Total No. of Questions : 5] **SEAT No. :**

P-470 **[Total No. of Pages : 2**

[4332] - 101

M.Sc. (Semester - I)

MICROBIOLOGY

MB - 501 : Microbial Diversity and Taxonomy

(2008 Pattern)

Time : 3 Hours] [Max. Marks : **80**

Instructions to the candidates:-

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

Q1) What is "Polyphasic Strategy of Classification of Prokaryotes" Explain why this approach is necessary in taxonomy of bacteria. **[16]**

OR

Describe the modern chemotaxonomic methods used in identification and differentiation of bacteria.

Q2) Attempt any two of the following:

a) Describe the method of extracting total DNA from a soil sample. **[8]**

b) What is metagenome analysis? Draw a flow-chart to carry out metagenome analysis. **[8]**

c) Describe the drawbacks of estimating bacterial diversity from a water sample using culturable methods. **[8]**

P.T.O.

Q3) Attempt any two of the following:

a) Justify the statement, 'Primer selection for PCR is crucial in gene sequencing'. **[8]**

b) Explain any one method to identify unculturable bacteria. **[8]**

c) Explain errors in gene sequencing due to improper amplification process. **[8]**

Q4) Attempt any two of the following:

a) Justify,'dominance in number of one type of organism in an ecosystem does not attribute a dominant role for that organism in the ecosystem'.**[8]**

b) Justify why morphological characterization is adequate for fungal classification upto the Class level. **[8]**

c) Write a short note on 'BLAST'. **[8]**

Q5) A water body has been contaminated with run-off water from an oil refinery. Explain how you would measure the possible difference in bacterial diversity. Draw a flow chart of your strategy. **[16]**

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Total No. of Questions : 5]

SEAT No. :

P471

[Total No. of Pages : 3

[4332] - 102
M.Sc. (Semester - I)
MICROBIOLOGY
MB - 502 : Quantitative Biology
(2008 Pattern)

Time :3 Hours] *[Max. Marks :80*

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***
4) ***Use of logarithmic tables, graph papers and scientific calculators is allowed.***
5) ***Assume suitable data if necessary.***
6) ***Figures to the right indicate full marks.***

Q1) Attempt any two of the following: **[16]**

a) What is pie diagram? Draw a pie diagram of the following data relating to the areas under cultivation of different crops in one of the Indian state in the year 1987-88.

Crops	Rice	Jowar	Bajra	Maize	Wheat
Area in thousand hectors	3123	1572	324	296	11

b) What is Skewness and Kurtosis and how are they measured?

c) Data recorded on soluble nitrogen N (mg/leaf) and total chlorophyll (mg/leaf) are given below:

Soluble nitrogen (mg/leaf)	1.04	1.34	2.00	2.44	1.36	0.92	1.40	0.29	1.21	2.27
Total Chlorophyll (mg/leaf)	0.75	1.32	1.76	2.67	1.42	0.73	1.71	0.40	1.12	2.61

Calculate the regression coefficient (b).

P.T.O.

Q2) Attempt any two of the following: **[16]**

a) From the data given below, find out whether the mean values of three samples differ significantly or not.

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

b) What is Simulation? Explain computer simulation of biological system.

c) Maturity data recorded on an early maturing mutant variety of Castor used for production biodiesel. Calculate variance, standard deviation and coefficient of variation.
Days of maturity = 140, 140, 141, 141,142, 145, 146, 150, 150, 155

Q3) Attempt any two of the following: **[16]**

a) In one microbiological, dairy fermented food samples were collected from six different dairy products. The number of *Lactobacillus* spp. were enumerated and count was expressed as 1×10^4 cfu/ml. Test the hypothesis that number of organism present in each sample does not depend on the particular sample using appropriate test.

Sample No.	1	2	3	4	5	6
Lactobacillus spp. (1×10^4 cfu/ml)	80	83	101	60	93	87

b) Define mode. Calculate the mode of the following data:

Wt. of seeds (mg)	0-5	5-10	10-15	15-20	20-25	25-30
Number of spikes	2	4	8	5	4	1

c) Describe the epidemiological model in biology.

Q4) Write short notes on any four of the following: **[16]**

a) Significance level

b) Compare correlation and regression

c) Hypothesis testing

d) Absolute and relative measures of dispersion

e) Non-parametric test

Q5) Attempt any two of the following: **[16]**

a) A pharmaceutical company claim to develop a drug, which increases hemoglobin content (g/100ml) of 10 subjects is measured before and after administration of the drug as given below. Test whether the company's claim is valid.

