Total No. of Questions : 5]

SEAT No.:

P731

[Total No. of Pages : 2

[4132]-101
M.Sc.
MICROBIOLOGY
MB - 501 : Microbiology Diversity and Taxonomy
(2008 Pattern) (Sem. - I)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Neat well labeled diagrams must be drawn wherever necessary.***
4) ***Use of log tables and electronic pocket 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 cell wall composition as a tool in taxonomy.

c) Describe the newer approaches for exploring unculturable bacteria from environmental habitats.

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

a) Describe the taxonomic significance of steps involved in gene transfer.

b) Explain Carl Woe's major contribution to microbial taxonomy.

c) Describe the significance of local and global alignment.

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

a) Enlist the stepwise procedure adapted for culture independent molecular studies. Explain TRFLP technique.

b) Describe the various cloning techniques as a culture independent molecular methods for establishing the metagenomic environmental libraries.

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

a) Oligonucleotide catalogues in taxonomy.

b) Cytochrome as a tool in taxonomy.

P.T.O.

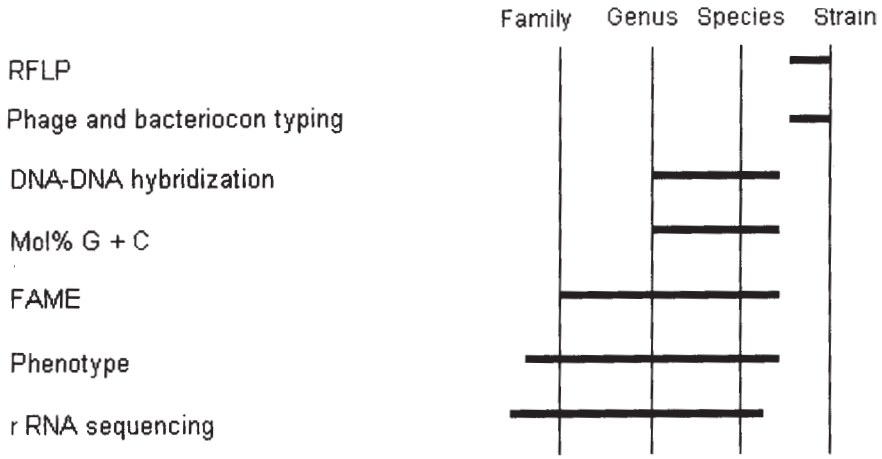
c) Compare PAM and BLOSSM.

d) Compare and contrast DGGE and TGGE.

e) Phenetic and phylogenetic classification.

Q5) The diagram below shows the techniques used in identifying bacteria. All these methods have their own resolution (ability to differentiate between taxonomic levels).

Explain why there are differences in resolution, and how the method/technique effects this resolution. **[16]**



Total No. of Questions : 5]

SEAT No.:

P732

[Total No. of Pages : 3

[4132]-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-labeled diagrams wherever necessary.***
4) ***Use of statistical tables and calculator is permitted.***
5) ***Assume suitable data if needed.***

Q1) Attempt Any Two of the following : **[16]**

a) What do you mean by central tendency? Explain the purpose of measures of central tendency. State the requirements of good measures of central tendency.

b) The distribution of the patients admitted in a certain Hospital on Sunday is given below :

Age (in years)	Number of patients.
More than 10	152
More than 20	128
More than 30	113
More than 40	77
More than 50	36
More than 60	22
More than 70	5

Obtain median and mode.

c) The following is the data of size of crop (hundreds of fruits) and percentage of wormy fruits on 10 apple trees. Obtain correlation coefficient between size of crop and wormy fruits.

Size of crop	15	15	12	26	18	12	8	38	26	19
Wormy fruits	52	46	38	37	37	37	34	25	22	22

P.T.O.

