Total No. of Questions : 5] **[Total No. of Pages : 2**

P762

[4032]-101
M.Sc. (Sem. - 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.***

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

a) Elaborate the salient morphological features employed in bacterial taxonomy with suitable examples.
b) Describe how the protein profiles are prepared and used in taxonomy.
c) Describe the methods of extracting total bacterial DNA from a habitat.

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

a) Describe the taxonomic significance of steps involved in gene transfer.
b) Describe the methodological strategy for identification of pure cultures.
c) Compare and contrast local and global alignment.

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

a) Illustrate the major steps involved in rRNA sequencing.
b) Describe the various culture independent molecular techniques for establishing the metagenomic environmental libraries.
c) Explain the significance of database search with the Smith-Waterman dynamic programming method.

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

a) FAME profiles in taxonomy.
b) Isoprenoid quinones as a tool in taxonomy.
c) Compare PAM and BLOSSM.
d) Gradient gel electrophoresis techniques.
e) Phylochip.

P.T.O.

Q5) An experimental soil patch has been treated with a pesticide, which is also known to inhibit some of the microorganisms present in the soil (by an earlier experiment). Design an experiment to determine whether there is a drastic change in the microbial system present in the soil.

In your answer, justify the methodology proposed. **[16]**

Total No. of Questions : 5] **[Total No. of Pages : 3**

P763

[4032]-102
M.Sc. (Sem. - 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 and statistical tables and scientific calculator is allowed.***
5) ***Assume suitable data, if necessary.***

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

a) What are the absolute and relative measures of skewness?

b) Construct a histogram for following data and determine mode graphically.

Class interval	Frequency
0 - 5	05
5 - 10	16
10 - 15	24
15 - 20	14
20 - 30	12
30 - 50	12
50 - 70	08

c) When a 5 ml pipette was used 100 times, the actual volume, it delivered was as follows :

Volume in microliters	Frequency
4850 - 4900	12
4900 - 4950	18
4950 - 5000	20
5000 - 5050	22
5050 - 5100	24
5100 - 5150	04

Determine the standard deviations and coefficient of variance.

P.T.O.

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

a) Persons A and B appeared for an interview for 2 vacancies. Probability of A's selection is 1/3 and probability of B's selection is 4/5.

Find the probability that :

i) A and B both are selected.
ii) Only A is selected.

b) Explain Hardy Weinberg equilibrium model.

c) In an experiment on immunization of cattle from tuberculosis, the following results were obtained. Test whether immunization protects the cattle against tuberculosis.

	Affected	Not affected
Inoculated	12	26
Not inoculated	16	06

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

a) A drug is administered to 10 anemic patients and increments in their hemoglobin level are found to be as follows :

6 3 – 2 4 – 3 4 6 0 0 2

Is it reasonable to conclude that the drug increases the hemoglobin level? Use 5% level of significance.

b) Random samples were drawn from two normal populations (A and B) and the CFU/g values of the types of organisms were recorded. They are as follows :

	CFU/g of samples										
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
A :	66	67	75	76	82	84	88	90	92	ND	ND
B :	64	66	74	78	82	85	87	92	93	95	97

ND : Analysis Not Done

Test whether the two populations have same variance at 5% level of significance.

c) Write a short note on the use of computers in biology.

Q4) Attempt <u>any two</u> of the following : **[16]**

a) Enlist different non parametric tests, their applications and limitations.

b) In a certain bivariate data on height and weight of 10 individuals. The results were obtained.

$\Sigma h = 50$, $\Sigma W = 40$, $\Sigma h2 = 550$, $\Sigma W2 = 600$, $\Sigma hW = 490$.

Find the correlation coefficient between height and weight and interpret the results.

c) In an intelligence test administered to 1000 students, the average score was 42 and standard deviation was 24. Find

i) The number of students exceeding the score of 50.

ii) The value of score exceeded by top 100 students.

