P2718

[5030]-11

M.Sc. - I
MICROBIOLOGY
MB -501 :Microbial Diversity and Taxonomy
(2008 Pattern)(Semester-I)

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

Instructions to the candidates:
1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Draw neat-labeled diagrams wherever necessary.*
4) *Use of logarithmic tables and scientific calculator 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 the role of chromosomal material transfer in bacterial 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.

Q5) Microscopic epifluoresence observations of a soil sample indicated a bacterial load in the order of 10^{14} cells/g. The part of the soil sample was subjected to 90° C for an hour. The heated sample was examined by standard plating techniques on conventional nutrient media, the viable counts obtained were in the order of 10^7 cells/g. Explain the reason for the difference in count by these two methods. Design a methodology by which this difference in the counts could be nullified. **[16]**

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[5030]-12

M.Sc.

MICROBIOLOGY

MB-502:Quantitative Biology

(2008 Pattern)(Semester - I)

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

Instructions to the candidates:

1)   *All questions are compulsory.*

2)   *All questions carry equal marks.*

3)   *Draw neat-labeled diagrams wherever necessary.*

4)   *Figures to the right side indicate full marks.*

5)   *Use of Statistical tables and scientific calculator are allowed.*

6)   *Assume suitable data if necessary.*

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

a)   From the following data recorded on the height of plants of varieties, G-65 and PS-16 of mungbean:Find out which variety is more consistent:

Var.G-65	25	50	45	30	70	42	36	48	34	60
Var.PS-16	10	70	50	20	95	55	42	60	48	80

b)   Following are the number of colonies observed on 15 sterile Nutrient agar plates after air exposure (10min). Calculate Arithmetic Mean and Variance?

No.of colonies	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Frequency	3	5	8	15	9	4	2

c)   What is random sampling? Describe in brief different types of sampling methods.

Q2) Attempt **any two** of the 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 result are given below in the table. Find out effectiveness of drug against disease.

	Infection	No Infection
Drug	200	300
No Drug	250	50

b) Represent the following data by a pie diagram:

Country	China	India	New Zealand	United Kingdom	Germany	Swedan
Birth Rate	40	33	30	20	16	15

c) Explain in detail biological databases.

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

a) Alpha particles are emitted by radioactive source at the rate of three per every minute on the average. The number of particles is distributed according to the Poisson distribution. Calculate the probability of getting exactly 6 emissions in one minute.

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

Subject	1	2	3	4	5	6	7	8	9	10
Hb Before	10	9	11	12	8	7	12	18	10	9
Hb. After	12	11	13	14	9	10	12	14	11	12

c) Explain in detail any population model.

Q4) Write short notes on any four of the following: [16]
a) Factorial design
b) Multiple regression.
c) Distribution of sample means
d) Skewness
e) Computer simulation in microbiology.

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

a) Data recorded on soluble nitrogen N(mg/leaf) and total chlorophyll(mg/leaf) are given below. Calculate correlation and regression coefficient.

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

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

Water Temperature	Detergents		
	A	B	C
Cold Water	27	25	37
Warm Water	19	22	38
Hot Water	24	16	28

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[5030]-13

M.Sc. -I

MICROBIOLOGY

MB -503 :Cell Organization and Biochemistry

(2008 Pattern)(Semester - I)

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

Instructions to the candidates:
1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of log tables, graph paper non programmable - electronic pocket calculator is allowed.*
4) *Assume suitable data if necessary.*
5) *Neat diagrams must be drawn wherever necessary.*

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

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

     b) Explain the structure and functions of globular proteins with suitable examples.

     c) What is cytoskeleton? Discuss its biological significance.

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

     a) How are lipids classified on the basis of their chemical structure?

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

     c) Explain molecular mechanism of quorum sensing in Gram negative bacteria.

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

     a) Draw structure of vitamin D and explain its biological role.

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

     c) Diagrammatically illustrate the D- series of aldoses.

