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

P2288 **[Total No. of Pages : 2**

[4830] - 11
M.Sc. (Semester - I)
MICROBIOLOGY
MB - 501 : Microbial Diversity & Taxonomy
(2008 Pattern)

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

Instructions to the candidates:

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

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

a) Explain & contrast between phenetic & phylogenetic approaches to classification.

b) Describe the role of extra chromosomal element transfer in bacterial taxonomy.

c) Explain the significance of lipid profile in bacterial taxonomy.

Q2) Attempt any two of the followings. **[16]**

a) Justify : the 16S rRNA is the most widely accepted 'Molecular chronometer' in bacterial taxonomy.

b) Describe how the protein profiles are prepared & used in taxonomy.

c) Describe the pair wise dynamic programming & gap penalties in sequence alignment.

Q3) Attempt any two of the followings. **[16]**

a) Describe the significance of databases in proteomic & genomic analysis.

b) Explain the need & techniques of extracting total bacterial DNA from a habitat.

c) Describe the various approaches to access the total number of species.

P.T.O.

Q4) Write short note on any four the followings. **[16]**

a) Applications of FISH in bacterial taxonomy

b) Methods to determine the extent of DNA hybridization

c) BAC library

d) Metagenomic environmental library

e) rRNA as tool in taxonomy

Q5) Microscopic epifluorescence observations of 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 (90^0C) 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 cells/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. :**

P2289 **[Total No. of Pages : 3**

[4830] - 12
M.Sc. 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-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) Water samples were taken from the wells of two localities, one from industrial area

i) and the other from non-industrial area

ii) The samples were analyzed for lead content and the following data were obtained.

Locality 1	Locality 2
Sample size$_1$ = 25	Sample size$_2$ = 25
Mean$_1$ = 390 ppb	Mean$_2$ = 10 ppb
Stand. Dev$_1$. = 277.5 ppb	Stand. Dev$_2$. = 5 ppb

Test the hypothesis that the average lead concentration in the ground water of industrial area exceeds that of the non-industrial area.

b) Describe the models in poulation genetics.

c) Calculate mean and mode of the following data:

Class Interval	0-5	5-10	10-15	15-20	20-25	25-30
Frequency	2	4	8	5	4	1

P.T.O.

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

a) Draw a histogram, frequency polygon representing following data :

Number of pods	10-20	20-40	40- 50	50-70	70-80	80-100	100-130	130-150
Number of plants	13	48	24	20	5	8	6	2

b) Calculate the variance, the standard deviation and coefficient of variation from the data recorded on the respiration rate per minute of 10 persons.

Respiration/minute = 22,22,20,24,16,17,18,19,21,21

c) Calculate the probability of following :

A bag contains 10 balls in the proportion of 7 red and 3 white.

i) If two balls are drawn at random replacing one after other. What is the probability that one is red and other is white?

ii) If two balls are drawn at random one after the other without replacement. What will be the probability that both the balls drawn are black?

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

a) A new drug candidate was administered to 450 persons out of a total 800 persons in a locality where epidemic was prevalent to test its efficacy against malaria. The results are given below in the tabel. Find out effectiveness of drug against disease

	Infection	Noinfection
Drug	200	300
No Drug	250	50

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

c) Explain the concept of epidemiological model.

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

a) Normal Distribution

b) Genome database

c) Significance level

d) Non-parametric test

e) Simulation of bacterial growth

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

a) Calculate the correlation coefficient and regression coefficient between two measurements of water quality of a lake. Comment on both the coefficients.

Salinity (%)	2	4	6	8	10	12	14
Dissolved Oxygen(mg/1)	4	2	5	10	4	11	12

b) To study the performance of three detergents and three different water temperatures; following whiteness readings were obtained with specially designed equipment.

	Detergents		
Water Temperature	A	B	C
Cold water	57	55	67
Warm water	49	52	68
Hot water	54	46	58

Apply two way ANOVA and interpret results.

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

P2290 **[Total No. of Pages : 2**

[4830]-13
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-labeled diagrams wherever necessary.***
4) ***Use of logarithmic tables and seientific calculator 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) Explain the N-terminal methods of sequencing of polypeptide.

b) Explain charge transfer complex and host-guest interactions with suitable examples.

c) Explain the regulation of cell cycle.

