Total No. of Questions : 5]

SEAT No. :

P451

[Total No. of Pages : 3

[4232] - 102

M.Sc. MICROBIOLOGY

MB 502 : Quantitative Biology

(2008 Pattern) (Semester - I)

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 Cumulative Frequency Curve? Draw "less than" and "more than" cumulative frequency curves from the following data :

Class interval	Frequency
30-40	8
40-50	12
50-60	20
60-70	25
70-80	18
80-90	17

b) Calculate the probability of the following :

i) A bag contains 5 white and 3 black balls. Two balls are drawn at random one after the other without replacement. Find the probability that both the balls are black.

ii) A box contains 4 white, 3 red and 2 black marbles. What is the probability of drawing a white or red marble?

c) Describe the population models in biology.

P.T.O.

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

a) The following results were obtained in a dihybrid cross involving shape of the seeds and the color of the pod.

Round/yellow = 317; Round/green = 109; wrinkled/yellow = 102 and Wrinkled/green = 32.

According to Mendel's laws the theory predicts that these types should be obtained in the ratio of 9:3:3:1. Test whether Law holds true for given data using appropriate statistical test.

b) In testing a new drug, it was found out that 10 out of 10,000 patients suffered from nausea. On the basis of this data, compute the probability that out of 1000 patients chosen at random :

i) Exactly one would suffer from sickness

ii) Exactly three would suffer sickness

iii) More than three would suffer sickness from nausea

c) Calculate the mean and median from the following data :

Class interval	0-3	3-6	6-9	9-12	12-15
Frequency	4	8	22	10	4

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

a) In order to find the effect of *Azolla* growth on the rice field. *Azolla* applied in 10 similar field plots before rice plantation and other 10 similar plots were taken as control (without *Azolla* application). Rice was grown in all these plots and yields were noted as follow:

Plot No	1	2	3	4	5	6	7	8	9	10
With *Azolla*	1.53	1.58	1.61	1.70	1.55	1.65	1.62	1.55	1.71	1.63
Without *Azolla*	1.45	1.38	1.59	1.39	1.48	1.49	1.52	1.5	1.41	1.37

Verify whether there is any significant effect of Azolla inoculation on the yield of rice.

b) Explain the concept of stochastic model.

c) Calculate the variance, standard deviation and the coefficient of variation of the following series data:
Yeast Biomass yield / liter of medium = 17.0, 19.1, 20.0, 20.7, 21.2, 22.7, 22.7, 23.1, 25.2, 26.6.

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

a) Factorial design

b) Non-parametric test

c) Degrees of freedom

d) Primary sequence database

e) Computer application in Systematics

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

a) Calculate the correlation coefficient between the height of the father and his son from given data :

Height of Father (Inches)	65	66	67	68	67	69	70	64	65	63
Height of Son (Inches)	68	65	68	70	67	68	72	66	68	62

Test significance of correlation coefficient and interpret your result.

b) Four different drugs have been developed for the cure of a certain disease. The drugs were tried on patients of three different age groups. The number of cases of recovery from disease per 100 patients is given below.

	Drug			
Age Group	A	B	C	D
G1	24	20	24	17
G2	20	25	30	9
G3	13	28	31	13

Carryout ANOVA and interpret results.

⌘⌘⌘

Total No. of Questions : 5]

SEAT No. :

P454

[Total No. of Pages : 2

[4232] - 202

M.Sc.

MICROBIOLOGY

MB-602 : Evolution, Ecology and Environmental Microbiology

(2008 Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Draw neatlabeled 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 between the unit processes used for nitrification and denitrification.

b) What is Neo-Darwinism. Describe the types of selection based on phenotype characteristics.

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

a) Discuss the principle of strategies used in the flotation unit processes for wastewater treatment.

b) Describe in brief the methods by which an industrial effluent can be treated so that it may be used for domestic and agricultural purposes.

c) Describe the components of rhizosphere ecosystem. Explain various control mechanisms operating within its microbial communities.

P.T.O.

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

a) Explain the evolutionary stability of cooperation and sociality in microorganisms.

b) Elaborate the mechanisms of dissolved organic matter production in marine ecosystem.

c) Delineate the host-fungus interactions in various mycorrhizal associations.

