**Total No. of Questions : 8]** **SEAT No. :**

**P2300** **[Total No. of Pages : 2**

# [4830]-101
## M.Sc. (Microbiology) (Semester - I)
## MB - 501 : MICROBIAL DIVERSITY & TAXONOMY
## (2013 Pattern) (Credit System)

***Time : 3 Hours]*** ***[Max. Marks : 50***

***Instructions to the candidates:***

1) ***Attempt five questions.***
2) ***Attempt any three questions from Q.1 to Q.4.***
3) ***Attempt at least 2 questions from Q.5 to Q.8.***
4) ***Figures to the right indicates marks.***
5) ***Draw diagrams wherever necessary.***
6) ***All Questions carry equal marks.***
7) ***Use of the logarithmic electronic pocket calculator is allowed.***
8) ***Assume suitable data, if necessary.***

***Q1)*** Attempt any two of the following :

a) Differentiate between species concept in eukaryotes and prokaryotes. **[5]**

b) The bacterial load of an soil sample was found to be $10^{12}$ cells/gm by direct microscopic counting technique. The soil sample was than heated at 90°C for one hour and examined by conventional standard plate count technique which was $10^7$ CFU/gm. Explain the reason for the difference in count. **[5]**

c) Write a note on evolution of species. **[5]**

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

a) Explain in brief the great plate count anomaly with suitable example. **[5]**

b) Given data is obtained from river sample. The total number of colonies were $202 \times 10^7$. Find out the Simpson index. **[5]**

| Sr. No. | Types | No. of colonies |
|---|---|---|
| 01 | Pale, pinpointed | 55 |
| 02 | Pigmented, 1 mm | 68 |
| 03 | White, less than 1 mm | 79 |

c) Briefly explain the factors affecting species diversion. **[5]**

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

a) Outline the strategy for identification of pure culture with suitable flow sheet diagram. **[5]**

b) Write short note on 5 Kingdom classification of bacteria. **[5]**

c) Explain the phylogenetic approach of bacterial classification. **[5]**

***P.T.O.***

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

a) Describe the importance of FAME profiling in bacterial taxonomy. **[5]**

b) Describe in brief the various approaches to access the total number of bacterial species. **[5]**

c) What is a molecular clock? Enlist various molecules used as molecular clocks in bacterial taxonomy. **[5]**

***Q5)*** Attempt any two of the following :

a) Justify : Classification of molds is chiefly based on their morphological characters. **[5]**

b) Give a comparative account of different classes of fungi. **[5]**

c) Give the salient features of Basidiomycetes. **[5]**

***Q6)*** Attempt any two of the following :

a) Explain the culture independent molecular methods for identifying unculturable bacteria. **[5]**

b) Explain the need of extracting total bacterial DNA from habitat. **[5]**

c) Describe - Metagenomic library. **[5]**

***Q7)*** Attempt any two of the following :

a) What is coevolution? Explain coevolution with respect to host-parasite evolution. **[5]**

b) Write note on Neo-Darwinism. **[5]**

c) Comment on the levels of selections. Define kin selection. **[5]**

***Q8)*** Attempt any two of the following :

a) What is vector? Explain use of vectors in gene sequencing. **[5]**

b) Explain the role of BLAST in microbial identification. **[5]**

c) Write short note on pyro-sequencing. **[5]**

Total No. of Questions : 8] SEAT No. :

P2301 [Total No. of Pages : 4

# [4830]-102
# M.Sc. (Part - I) (Semester - II)
# MICROBIOLOGY
# MB - 502 : Quantitative Biology
# (2013 Pattern) (Credit System)

*Time : 3 Hours]* *[Max. Marks : 50*

***Instructions to the candidates:***

1) ***Attempt any three questions from 1 to 4 (Core Credits)***
2) ***Attempt any two questions from 5 to 8 (noncore-Credits)***
3) ***All questions carry equal marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figure to the right indicate full marks.***
6) ***Use of logarithmic tables/scientific Calculator/statistical table and Graph paper is allowed.***
7) ***Assume suitable data if necessary.***

***Q1)*** Attempt any two of the following : **[10]**

a) Compute mean of the following distribution.

| Score | 60-64 | 55-59 | 50-54 | 45-49 | 40-44 | 35-39 | 30-34 | 25-29 | 20-24 |
|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 2 | 4 | 6 | 9 | 12 | 7 | 5 | 3 |

b) Calculate correlation coefficient between X & Y for the following data:

| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Y | 10 | 11 | 12 | 14 | 13 | 15 | 16 | 17 | 18 |

c) When 10 sterile nutrient agar plates were exposed for 10 min. in a fruit juice manufacturing unit, following number of colonies were obtained after incubation.