Q5) Write short notes on <u>any four</u> of the following : **[16]**

a) Poisson distribution.

b) Two tailed test.

c) Use of logarithmic scale.

d) Level of significance.

e) Merits and demerits of using Mean Values.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P764

[4032]-103
M.Sc. (Sem. - 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-labeled 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) Describe the structure and function of intermediate filaments.

b) Justify that weak interactions are crucial to macromolecular structure and function.

c) Describe the formation of biofilm on surfaces.

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

a) What is quaternary structure of protein? Describe it with suitable example.

b) What are reducing sugars? Describe any one method for estimation of reducing sugars.

c) Describe organizer in *Xenopus*.

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

a) Justify "The cell cycle control system depends on cyclical proteolysis".

b) Diagrammatically illustrate double helix of DNA showing Watson and Crick base pairing.

c) Draw the structure of endoplasmic reticulum and elaborate on its function.

P.T.O.

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

a) Antihemorrhage factor.

b) Weak acids and weak bases.

c) Significance of resonance in biomolecules.

d) Prostaglandins.

e) Dedifferentiation.

Q5) a) A hexapeptide that is part of mouse polypeptide hormone is analyzed by number of chemical and enzymatic methods. **[10]**

i) The amino acid analyzer detected following amino acids : Tyr, Met, Ile, Glu, Cys and Lys.

ii) Two cycle of Edman degradation of the intact hexapeptide released PTH-Met and PTH-Ile.

iii) Cleavage of intact protein with cynogen bromide yields methionine and a pentapeptide.

iv) On trypsinization, intact peptide yielded a tetrapeptide and a dipeptide containing Tyr + Glu.

v) Carboxypeptidase A treatment yielded a pentapeptide and Tyr. What is the amino acid sequence of this peptide?

b) Predict the direction of migration of peptide Gln-Gly-Ala-Glu during electrophoresis at pH 2, 4, 6, and 11, using the information provided in the table. **[6]**

Amino acid	***pka*** **α-COOH**	***pka*** **α-NH_3^+**	***pka*** **R**
Glutamine	2.2	9.1	-
Glycine	2.3	9.6	-
Alanine	2.4	9.7	-
Glutamic acid	2.2	9.7	4.3

Total No. of Questions : 5] **[Total No. of Pages : 3**

P765

[4032]-201
M.Sc. (Sem. - 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) ***Use of logarithmic tables graph papers and scientific calculator is allowed.***
5) ***Assume suitable data, if necessary.***

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

a) Give the principle of Ion-exchange chromatography. Justify the order of retention for Cl (I), NO_2 (I), and NO_3 (I) on an anion exchange column based on their attractiveness toward the resin.

b) Justify "Conjugation leads to bathochromic shifts in the absorption maxima of chromophores".

c) Explain why gel filtration is actually a suitable technique for estimating molecular size rather than molecular mass.

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

a) Discuss in detail the instrumentation used in single crystal X-ray crystallography.

b) Give the principle of NMR. How does a COSEY contour plot helps in understanding protein structure.

c) How is Mass spectrometry applied to analyze the protein molecules to separate and determine their individual characteristics.

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

a) Explain the fractionation done by differential centrifugation. Compare rate-zonal and isopycnic centrifugation.

b) Justify "All conformational space is not accessible for protein folding according to Prof. Ramachandran".

c) Justify "Alpha-helix of proteins and the double helix of nucleic acids have CD spectral signatures representative of their structures."

P.T.O.

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

a) FRET.
b) GC-MS.
c) Iso electric focusing.
d) Liquid scintillation counter.
e) Super secondary structures of protein.

Q5) Solve : **[16]**

a) Briefly describe what each of the following tells you about the characteristics of the proteins of interest described in the statement **(Note : protein is not the same in each statement).**