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

a) Residual chlorine and dechlorination.

b) Rotating Biological Contactors.

c) Industrial ETP layout for distillery waste.

d) Game theory.

e) Siderophores.

Q5) The following parameters relate to a completely-mixed activated sludge system. **[16]**

Population equivalent 40,000 = 1050 m^3/d.

Influent BOD = 260mg/L

Required effluent discharge limit not greater than 8 mg/L

Y = 0.6; kd = 0.06d^{-1}

Assume : MLSS in aeration basin = 3850 mg/L.

MLSS in clarifier sludge = 16,500 mg/L

MCRT = 10 days

From these parameters, determine the following :

a) The hydraulic retention time.

b) The sludge volume wasted daily

c) The mass of sludge wasted daily, and

d) The faction of sludge recycled.

⌘⌘⌘

Total No. of Questions : 5]

SEAT No. :

P455

[Total No. of Pages : 2

[4232] - 203

M.Sc.

MICROBIOLOGY

MB-603 : Microbial Metabolism

(2008 Pattern) (Semester - II)

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.***

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

a) What are laws of thermodynamics? Discuss their role in biochemistry.

b) Derive the equation for two-substrate enzyme catalyzed reaction with compulsory order single displacement mechanism.

c) Describe the energy generation pathway in methanogens.

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

a) Justify: Monocotyledonous tropical plants have better photosynthetic ability than dicotyledonous plants.

b) Justify: In uncompetitive inhibition there is increase in the affinity of enzyme towards its substrate in presence of inhibitor.

c) What are inhibitors and uncouplers of oxidative phosphorylation? What is their significance?

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

a) Diagrammatically illustrate the difference between ETC of phtosynthetic plants and photosynthetic bacteria.

b) Describe biosynthesis of pyruvate family amino acids.

c) Describe the mechanisms adapted by various organisms to prevent oxidative damage to nitrogenase.

P.T.O.

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

a) Atkinson's energy charge

b) Significance of Kcat, Catalytic efficiency, K_M

c) Nernst equation

d) Ionophores

e) Membrane potential

Q5) **Solve**

a) The kinetics of an enzyme are measured as a function of substrate concentration in the presence and in the absence of 2 mM inhibitor (I). (a) What are the values of *V*max and K_M in the absence of inhibitor? In its presence? (b) What type of inhibition is it? **[10]**

[S]	**Velocity (μmol/minute)**	
(μM)	**No inhibitor**	**Inhibitor**
3	10.4	4.1
5	14.5	6.4
10	22.5	11.3
30	33.8	22.6
90	40.5	33.8

b) *Nitrobacter agilis* plays an important role in the nitrogen cycle in nature by oxidizing soil nitrite to nitrate in the presence of oxygen. Given the ε_0' values shown below, calculate the potential ATP yield per mole of nitrite oxidized assuming an efficiency of 50%. **[6]**

$NO_3^- + 2H^+ + 2e^- \rightarrow NO_2^- + H_2O$ $\varepsilon_o' = + 0.42$ V

$\frac{1}{2} O_2 + + 2H^+ + 2e^- \rightarrow H_2O$ $\varepsilon_o' = + 0.82$ V

(F = 96.485 KJ/V.mol, R = 8.314 J/mol, Temp = 25°C).

⌘⌘⌘

Total No. of Questions : 5]

SEAT No. :

P456

[Total No. of Pages : 2

[4232] - 301

M.Sc.

MICROBIOLOGY

MB-701 : Immunology

(2008 Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All question 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) Attempt ***any two*** of the following : **[16]**

a) Describe the types of cytokines based on their activity, giving suitable examples.

b) Justify, "Idiotopes on B cell surface immunoglobulins regulates immune responses".

c) Explain the role of TCR associated accessory molecules in T cell function?

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

a) Describe the experimental induction of tolerance in animals.

b) Justify, "Reason for evolution of different immunoglobulins was functional insufficiencies of IgM".

c) Describe the cytological and behavioral differences between tumor tissue and normal tissue.

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

a) Explain the host immune responses that can effectively lead to regression of tumor mass.

b) Explain diagnosis of pathological conditions arising from phagocytic deficiencies.

c) Describe pathophysiology of myasthenia gravis.

P.T.O.