Number of colonies (CFU) on each agar plate : 12,13,12,16,15,09,18,10,12,13

Determine standard deviation and coefficient of variation.

***Q2)*** Attempt any two of the following : **[10]**

a) Two horticulture plots were each divided into six equal sub-plots. Organic fertilizer is added to Plot 1 and chemical fertilizer is added to Plot 2. The yields of fruits from Plot 1 and Plot 2, in kg/sub-plot, is given below. Can we say the yield due to organic fertilizer is higher than due to chemical fertilizer?

| Plot 1 | 6.2 | 5.7 | 6.5 | 6.0 | 6.3 | 5.8 |
|---|---|---|---|---|---|---|
| Plot 2 | 5.6 | 5.9 | 5.6 | 5.7 | 5.8 | 5.7 |

***P.T.O.***

b) The mean IQ of a sample of 1600 children was 99. Test the hypothesis that this was a random sample from a population with mean IQ 100 and standard deviation 15. Use Z test at 5% level of significance.

c) Describe in brief process of hypothesis testing.

***Q3)*** Attempt any two of the following : **[10]**

a) Find whether or not the following observed distribution of phenotypes in a sample of 384 Drosophila flies have a significant goodness of fit with proposed Mendelian 9:3:3:1 distribution (L.S.5%)

b) A researcher designed an experiment to assess the effects of prolonged inhalation of cadmium oxide. Fifteen laboratory animals served as experimental subjects, while 10 similar animals served as controls. The variable of interest was hemoglobin level following the experiment. From the data can we conclude that prolonged inhalation of cadmium oxide reduces hemoglobin level. Use Mann whitely test. (Critical U = 45) :

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exposed | 14.4 | 14.2 | 13.8 | 16.5 | 14.1 | 16.6 | 15.9 | 15.6 | 14.1 | 15.3 | 15.7 | 16.7 | 13.7 | 15.3 | 14 |
| Unexpoxed | 17.4 | 16.2 | 17.1 | 17.5 | 15 | 16 | 16.9 | 15 | 16.3 | 16.8 | | | | | |

c) In an experiment on immunization of goats from anthrax, the following results were obtained. Derive your inferences on the efficacy of the vaccine.

| | Affected | Not Affected | Total |
|---|---|---|---|
| Inoculated | 2 | 10 | 12 |
| Not Inoculated | 6 | 6 | 12 |
| Total | 8 | 16 | 24 |

***Q4)*** Attempt any two of the following : **[10]**

a) Calculate Karl Pearson's coefficient of skewness from the data recorded on the number of fruits per plant.

| No. of fruits | 8 | 11 | 14 | 17 | 20 | 23 |
|---|---|---|---|---|---|---|
| No. of plants | 2 | 4 | 6 | 10 | 6 | 3 |

b) Blood samples were taken from 16 hepatitis patients and 9 healthy controls. The following data were obtained on the percentage of yeast cells killed by monocytes in culture.

| Controls | Patients |
|---|---|
| n1 = 9 | n2 = 16 |
| Mean 1 = 44.22% | Mean 2 = 28.22% |
| Stand.dev. 1 = 6.17% | Stand. dev. 1 = 4.11% |

Is there significant evidence to claim that the mean percentage of yeast cells killed by monocytes among control higher than among patients using t test.

c) A survey of 320 families with five children each revealed the following distribution.

| No. of boys | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|
| No. of girls | 0 | 1 | 2 | 3 | 4 | 5 |
| No. of families | 14 | 56 | 110 | 88 | 40 | 12 |

Is the result consistent with the hypothesis that the male and female births are equally probable?