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

a) Describe the methods for estimation of nucleic acid.

b) How are proteins imported into mitochondria?

c) Explain Apoptosis.

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

a) Describe cell signaling and communication in Myxobacteria.

b) Explain anterior-posterior axis formation in Drosophila.

c) How is co-translational translocation of protein brought about in ER?

P.T.O.

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

a) Elimination reaction

b) Sugar acid

c) Biofilm

d) Trans differentiation

e) Prostaglandins

Q5) a) A peptide has the sequence

Glu-His-Trp-Ser-Gly-Leu-Arg-Pro-Gly

i) What is net charge of the molecule at pH-3,8,11

ii) Estimate pI of this peptide

Considering the following data

Amino acid	pKa	pKb	pK_R
Glu	2.19	9.67	4.25
His	1.81	9.17	6
Trp	2.38	9.39	-
Ser	2.21	9.15	-
Gly	2.34	9.6	-
Leu	2.36	9.6	-
Arg	2.17	9.04	12.48
Pro	1.99	10.96	-

b) When double stranded DNA is dissolved in formamide the Tm value decreases. When it is dissolved in alkali again its Tm value decreases. Explain.

[16]

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

P2291 **[Total No. of Pages : 2**

[4830] - 21
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) ***Figures to the right indicate full marks.***
3) ***All questions carry equal marks.***
4) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket Calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Neat diagrams must be drawn wherever necessary.***

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

a) Explain the principle of Gas chromatography and dectectors used in it.

b) Explain the principle of Isoelectric focusing gel electrophoresis. What is its benefit over the PAGE.

c) Explain the fractionation performed by differential centrifugation with an example.

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

a) Give the principle and schematic diogrammatical representation of circular Dichroism spectroscopy.

b) Give applications of tracer techniques in biology.

c) Explain the tertiary structure of protein with an example.

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

a) Explain in brief one method of protein purification and crystallization each.

b) What is the principle of NMR spectroscopy? Explain the term chemical shift.

c) Explain principle of Tandem MS and state its use in protein structure determination.

P.T.O.

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

a) Cerenkov radiation

b) Isopycnic centrifugation

c) Electrospray ionization

d) Magnetic sector analyzer

e) Quaternary structure of proteins

Q5) Attempt the following. **[16]**

a) Explain the secondary structure prediction by Garnier-Osguthorpe-Robson (GOR) method.

b) Calculate the relative centrifugal force (RCF) exerted on top and bottom of a fixed angle rotor, dimensions for the maximum radius (r_{max}) at the bottom is 9 cm and for the minimum radius (r_{min}) is 4.8 cm, and the rotor is spinning at the 12000 rpm.

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

P2292 **[Total No. of Pages : 2**

[4830] - 22
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) Describe the role of anaerobic heterotrophs in wastewater treatment. Explain the operating parameters for UASB digester.

b) Discuss the concept of evolutionary r and k selection. Elaborate on the various regulatory factors.

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

a) Enlist the various chemical agents used in flocculation process.

Explain how these chemicals manifest floccules formation

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

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

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

a) Describe the various agencies involved in speciation of sexual and asexual organisms.

b) Describe the various agencies involved in speciation of sexual and asexual organisms.

c) Describe the various agencies involved in speciation of sexual and asexual organisms.

P.T.O.

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

a) Anoxic denitrification

b) Microbial bleaching of dyes

c) Bioremediation

d) Proteinase inhibitors as plant defense agents

e) Significance of selfish gene in evolution

Q5) A municipal waste having a BOD_5 of 250 mg/L is to be treated by a two- stage trickling filter. The discharge limit for BOD_5 is 20 mg/L. The depth of the trickling filter is 6 feet and the recirculation ratio is 2:1. The influent flow rate is 2 Mgal/d. The efficiency of BOD_5 removal at both stages of the filter is the same. **[16]**

Determine the following :

a) BOD_5 loading for both the filters.

b) Diameter of the two filters.

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

P2293 **[Total No. of Pages : 2**

[4830] - 23
M.Sc. (Semester - II)
MICROBIOLOGY
MB - 603 : Microbial Metabolism
(2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

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

a) Differentiate between competitive & uncompetitive inhibitions in enzyme catalysed reactions.

b) Describe the role of glutamate dehydrogenase, glutamine synthetase & glutamate synthetase in ammonia assimilation.

c) Justify 'ATP is high energy compound'.