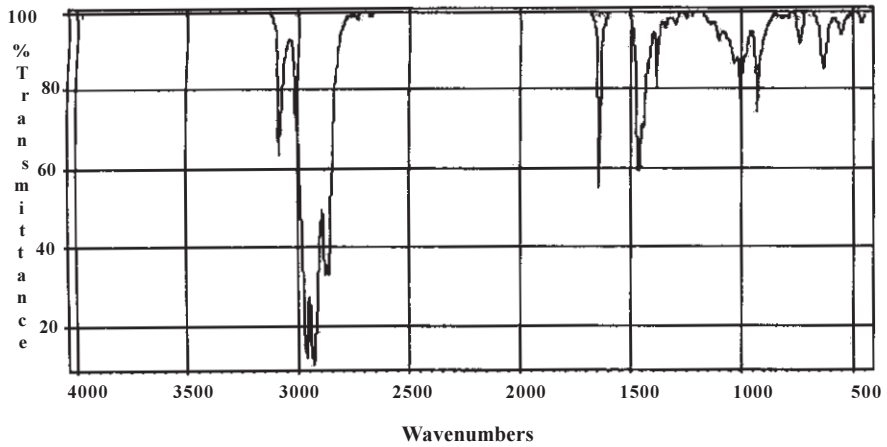
i) When the protein was subjected to ion-exchange chromatography using an anion-exchange column and the buffer of pH 8.0, a protein of interest bound to the column.

ii) When a protein of interest was subjected to IEF, the protein migrated to a position of approximately, pH 7.2 in the pH gradient of the gel.

iii) When a protein of interest was subjected to SDS-PAGE, in both the presence and absence of mercaptoethanol, the protein appeared as 3 bands at molecular mass 42,000, 45,000 and 48,000 Da.

iv) When a solution with various proteins was heated to 60 degree celcius, the protein of interest was found in the precipitate obtained upon centrifugation of the solution.

b)



The given IR spectrum has few strong absorption bands. The spectrum has the various stretch bands near 3000 cm^{-1}. The asymmetric stretch at 2960 cm^{-1} and symmetric stretching vibrational band near 2870 cm^{-1} is seen. At 3080-3020 cm^{-1} medium intensity stretch band is also found. Note the weak absorption near 1650 cm^{-1} and the weak bendingvibrational band just below 1450 cm^{-1}. Interpret the IR spectra and identify the compounds out of following :

i) $CH_3 - CH_2 - CH_2 - CH_3$
ii) $CH_3 - CH_2 - C \equiv C - H$
iii) $CH_3 - CH_2 - CH = CH_2$
iv) $CH_3 - CH_2 - CH_2 - CH_2 - Cl$

☒☒☒☒

Total No. of Questions : 5] **[Total No. of Pages : 2**

P766

[4032]-202
M.Sc. (Sem. - 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-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 one of the following : **[16]**

a) Describe the role of anaerobic heterotrophs in wastewater treatment. Explain the operating parameters for UASB digester.

b) Discuss the molecular evolution with context to the origin of new genes and proteins.

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

a) Describe how chemical disinfection of water is achieved. What is break-point chlorination.

b) Explain the different sedimentation phenomena observed during the process of setting of solids.

c) Describe the various defense mechanisms in plants against microbial pathogens.

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

a) Describe neutral evolution and elaborate on its significance to molecular phylogeny.

b) Explain rhizosphere community and rhizosphere effect.

c) Justify that the plant root exudates regulate the microbial populations in the rhizosphere.

P.T.O.

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

a) Anoxic denitrification.

b) Industrial ETP layout for dyestuff and textile industry.

c) Continuous granular medium filtration.

d) Lectins.

e) Significance of selfish gene in evolution.

Q5) The Following parameters relate to a completely mixed activated sludge system. Population equivalent 50,000 = 10250 m^3/d, influent BOD = 180 mg/L, required effluent not greater than 10 mg/L, y = 0.6, $k_d = 0.06\ d^{-1}$.

Assume - MLSS in aeration basin = 3300 mg/L,

MLSS in clarifier sludge = 14000 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 fraction of sludge recycled. **[16]**

☒☒☒☒

Total No. of Questions : 5] **[Total No. of Pages : 2**

P767

[4032]-203
M.Sc. (Sem. - 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) ***Use of logarithmic tables, graph papers and scientific calculators is allowed.***
5) ***Assume suitable data, if necessary.***

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

a) Diagrammatically illustrate Z scheme of electron transport in plants.

b) Justify : "During competitive inhibition K_m increases where as Vm remains unaltered".

c) Describe various coenzymes involved in methanogenesis and comment on their significance.