Q2) Attempt Any Two of the following : **[16]**

a) i) What do you understand by multiple regression? Explain one situation in which it can be used.

ii) Explain the terms skewness and kurtosis.

b) Ten kernels of mature iodent corn were tested for crushing resistance. Measured in kg the resistance were :

25, 18, 17, 22, 28, 21, 26, 12, 33, 17. Another batch of ten kernels was tested after being harvested in the dough stage : 21, 22, 25, 30, 50, 20, 30, 22, 23, 27. Test the significance of the difference of the two means. Use 5% level of significance.

c) The following data give the distribution of sesame plants based on capsule length and yield per plant. Test whether capsule length and yield are independent. Use 5% level of significance.

Yield per plant (gms)	Capsule length (mm)		
	6 - 9	10 - 13	14 - 17
11 - 15	10	33	10
16 - 20	30	159	13
21 - 25	9	60	22

Q3) Attempt Any Two of the following : **[16]**

a) Write short notes on the following :

i) Normal distribution.

ii) Non-parametric tests.

b) Draw histogram, frequency polygon and also obtain mode graphically for the following data :

Number of tillers per plant	Number of plants
0 - 6	4
6 - 12	8
12 - 18	15
18 - 24	20
24 - 30	12
30 - 36	6

c) i) A manufacturer of cotter pins knows that one percent of his product is defective. He sells the cotter pins in boxes of 100 pins each and guarantee that not more than two pins in a box will be defective. Find the probability that a box will meet guarantee.

ii) Compute standard deviation for following data :

36, 15, 25, 10, 14.

Q4) Write short notes on Any Four of the following : **[16]**

a) Applications of Internet.

b) Use of computers in biology.

c) Uses of database in biology.

d) Simple Random Sampling With Replacement and Simple Random Sampling Without Replacement.

e) F-test.

Q5) Attempt Any Two of the following : **[16]**

a) Describe chemostat model with its significance.

b) How will you indicate the rate of change of biomass in a culture vessel? What are the significance of growth rate determination?

c) Explain in brief stochastic model.

Total No. of Questions : 5]

SEAT No.:

P733

[Total No. of Pages : 2

[4132]-103
M.Sc.
MICROBIOLOGY
MB - 503 : Cell Organization and Biochemistry
(2008 Pattern) (Sem. - I)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Neat well labeled diagrams must be drawn wherever necessary.***
4) ***Use of log tables and electronic pocket calculators is allowed.***
5) ***Assume suitable data if necessary.***

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

a) Diagrammatically illustrate the nuclear pore complex.

b) Describe the mechanism of bio-film formation and comment on its significance.

c) Diagrammatically illustrate the working of confocal microscope, comment on its applications.

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

a) Justify that amino acids and proteins can act as buffers.

b) Discuss the nomenclature and properties of fatty acids.

c) What is hydrogen bonding? Discuss the role of H-bonding in biomolecules.

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

a) Justify : "*Dictyostellium* can be used as model to study cellular differentiation".

b) Describe the process of blastulation in *Xenopus* embryo.

c) Diagrammatically illustrate the difference between smooth and rough endoplasmic reticulum.

P.T.O.

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

a) Vitamin K.

b) Ninhydrin reaction.

c) Biochemical significance of inductive effect.

d) Nucleolus.

e) Re-differentiation.

Q5) Solve :

a) An amino acid analyzer containing polystyrene cation exchanger column at pH 3.2 was loaded with mixture of amino acids containing alanine (pl 6.02), arginine (pl 10.76), Glutamic acid (pl 3.22), cysteine (pl 5.00) and tryptophan (pl 5.88).

Give the order of elution of these amino acids using buffer of successively higher pH with explanation. **[10]**

b) What is the pH of 0.1 M acetic acid? (pKa = 4.76). **[6]**

Total No. of Questions : 5]

SEAT No.:

P734

[Total No. of Pages : 3

[4132]-201
M.Sc.
MICROBIOLOGY
MB - 601 : Instrumentation and Molecular Biophysics
(2008 Pattern) (Sem. - 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) ***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) Rationalize why larger molecules elute earlier in gel exclusion chromatography.