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

a) Symptoms of complement component C 3 deficiency

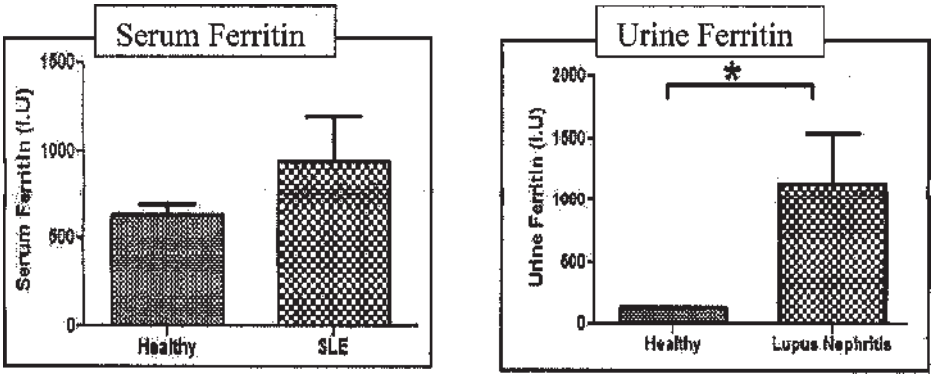
b) Side effects of cancer chemotherapy

c) ELISpot assay

d) Use of cell lines in functional assays of cytokines

e) Hu-SCID mouse

Q5) Proteins that regulate the storage, transfer and release of iron play an important role in inflammation. Ferritin is an acute-phase reactant and is elevated in inflammation, autoimmune disorders, chronic infection and liver disease. A study was carried out to correlate levels of ferritin in systemic lupus erythematosus (SLE) patients. Ferritin levels in serum and urine of healthy (N = 3), SLE (N = 5) and Lupus Nephritis (LN) (N = 5) patients were determined using a protein array. An unpaired Student's t-test with Welch's correction was applied to compare the means between groups. Data represent the mean ± standard error of mean (SEM). *represents P = 0.02. **[16]**



a) SLE is being an inflammatory disease of autoimmune origin; based on the above data, discuss use of ferritin as biomarker in monitoring of disease activity?

b) Explain the conventional methods used for diagnosis of SLE.

⌘⌘⌘

Total No. of Questions : 5]

SEAT No. :

P457

[Total No. of Pages : 2

[4232] - 302

M.Sc.

MICROBIOLOGY

MB -702 : Molecular Biology - I

(2008 Pattern) (Semester - III)

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

a) Describe the cell cycle related to replication in *E. coli*?

b) Explain the Site Specific Recombination by tyrosine recombinases.

c) How is the controlling of transposition achieved in case of Tn 10 element?

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

a) With a suitable example, explain development of superfamily of a gene.

b) Explain the control of regulation of replication in eukaryotes.

c) Explain role of each protein involved in homologous recombination in *E. coli.*

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

a) What is C-value paradox? Explain it with examples.

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

c) Justify, “RB proteins play an important role in tumor suppression”.

P.T.O.

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

a) SOS operon

b) $Cot_{1/2}$

c) Tn5 transposones

d) Gene conversion

e) C-onc genes

Q5) a) In some organisms, cytosine is methylated at carbon 5 of the Pyrimidine ring after it is incorporated into DNA. If a 5-methyl cytosine is hydrolyzed as describe above for cytosine, what base will be generated? And Why?

b) Why is this spontaneous lesion mutagenic? If left unrepaired, what type of mutation will eventually result from hydrolysis of amino group of methyl cytosine?

[16]

⌘⌘⌘

Total No. of Questions : 5]

SEAT No. :

P459

[Total No. of Pages : 2

[4232] - 401

M.Sc.

MICROBIOLOGY

MB-801 : Pharmaceutical and Medical Microbiology

(2008 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

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

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

b) Explain the rational drug design approach to discovery of drugs, giving suitable examples.

c) Explain the significance of ADME studies in preclinical development of drugs.

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

a) Explain the experimental strategies to study mode of action of drugs inhibiting cell membrane functions, giving suitable examples.

b) Enlist the factors affecting antibacterial susceptibility testing in solid media. Explain the significance of critical concentration.

c) Describe the methods to study drug interactions in vitro.