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

a) How will you determine free energy change in a redox reaction under standard and non-standard conditions?

b) Derive rate equation for any two substrate enzyme catalyzed reaction using Dalziel (***Phi***) parameters.

c) Describe biosynthesis of aspartate family amino acids.

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

a) Describe structure and function of nitrogenase enzyme. Elaborate on the energy and reducing power requirement per mole of nitrogen fixed.

b) Diagrammatically illustrate shuttle systems across mitochondrial membrane.

c) Explain with the help of suitable example what are gated ion channels?

P.T.O.

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

a) 'Q' cycle.

b) Nernst equation.

c) Photosystem I.

d) Allosteric enzymes.

e) Significance of K_m, Vm and Kcat.

Q5) Solve <u>any two</u> of the following : **[16]**

a) Spinach chloroplasts are illuminated in the absence of ADP and Pi for a short while and the light is turned off. If now ADP and Pi are added, ATP is synthesized for a short time in the dark. How does this work?

b) Sonic treatment of mitochondria yields sub-mitochondrial vesicles capable of both electron transport and oxidative phosphorylation. If these vesicles are treated with reagents that make their membrane 'leaky' their ability to synthesize ATP is lost. Why?

c) In a single substrate enzyme catalyzed reaction, at saturating substrate concentration, an inhibitor caused 90% reduction in velocity. In presence of inhibitor, at less than saturating substrate concentration, at which velocity of the reaction was reduced to half the Vm value; was the same substrate concentration that caused un-inhibited reaction to proceed at half the Vm. Comment on the type of inhibition.

Total No. of Questions : 5] **[Total No. of Pages : 4**

P768

[4032]-301
M.Sc. (Sem. - III)
MICROBIOLOGY
MB - 701 : Immunology
(2008 Pattern) (New)

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

a) Experimental induction of tolerance is difficult to establish in adult stage than in fetal stage.

b) Self red blood cells are not lyzed by autologous or homologous complement.

c) Antigen is not the only factor that regulates host immune response.

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

a) Giving suitable examples, explain the trends in evolution of immune system in invertebrates.

b) Describe the structure and types of T cell receptors.

c) Describe the functional assays for evaluation of cytokines.

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

a) Giving suitable examples, explain the difference between benign and malignant tumors.

b) How the diagnosis of tumor is carried out using different biochemical and immunological markers?

c) What is pathophysiology of myasthenia gravis?

P.T.O.

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

a) Septic shock syndrome.

b) SCID Hu mouse model.

c) Phagocyte function assays.

d) Sources of IFN – α, IFN – β and IFN – γ.

e) Tumor vaccines.

Q5) Interleukin (IL) - 9 is a pleiotropic T_H2 - type cytokine that has been shown to be up-regulated in allergic airway disease, including asthma. IL - 9 has been demonstrated to be a potent stimulus for the production and secretion of mucus from airway epithelial cells via induction of a calcium-activated chloride channel, hCLCAl.

A study was carried out to investigate the expression of IL - 9 and hCLCAl following allergen challenge in the nasal mucosa of allergic rhinitis patients. Nasal biopsies were obtained from allergic rhinitis patients, both before (baseline) and after local antigen challenge with either ragweed or a sakine (control). Immunohistochemistry and *in situ* hybridization were used to assess IL - 9 protein and hCLCAl messenger ribonucleic acid. Eosinophils and T cells were detected using immunohistochemistry.

Table 1 : Numbers of IL - 9 - positive cells, Eosinophils, CD3-Positive T Lymphocytes, and Epithelial hCLCAl and Mucus expression **at baseline** in both groups.