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

c) Describe the following detection devices in gas chromatography, and state their advantages.

i) Flame ionization.
ii) Thermal conductivity.
iii) Electron capture.
iv) Flame photometric.

Q2) Attempt Any Two of the following : **[16]**

a) Justify "The relationship between period and frequency is similar to that of the reciprocal and the direct lattice in respect to X-ray crystallography."

b) Give an overall approach to structure determination by 2-D NMR.

c) Explain the instrumentation of Mass spectroscopy.

Q3) Attempt Any Two of the following : **[16]**

a) Give applications of Tracer techniques in biology.

b) What is Ramachandran Plot? How are the definite locations of alpha helix and beta sheets are restricted on phi and psi values based on the macromolecule geometry?

P.T.O.

c) Give the schematic diagrammatical representation of single beam and double beam uv-visible spectrophotometer?

Q4) Write short notes on Any Four of the following : **[16]**

a) FRET.

b) ESI-QTOF-MS.

c) Molar extinction coefficient.

d) Circular dichroism.

e) Neural networks.

Q5) Solve : **[16]**

a) You have a mixture of proteins with the following properties :

Protein 1 : Mr 12,000 Daltons	pI = 10
Protein 2 : Mr 62,000 Daltons	pI = 4
Protein 3 : Mr 28,000 Daltons	pI = 8
Protein 4 : Mr 9,000 Daltons	pI = 5

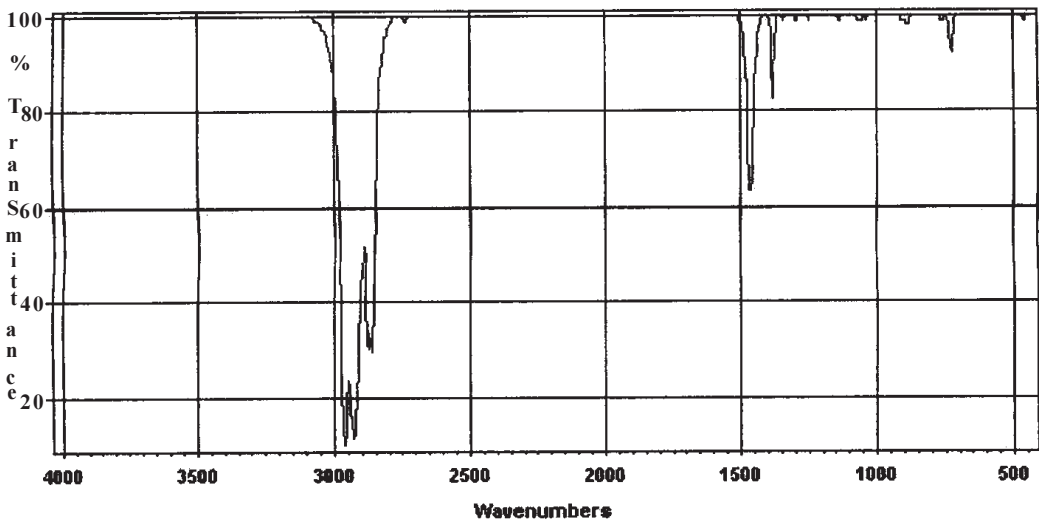
Predict the order of emergence of these proteins when a mixture of the four is chromatographed in the following systems :

i) DEAE - cellulose at pH7, with a linear salt gradient elution.

ii) CM-cellulose at pH7, with a linear salt gradient elution.

iii) A gel exclusion column with a fractionation range of 1,000 - 30,000 D at pH7.