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

a) Describe the principle & operation of affinity chromatography in purification of enzyme.

b) Describe the biosynthesis of pyruvate family of amino acids.

c) Describe different components involved in mitochondrial electron transport chain.

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

a) Compare plant & bacterial photosynthesis.

b) Describe the energy generation pathway in methanogens.

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

P.T.O.

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

a) Laws of thermodynamics

b) Nitrogenase enzyme

c) Liposomes

d) Inhibitors of oxidative phosphorylation

e) Ammonia oxidation.

Q5) a) A single substrate enzyme catalysed reaction was investigated at fixed total enzyme conc. & the following results were obtained. **[8]**

S_o (mmole/lit)	V_o (μmole/min
1.0	1.10
1.67	1.43
2.0	1.54
2.5	1.75
3.3	2.00
5.0	2.56
10.0	4.00

Draw Michaelis - Menten & Lineweaver Burk plot of these data. Assuming the reaction was proceeding under steady state condition in each case, what type of cooperative effect is indicated?

b) If a maize plant is illuminated in the presence of $^{14}CO_2$, after about 1 second, more than 90% of the radioactivity incorporated in the leaves is found at C_4 of malate, aspartate and oxaloacetate. Only after 60 seconds does ^{14}C appear at C_1 of 3-phosphoglycerate, explain. **[8]**

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

P2294 **[Total No. of Pages : 3**

[4830] - 31
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 labeled diagrams wherever necessary.***
4) ***Use of logarithmic tables and scientific calculator is allowed.***
5) ***Assume suitable data, if necessary.***
6) ***Figures to the right inducate full marks.***

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

a) Describe types of tumor necrosis factors and explain its' role in immune mechanisms.

b) Explain the nature of cytokine receptors?

c) Justify, "Cytokines are indicated in disease development"

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

a) Explain the signal transduction pathways that are initiated by TCR-CD3 complex.

b) Justify, "Gene duplication and point mutations are the possible mechanisms in immunoglobulin evolution".

c) With the help of diagram, explain regulation of alternative complement pathway.

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

a) How T-cell deficiency disorders are diagnosed?

b) Explain the principle and applications of ELISPOT assays.

c) Describe the pathophysiology of Myasthenia Gravis

P.T.O.

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

a) Tumor specific antigens

b) Tumor infiltrating lymphocytes (TILs)

c) Principles of cancer immunotherapy

d) Tumor classification based on immunological properties

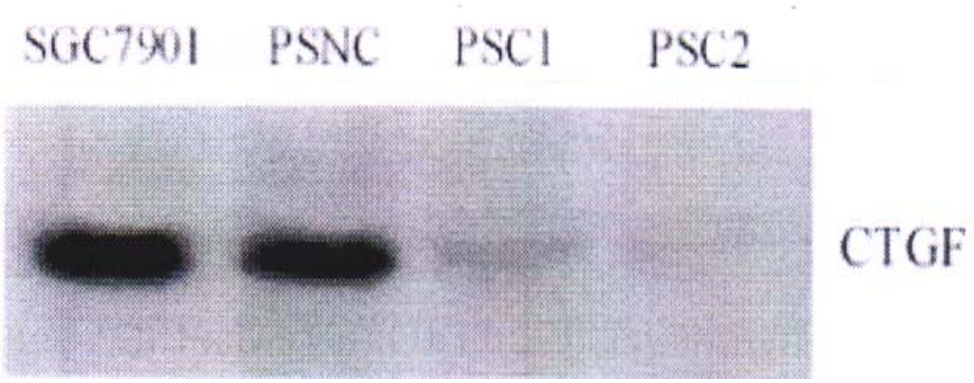
e) Immunity to extracellular bacterial pathogens

Q5) Connective tissue growth factor (CTGF) has been shown to be implicated in tumor development and progression. However, the role of CTGF in gastric cancer was not clear.