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

a) How bacterial pathogens overcome specific humoral defense mechanisms of host? Explain giving suitable examples.

b) Explain *in vitro* assay systems for diphtheria toxin.

c) Describe the role of extracellular enzymes in bacterial pathogenesis, giving suitable examples.

P.T.O.

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

a) Virulence genes

b) Role of FDA in drug development

c) LAL test

d) Acute toxicity studies

e) Mutagenecity testing

Q5) Interpretive standards and approximate minimum inhibitory concentrations (MIC) for *Pseudomonas* are given below :

Antimicrobial agent	Disc content	Inhibition zone diameter (mm)			Approximate MIC correlates (µg/ml)	
		Resistant	Intermediate	Susceptible	Resistant	Susceptible
Amoxicillin	25µg	≤ 13	14–20	≥ 21	≥ 16	≤ 4
Apalcillin	20µg	≤ 12	13–19	≥ 20	≥ 64	≤ 8
Azlocillin	75µg	≤ 9	10–18	≥ 19	≥ 128	≤ 16

a) Which is the most effective drug? Explain why? **[8]**

b) Give different interpretive methods used in susceptibility testing. **[4]**

c) Enlist the mechanisms by which bacteria acquire drug resistance. **[4]**

⌘⌘⌘

Total No. of Questions : 5]

SEAT No. :

P450

[Total No. of Pages : 2

[4232] - 101

M.Sc.

MICROBIOLOGY

MB-501 : Microbial Diversity and Taxonomy

(2008 Pattern) (Semester - I)

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) Explain the difference between Phenetic Classification and Phylogenetic Classification, with reference to the objectives, methodology and application. **[16]**

OR

Describe the DNA hybridization techniques used to differentiate bacteria at the species level. **[16]**

Q2) Attempt **any two** of the following :

a) Explain the anomalies seen while using molecular biological methods in bacterial taxonomy. **[8]**

b) Explain how the discovery of archaebacteria revolutionized bacterial classification. **[8]**

c) Draw and explain the flow chart for identification of a pure culture of a bacterium, to the species level. **[8]**

Q3) Attempt **any two** of the following :

a) Draw and explain the flow sheet for DNA sequencing. **[8]**

b) Explain why 16S rRNA is significant in systematic bacteriology. **[8]**

c) What is a phylogenetic tree? Explain how it is constructed. **[8]**

P.T.O.

Q4) Attempt **any two** of the following :

a) Justify, 'chemotaxonomy is replacing gene sequencing in bacterial identification'. **[8]**

b) Justify why the Shannon Index is better than the Simpson's Index for expressing bacterial diversity in a ecological sample. **[8]**

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

Q5) Microscopic epifluorescence observations of a soil sample indicated a bacterial load in the order of 10^{12} cells/ g. The part of the same soil sample was subjected to high temperature (90^{o}C) for one hour. The heated sample was examined by standard plating techniques on conventional nutrient media, the viable counts obtained were in the order of 10^{6} CFU/g. Explain the reason for the difference in count by these two methods. Describe the method(s) by which this difference in count could be nullified. **[16]**

■■■

Total No. of Questions : 5]

SEAT No. :

P452

[Total No. of Pages : 2

[4232] - 103

M.Sc.

MICROBIOLOGY

MB 503 : Cell organization and Biochemistry

(2008 Pattern) (Semester - I)

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

a) Diagrammatically illustrate the process of gastrulation in *Drosophila*.

b) How will you classify lipids? Illustrate with examples.

c) Justify: "Three types of cytoskeletal filaments are common to many eukaryotic cells and are fundamental to the spatial organization of these cells".

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

a) What is the intracellular and extracellular buffering system occurring in animals with lungs?

b) Explain the N-terminal and C-terminal sequencing by giving at least two methods for each.

c) Diagrammatically explain organization of the eukaryotic nucleus.

P.T.O.

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

a) Describe regulation of cell cycle in eukaryotes.

b) Justify: 'Morphogen gradients exist in *Drosophila* egg and are responsible for generation of anterior posterior polarity of embryo'.

c) Describe the mechanism of biofilm formation with a suitable example.