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. The spectrum is quite simple with another weak absorption band near 1450 cm^{-1}. Interpret the IR spectra and identify the compounds out of following :

a) $CH_3 - CH_2 - CH_2 - CH_3$

b) $CH_3 - CH_2 - C \equiv C - H$

c) $CH_3 - CH_2 - CH = CH_2$

d) $CH_3 - CH_2 - CH_2 - CH_2 - Cl$

☒☒☒☒

Total No. of Questions : 5]

SEAT No.:

P735

[Total No. of Pages : 2

[4132]-202
M.Sc.
MICROBIOLOGY
MB - 602 : Evolution, Ecology and Environmental Microbiology
(2008 Pattern) (Sem. - 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 One of the following : **[16]**

a) Enlist the different anaerobic suspended and attached processes used in wastewater treatment. Describe the operating parameters for two-stage high rate digester.

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

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) Describe in the strategies of organic matter utilization in marine environment.

c) Explain the succession, competition and predation within the microbial communities of rhizosphere.

Q3) Attempt Any Two of the following : **[16]**

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

b) Explain the various plant products as anti microbial agents.

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

P.T.O.

Q4) Write short notes on Any Four of the following : **[16]**

a) Reuse of treated solid wastes.

b) Bioremediation.

c) Aerated lagoons.

d) Speciation in sexual and asexual organisms.

e) Industrial ETP layout for dairy industry.

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.:

P736

[Total No. of Pages : 2

[4132]-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) Attempt Any Two of the following : **[16]**

a) Compare oxygenic and non-oxygenic photosynthesis.

b) Explain with the help of suitable example the construction of enzyme purification chart.

c) Explain in brief process of nitrate respiration.

Q2) Attempt Any Two of the following : **[16]**

a) What is Atkinson's energy charge? Discuss its significance in metabolism.

b) Derive Adair equation for cooperativity and state its significance in relation to allosteric enzymes.

c) Compare the ETC in aerobic chemolithotrophs and heterotrophs.

Q3) Attempt Any Two of the following : **[16]**

a) How is ammonia assimilated into biomolecules?

b) Describe biosynthesis of serine-glycine family amino acids.

c) Diagrammatically illustrate structure and function of $Na^+ – K^+$ ATPase.

Q4) Write short notes on Any Four of the following : **[16]**

a) Glutamate dehydrogenase.

b) Anammox.

c) Second law of thermodynamics.

d) Rubisco.

e) Model membranes.

P.T.O.

Q5) Solve Any Two of the following : **[16]**

a) When ratio of NADPH/$NADP^+$ in chloroplast is high, photophosphorylation is predominantly cyclic. Is O_2 evolved during cyclic photophosphorylation? Explain. Can a chloroplast produce NADPH this way? What is the main function of cyclic photophosphorylation?

b) If valinomycin, an antibiotic produced by *Streptomyces sp*. is added to actively respiring mitochondria, several things occur : the yield of ATP decrease, the rate of oxygen consumption increases, heat is released, and pH gradient across the inner mitochondrial membrane increases. Does valinomycin act as an un-coupler or inhibitor of oxidative phosphorylation? Explain these observations in terms of antibiotics ability to transfer K^+ ions across the inner mitochondrial membrane.

c) An enzymatic reaction following Michaelis-Menten kinetics (Km = 10 μM) converts 10% of the substrate (S_o = 1mM) to product in 5 minutes. If the enzyme concentration is doubled and substrate concentration is brought down to 0.1mM, in the initial reaction mixture, calculate the time required for conversion of 50% of substrate to product.

Total No. of Questions : 5]

SEAT No.:

P737

[Total No. of Pages : 3

[4132]-301
M.Sc.
MICROBIOLOGY
MB - 701 : Immunology
(2008 Pattern) (Sem. - 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.***

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

a) Justify, "T and B cells differ in their susceptibility to tolerance induction".

b) Explain the regulatory mechanisms operating preventing the assembly of different convertases in the complement system.

c) Justify, "There exist a T cell population that functions as immunoregulatory cell".

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

a) Justify, "Divergence in evolution of immune system occurred after the phylum Porifera".

b) Explain the role of IL - 1 in pyrogenesis.

c) Explain the role of IL - 4 and IFN - γ in modulation of immune response.