***Q5)*** Attempt any two of the following : **[10]**

a) Draw the cumulative frequency polygon or ogives (both 'less than' and 'more than' types) for the following frequency distribution.

| No. of colonies | 50-59 | 60-69 | 70-79 | 80-89 | 90-99 | 100-109 | 110-119 |
|---|---|---|---|---|---|---|---|
| No. of plates | 8 | 10 | 16 | 14 | 10 | 5 | 2 |

b) Describe scales used in statistics.

c) Write a note on accuracy and precision.

***Q6)*** Attempt any two of the following : **[10]**

a) If three coins are tossed. Find the probability of

i) 0 heads, 1 heads, 2 heads & 3 heads

ii) More than one head

iii) at least one head

b) A book contains 100 misprints distributed randomly throughout its 100 pages. What is the probability that a pages observed at random contains at least two misprints. Assuming Poisson distribution.

c) Sex of birth and Rh factors are independent events and occur in any child. What will be the probability of a child being male and Rh positive?

***Q7)*** Attempt any two of the following : **[10]**

a) Calculate risk ratio of developing lung cancer among smoker and non smoker from the following table

| Risk | Disease status | |
|---|---|---|
| Smoker | 25 | 75 |
| Non Smoker | 2 | 98 |

b) Write a note on clinical trial.

c) What is Plackett Burman design?

***Q8)*** Attempt any two of the following : **[10]**

a) Write on concept and process of modelling.

b) Explain the Susceptible Infected and Recovery model.

c) A study on blood types in a population found the following genotypic distribution among the people sampled : 1101 were MM, 1496 were MN and 503 were NN. Calculate the allele frequencies of M and N, the expected numbers of the three genotypic classes (assuming random mating.)

Total No. of Questions : 8] SEAT No. :

**P2302** [Total No. of Pages : 2

# [4830]-103
# M.Sc. (Part - I) (Semester - I)
# MICROBIOLOGY
## MB - 503 : Cell Organization and Biochemistry
## (2013 Pattern) (Credit System)

*Time : 3 Hours]* *[Max. Marks : 50*

***Instructions to the candidates:***

1) ***Q.1 to Q.3 is compulsory.***
2) ***Attempt at least two from Q.4 to Q.8.***
3) ***All questions carry equal marks.***
4) ***Draw neat-labelled diagrams wherever necessary.***
5) ***Use of logarithmic tables and scientific calculators is allowed.***
6) ***Assume suitable data if necessary.***
7) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any two of the following : **[10]**

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

b) Explain 5' $\rightarrow$ 3' polarity of nucleic acids.

c) Describe the preparation of 100 ml of 0.5M $KH_2PO_4$-$K_2HPO_4$ buffer, $P^H$ 7.5 using acid pKa = 6.86.
(Given - MW. $KH_2PO_4$ = 136, $K_2HPO_4$ = 174)

***Q2)*** Attempt any two of the following : **[10]**

a) Describe regulation of cell cycle in eukaryotes.

b) Diagrammatically illustrate the working of immunoelectron microscope and comment on its applications.

c) Describe structure and function of intermediate filaments.

***Q3)*** Attempt any two of the following : **[10]**

a) Write a note on commitment in embryo development.

b) Diagrammatically explain anterio-posterior body axis formation in Drosophila.

c) Describe organizers in xenopus

***Q4)*** Attempt any two of the following : **[10]**

a) Write a note on cell communication among myxobacteria.

b) Explain the molecular mechanism of quorum sensing in Gram positive bacteria.

c) Describe the mechanism of biofilm formation and comment on its significance.

***P.T.O.***

***Q5)*** Attempt any two of the following : **[10]**

a) Write a note on weak acids and weak bases.

b) Explain biochemical significance of inductive effect.

c) Explain the mechanism of substitution reactions giving suitable examples.

***Q6)*** Attempt any two of the following : **[10]**

a) What are steroids? Explain their structure and function with suitable examples.

b) How are lipids classified on the basis of their chemical structures?

c) Diagrammatically illustrate the D-series of aldoses.

***Q7)*** Attempt any two of the following : **[10]**

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

b) Explain the function of iron as a cofactor.

c) Explain any two enzyme catalysed reactions where FAD is involved.