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

a) Edman's degradation

b) Epimers.

c) Immunoelectron microscopy.

d) t-RNA

e) Terpenes

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

a) A disaccharide, which you know to be either maltose or sucrose, is treated with Fehling's Solution, and a red color is formed. Which sugar is it, and how do you know?

b) What would be net charge on following hexapeptide at pH 1,7 and 13?
   H_2N-Val-Asp-Lys-Gly-Arg-Glu-COOH

   Given:

   pKa α-COOH=2.3, pKa α-NH_2=9.7, pK_RAsp=3.65,
   pK_RGlu=4.25, pK_RLys=10.53, pK_RArg=12.48

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[5030]-21

M.Sc. - I

MICROBIOLOGY

MB -601 :Instrumentation And Molecular Biophysics

(2008 Pattern)(Semester - II)

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

Instructions to the candidates:
1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of log tables, non programmable - electronic pocket calculator is allowed.*
4) *Assume suitable data if necessary.*
5) *Neat diagrams must be drawn wherever necessary.*

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

   a)   Describe the principle of Gel filtration chromatography.

   b)   Describe the instrumentation of MALDI-TOF.

   c)   Give the applications of Differential centrifugation.

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

   a)   Give the principle of UV-Vis spectroscopy with a neat labeled diagram.

   b)   Write the differences between CD and ORD.

   c)   State the applications of NMR in biology and explain one application in detail.

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

   a)   Draw a flow chart for isolation and purification of proteins.

   b)   Diagrammatically describe the column mode of chromatography.

   c)   Draw a neatly labeled Ramachandran plot.

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

a) Infra-red spectroscopy and its application.

b) Autoradiography.

c) Concept of Chou-fasman method.

d) 3D structures of proteins.

e) NMR parameters.

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

a) A chromatographic analysis for the chlorinated pesticide Dieldrin gives a peak with a retention time of 8.68 min and a baseline width of 0.29 min. What is the number of theoretical plates? Given that the column is 2.0 m long, What is the height of a theoretical plate in mm?

b) The absorbance of a 5×10^{-4} M solution of amino acid tyrosine, at a wavelength of 280 nm is 0.75. The path length of cuvette is 1 cm. What is the molar absorption coefficient?

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[5030]-22

M.Sc.

MICROBIOLOGY

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

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

Instructions to the candidates:
  1) *All questions are compulsory.*
  2) *All questions carry equal marks.*
  3) *Draw 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 <u>any one</u> of the following: **[16]**

  a) Enlist various anaerobic suspended growth treatment processes. Explain in detail design and working of UASB reactors.

  b) Explain different types and levels of selection. Describe kin selection in detail.

Q2) Attempt <u>any two</u> of the following: **[16]**

  a) Elaborate the process of adsorption using granular and powdered activated carbon.

  b) Enlist and explain mechanisms of disinfection and factors affecting efficiency of disinfection.

  c) Explain host fungus specificity and interactions in mycorrhiza formation. State advantages of mycorrhizal associations.

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

  a) Explain cooperation and its significance in evolution of sociality and multi-cellularity in microorganisms.

  b) Describe marine environment and regulation of bacterial community in marine ecosystem.

  c) Explain the terms rhizosphere and rhizoplane. Describe role of siderophore and indole acetic acid in community ecology.

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

    a)   Selfish gene

    b)   Interaction of mychorrhizal fungi with non host plants.

    c)   Direct and indirect reuse of treated effluent and sludge.

    d)   Mechanism of sedimentation.

    e)   Molecular clock.

Q5) An industrial waste water having BOD_5 of 200 mg/L is to be treated using two stage trickling filters. The desired effluent quality is 20mg/L BOD_5. If the depths of both filters are to be kept 1.87m and the recirculation ratio is 2:1, what are the required diameters of each filter? Assume that the flow rate is $7500m^3/d$, waste water temperature is 20°C and $E_1 = E_2$.   [16]

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[5030]-23

M.Sc. -I
MICROBIOLOGY
MB -603 :Microbial Metabolism
(2008 Pattern)(Semester - II)

Time : 3 Hours]   *[Max. Marks : 80*
Instructions to the candidates:
  1) *All questions are compulsory.*
  2) *Figures to the right indicate full marks.*
  3) *Use of log tables, graph paper, non programmable-electronic pocket calculator is allowed.*
  4) *Assume suitable data, if necessary.*
  5) *Neat diagrams must be drawn wherever necessary.*

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

  a) Describe the energy generation pathway in methanogens..

  b) Describe in details the enzymatic processes involved in dinitrogen fixation.