Subject	1	2	3	4	5	6	7	8	9	10
Hb before	10	9	11	12	8	7	12	18	10	9
Hb after	12	11	13	14	9	10	12	14	11	12

b) If two parents, both heterozygous carrier of the autosomal recessive gene causing cystic fibrosis, have five children. What is the probability that three will be normal?(Assume- monohybrid heterozygous cross)

c) Calculate the probability of following:

i) What is the probability of getting a joker and ace from a pack of 54 cards?

ii) A person is known to hit the target in 4 out of 5 shots. Whereas another person is known to hit the target in 3 out of 4 shots. Find the probability of the target being hit at all when they both try.

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Total No. of Questions : 5]

SEAT No. :

P472

[Total No. of Pages : 2

[4332] - 103

M.Sc. (Semester- I)

MICROBIOLOGY

MB - 503 : Cell Organization and Biochemistry

(2008 Pattern)

Time :3 Hours] *[Max. Marks :80*

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***
4) ***Use of logarithmic tables and scientific calculators is allowed.***
5) ***Assume suitable data if necessary.***
6) ***Figures to the right indicate full marks.***

Q1) Attempt any two of the following: **[16]**

a) Diagrammatically explain anterio-posterior body axis formation in *Drosophila.*

b) What are steroids ? Explain their structure and function with suitable examples.

c) Describe the targeting of proteins of ER by cotranslational and posttranslational pathway.

Q2) Attempt any two of the following: **[16]**

a) Explain the role of hydrophobic and hydrophilic interactions in biomolecules.

b) Justify: "Intermediate filaments come in wide variety of types and impart mechanical stability to animal cells".

c) Explain the phenomenon of quorum sensing and its role in microbial communities.

P.T.O.

Q3) Attempt any two of the following: **[16]**

a) Draw the structure of a dinucleotide that might be obtained by the partial hydrolysis of DNA and RNA. Indicate the following:
   i) The 5' end
   ii) The 3' end

b) How will you localize and study an organelle in a eukaryotic cell?

c) Describe structure and function of fibrous proteins.

Q4) Write short notes on any four of the following: **[16]**

a) Host - guest interaction.

b) Teratogenesis.

c) Henderson Hasselbalch equation.

d) Vitamin D.

e) Anomers.

Q5) a) Indicate whether and where the following peptides are cleaved by the indicated treatments. Justify your answer. **[10]**

Peptide		Treatment
a.	Phe-Arg-Pro	Trypsin
b.	Phe-Met-Leu	Carboxypeptidase B
c.	Ala-Gly-Phe	Chymotrypsin
d.	Gly-Met-Pro	CNBr

b) Calculate the pH of the final solution when 100 ml of 0.1 M NaOH is added to 150ml of 0.2 M CH_3COOH ($K_a = 1.8 \times 10^{-5}$). **[6]**

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Total No. of Questions : 5]

SEAT No. :

P473

[Total No. of Pages : 2

[4332] - 201

M.Sc. (Semester - II)

MICROBIOLOGY

MB - 601 : Instrumentation and Molecular Biophysics

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Attempt any two of the following: **[16]**

a) What is gel filtration chromatography? Explain distribution coefficient in gel filtration.

b) Explain the concept behind 2D gel electrophoresis. What are its advantages and limitations over other methods of protein characterization?

c) What is density gradient centrifugation? How was it used to determine semiconservative mode of DNA replication?

Q2) Attempt any two of the following: **[16]**

a) Explain the four measurable NMR parameters namely chemical shift, intensity, line-width and spin-spin coupling constants.

b) Explain the principle behind mass spectroscopy. What is GC-MS? What are its biological applications?

c) Explain how does X-ray crystallography reveals the 3-D structure of biomolecules in atomic details?

P.T.O.

Q3) Attempt any two of the following: **[16]**

a) What is the difference between Chou-Fasman, Garnier-Osguthrope-Robson and Lim's steriochemical method for determining the secondary structure of proteins?

b) All L amino acids have an S absolute configuration except L-cysteine. Explain why L-cysteine is designated as the R absolute configuration.

c) Explain the partial double bond and polar character of the peptide bond.Comment on phi and psi angles.