	Saline Challenge Group (n = 7)	*Ragweed Challenge Group (n = 7)*
IL-9-positive cells/field	4.1 ± 1.9	5.3 ± 2.1
Eosinophils/field	3.4 ± 1.3	4.6 ± 1.7
CD3-positive cells/field	36.7 ± 7.5	35.3 ± 8.7
hCLCA1 expression	1.7 ± 1.0	1.6 ± 0.8
Mucus expression	1.3 ± 0.9	1.2 ± 0.7

IL = interleukin, Mean values ± SD. Epithelial expression of hCLCA1 and mucus is scored from 0 (no cells) to 8 (all cells).

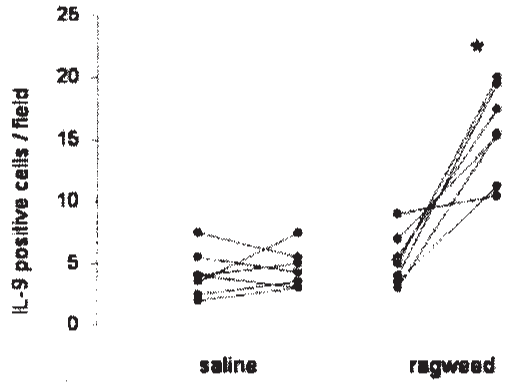


Figure 1: **IL-9 positive cells in the submucosa before and after** challenge with either saline or ragweed. There is a significant increase in IL-9-positive cells after ragweed challenge but not after saline compared with baseline. Value pairs for each patient before and after challenge are shown by connected dots. Mean values are indicated by lines. *p < 0.01

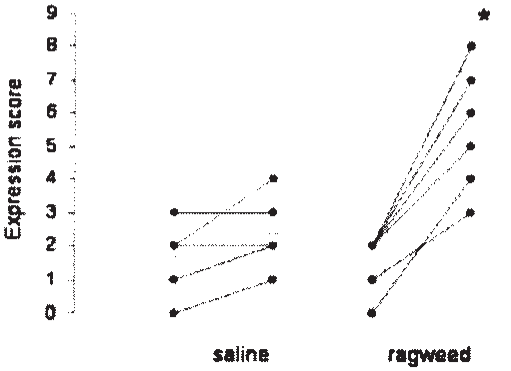


Figure 2: Expression of hCLCA1 in mucus-producing epithelial cells before and after challenge with either saline or ragweed. There is a significant increase in hCLCA1 expression after ragweed challenge but not after saline compared with baseline. Value pairs for each patient before and after challenge are shown by connected dots. Mean values are indicated by lines. *p < 0.01. Epithelial hCLCA1 expression is scored from 0 (no cells) to 8 (all cells).

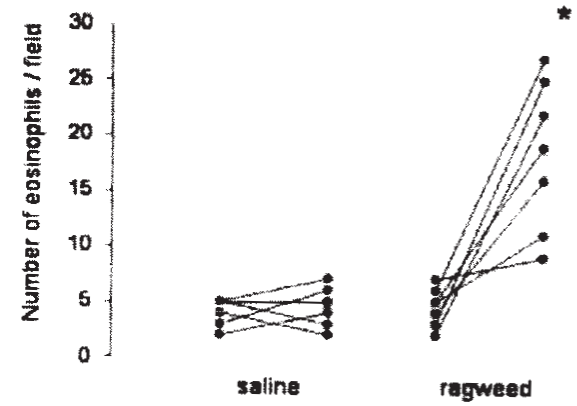


Figure 3: Eosinophils in the submucosa before and after challenge with either saline or ragweed. There is a significant increase in eosinophils after ragweed challenge but not after saline compared with baseline. Value pairs for each patient before and after challenge are shown by connected dots. Mean values are indicated by lines. *p < 0.01.

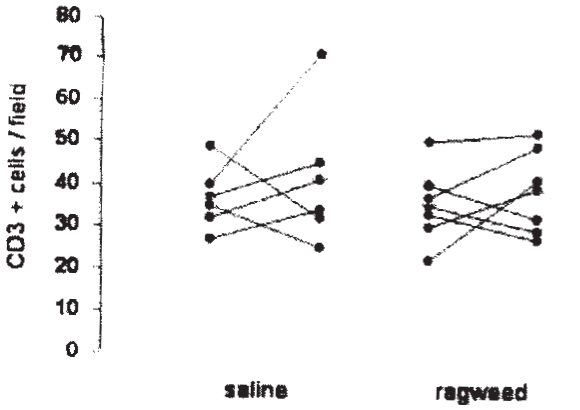


Figure 4: CD3-positive T lymphocytes in the submucosa before and after challenge with either saline or ragweed. There is no significant change after either saline or ragweed challenge compared with baseline. Value pairs for each patient before and after challenge are shown by connected dots. Mean values are indicated by lines.