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

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

  a) Explain the regulation of glutamine synthetase.

  b) What is reverse electron flow? Discuss its significance in autotrophic microorganisms.

  c) State the laws of thermodynamics and discuss their role in biochemistry.

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

  a) Diagrammatically illustrate mitochondrial electron transport chain.

  b) Diagrammatically illustrate $Na^+ - K^+$ ATPase.

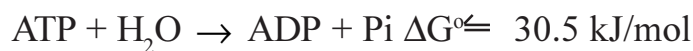 c) Describe biosynthesis of serine-glycine family amino acids.

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

a) Nernst equation.

b) Ionophores.

c) Nitrate respiration.

d) Rubisco.

e) KNF model of allosteric enzymes.

Q5) Attempt the following: [16]

a) In a single substrate enzyme catalyzed reaction.

   i) Show that K_M is the substrate concentration at velocity $=Vm/2$.

   ii) If we use substrate concentration $[S]=2K_M$, the velocity does not equal to *Vm*. Explain this behavior.

b) The phosphorylation of glucose in the cell is coupled to the hydrolysis of ATP; that is, part of the free energy of ATP hydrolysis is used to phosphorylate glucose:

Glucose + Pi $\rightarrow$ glucose 6 - phosphate + H_2O $\Delta G^{o'}=$ 13.8kJ/mol

ATP + H_2O $\rightarrow$ ADP + Pi $\Delta G^{o'}=$ 30.5 kJ/mol

Sum: Glucose + ATP glucose 6-phosphate + ATP

Calculate K′eq at $37\,°C$ for the overall reaction. For the ATP dependent phosphorylation of glucose, what concentration of glucose is needed to achieve a 250 μM intracellular concentration of glucose 6-phosphate when the concentrations of ATP and ADP are 3.38 mM and 1.32 mM, respectively? Given R=8.314 J/mol.

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[5030]-31

M.Sc. - III

MICROBIOLOGY

MB - 701 : Immunology

(2008 Pattern) (Semester - III)

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

Instructions to the candidates:

    1)   All questions are compulsory.

    2)   All 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)   Giving the sources and types of interferons, explain its' role in immune response activation.

    b)   Justify, "Spatial control is not the only mechanism involved in regulation of complement pathways".

    c)   Describe the types and functions of T cell receptors.

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

    a)   Explain Jerne's network theory for regulation of immune response system.

    b)   Justify, "All vertebrate species evolved with both functional arms of immune system".

    c)   Explain the regulation of alternative pathway of complement system.

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

   a)   Describe the properties and applications of tumor specific and tumor associated antigens.

b) Give the similarities and differences in benign tumors and malignant cancers, with suitable examples.

c) Explain the pathophysiology of systemic lupus erythomatosus.

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

a) Functional assays for phagocytic function.

b) Animal models used for research in autoimmunity.

c) Determination of antibody affinity by equilibrium dialysis.

d) Stem cell therapy.

e) Prognosis of asthma.

Q5) Myasthenia Gravis (MG) and animal model of Experimental Autoimmune Myasthenia Gravis (EAMG) is the most common autoimmune disorder of neuromuscular transmission. The disease is caused by the breakdown of the acetylcholine receptor (AChR) which is largely due to complement activation at the NeuroMuscular Junction (NMJ). It is known that Complement Receptor 1 - Related gene/protein Y deficiency (Crry –/–) modulates the adaptive immune response and EAMG outcome.

A study was carried to determine whether Crry –/– mice have impairment in membrane -related inhibition of complement activation and show failure in controlling complement homeostasis. EAMG was induced by four subcutaneous injections of 20µg AChR emulsified in complete Freund's adjuvant (CFA). Mice were immunized along the back subcutaneously, at the base of the tail and boosted twice with 20µg of tAChR in incomplete Freund's adjuvant 4 and 8 weeks after primary immunization. Control mock immunized mice received an equal volume of PBS in CFA or IFA.