Q4) Write short notes on any four of the following: **[16]**

a) Radioactive isotopes used in biology

b) Alpha helix

c) Protein motifs

d) Pulse chase experiment

e) Optical Rotatory Dispersion (ORD) spectroscopy and its uses.

Q5) Solve **[16]**

a) Calculate the molar absorption coefficient of $KMnO_4$ at 530 nm based on the following measurement data: absorbance of a 2.5×10^{-4} M $KMnO_4$ solution in a 1cm path length cuvette is 0.582, and absorbance of a 4.5×10^{-4} M $KMnO_4$ solution in a 1cm path length cuvette is 1.048.

b) Tropomyosin, a 93-kd muscle protein, sediments more slowly than does hemoglobin (65 kd). Their sedimentation coefficients are 2.6S and 4.31S, respectively. Which structural feature of tropomyosin accounts for its slow sedimentation?

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Total No. of Questions : 5]

SEAT No. :

P474

[Total No. of Pages : 2

[4332] - 202

M.Sc. (Semester - II)

MICROBIOLOGY

MB - 602 : Evolution, Ecology and Environmental Microbiology (2008 Pattern)

Time :3 Hours] ***[Max. Marks :80***

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data if necessary.***

Q1) Attempt any one of the following: **[16]**

a) Enlist the various anoxic processes used in wastewater treatment. Describe and differentiate the unit operations for nitrification and denitrification.

b) Discuss the concept of evolutionary r and k selection. Explain their various regulating factors.

Q2) Attempt any two of the following: **[16]**

a) Discuss in brief the various methods employed in bioremediation and phytoremediation.

b) Explain the regulations and limits for the wastewater disposal into lakes, rivers and on land.

c) Describe the growth and distribution patterns of marine microplankton and its regulation by environmental conditions.

P.T.O.

Q3) Attempt any two of the following: **[16]**

a) Describe the ecological significance of rhizosphere.

b) Discuss in brief the evolution of social behavior in microorganisms with suitable examples.

c) Explain the significance of rhizosphere environment and recognition phenomenon in mycorrhiza formation.

Q4) Write short notes on any four of the following: **[16]**

a) Residual chlorine and dechlorination.

b) Industrial ETP layout for sugar and distillery unit.

c) Adsorption using granular and activated carbon.

d) Role of the "harting net" in mycorrhizal associations.

e) Neo-Darwinism.

Q5) A municipal wastewater having a BOD of 250 mg/L is to be treated by a two stage tricking filter. The desired effluent quality is 25mg/L of BOD. If both of the filter depths are to be 1.83 meter and the recirculation ratio is 2:1, find the required filter diameter of each filter.

Design assumptions:

Flow rate = 7570m^3/d, wastewater temperature = 20^oC,

BOD removal in primary sedimentation = 35%, $E_1 = E_2$. **[16]**

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Total No. of Questions : 5]

SEAT No. :

P475

[Total No. of Pages : 2

[4332] - 203
M.Sc. (Semeter - II)
MICROBIOLOGY
MB-603 : Microbial Metabolism
(2008 Pattern)

Time :3 Hours] *[Max. Marks :80*

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculators is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Attempt any two of the following: **[16]**

a) Discuss the steps involved in King Altmsn approach to derive two substrate enzyme catalyzed reaction.

b) Describe the coordinated regulation of glutamate dehydrogenase, glutamine synthase, and glutamate synthase during ammonia assimilation.

c) Explain the concept of free energy of a biochemical reaction in relation to feasibility of reaction.

Q2) Attempt any two of the following: **[16]**

a) Describe the principle and operation of ion exchange chromatography in purification of enzymes.

b) When ratio of NADPH/NADP in the chloroplast is high, photophosphorylation is predominantly cyclic. Is oxygen evolved during cyclic photophosphorylation? Can the chloroplast produce NADPH this way? What is the main function of cyclic photophosphorylation?

c) What are liposomes? How are they useful?

P.T.O.

Q3) Attempt any two of the following: **[16]**

a) How are allosteric enzymes regulated? What is their significance?

b) What are laws of thermodynamics? How are they applied to biochemical system?

c) Aerobic bacterium of genus Nitrosomonas can survive with NH_3 and CO_2 as their only source of nitrogen and carbon. Where do these bacteria obtain energy and reducing power to transform CO_2 to glucose? Explain.