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

a) Charge transfer complexes

b) Quaternary structure

c) Polysaccharides

d) t-RNA

e) Vitamin A

Q5) a) If placed in water and adjusted to a pH of 3.0, will the following molecules migrate toward the anode or the cathode if placed in an electrical field? **[8]**

(i) aspartic acid,

(ii) alanine,

(iii) tyrosine,

(iv) lysine,

(v) arginine, and

(vi) glutamine.

Justify your answer.

b) Describe the preparation of 100 ml of 0.1 M phosphate buffer pH 6.7, starting with 1M H_3PO_4 and 1M NaOH. The pKa's for H_3PO_4 are $pKa_1 = 2.1$, $pKa_2 = 7.2$, $pKa_3 = 12.7$ **[8]**

■■■

Total No. of Questions : 5]

SEAT No. :

P453

[Total No. of Pages : 2

[4232] - 201

M.Sc.

MICROBIOLOGY

MB-601 : Instrumentation and Molecular Biophysics

(2008 Pattern) (Semester - II)

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) Explain the principle underlying and detectors used in HPLC.

b) Explain Ion-Exchange chromatography. On what basis the choice of exchangers are made? Discuss "flow through" mode of binding.

c) Give applications of Fluorescence Spectroscopy. Explain resonance energy transfer between the fluors.

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

a) Describe the working of NMR spectroscopy. How does a COSY contour plot helps in understanding protein structure?

b) Explain X-ray Diffraction. How the concept of reciprocal lattice is used in the study of diffracting system?

c) Give the principle of Mass Spectroscopy. How does the fragmentation of sample ions take place in Mass spectroscopy?

P.T.O.

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

a) Explain Ramchandran plot. Larger side chains would result in more restrictions. Justify.

b) Give the principle behind Chou-Fasman Method of determining secondary structure of proteins. Out of the GOR and Chou-Fasman Method which method would you prefer? Give reasons.

c) Give the principle of Pulse-Chase Experiment. How is it used to track protein movement in a eukaryotic cell?

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

a) SDS-PAGE.

b) Chemical Shifts in NMR

c) Phosphor imaging

d) Super Secondary structures of protein.

e) Density gradient centrifugation.

Q5) Solve : **[16]**

a) Calculate the axial length of an α-helix containing 78 Amino acids. How long will the polypeptide chain be if it were fully extended?

b) At $20^{o}C$, human serum albumin has a diffusion coefficient of 6.1×10^{-7} cm^2/sec and a Sedimentation coefficient of 4.6S. The density of water at $20^{o}C$ is 0.998. Calculate the Mr of the albumin, assuming a specific volume of 0.74 at $20^{o}C$.

■■■

Total No. of Questions : 5]

SEAT No. :

P458

[Total No. of Pages : 2

[4232] - 303
M.Sc.
MICROBIOLOGY
MB-703 : Virology
(2008 Pattern) (Semester - III)

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) Enlist various structural proteins and their role in viral life cycle.

b) Explain the use of primary and secondary cell lines in the cultivation of viruses.

c) Describe any one nucleic acid based diagnostic method for detection of viruses.

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

a) Elaborate on rules of nomenclature of viruses.

b) Explain the pathophysiology and infection caused by SV40.

c) How plant viruses are detected using fluorescent antibody technique?

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

a) Explain the mechanism of action and drug resistance for any one antiretroviral.

b) Describe the life cycle of TMV.

c) Comment on need for modern viral vaccines.

P.T.O.

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

a) Prions.

b) Interferon.

c) RIPA (Radioactive Immuno Precipitation Assay).

d) Rinderpest disease.

e) Edible viral vaccines.

Q5) A virus solution is serially diluted in a buffer.0.1 ml of each dilution was inoculated into a set of 5 eggs. The eggs were found to be infected after incubation. The data has been given below. **[16]**

Virus Dilution	No. of eggs infected
10^{-7}	5
10^{-8}	4
10^{-9}	2
10^{-10}	0

a) Calculate virus index.

b) Calculate EID 50 value per ml of the sample.

■■■

Total No. of Questions : 5]

SEAT No. :

P460

[Total No. of Pages : 3

[4232] - 402

M.Sc.