Deposition of complement at the NMJ
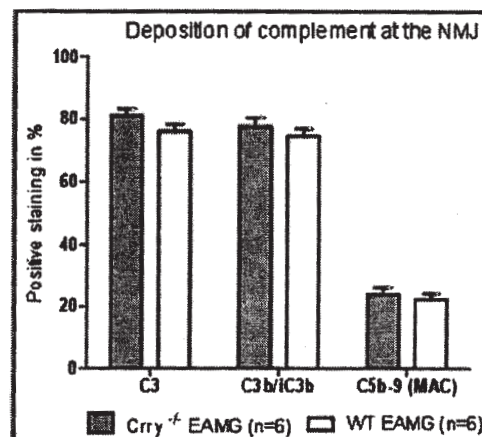
Complement deposition was at NMJ was assessed by staining diaphragms from wild type (WT) EAMG and Crry –/– EAMG mice for C3, C3 fragments (C3b/iC3b) and C5b-9 (MAC). The results are expressed as percentage of NMJ (%) with detected complement deposits. Minimum three sections with 10-15 NMJs from each diaphragm were quantified (n = 5 mouse per experimental group).

Based on the given data explain the following:

a)   Whether there is any significant quantitative difference in deposition of C3, C3b/iC3b fragments and C5b-9 (MAC) at the NMJ of WT EAMG and Crry –/– EAMG mice?   **[4]**
b)   Whether Crry –/– mice have deficiency in membrane-related inhibition of complement activation and thus show failure in regulating self complement mediated cytotoxicity.   **[4]**

c)   How the self cells are protected from complement mediated cytotoxicity?**[8]**

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[5030]-32

M.Sc. - 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-labeled diagrams wherever necessary.*
4) *Use of logarithmic tables and scientific calculators is allowed.*
5) *Assume suitable data, if necessary.*
6) *Figures to the right indicate full marks.*

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

a)   Discuss the prokaryotic DNA replication process 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 phage.

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.

Q4) Write short note on **any four** of the following: [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 the same cells, a specialized repair system recognizes G-T mismatches and repairs them to G-C base pair.
Explain the mechanism of this repair system. [8]

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

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[5030]-33

M.Sc. - III

MICROBIOLOGY

MB - 703 : Virology

(2008 Pattern) (Semester - III)

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

Instructions to the candidates:
1) *All questions are compulsory.*
2) *All questions carry equal marks.*
3) *Draw neat-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 protein nucleic acid interactions and genome packaging in viruses.

b)   How is designing and screening of antivirals is carried out?

c)   Explain the strategies used by Todd Phages to survive in host cell, with suitable example.

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

a)   Describe the life cycle of cauliflower mosaic virus.

b)   Which are the envelope proteins present on virus surface and elaborate on HA test for virus detection.

c)   What are the characteristics shown by transformed cells? How is cell transformation brought about by oncogenic viruses?

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

a)   Give the rules of ICTV for classification of virus.

b)   Explain the pathophysiology and epidemiology caused by new castle disease virus.

c)   Describe the internal symptoms shown by virus infected plants.

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

    a)   Disease forecasting.

    b)   Advantages of phage therapy.

    c)   Subunit vaccines.

    d)   Western blotting for virus detection.

    e)   Growth of virus in experimental animal.

Q5) A viral sample was sent to the laboratory to determine its infectivity. A 96 well tissue culture plate was used to check its infectivity.

The following table shows the result obtain in the laboratory:

Dilution of virus used	Row	Control well 1	Control well 2	Tissue culture wells with added viral dilutions (0.005 ml of each dilution)									
				3	4	5	6	7	8	9	10	11	12
10^{-1}	A	-	-	+	+	+	+	+	+	+	+	+	+
10^{-2}	B	-	-	+	+	+	+	+	+	+	+	+	+
10^{-3}	C	-	-	+	+	+	+	+	+	+	+	+	+
10^{-4}	D	-	-	+	+	+	+	+	+	+	+	+	+
10^{-5}	E	-	-	+	+	+	+	+	+	+	+	+	+
10^{-6}	F	-	-	+	+	+	+	+	+	+	+	–	–
10^{-7}	G	-	-	–	–	–	–	–	–	–	–	–	–
10^{-8}	H	-	-	–	–	–	–	–	–	–	–	–	–

    Key: '+' sign indicates cytopathic effects on cells of tissue culture.