Q4) Write short notes on any four of the following: **[16]**

a) Model membranes

b) Regulation of synthesis of pyruvate family of amino acids

c) Inhibitors and un couplers of electron transport chain

d) Generation and maintenance of proton motive force

e) Biochemical mechanism of sulfate reduction.

Q5) a) The bacterium Methylophilis methylotrophus can synthesize protein from methanol and ammonia. Recombinant DNA techniques have recently improved yields of this synthesis by introducing glutamate dehydragenase gene from E. coli to M.methlotrophus. Explain this increase in yield. **[8]**

b) When illuminated in the presence of water and CO_2, broken chloroplast fragments produce molecular O_2. Isotope experiments with ^{18}O labeled water or $C^{18}O_2$ showed the following:

Sr. No.	Tracer experiment	MW of oxygen produced
1	^{18}O labeled CO_2, un-labeled water	32.00
2	^{18}O labeled water, unlabeled CO_2	36.00

What do these results indicate about the source of the molecular oxygen produced during photosynthesis? **[8]**

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Total No. of Questions : 5]

SEAT No. :

P476

[Total No. of Pages : 2

[4332] - 301
M.Sc. (Semester - III)
MICROBIOLOGY
MB - 701 : Immunology
(2008 Pattern)

Time :3 Hours] *[Max. Marks :80*

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat - labelled diagrams wherever necessary.***
4) ***Use of logarithmic tables and scientific Calculators is allowed.***
5) ***Assume suitable data if necessary.***
6) ***Figures to the right indicate full marks.***

Q1) Attempt any two of the following : **[16]**

a) Describe nature of cytokine activities , giving suitable examples.

b) Justify, "Spatial control prevents uncontrolled activation of complement pathways".

c) Explain the structure and function of receptors for antigen on T cells.

Q2) Attempt any two of the following: **[16]**

a) Explain T cell mediated suppression of immune system.

b) Justify, "IgM was retained in course of evolution despite appearance of new immunoglobulin molecules".

c) Describe the characters features of benign and malignant tumors.

Q3) Attempt any two of the following: **[16]**

a) What are tumor markers? Giving suitable examples explain their use in diagnosis of cancer.

P.T.O.

b) Explain the protective immune mechanisms in infections with extracellular pathogens.

c) Explain diagnosis of HIV-AIDS.

Q4) Write short notes on any four of the following: **[16]**

a) Functional assays for phagocytic function.

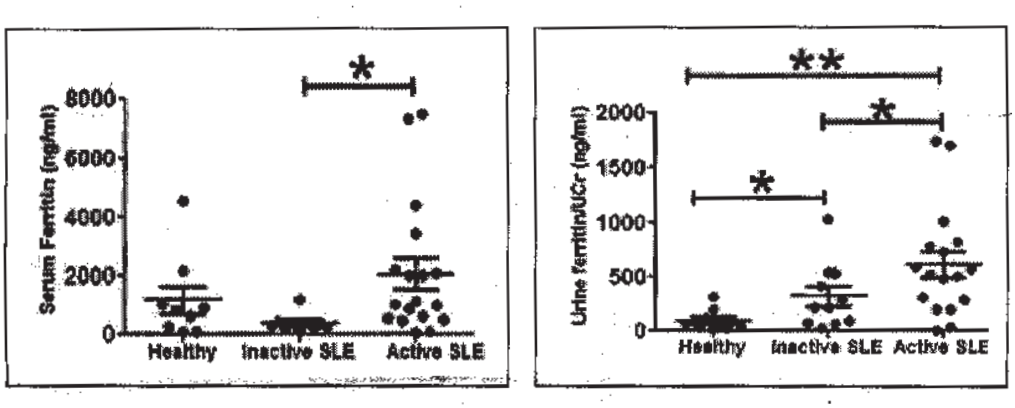
b) Use of transgenic animals in immunological tolerance.

c) Toxic shock syndrome.

d) Determination of antibody affinity by equilibrium dialysis.

e) Prognosis of T cell deficiencies.

Q5) In a comparative study to identify novel biomarkers of disease activity in systemic lupus erythematosus (SLE); serum and urine ferritin levels and urine creatinine levels of healthy (N = 9), inactive SLE (N = 10), and active SLE patients (N = 18) was determined by ELISA. Data were analyzed for possible correlation. The data are represented as follows: **[16]**



a) Ferritin is an acute phase reactant and SLE is being an inflammatory disease of autoimmune origin; based on the above data discuss suitability of serum and /or urine ferritin as biomarker in monitoring of disease activity?

b) Explain the prognosis of SLE. Justify, "Outcome of this experiment will be useful in improving the prognosis of SLE".