MICROBIOLOGY

MB-802 : Molecular Biology - II

(2008 Pattern) (Semester - IV)

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.***

Q1) Answer any four of the following w.r.t genetic code and translation : **[16]**

a) Membrane binding assay

b) Codon as triplet of bases

c) Modified bases affect anticodon-codon binding.

d) Aminoacyl t RNA synthetase.

e) Molecular chaperons.

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

a) Justify: The "Wallace rule" determines stringency wash temperature of the membrane is Southern blotting.

b) What is the role of different sigma factors in the initiation of transcription in *E. coli*?

c) Comment on "cDNA cloning is better than native gene cloning in eukaryotes".

P.T.O.

Q3) Answer <u>any two</u> of the following : **[16]**

a) State the principal of Sanger's di-deoxy method of DNA sequencing. Add a note on its advantages over other methods of DNA sequencing.

b) Differentiate eukaryotic RNA polymerases w.r.t. their structure and function.

c) Give an account of different enzymes used in making recombinant DNA molecule.

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

a) Cyclic events in PCR

b) Active centers in ribosome

c) Features of YAC

d) Screening of recombinant DNA molecule

e) Mechanism of termination of prokaryotic transcription

f) Eukaryotic mRNA

Q5) a) A typical eukaryotic protein-coding gene has been transcribed onto mRNA molecule having following sequence. **[6]**

5' end - Exon I (100) - Intron I (80) - Exon II (99) - Intron II (48) - Exon III - (78) - A (200) - 3' end

Note : 1) The numbers in the parentheses indicate the number of bases.

2) A stands for Adenine

i) What is the size in bases of the native mRNA and the fully processed mature mRNA?

ii) Diagrammatically represent the linear sequence of native and mature mRNA molecules.

b) An ampicillin resistant plasmid of 8kB DNA from *E. coli* has been extracted, purified and digested *in vitro* using following mixtures of RE. The digest was resolved by gel electrophoresis. **[10]**

The results are shown in the following table:

RE used in the reaction	**Lengths of DNA fragments in KB**			
Sma I and EcoRI	2.0	2.0	4.0	
Sma I and Sau3AI	1.5	6.5		
Sma I and Hind III	2.0	2.5	3.5	
EcoRI and Sau3AI	0.5	2.0	5.5	
EcoRI and Hind III	0.5	1.5	2.0	4.0
Hind III	3.5	4.5		
Sau3AI	8.0			
EcoRI	2.0	6.0		
Sma I	8.0			

i) Draw the positions of bands of DNA-fragments as seen in the agarose gel.

ii) Construct a circular restriction map of the plasmid DNA considering site for EcoRI at 0/8 kB. Show the positions and mapping distance of other restriction sites.

■■■

Total No. of Questions : 5]

SEAT No. :

P461

[Total No. of Pages : 3

[4232] - 403

M.Sc.

MICROBIOLOGY

MB-803 : Microbial Technology

(2008 Pattern) (Semester - IV)

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) Describe the construction and operation of an air-lift bioreactor. Justify that "Air lift bioreactor is more advantageous than conventional CSTR for SCP production" **[16]**

OR

Describe the process of protease production using immobilized cell reactor. How are immobilized cells advantageous over free cells.

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

a) Justify "Rheogram of non-Newtonion fluids deviate from that of Newtonion Fluids" with examples.

b) Illustrate the concept of 2-film theory of O_2 transfer to cell from bubble during aerobic fermentation.

c) Explain the uses of fungi as biofertilizer and biocontrol agent giving suitable example.

P.T.O.

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

a) Justify "In continuous culture specific growth rate is controlled by dilution rate". Describe the operation of basic chemostat with modification for feeding back.

b) Explain the principle underlying recombinant vaccine production using animal cell culture.

c) Discuss principle underlying validation in context with the process qualification giving suitable example.

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

a) N_{Re}

b) Type of impellers

c) DO sensors

d) Forms of IPR

e) Growth associated and growth non-associated metabolites.

Q5) Production of Rifamycin was carried out by *Amylolatoposis mediterranei* XC 9-25 in a 15L stirred tank fermenter. **[16]**

Experiment was carried out in batch and fed batch mode.

Batch fermentation was completed after 144hrs. while for fed batch fermentation glucose and ammonia were fed continuously during fermentation to maintain reduced sugar concentration at 1%- 1.5%and pH value at 6.4-6.6. After 9 days production fermentation broth was harvested.