                '–' sign indicates no cytopathic effects the cells of tissue culture.

From the above data, calculate:

    a)   Proportionate distance. **[6]**

    b)   50% end point log over dilution. **[4]**

    c)   Determine $TCID_{50}$/ml of the viral sample. **[6]**

[5030]-41

M.Sc.

MICROBIOLOGY

MB - 801 : Pharmaceutical and Medical Microbiology
(2008 Pattern) (Semester - IV)

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

Instructions to the candidates:
  1)   All questions are compulsory.
  2)   Figures to the right indicate full marks.
  3)   Draw neat, 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) Attempt any two of the following: **[16]**

  a)   Explain the pharmacokinetic studies carried out for a candidate drug.

  b)   How drug interactions are studied in the laboratory?

  c)   Describe Paul Ehrlich's postulates for drug discovery.

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

  a)   Explain agar diffusion tests used for susceptibility testing.

  b)   Describe Ames mutagenicity test, giving its significance.

  c)   What are the objectives of clinical trials carried out for a candidate drug?

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

  a)   How bacterial pathogens overcome host phagocytic defense mechanisms.

  b)   Explain *in vitro* assay of endotoxins of Gram negative pathogens.

  c)   Discuss screening strategies for bioactive molecules inhibiting bacterial
       cell wall synthesis.

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

    a) Toxicity testing of a candidate drug.

    b) Host cytoskeletal modulation by pathogen.

    c) Objective and guidelines of CLSI.

    d) Laboratory methods for testing of drug interactions.

    e) Susceptibility testing for anti-mycobacterial agents.

Q5) *Jatropha* species belong to the family Euphorbiaceae and are used in traditional folklore medicine to cure various ailments in different countries. *In vitro* antifungal activity profile of three extracts (solvents ethanol, methanol and water) from the stem bark of *J. curcas* was determined and compared with known antifungal agents. The data is given below:

Test Fungus	Zone of Inhibition (mm) (Values = mean $\pm$ SD)				
	Ethanol (10mg/ml)	Methanol (10mg/ml)	Water (10mg/ml)	Miconazole (1mg/ml)	Amphotericin B (1mg/ml)
Trichophyton longifusis	15 ± 0.1	15 ± 2.5	8 ± 0	19 ± 1.2	20 ± 0.5
Candida glaberata	13 ± 0.1	18 ± 2.0	10 ± 0	21 ± 1.1	25 ± 0.8
Fusarium solani	15 ± 1.1	18 ± 1.5	10 ± 0	22 ± 0.2	20 ± 1.0
Microsporum Canis	12 ± 0.5	15 ± 1.2	5 ± 0	20 ± 1.2	22 ± 0.2
Aspergillus flavus	15 ± 0.2	18 ± 1.0	5 ± 0.1	27 ± 0.1	25 ± 0.4
Penicilium notatum	14 ± 1.5	16 ± 1.5	8 ± 0	25 ± 0.2	25 ± 0.5
Candida albicans	18 ± 0.5	20 ± 0.5	10 ± 0	30 ± 1.0	28 ± 2.2

    a) Comment on therapeutic use of *Jatropa* stem bark extract as an alternative to miconazole and or amphotericin B. **[8]**

    b) Give an account of different methods for susceptibility testing of antifungal agents for clinical isolates. **[8]**

[5030]-42

M.Sc.

MICROBIOLOGY

MB - 802 : Molecular Biology - II

(2008 Pattern) (Semester - IV)

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

Instructions to the candidates:

1)   All questions are compulsory.

2)   All questions carry equal marks.

3)   Figures to the right indicate full marks.

4)   Use of log tables, scientific calculator is allowed.

5)   Assume suitable data if necessary.

6)   Draw neat labelled wherever necessary.

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

a)   Explain the role of various sigma factors in controlling transcription.

b)   Describe the structure of ribosome and explain the role of rRNA in translation.

c)   Explain Wobble hypothesis in detail.

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

a)   Explain the role of various enzymes in recombinant DNA technology.

b)   Explain any one method of DNA sequencing with its principle & advantages.

c)   Describe the methods of screening of recombinants with examples.