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Total No. of Questions :5]

SEAT No. : ____

P477

[Total No. of Pages : 2

[4332] - 302

M.Sc. (Semester - III)

MICROBIOLOGY

MB-702 : Molecular Biology - I

(2008 Pattern)

Time :3 Hours] ***[Max. Marks :80***

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, and scientific calculators is allowed.***
6) ***Assume suitable data if necessary.***

Q1) Attempt any two of the following: **[16]**

a) Explain the role of Ruv protein complex in resolving the Holiday junction?

b) Explain the Site Specific Recombination by serine recombinases.

c) What are histones? How do histone chaperons direct nucleosome assembly to sites of new DNAsynthesis?

Q2) Attempt any two of the following: **[16]**

a) Describe the process of DNA replication in mitochondria.

b) Explain how yeast Ty elements resemble to retroviruses?

c) Explain the mitotic recombination pathway in eukaryotes.

Q3) Attempt any two of the following: **[16]**

a) Explain nucleotide excision repair mechanism in *E. coli*? Which proteins are involved in eukaryotes for the same?

b) Explain the role of different proteins involved in Ras pathway.

c) Explain the role of p53 Proteins in tumor suppression.

P.T.O.

Q4) Write short notes on any four of the following: **[16]**

a) Pseudogenes.

b) Src kinase.

c) DNA damage by UV.

d) Transcription coupled repair system.

e) LINES.

Q5) Consider the data from following table. **[16]**

Effect of reassociation temperature on apparent percentage of repetitive DNA.

DNA	Temperature of reassociation in ^{o}C	% of genome as repetitive DNA
Human	51	43
	60	34
	66	25
Mouse	51	53
	60	34

a) Why there is a change in reassociation temperature affect the percentage of the genome classified as repetitive DNA.

b) What dose the temperature effect indicates about mammalian DNA.

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Total No. of Questions : 5] **SEAT No. :**

P478 **[Total No. of Pages : 2**

[4332] - 303
M.Sc. (Semester - III)
MICROBIOLOGY
MB -703 : Virology
(2008 Pattern)

Time :3 Hours] ***[Max. Marks :80***

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***
4) ***Use of logarithmic tables, and scientific calculators is allowed.***
5) ***Assume suitable data if necessary.***
6) ***Figures to the right indicate full marks.***

Q1) Attempt any two of the following: **[16]**

a) Describe the different capsid symmetry in viruses.

b) Explain ***in vitro*** techniques for cultivation of viruses.

c) What are the objectives of ICTV? Enlist the general rules of ICTV.

Q2) Attempt any two of the following: **[16]**

a) Explain how Lambda Phage establishes a lysogenic state in ***E. coli.***

b) Describe the genomic organization and general characters of Herpes Simplex virus.

c) Enlist serological methods for virus detection and describe any one method in detail.

Q3) Attempt any two of the following: **[16]**

a) Justify M13 Phage can be used as a vector for cloning.

b) Explain the histological changes that occur in virus infected plant.

c) Explain the mechanism of action of antiviral nucleoside analogue.

P.T.O.

Q4) Write short notes on any four of the following: **[16]**

a) Viroids

b) Interferon

c) Indicator plants

d) Nucleic acid probes

e) Phage therapy for poultry disease

Q5) A virus preparation was serially diluted in a buffer. 0.1 ml of each dilution was inoculated into 8 separate tissue culture flasks containing healthy monolayer of tissue culture. The cytopathic effects were detected in monolayer after incubation The data is provided in the following table: **[16]**

Virus Dilution	No. of infected monolayers
10^{-1}	8
10^{-2}	7
10^{-3}	5
10^{-4}	3
10^{-5}	1
10^{-6}	0

a) Calculate TCID 50 value of the original virus preparation.

b) Calculate virus index.

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Total No. of Questions : 5]

SEAT No. :

P479

[Total No. of Pages : 3

[4332] - 401

M.Sc. (Semester - IV)

MICROBIOLOGY

MB - 801: Pharmaceutical and Medical Microbiology

(2008 Pattern)

Time :3 Hours] *[Max. Marks :80*

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat, labeled diagrams wherever necessary.***
4) ***Use of the logarithmic table, electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Figures to the right indicate full marks.***

Q1) Answer *any two* of the following: **[16]**

a) Explain the objectives, conduct and outcome of phase IV clinical trials for antibacterial drugs.

b) Enlist different methodologies in rational drug discovery. Explain any one, in detail.

c) What are drug interactions? Explain *in vivo* and *in vitro* drug interactions.