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

a) How tumor escapes host immune mechanisms?

b) Explain use of immune adjuvants in developing tumor immunotherapy.

c) How diagnosis of phagocytic deficiencies is carried out?

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

a) Superantigen.

b) Hemolytic plaque assay.

c) Nude/Athymic mouse.

d) Tumor Necrosis Factor.

e) Kinetics of antigen antibody reaction.

P.T.O.

Q5) Metabolic syndrome (MetS) is associated with an increased risk of the development of atherosclerotic cardiovascular disease (CVD). Interleukin-18 (IL-18), which is a pleiotropic proinflammatory cytokine with important regulatory functions in the innate immune response system, plays a crucial role in vascular pathologies. IL-18 is also a predictor of cardiovascular death in patients with CVD and is involved in atherosclerotic plaque destabilization.

In order to determine if circulating levels of IL-18 can serve as a specific biomarker for distinguishing MetS patients from pre-MetS subjects, a study was undertaken that included 78 patients with visceral fat deposition and 14 age-matched control subjects.

Table 1 : Components of the metabolic syndrome :

Components	MetS	Pre-MetS	Control
Plasma glucose (mg/dL)	136 ± 50*	110 ± 12	99 ± 7
Plasma insulin (IU/mL)	8.7 ± 5.6* #	6.3 ± 2.7	5.2 ± 1.5
HOMA - IR	2.0 ± 1.1*	1.7 ± 0.7*	1.3 ± 0.4
HDL cholesterol (mg/dL)	48 ± 12*	59 ± 16*	71 ± 16
Triglyceride (mg/dL)	187 ± 25*	160 ± 24*	69 ± 21
Hypertension, n (%)	21 (75.0%)*	5 (35.7%)#	3 (21.4%)

Data are means ± SD. *P < 0.01 for MetS (or pre-MetS) vs. Control. #P < 0.05 for MetS vs. pre-MetS HOMA-IR = homeostatis model assessment;

MetS = metabolic syndrome

Table 2 : Interleukin-18 and related biomarkers

	MetS	Pre-MetS	Control
HbAlC (%)	6.3 ± 1.3*	5.4 ± 0.4	5.0 ± 0.3
CRP (µg/dL)	365 ± 272*	114 ± 98	82 ± 55
Adiponectin (µg/mL)	5.0 ± 0.7*	5.5 ± 0.8*	6.3 ± 0.9
IL-18 (µg/mL)	301 ± 220*#	121 ± 31	112 ± 29

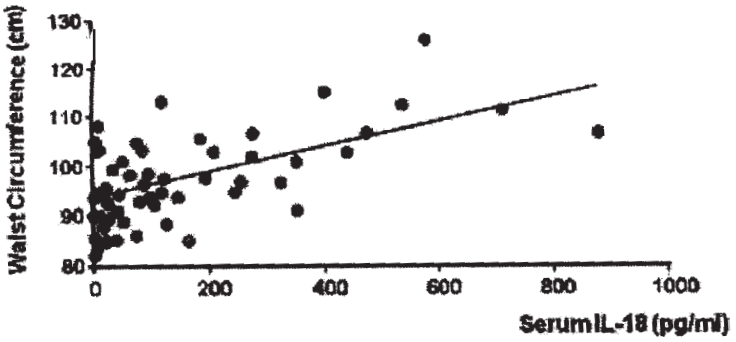
Data are means ± SD. *P < 0.05 for MetS (or pre-MetS) vs. Control.