Time-courses of two fermentations are given below,

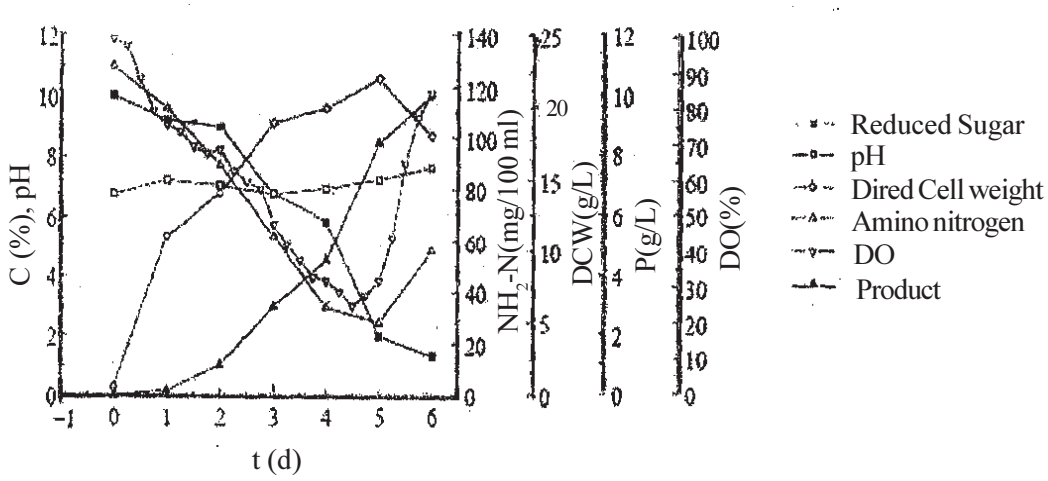


Fig. 1. Batch fermentation process of rifamycin B with *A. mediterranei* XC 9-25 in a 15 L fermentor

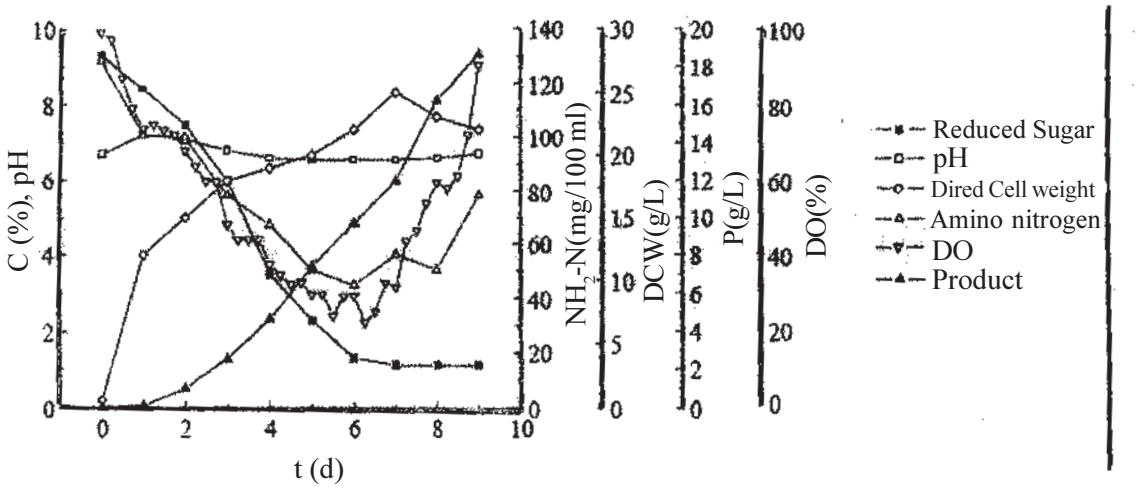


Fig. 2.Rifamycin B fed batch fermentation with continuous feed in a 15 L fermentor

Interpret the results and answer the following :

a) How are DO, biomass and product concentrations related in two modes?

b) Why more amounts of amino nitrogens were needed in fed batch culture?

c) Which one of the two processes was more efficient and why?

d) If this experiment is to be used for scale-up, which mode would you prefer?

■■■