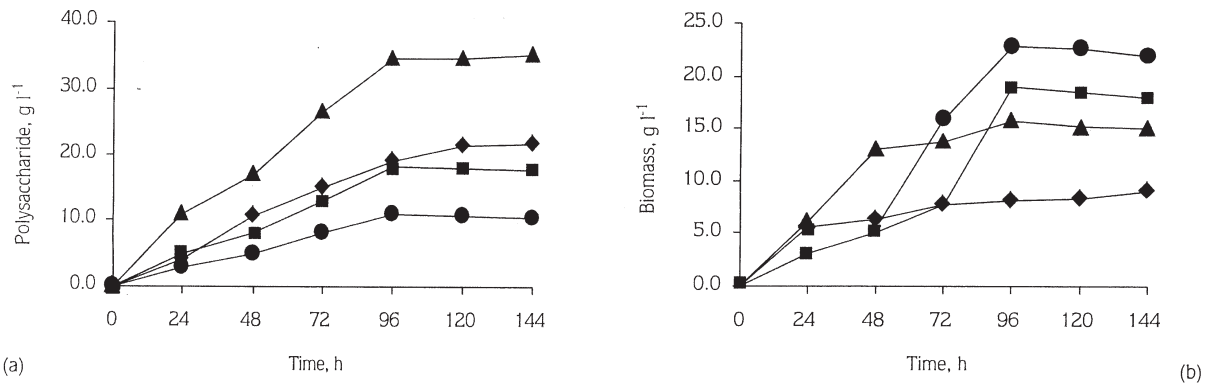


Figure 1. Polysaccharide (a) and biomass (b) production of *A. pullulans* in synthetic medium (◆), sulfuric acid + activated carbon treated molasses (▲), sulfuric acid treated molasses (■), potassium ferrocyanide treated molasses (●) in shake flasks at 28 °C, 200 rpm (pH 7.5, initial sugar concentration = 50 g l⁻¹).

Interpret the results and answer the following:

- Which medium is most productive for the pullulan and why?
 - Which medium is most suitable for the biomass generation and why?
- c) Describe patents and designs as forms of IPR.

Q4) Attempt any two of the following: **[10]**

- Explain the flow patterns created by different types of impellers.
- Describe the various techniques for determination of K_{La} .
- Graphically represent the production of protease and leakage of cells during batch fermentation by immobilized cells for the consecutive three cycles.

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

- Describe concept of growth non-associated metabolites and their control.
- How the mycelial pellet form growth during fermentation is important in context with product yield?
- How the cell proliferation can be affected by shearing of cells?

Q6) Attempt any two of the following: **[10]**

- a) Describe the role of fungi in bioremediation.
- b) Delineate the applications of fungi in food industry.
- c) Explain the cytoskeleton of fungal cell and its importance.

Q7) Attempt any two of the following: **[10]**

- a) Describe production of recombinant Malaria vaccine.
- b) Explain production of recombinant Lipase enzyme.
- c) Introduce Gene therapy by nucleic acid-based products.

Q8) Attempt any two of the following: **[10]**

- a) Describe the essential characteristics of SOP.
- b) Explain the concept of ISO certification.
- c) Explain the principles of validation process.