#P < 0.01 for MetS vs. pre-MetS IL-18 = interleukin-18;

MetS = metabolic syndrome. HbAlc = haemoglobin A1c;

CRP = C-reactive protein;

Figure 1 : Circulating Interleukin-18 (IL-18) as a biomarker in the adipocytokine family



Serum levels of IL-18 and waist circumference. Correlations : $P < 0.01$ based on the data given, answer the following :

a) Explain, whether the association of higher circulating levels of IL-18 with increased MetS scores and systemic inflammation, was independent of the presence of diabetes or dyslipidemia. **[4]**

b) Explain, whether IL-18 dysfunction or resistance is a novel pathophysiological mechanism underlying insulin resistance and MetS. **[4]**

c) What is the significance of IL-18 levels and its correlation with waist circumference in patients with MetS and in pre-MetS subjects? **[4]**

d) Explain the diagnostic value of different components of metabolic syndrome and biomarkers in CVD. **[4]**

Total No. of Questions : 5]

SEAT No.:

P738

[Total No. of Pages : 2

[4132]-302
M.Sc. (Sem. - III)
MICROBIOLOGY
MB - 702 : Molecular 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) Answer Any Two of the following : **[16]**

a) Describe the structure and arranement of nucleosomes in solonoid.

b) Explain the role of Ruv system in resolving Holiday junction.

c) Justify, "Replication of DNA in *E.coli* is semi discontinuous".

Q2) Answer Any Two of the following : **[16]**

a) What are transposons? Explain replicative mechanism of transposition.

b) Comment on - Co-ordination between Rec A and Lex A proteins in SOS repair of damaged DNA.

c) Justify, "Retroviral genes code for polyproteins".

Q3) Answer Any Two of the following : **[16]**

a) Describe D loop model of replication of mtDNA.

b) Justify, "Mutations in p^{53} gene lead to the development of cancer".

c) Describe the structure and explain the functions of subunits of DNA polymerase III in *E.coli*.

Q4) Write short notes on Any Four of the following : **[16]**

a) C value paradox.

b) Proto-oncogenes.

c) ARS in yeast.

d) Pseudo genes.

e) Methylation of DNA.

P.T.O.

Q5) a) The DNA of *E.coli* is in the B form. During intracellular replication, the replication fork moves forward at 1000 nucleotide pairs per second. How fast is the DNA ahead of the replication fork rotating? **[6]**

b) An yeast cell contains two transposons A and B. Each contains an intron. Each transposes to a new location in the yeast genome and then is examined for the presence of the intron. It was observed that in the new location A has no intron, but B does. What can you conclude about the mechanisms of transposons movement for A and B from these facts? Support your answer with a diagram. **[10]**

Total No. of Questions : 5]

SEAT No.:

P739

[Total No. of Pages : 2

[4132]-303
M.Sc.
MICROBIOLOGY
MB - 703 : Virology
(2008 Pattern) (Sem. - 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.***

Q1) Attempt Any Two of the following : **[16]**

a) Explain morphogenesis in T_4 phage.

b) Describe the genome organization and replication of single stranded RNA virus.

c) Describe the physical methods for concentration of plant virus from infected material.

Q2) Attempt Any Two of the following : **[16]**

a) How does transmission of virus occur without vector?

b) Comment on : Mechanism of action of anti-retro-virals and drug resistance.

c) Elaborate on primary and secondary cell culture for cultivation of viruses.

Q3) Attempt Any Two of the following : **[16]**

a) Describe the genomic structure and patho physiology of Herpes simplex virus.

b) Justify, “Rhabdovirus is bullet shaped”.

c) What are the external symptoms of virus infection in plants?

P.T.O.

Q4) Write short notes Any Four of the following : **[16]**

a) Life cycle of M13 phage.

b) Methods for vector control.

c) Adjuvant viral vaccine.

d) Marek disease.

e) Pock method for virus assay.

Q5) To measure effective infective dose of avian virus, five eggs were innoculated per virus dilution. Column A indicates 10 fold dilutions of the virus. Column B indicates number of eggs infected (HA + ve) (Use the method of Reed & Munch).