Q2) Answer *any two* of the following: **[16]**

a) Explain the screening strategies to study mode of action of drugs inhibiting protein synthesis in bacteria, giving suitable examples.

b) Explain the need for clinical laboratory standards and its significance in discovering new antimicrobial agents.

c) Describe the factors affecting diffusion of antibacterial drugs in solid nutrient media.

P.T.O.

Q3) Answer *any two* of the following: **[16]**

a) Describe role of adhesions in bacterial pathogenesis.

b) Explain *in vivo* and *in vitro* assay systems for cholera toxin.

c) Discuss the role of enzymes in invasion of host tissues by bacterial pathogens.

Q4) Write short notes on *any four:* **[16]**

a) Ames' test

b) Subacute toxicity studies

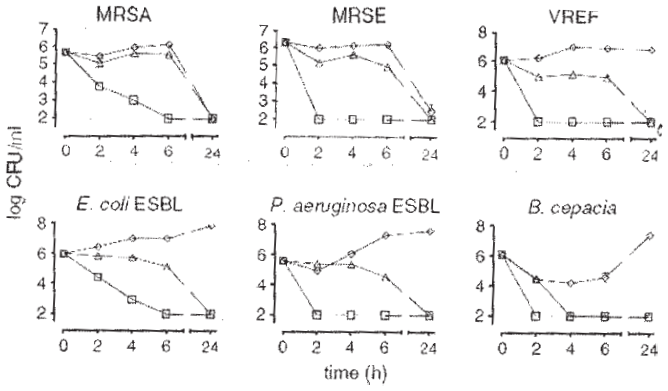
c) Siderophores

d) Pathogenicity islands

e) Lead optimization

Q5) Honey has potent activity against both antibiotic sensitive and -resistant bacteria. It is used traditionally for topical antimicrobial application to wounds. As honey is diluted by its hygroscopic characteristics and by wound exudate, rapid broad-spectrum bactericidal activity, and up to high dilution is a prerequisite for its successful application.

Kinetics of killing of antibiotic resistant bacteria by different dilutions of medical-grade honey was investigated. Bacteria were incubated in honey diluted to 40% (squares), 20% (triangles), and 10% (diamonds). At the indicated time points, survival was determined quantitatively:



[MRSA = methicillin resistant *Staphylococcus aureus,* MRSE = methicillin resistant *S. epidermidis,* VREF = vancomycin resistant *Enterococcus faecium*, ESBL = extended spectrum beta-lactamase, *B. cepacia* = *Burkholderia cepacia* ATCC 25416 type strain]

a) Explain the effect of dilution of honey on its antibacterial activity against all different drug resistant pathogens tested. **[10]**

b) Give the steps to develop honey into an FDA approved topical antimicrobial application got for the wounds. **[6]**

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Total No. of Questions : 5]

SEAT No. :

P480

[Total No. of Pages : 3

[4332] - 402
M.Sc. (Semester - IV)
MICROBIOLOGY
MB - 802 : Molecular Biology - II
(2008 Pattern)

Time :3 Hours] *[Max. Marks :80*

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Use of logarithmic tables, graph papers and scientific calculators is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) Attempt any four of the following with reference to transcription/post-transcriptional processing in eukaryotes. **[16]**

a) Key elements of m-RNA decay pathways.

b) Guide RNA in RNA editing.

c) Capping of 5' end of m-RNA.

d) Polyadenylation of 3' end of m-RNA.

e) Noncoding RNAs as regulators of gene expression.

f) Riboswitch as a regulators.

Q2) Describe the principle, working and applications of any two of the following techniques. **[16]**

a) Microarray.

b) Southern blotting.

c) Real time PCR.

P.T.O.

Q3) Justify any two of the following. **[16]**

a) Multiple regions in RNA polymerase directly contact promoter DNA.

b) Sigma factors are organized into cascade in sporulation event.

c) Micro RNAs are widespread regulators in Eukaryotes.

Q4) Comment on any two of the following: **[16]**

a) Genome sequencing projects.

b) Disarmed Ti plasmid as a vector system for gene manipulation in plants.

c) Importance of blue, white screening and α complementation of β galactosidase in selection of clones.