***Q8)*** Attempt any two of the following : **[10]**

a) Explain chemical structure and functions of parathyroid hormones.

b) Give major types and functions of pancreas hormones.

c) Write a note on ovarian hormones.

**Total No. of Questions : 8]** **SEAT No. :**

**P2303** **[Total No. of Pages : 2**

# [4830]-201
# M.Sc. (Semester - II)
# MICROBIOLOGY
## MB - 601 : Instrumentation & Molecular Biophysics
## (2013 Pattern) (Credit System)

***Time : 3 Hours]*** ***[Max. Marks : 50***

***Instructions to the candidates:***

1) ***Attempt any three questions from 1 to 4. (Core-Credits)***
2) ***Attempt any two questions from 5 to 8. (Noncore-Credits)***
3) ***All questions carry equal marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables/scientific calculator is allowed.***
7) ***Assume suitable data if necessary.***

***Q1)*** Attempt any two of the following : **[10]**

a) Differentiate between native PAGE and SDS - PAGE.

b) Predict the order of elution when a mixture containing the following compound is passed through a column containing gel that exclude all protein of MW 200000 and higher.
Cytochromec (MW = 13000) Tryptophan Synthetase (MW = 117000) hexokinase (MW = 96000) ATP Sulfurase (MW = 440000) glucose oxidase (MW = 154000) and xanthine oxidase (MW = 300000).

c) Explain Equilibrium isodensity centrifugation and comment on: Nature of gradient material.

***Q2)*** Attempt any two of the following : **[10]**

a) Write a short note on FRET.

b) Calculate absorbance and transmission of $5\times10^{-5}$ MATP Solution in a 1cm cuvette with molar extinction coefficient of $1.54\times10^{4}$ $(moldm^{-3})^{-1}$ $cm^{-1}$.

c) Describe the components of Mass spectroscope.

***Q3)*** Attempt any two of the following : **[10]**

a) Describe Bravais lattices.

b) Write a short note on spin-spin coupling parameter of NMR.

c) Diagrammatically represent the X-ray crystallography instrument. How is the phase problem of crystallography solved in case of Proteins?

***P.T.O.***

***Q4)*** Attempt any two of the following : **[10]**

a) Comment on :
   i) Splitter system for sample injection.
   ii) Isocratic and gradient elution used in High performance liquid chromatography.

b) Describe the components of NMR and sample preparation required for NMR.

c) With suitable example explain bathochromic and hypsochromic shift seen in Absorption spectra.

***Q5)*** Attempt any two of the following : **[10]**

a) Draw Resonance forms of the peptide bond and cis/Trans isomer of peptide bond.

b) Explain any two non-covalent interactions of protein.

c) Describe the tertiary structure of Myoglobin.

***Q6)*** Attempt any two of the following : **[10]**

a) Write a short note on ligand Explorer software.

b) Explain the steps involve-in BLAST.

c) Explain local alignment method.

***Q7)*** Attempt any two of the following : **[10]**

a) Explain the working of Zeta Potential measuring instrument.

b) With a suitable example explain biogenic synthesis of nano particle.

c) Explain how characterization of nano particles can be done using SEM.

***Q8)*** Attempt any two of the following : **[10]**

a) Justify : "All conformational space is not accessible for protein folding" according to Prof. Ramchandran.

b) Comment on : Nucleic acid databases.

c) What are magnetosomes? Which are the bacteria that produce it.

**Total No. of Questions : 8]** **SEAT No. :**

**P2304** **[Total No. of Pages : 3**

# [4830]-202
# M.Sc. (Part - I) (Semester - II)
# MICROBIOLOGY
# MB - 602 : Virology
# (2013 Pattern) (Credit System)

***Time : 3 Hours]*** ***[Max. Marks : 50***

***Instructions to the candidates:***

1) ***Attempt any three questions from 1 to 4 (Core-Credits)***
2) ***Attempt any two questions from 5 to 8 (noncore-Credits)***
3) ***All questions carry equal marks.***
4) ***Draw neat labeled diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of log tables/scientific calculator is allowed.***
7) ***Assume suitable data, if necessary.***

***Q1)*** Attempt any two of the following : **[10]**

a) Explain the mechanism of adsorption and penetration of viral particles during replication.

b) Elaborate on structural components of a virus.

c) Diagrammatically show rolling circle mechanism of replication of viral DNA.