Q3) Diagrams or flow chart of Tech. (Any two):   **[16]**

a)   Process of Transcription in eukaryotes.

b)   Southern blotting technique.

c)   RNA splicing by splisosomes.

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

   a) Cytosolic protein degradation.

   b) RNA interference.

   c) Protein splicing.

   d) Co-translation modification.

   e) Cosmid.

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

   a) Explain how gel electrophoresis can be used to determine the size of PCR product.

   b) A new restriction endonuclease is isolated from a bacterium. This enzyme cuts the DNA into fragments average 4,096 base pairs long. Like many other known restriction enzymes the new one recognizes a sequence in DNA that has two fold rotational symmetry. From the information given, how many base pairs of DNA constitute the recognition sequence for the new enzyme?

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[5030]-43

M.Sc.

MICROBIOLOGY

MB - 803 : Microbial Technology

(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 table and 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 an airlift bioreactor. Explain the advantages of an airlift bioreactor over a conventional CSTR.

b) Justify 'In continuous culture specific growth rate is controlled by dilution rate'. Describe the operation of basic chemostat.

c) Explain how the types of growth affect mass transfer of nutrients, oxygen and heat.

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

a) Why the mycellial pellet form growth during fermentation is important with context to product yield.

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

c) Describe the process of Rifamycin production.

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

a) Describe animal cell culture technology to produce recombinant vaccines.

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

c) Explain the membrane and cytoskeleton of fungal cell.

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

a) OUR and OTR.

b) Short Note on different types of Impellers.

c) Secondary metabolites and their control.

d) Downstream processing for lipases.

e) Reynold's Number.

Q5) The production of pullulan from beet molasses and synthetic medium by *Aureobasidium pullulans* P56 in batch culture was investigated. Molasses consist of water, sucrose, proteins, vitamins, amino acids, organic acids and heavy metals, which cause a critical problem during fermentation, together with some colored substances. **[16]**

Molasses was pretreated by three methods to remove these substances,

a) sulfuric acid treatment,

b) sulfuric acid and activated carbon treatment.

c) potassium ferrocyanide treatment,

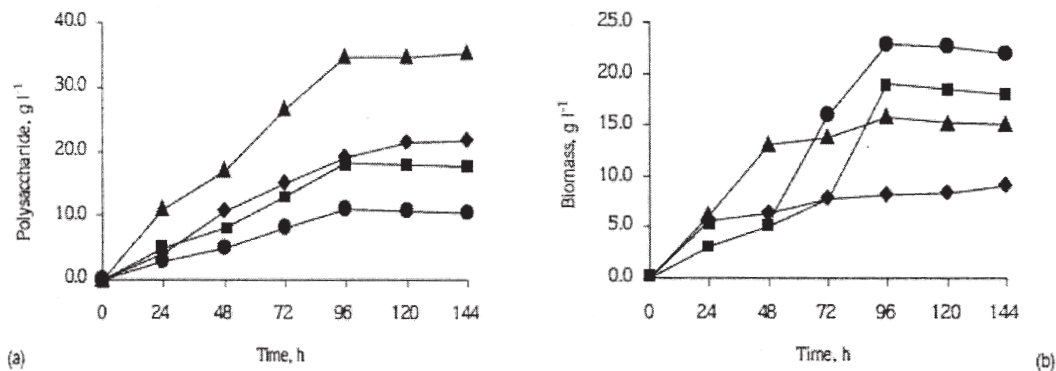Results of treatment of molasses on polysaccharide and biomass production were as below:

Figure 1. Polysaccharide (a) and biomass (b) production of *A. pullulans* in synthetic medium (◆), sulfuric acid + activated carbon treated molasses (▲), sulfuric acid treated molasses (■), potassium ferrocyanide treated molasses (●) in shake flasks at 28 °C, 200 rpm (pH 7.5, initial sugar concentration = 50 g l^{-1}).

Interpret the results and answer the following:

1) Is it beneficial to use shake flask rather than stirred tank for pullulan production? Explain.

2) Is there any relation between polysaccharide production to biomass production?

3) What is Pullulan? What type of metabolic product is this?

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