Based on the data given, answer the following :

a) What is the effect of ragweed challenge on expression of IL - 9 and hCLCAI? **[4]**

b) What is the effect of ragweed challenge on number of eosinophils and T-cell counts? **[4]**

c) What is the relationship between allergen challenge and expression of IL - 9 and hCLCAI? **[4]**

d) Comment on the possible mechanism for the symptoms of rhinitis in allergic airway disease. **[4]**

Total No. of Questions : 5] **[Total No. of Pages : 2**

P769

[4032]-302
M.Sc. (Sem. - III)
MICROBIOLOGY
MB - 702 : Molecular Biology - I
(2008 Pattern) (New)

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 two of the following : **[16]**

a) Diagrammatically illustrate synthesis of Leading and Lagging strand at replication fork in DNA of *E.coli*.
b) Explain the role of Rec A protein in DNA recombination.
c) Justify. "Methylation of histones leads to its inactivation".

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

a) Diagrammatically illustrate the packing of double stranded DNA into higher order compact chromosome in eukaryotic cell.
b) Compare and contrast DNA polymerases in prokaryotes and eukaryotes.
c) Justify, "Mut gene products are required for mismatch repair of damaged DNA".

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

a) Describe rolling circle model of replication of circular DNA.
b) Comment on Mu transposition.
c) Explain the role of RB and p^{53} tumor suppressor genes in cancer.

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

a) Cot curve.
b) Gene conversion.
c) Apoptosis.
d) Intasome.
e) C_PG islands.

P.T.O.

Q5) a) A diploid organism has 6×10^8 bp in its DNA. This DNA is replicated in 6 minutes. Assume that all replication forks move at a rate of 10^4 bp per minutes. How many replicons are present in the genome of this organism? **[8]**

b) A solution of double stranded DNA is heated and then cooled to room temperature over a two minute interval. How will the absorbance at 260 nm change during cooling under the following conditions? **[8]**

i) The solution is heated to just below Tm.

ii) The solution is heated to well above Tm.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P770

[4032]-303
M.Sc. (Sem. - III)
MICROBIOLOGY
MB - 703 : Virology
(2008 Pattern) (New)

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

a) Explain the delicate balance between lytic and lysogenic cycle of phage lambda.
b) Describe the different capsid symmetry in viruses.
c) What are the objectives of ICTV? Enlist the general rules of ICTV.

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

a) Describe the genome organization and general characters of SV40.
b) Explain the histological changes that occur in virus infected plants.
c) Justify, "Plaque method is fundamental method for virus detection".

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

a) Enlist serological methods and describe any one method in detail for detection of viruses.
b) Describe the life cycle of TMV.
c) Explain the mechanism of action of antiviral nucleoside analogues.

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

a) Indicator Plants.
b) Edible viral vaccines.
c) Rinderpest disease.
d) Phage therapy.
e) Prions.

P.T.O.

Q5) a) What is the multiplicity of infection required for infecting 95% of the cells? **[4]**

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 LD_{50} value using cumulative values. **[12]**

Virus dilution	Test unit	
	Dead	Live
10^{-1}	8	0
10^{-2}	6	2
10^{-3}	1	7
10^{-4}	0	8
10^{-5}	0	8
10^{-6}	0	8

Total No. of Questions : 5] **[Total No. of Pages : 2**

P771

[4032]-401
M.Sc. (Sem. - IV)
MICROBIOLOGY
MB - 801 : Pharmaceutical and Medical Microbiology
(2008 Pattern) (New)

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, labeled diagrams wherever necessary.***
4) ***All questions carry equal marks.***
5) ***Use of the logarithmic table, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

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

a) Explain receptor-ligand concept in designing of the drugs.
b) Discuss bioprospecting for discovery of anti-infective agents.
c) Describe toxicity testing in drug development.