***Q2)*** Attempt any two of the following : **[10]**

a) Briefly explain various routes of inoculation of viruses in experimental animals.

b) Describe western blotting technique in detection of viruses.

c) In an infectivity assay, Lysate of the virus was diluted tenfold. 0.1 ml diluted lysate of each dilution was added to tissue culture flasks carrying monolayers of VERO cell line, separately. The flasks were incubated in $CO_2$ incubator and checked for cytopathic effects.

***P.T.O.***

Following table represents the data obtained. Calculate $TCID_{50}$ value using cumulative values. **[10]**

| Virus dilution used | No. of flasks showing cyto pathic effects |
|---|---|
| $10^{-1}$ | 8 |
| $10^{-2}$ | 6 |
| $10^{-3}$ | 5 |
| $10^{-4}$ | 2 |
| $10^{-5}$ | 0 |
| $10^{-6}$ | 0 |

***Q3)*** Attempt any two of the following : **[10]**

a) Describe classification of viruses based on the type of host they infect.

b) Briefly explain critend used to differentiate virus genera from species.

c) State the principles of homenclature of viruses as given by ICTV.

***Q4)*** Attempt any two of the following : **[10]**

a) Compare positive sense RNA with negative sense RNA.

b) Explain cultivation of viruses in secondary cell line.

c) Explain RIPA for immunodiagnosis of viruses.

***Q5)*** Attempt any two of the following : **[10]**

a) Differentiate between $T_{odd}$ & $T_{even}$ phages.

b) Comment on - Bacteriophage therapy.

c) Describe life cycle of $M_{13}$ phage.

***Q6)*** Attempt any two of the following : **[10]**

a) Compare killed and attenuated vaccines.

b) Explain the role of Si RNA in controlling infections of viruses.

c) Give a protocol for designing and screening of antiviral agents.

***Q7)*** Attempt any two of the following : **[10]**

a) Write a note on emerging animal viruses.
b) Give characteristics features of HIV.
c) Explain the mechanism involved in cell transformation by RNA viruses.

***Q8)*** Attempt any two of the following : **[10]**

a) Explain various morphological changes in plants infected by viruses.
b) Enlist antigen based methods for detection of plant viruses. Explain any one method.
c) Elaborate on various methods used to prevent infections of plants by viruses.

Total No. of Questions : 8] SEAT No. :

**P2305** [Total No. of Pages : 2

# [4830]-203
# M.Sc. (Part - I) (Semester - II)
# MICROBIOLOGY
# MB - 603 : MICROBIAL METABOLISM
# (2013 Pattern) (Credit System)

*Time : 3 Hours]* *[Max. Marks : 50*

***Instructions to the candidates:***

1) ***Q.1 to Q.3 is compulsory.***
2) ***Attempt at least two from Q.4 to Q.8.***
3) ***All questions carry equal marks.***
4) ***Draw neat labelled diagrams wherever necessary.***
5) ***Use of logarithmic tables and scientific calculators is allowed.***
6) ***Assume suitable data if necessary.***
7) ***Figure to the right indicate full marks.***

***Q1)*** Attempt any two of the following : **[10]**

a) Discuss the steps involved in king Altman approach to derive two substrate enzyme catalysed reaction.

b) Explain the KNF model of allosteric enzyme.

c) Justify: "During simple non-competitive inhibition km remains unaltered but Vm decreases".

***Q2)*** Attempt any two of the following : **[10]**

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

b) Comment on 'Entropy'.

c) The $\Delta G°$ of acetyl Ⓟ $\rightarrow$ acetate + pi is – 10,000 cal/mol. The $\Delta G°$ of hydrolysis of ATP $\rightarrow$ ADP + Pi is –7.3 kcal/mol. Calculate $\Delta G°$ and keq of the reaction given below under standard conditions.

Acetyl Ⓟ + ADP $\rightarrow$ Acetate + ATP

***Q3)*** Attempt any two of the following : **[10]**

a) Explain the concept of anaerobic respiration with suitable example.

b) Comment on inhibitors of electron transport chain of mitochondria.

c) Schematically represent mitochondrial ETC.