COLUMN A	COLUMN B
Dilution of Innoculum	No. of eggs Infected (HA + ve)
10^{-6}	5
10^{-7}	4
10^{-8}	1
10^{-9}	1
10^{-10}	0

a) Calculate LD_{50} doses using cumulative values. **[8]**

b) Calculate infectivity titre of virus suspension in EID_{50}/ml. **[8]**

Total No. of Questions : 5]

SEAT No.:

P740

[Total No. of Pages : 2

[4132]-401
M.Sc. (Sem. - 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) ***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 the objectives, conduct and outcome of phase I clinical trials for development of antibacterial drugs.

b) What are conventional stages in discovery of anti-infectives?

c) Describe the toxicological studies carried out for a candidate drug.

Q2) Answer Any Two of the following : **[16]**

a) Explain the experimental strategies to study mode of action of drugs inhibiting bacterial cell wall synthesis, giving suitable examples.

b) Discuss in detail, the use of agar dilution and gradient plate technique for susceptibility testing of antibacterial agents.

c) Explain the methods used for testing of antimycobacterial drugs, giving suitable examples.

Q3) Answer Any Two of the following : **[16]**

a) Describe the evasion of non-specific cellular defenses of host by bacterial pathogens.

b) Explain mode of action and assay of tetanus toxin.

c) Discuss the types of pili and its role in bacterial pathogenesis.

P.T.O.

Q4) Write short notes on Any Four : **[16]**

a) Modulation of host cell cytoskeleton by pathogens.

b) Lipid A of Gram negative bacteria and virulence.

c) Carcinogenicity testing.

d) Adverse drug reactions.

e) Lead drug discovery.

Q5) Effect of tetracycline on binding of phenyl alanyl t-RNA to 30 S ribosomal subunit was studied *in vitro*. Phenylalanyl t-RNA binding to ribosomes was measured by incubating ^{3}H labeled phenylalanyl tRNA with poly U and 30 S subunits at 24 C for 20 minutes. After incubation the samples were filtered and washed. The ribosome bound radioactivity remained on the filtered, while the unbound radioactive aminoacyl t-RNA passed through. Values represent the total phenylalanyl t-RNA bound per 7 μg of 30 S subunit :

Conditions of prebinding	Binding of [^{3}H] phenylalanyl t-RNA	
	Tetracycline added with 30 S subunits	Tetracycline added 20 minutes after 30 S subunits
Control	781	851
Tetracycline (4.5×10^{-4} M)	226	674

a) From the data given, interpret the mode of action of tetracycline on susceptible bacteria. **[8]**

b) Enlist the drugs that inhibit protein synthesis and mode of action of any one. **[8]**

Total No. of Questions : 5]

SEAT No.:

P741

[Total No. of Pages : 2

[4132]-402
M.Sc. (Sem. - IV)
MICROBIOLOGY
MB - 802 : Molecular Biology - II
(2008 Pattern)

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

Instructions to the candidates:

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

Q1) Answer Any Two of the following : **[16]**

a) Describe the structure of ribosome and explain the role of r RNA in translation.

b) Explain the principle of Maxim and Gilbert method of DNA sequencing. Add a note on its advantages over other methods of sequencing.

c) Explain how rho independent termination of transcription takes place in prokaryotes.

Q2) Answer Any Two of the following : **[16]**

a) Justify : Genetic code is degenerate.

b) What is protein sequencing? Explain with a suitable example.

c) Explain initiation of transcription in prokaryotes.

Q3) Comment Any Two of the following : **[16]**

a) Role of t RNA in translation.

b) Ti plasmid as a vector in genetic engineering.

c) DNA foot printing.

P.T.O.

Q4) Write short notes on Any Four of the following : **[16]**

a) Flurochromes in automated sequencing.

b) Type II R.E.

c) Eukaryotic mRNA.

d) Features of YAC.

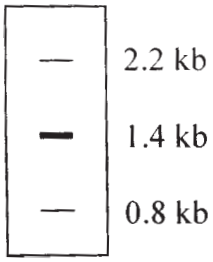
e) Altered code in mitochondria.

f) Reaction mixture in PCR.