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

a) Explain the experimental strategies to study mode of action of drugs affecting bacterial cell membrane function, giving suitable examples.
b) Describe the factors affecting bioassay procedures for antimicrobial agents, using solid media.
c) Explain the methods used for testing of antimalarial drugs, giving suitable examples.

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

a) Describe the role of spreading factors in bacterial pathogenesis.
b) Explain mode of action and assay of cholera toxin.
c) How bacterial pathogens overcome specific humoral defenses of host?

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

a) Pathogenecity islands.
b) Eleck's test.
c) Pyrogenecity testing.
d) Targeted drug delivery.
e) Testing for drug interactions.

P.T.O.

Q5) Following observations were made while investigating effect of chlortetracycline (CTC) upon polyribosome metabolism of *B. megaterium* KM : **[16]**

- At low concentration (around 5×10^{-6}), the drug caused progressive breakdown of polyribosomes during a period of about 6 minutes (time needed for cessation of protein synthesis under these experimental conditions).
- The maximal extent of polyribosome breakdown was close to 50%. With increasing concentrations of CTC, lesser breakdown occurred and at 3×10^{-4} M CTC, polyribosomes were preserved intact.

Illustrate the site of action of CTC with the help of protein biosynthsis pathway and answer the following :

a) Will the CTC act on preformed polyribosomes?
b) Does CTC interrupt peptide chain elongation cycle, preventing relative movement of ribosome and mRNA?
c) Does CTC inhibit initiation of peptide chain formation or terminates peptide chain formation?

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Total No. of Questions : 5] **[Total No. of Pages : 2**

P772

[4032]-402
M.Sc. (Sem. - IV)
MICROBIOLOGY
MB - 802 : Molecular Biology - II
(2008 Pattern) (New)

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) Justify any four of the following with reference to translation/post translational events in prokaryotes. **[16]**

a) Initiation of translation in prokaryotes require interaction of m, r and t RNA.
b) f-met t-RNA has unique features that distinguish it as the initiator t-RNA.
c) Eukaryotes use a complex of many initiation factors.
d) Peptide bond formation is a function of a large ribosomal subunit.
e) Ribosomal translocation requires EF-G and GTP hydrolysis.
f) Certain proteins require 'Molecular Chaperons' for folding.

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

a) Southern blotting technique.
b) Pulse-field gel electrophoresis.
c) Reverse transcriptase PCR.

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

a) Describe the assembly of basal apparatus and RNA polymerase II to initiate transcription at eukaryotic promoter.
b) What is DNA foot-printing? How are DNA and protein interactions studied by DNA footprinting?
c) What is riboswitch? How does it respond to the environmental conditions?

P.T.O.

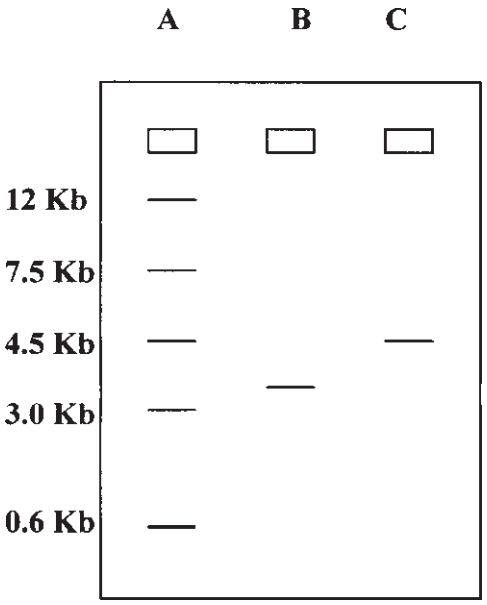
Q4) Attempt <u>any two</u> of the following : **[16]**

a) Write the principle of Sanger's method of DNA sequencing. Compare it with Maxim Gilbert's method. Elaborate on the application of Sanger's method in automated sequencing.

b) Enlist the enzymes used in genetic engineering and discuss their role in detail.

c) Comment on the importance of α complementation of β galactosidase, use of X-gal, and IPTG.