Q5) a) The transcription and translation of a protein that is routinely synthesized and secreted by a certain type of glandular cell in reptiles is studied in detail. **[8]**

i) The protein's gene consists of 5318 base pairs. How many bases will occur in the primary mRNA transcript produced from this gene?

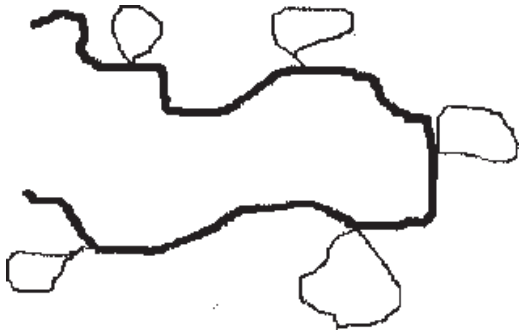
ii) During its post-transcriptional modification, the length of this mRNA transcript is increased by several hundred nucleotides. What is added to contribute to this increase in length?

iii) At the end of its post-transcriptional modification, the mRNA, now designated as mature mRNA, consists of 1222 nucleotides. What has been responsible for decreasing the length of the transcript?

iv) The protein consists of 262 amino acids. How many of the nucleotides present in the mature mRNA strand are required to code for these amino acids?

v) Identify the sections of the mature mRNA strand that make up the remaining, that is, noncoding, portions of the mature mRNA.

b) DNA from a eukaryotic gene was isolated, denatured, and hybridized to the mRNA transcribed from the gene. (Hybridization involves bonding the mRNA to the single template strand of DNA using the same base-pairing rules). The following hybridized structure was observed. The thicker lines indicate there are two strands together while the thinner lines represent only one strand.



In the above figure, identify the DNA and RNA strands, introns and exons. Explain. **[8]**

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Total No. of Questions : 5]

SEAT No. :

P481

[Total No. of Pages : 2

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M.Sc. (Semester - IV)

MICROBIOLOGY

MB - 803 : Microbial Technology

(2008 Pattern)

Time :3 Hours] *[Max. Marks :80*

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neat labelled diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Justify "Newtonian fluids obey Newton's law of viscous flow while non Newtonian do not". Discuss the various types of non-Newtonian fluid with their rheogram. **[16]**

OR

Describe the commercial production of Rifamycin with the help of flow chart. Discuss the various process parameters critical in Rifamycin yield.

Q2) Attempt any two of the following: **[16]**

a) Describe the different type of impellers. Explain flow patterns produced by Rushton turbine and propellers.

b) Elaborate "In batch culture growth rate decreases due to depletion of essential nutrients".

c) What is ISO certification? Comment on preparation of SOP.

Q3) Attempt any two of the following: **[16]**

a) What are biosensors? Enlist different type of biosensors, explain any one in detail.

b) Describe the construction and operation of various type of air lift bioreactors.

c) Explain the use of fungi in promoting plant growth with appropriate examples.

P.T.O.

ZQ4) Write short notes on any four of the following: **[16]**

a) Advantages of synthetic vaccines.

b) N_{Re}.

c) Galvanic electrodes.

d) Forms of IPR.

e) Packed bed reactor.

Q5) A wild yeast strain of *Candida utilis* was used for production of lipase. Fermentation was carried out using optimum media and kinetics of lipase production was studied. **[16]**

Data regarding kinetics of lipase production; lipase activity, total produced proteins and cell growth during 7 days of fermentation are given in table.

Table : Time course of lipase production, total proteins and cell growth in optimized medium.

Time (Days)	Cell growth (Cells $cm^{-3} \times 10^{-8}$)	Total proteins (mg cm^{-3})	Lipolytic activity (IU dm^{-3})
0	0	0	0
1	0.8	1.5	0.5
2	1.2	2.8	2.2
3	5.5	2.1	4
4	10	1.8	4.8
5	2	2.4	8
6	1.6	2.4	3
7	0.25	0.25	1.8
8	0	0	0

Interpret the results and answer the following:

a) Draw the graphical representation of data for all the parameters.

b) How the cell growth, total proteins and lipase activity are interrelated?

c) At which phase of the growth the maximum lipolytic activity was obtained?

d) Why did lipase activity decreased more rapidly than proteins after reaching peak at death phase of growth?

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