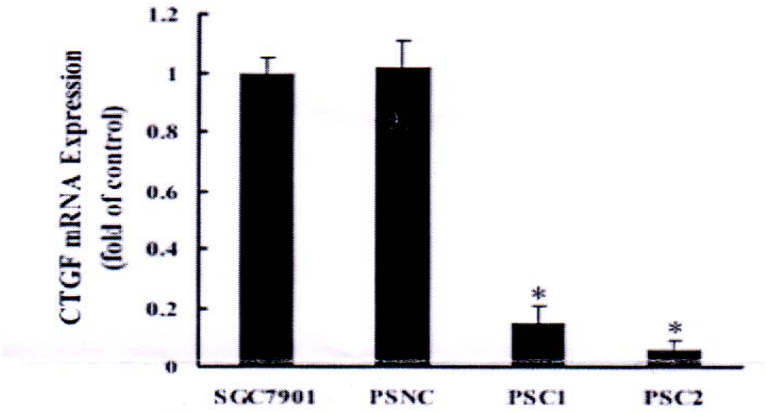
To study the function of CTGF in SGC 7901 cells, the CTGF knockdown stable cell lines were used to analyze the silencing effect. Two small interfering RNA (siRNA) oligonucleotides were synthesized to target two different regions in the CTGF cDNA *viz*. PSC1 and PSC2 The nonspecific siRNA was used as a negative control (PSNC).

Given below :

a) Western blot analysis of CTGF protein expression in SGC 7901, PSNC and CTGF knockdown stable cell lines (PSC 1 and PSC2):



b) RT-QPCR showing CTGF mRNA levels in SGC 7901, PSNC and CTGF knockdown stable cell lines (PSC1 and PSC2). Data are expressed as a fold change relative to control (SGC 7901). Values are given as mean $\pm$ SD of three experiments. *P <0.05 as compared to control.



Based on the given data :

a) How CTGF expression can be used as biomarker for diagnosis and monitoring gastric cancer? **[8]**

b) Explain role of different biomarker in diagnosis of cancer, giving specific examples. **[8]**

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

P2295 **[Total No. of Pages : 2**

[4830]-32
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 and labeled diagrams wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of logarithmic tables and scientific calculator is allowed.***
6) ***Assume suitable data, if necessary.***

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

a) Illustrate the details of replication process in prokaryotes with the help of diagram.

b) Explain the role of Ruv ABC in recombination.

c) Comment on the controlling of Tn 10 transposition.

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

a) Explain the role of p53 proteins in cancer.

b) Describe Cot ½ and Rot ½ values.

c) Explain in brief replication features of single stranded phages.

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

a) Elaborate the role of (ORC) in eukaryotes.

b) Justify “methylation of histones leads to inactivation”.

c) Describe the mechanism of mismatch repair.

P.T.O.

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

a) SINES

b) Gene imprinting

c) Composite transposons

d) Molecular markers of tumor

e) Pseudogenes

Q5) a) Vertebrate and plant cells often methylate cytosine in DNA to form 5-methylcytosine In these same cells, a specialized repair system recognizes G-T mismatches and repairs them to G-C base pairs. Explain the mechanism of this repair system. **[8]**

b) The diploid human genome comprises 6.4×10^9 bp and fits in the nucleus that is 6 μm in diameter. In this DNA the base pair occurs at intervals of 0.34 nm along the DNA helix, what is the length of DNA in human cell? **[8]**

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

P2296 **[Total No. of Pages : 2**

[4830]-33
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, labeled diagrams wherever necessary.***
4) ***Use of log table and electronic pocket calculator is allowed.***
5) ***Assume suitable data if necessary.***

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

a) Describe the genome organization and multiplication of Cauliflower mosaic virus.

b) Patho-physiological changes caused by simian 40 virus Explain.

c) How are cell lines prepared in laboratory? How are they used for cultivation of viruses?

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

a) Describe disease forecasting

b) Retroviruses are oncogenic.

c) Explain in *ovo* technique for cultivation of viruses

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

a) Capsid symmetries in viruses.

b) Morphogenesis during life cycle of bacteriophage T_7 in *E.coli.*

c) LINE probe assay technique for detection and identification of viruses.

P.T.O.

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

a) Symptoms of viral diseases in plants

b) Comment on need subunit vaccines

c) Interferons

d) Prions

Q5) Answer the following : **[16]**

To measure effective infective dose of avian virus, five eggs were inoculated per virus dilution, column A indicates 10 folds dilution of the virus, column B indicates no.of eggs infected (HA +ve).

Column A	Column B
Dilution of inoculum	Number of eggs infected
10^{-6}	5
10^{-7}	4
10^{-8}	1
10^{-9}	1
10^{-10}	0

Calculate :

LD 50 using cumulative values.