Q5) a) You have cloned a cDNA fragment in the plasmid pBS (2.9kb). Following transformation, you have isolated plasmid DNA coming from a white and a blue colony. After agarose gel electrophoresis of the plasmid preparations, you obtain the results illustrated below (The plasmid DNA was not digested with a restriction endonuclease). **[8]**



Well A : Molecular weight marker. In which well did you load the plasmid coming from a white colony? B/C, explain. Evaluate the size of the DNA fragment cloned in the recombinant plasmid (+ or – 100bp).

b) Draw the banding pattern you would expect to see on a DNA-sequencing gel if you annealed the primer 5'-T-C-G-A-A-3' to the following single-stranded DNA fragment and carried out a DNA sequencing experiment using the dideoxy chain termination method. **[8]**

5'-A-G-C-T-T-G-G-A-C-T-C-A-G-T-A-G-C-T-T-C-G-A-3'

Assume :

i) All four DNA precursors were labelled.

ii) Only the dATP is labelled.

Total No. of Questions : 5] **[Total No. of Pages : 3**

P773

[4032]-403
M.Sc.
MICROBIOLOGY
MB - 803 : Microbial Technology
(Sem. - IV) (2008 Pattern) (New)

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) Elucidate the design of immobilized cell reactor with continuous process. State its advantages over a chemostat. **[16]**

OR

Comment on the necessity to monitor and control pressure during fermentation. Describe various types of sensors used to monitor pressure in reactor vessels.

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

a) Justify with example 'Mycelial forms of growth affects mass transfer of heat and oxygen'.
b) Illustrate various forms of IPR.
c) Describe the process to produce recombinant vaccines using animal cell culture.

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

a) Write the SOP for temperature controlled ultracentrifuge.
b) Explain the unit operations involved in downstream processing of Rifamycin.
c) Explain the various mechanisms involved in regulation of primary metabolites.

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

a) Limitations of batch process.
b) Newtonian fluids.
c) Process validation.
d) Flat blade disk turbine.
e) Growth rate.

P.T.O.

Q5) Pullulan was produced from starch hydrolysate with *Aureobasidium pullulans*. The comparative studies for various starch hydrolysates with differential dextrose equivalent was done. Table 1 details various starch hydrolysates used in the study. Table 2 details the pullulan yield for respective hydrolysates. **[16]**

Table 1. Sugar compositions of starch hydrolysates prepared by 0.1 N HCl treatment

Sugar	DE 30	DE 45	DE 55	DE 75
G1	8.0	14.7	20.2	33.5
G2	9.3	14.5	16.5	24.1
G3	7.8	12.5	12.3	17.4
G4	7.7	10.5	9.8	12.6
G5	6.9	9.2	8.3	7.3
G6	4.5	9.1	6.8	5.3
Higher oligomers	55.8	29.8	26.1	0

G1, G2, G3, G4, G5, and G6 represent glucose, maltose, maltotriose, maltotetraose, maltopentaose, and maltohexaose, respectively. DE represents dextrose equivalent.

Table 2. Production of pullulan from starch hydrolysate by *A. pullulans* SH8646

Dextrose equivalent	Concentration (%)	Pullulan (g/l)	Pullulan yield (%)
25	5	15	30
	10	25	25
	15	35	23
45	5	12	24
	10	20	20
	15	30	20
75	5	17	34
	10	30	30
	15	35	23

Pullulan yield represents the percent ratio of pullulan produced to substrate added. Pullulan content was determined after 7-days cultivation.

Considering the above information answer the following questions ;

a) Define dextrose equivalent.
b) Graphically represent Table 2.
c) Interpret the data to determine.
    i) The best suitable dextrose equivalent for pullulan production.
    ii) Effect of mono-or disaccharides to enhance pullulan production.

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