Q5) a) A cloned *EcoRI* fragment 1.4 kb in length from a genomic library of housefly DNA is labeled and used to probe a Sourthern transfer of an *EcoRI* digest of genomic DNA, with the results shown in the figure. From other evidence, the cloned fragment is known to include at least part of a gene 1.3 kb in length. How many copies of that gene are present in the housefly genome and how are these copies arranged?

b) Draw a diagram of a possible gene copies in the genome and the *EcoRI* restriction sites in their vicinity.

Figure - Pattern of labeled bands a Southern transfer of a genomic *EcoRI* digest probed with a cloned *EcoRI* fragment. The intensity of the 1.4 Kb. band is three times that of the other two, which are approximately equal in intensity. **[16]**



Total No. of Questions : 5]

SEAT No.:

P742

[Total No. of Pages : 3

[4132]-403
M.Sc.
MICROBIOLOGY
MB - 803 : Microbial Technology
(2008 Pattern) (Sem. - 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 calculator is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Discuss the construction of CSTR with the help of a diagram. Enlist the different type of impellers used in it. Explain "Disc turbines are superior to propellers". **[16]**

OR

Critically comment on "Continuous culture is more productive, still fermentation industry has not adopted it for manufacture of microbial products".

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

a) Give the relationship between power number and Reynolds number. How do they depict different types of fluid flows?

b) How DO and DCO_2 are monitored using in line sensors during fermentation?

c) What is validation? Explain the process validation with suitable example.

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

a) With the help of flow chart describe the commercial production of pullulan.

b) Discuss how mass transfer of nutrients and O_2 is affected by mycelial pellet giving appropriate example.

c) Explain use of fungi in bioremediation. Give examples to support your answer.

P.T.O.

Q4) Write short notes on Any Four of the following : **[16]**

a) $K_L a$

b) Fungi as biosensor.

c) ISO certification.

d) Biomass yield coefficient.

e) Cyclic fed batch mode of fermentation.

Q5) a) *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 :

1) Which type of cells (free or immobilized) were more effective and why?

2) If experiment is to be used for scale-up, which method of immobilization and which carrier should be selected for immobilization?

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.

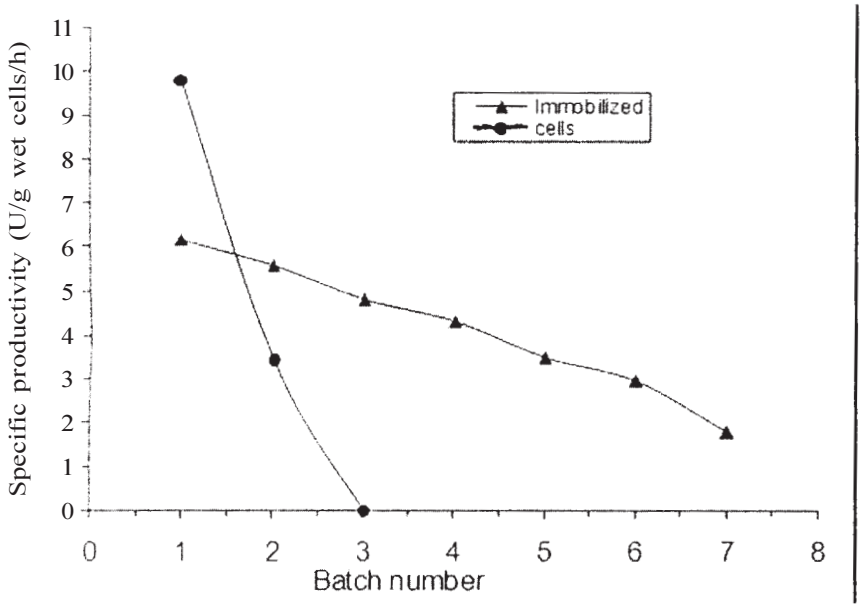


Figure 1 : Repeated batch fermentation for alkaline protease product ion by free and wool immobilized *B.licheniformis* ATCC 21415 cells.

1) Which cells were more productive and why?
2) How long can production be done by using immobilized cells compared to free cells?