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

P2297 **[Total No. of Pages : 3**

[4830] - 41
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 labelled diagrams wherever necessary.***
4) ***Use of logarithmic tables, and scientific calculator 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) Explain in brief, the concepts and methodologies of bio-prospecting in discovery of drugs.

b) Giving suitable examples, explain structure activity relationship for a drug.

c) What are the *in vitro* methods to determine mutagenic properties of a candidate drug?

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

a) Give an outline of clinical drug trials

b) Explain the role of Food and Drug Administration authorities in drug development.

c) What are bio-availability studies? Explain giving suitable examples.

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

a) How bacterial pathogens cross host defence system barriers?

b) Explain the role of siderophores in pathogenesis of bacteria.

c) Describe assay of cholera toxin in animals.

P.T.O.

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

a) Pathogenicity islands

b) Pili as virulence mechanisms

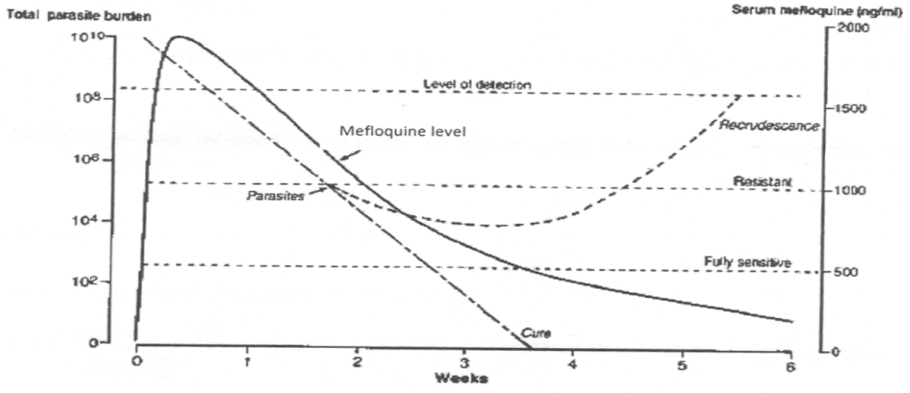
c) Drug interactions

d) Good Manufacturing Practices (GMP)

e) Teratogenicity studies

Q5) The therapeutic level of an antimalarial drug in plasma or blood *in vivo* and the parasite killing rate are reflected by the parasite reduction ratio (PRR). The minimum parasiticidal concentration (MPC) is the lowest concentration of the antimalarial agent in blood or plasma that results in a maximal effect, i.e., a maximum PRR. When the interval from primary treatment to recurrence (recrudescence) and the concentration in blood at that time are known (for example, with chloroquine or mefloquine resistance), it may be possible to estimate the MIC. In the presence of effective antimalarial drug concentrations (i.e. concentrations greater than the MIC) parasitemia falls as a consequence of a reduced input of new young parasites, clearance of circulating rings, and sequestration.

To check development of mefloquine resistance; mefloquine concentrations in serum and parasitemias in a sensitive *plasodium falciparum* infection with an *in vivo* MPC of 500 ng/ml and in a resistant infection with an *in vivo* MPC of 1,000 ng/ml that recurred (recrudesced) 38 days after the initial treatment were estimated.



From the results given above :

a) Comment on the PRRs of the sensitive and resistant *Plasmodium falciparum.* **[8]**

b) Explain the significance of PRR in designing treatment regimes for drug resistant malarial infections. **[4]**

c) Describe in brief, the drugs used in treatment of malaria. **[4]**

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

P2298 **[Total No. of Pages : 2**

[4830] - 42
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) ***Figures to the right indicate full marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***All questions carry equal marks.***
5) ***Use of logtables, electronic pocket calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Explain the principle and give applications of any four of the following techniques. **[16]**

a) Real Time PCR.

b) Pulse field gel electrophoresis.

c) Southern blotting.

d) Maxam-Gilbert method of DNA sequencing.

e) DNA microarray.

f) Protein sequencing.

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

a) Describe the structure of typical bacterial promoter.

b) Justify : Eukaryotes use a number of initiation factors for transcription.

c) Describe the process of DNA foot printing and add a note on its application.

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

a) Bacterial RNA polymerase.

b) tRNA

c) Termination of transcription

P.T.O.

Q4) Answer any two of the following. **[16]**

a) Explain the use of automated sequencer in DNA sequencing method.

b) Comment on - Type II R.E.

c) Compare high capacity vectors used in genetic engineering.

Q5) a) Justify giving suitable examples - 'The genetic code is degenerate'. **[8]**

b) The sequence of nucleotides on mRNA is 5'AUG UUU CUC UGC AUG UGU UCA UAG 3'.

i) Determine the sequence of corresponding nucleotides on coding strand of DNA. From which the mRNA is synthesized. **[3]**

ii) Determine the sequence of corresponding nucleotides on template strand of DNA from which the mRNA is synthesized. **[3]**

iii) How many amino acids would the resulting polypeptide chain have? **[2]**

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

P2299 **[Total No. of Pages : 3**

[4830] - 43
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 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) With the help of a diagram, describe the construction of a bioreactor used for immobilized cells.

b) Delineate the critical operating parameters for Rifamycin production.

c) What is "2-film theory of oxygen transfer"? Explain with a suitable diagram. Advantages of synthetic vaccines.

Q2) 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) State and explain biomass yield coefficient.

c) Explain the principle, construction and operation of a DCO_2 sensor.

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

a) What is "OTR" and OUR in context with a fermentation process

b) Explain biofertilizers and biocontrol with the help of a suitable example.

c) Draw any two types of impellers used in fermenters to provide radial flow to the broth.

P.T.O.

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

a) KLa

b) Growth associated and growth non-associated metabolites

c) 'ISO certification

d) SOP

e) N_{Re}

Q5) *Bacillus licheniformis* ATCC 21415 cells were immobilized on different carriers by different modes of immobilization using same amount of bacterial cells.**[16]**

Suitable method and carrier were selected on the basis of specific productivity and effectiveness factor as key parameters.

Results obtained are as shown in table,

Table 1 : Production of alkaline protease in batch culture by free and immobilized *B. licheniformis* ATCC 21415 cells.

Carriers	Caseinase activity (U/mL)	Specific productivity (U/g wet cells/h)	Effectiveness factor of immobilization*
Free cells	14.33	9.82	1.00
Immobilized cells			
I. Entrapment			
Agar 3%	6.15	4.21	0.43
Ca-alginate 3%	6.21	4.26	0.43
k-carrageen 3%	5.47	3.75	0.38
II. Covalent binding			
Loofa	8.50	5.83	0.59
Sponge	6.45	4.42	0.45
Stainless steel	1.31	0.89	0.09
Wool	9.00	6.17	0.64
III. Adsorption			
Chitosan	8.13	5.57	0.57

*The activity of immobilized cells/the activity of the same amount of free cells.

Interpret the results and answer the following-

A) Effectivity of Which type of cells (free or immobilized) were less and why?

B) Using most effective carrier from 1st experiment for immobilization, production of protease was carried out by repeated batch fermentation (i.e. multiple uses of free cells and immobilized cells).

Specific activity at different batches was obtained as given in fig.

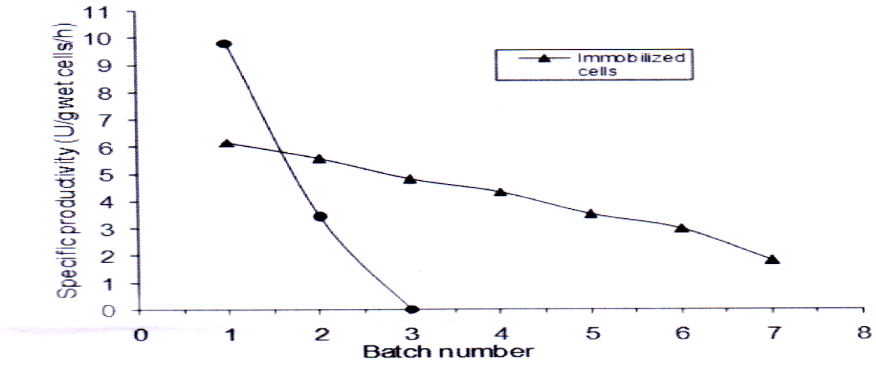


Figure 1 : Repeated batch fermentation for alkaline protease product ion by free and wool immobilized *B. licheniformis* ATCC 21415 cells

a) What is the use of repeated batch fermentation?

b) How long can production be done by using immobilized cells compared to free cells?