***P.T.O.***

***Q4)*** Attempt any two of the following : **[10]**

a) Describe transport of ions across membranes.

b) Explain concept of model membranes

c) Describe facilitated transport across membranes with suitable examples.

***Q5)*** Attempt any two of the following : **[10]**

a) Schematically represent biosynthesis of glutamate family amino acids.

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

c) Explain regulation of glutamate synthetase.

***Q6)*** Attempt any two of the following : **[10]**

a) Compare cyclic and non cyclic photophosphoxylation.

b) Diagrammatically illustrate ETC of cyano bacteria.

c) Justify "The pathway of $CO_2$ assimilation has a greater energy cost in $C_4$ plants than in $C_3$ plants.".

***Q7)*** Attempt any two of the following : **[10]**

a) Justify "One round of calvin cycle for fixation of six moles of $CO_2$ requires 18 moles ATP and 12 moles NADPH".

b) Explain the process of solute transport across chloroplast membrane.

c) Describe the steps involved in synthesis of peptidoglycan.

***Q8)*** Attempt any two of the following : **[10]**

a) Describe the steps involved in synthesis of unsaturated fatty acid.

b) Give the role of phosphotidyl inositol as signal molecule

c) Explain synthesis of Dolichols.

Total No. of Questions : 8] SEAT No. :

P2306 [Total No. of Pages : 2

# [4830]-301
# M.Sc. (Semester - III)
# MICROBIOLOGY
# MB - 701 : IMMUNOLOGY
# (2013 Pattern) (Credit System)

*Time : 3 Hours]* *[Max. Marks : 50*

***Instructions to the candidates:***

1) ***Attempt any three questions from 1 to 4 (Core Credits)***
2) ***Attempt any two questions from 5 to 8 (Non-Core Credits)***
3) ***All questions carry equal marks.***
4) ***Draw neat-labeled diagrams wherever necessary.***
5) ***Use of logarithmic tables and scientific calculators is allowed.***
6) ***Figures to the right indicate full marks.***

***Q1)*** Attempt **any two** of the following : **[10]**

a) Explain the role of B-cell receptor (BCR) in activation of immune response.

b) With the help of diagram, describe the structure of T-cell receptor (TCR).

c) Describe Ras/MAP kinase pathway in initiation of IL-2 synthesis.

***Q2)*** Attempt **any two** of the following : **[10]**

a) How cytokines influence the Th1 – Th2 balance during activation of immune response.

b) Describe the spatial control of complement system.

c) Explain the role of idiotypic network in immune regulation.

***Q3)*** Attempt **any two** of the following : **[10]**

a) Explain the steps in preparation of an established cell line from cancer biopsy specimen.

b) Describe use of the cell lines in functional assay of TNF.

c) Explain giving examples, application of knock-out mice in immunology research.

***Q4)*** Attempt **any two** of the following : **[10]**

a) Describe tyrosine kinase linked receptors.

b) Explain the mechanism of induction of central tolerance.

c) Explain role of serum in animal cell culture media.

***P.T.O.***

***Q5)*** Attempt **any two** of the following : **[10]**

a) Explain the cellular transformations taking place in developing neoplasia.

b) What is the difference in tumor associated antigens and tumor specific antigens?

c) Discuss the significance of humoral effector mechanisms in defense against tumor.

***Q6)*** Attempt **any two** of the following : **[10]**

a) How host immune system responds to *Salmonella* infections?

b) Explain the pathophysiology in tuberculosis.

c) Discuss the approaches in developing vaccine against HIV-AIDS.

***Q7)*** Attempt **any two** of the following : **[10]**

a) Describe the symptoms of complement deficiency disorders.

b) Describe the prognosis and treatment of myasthenia gravis.

c) How humoral deficiency disorders are treated?

***Q8)*** Attempt **any two** of the following : **[10]**

a) Describe presence and function of immune system components in unicellular invertebrates.

b) Explain how phagocytosis function evolved from lower to higher invertebrate species.

c) Describe the functional diversity of cellular components in different species of vertebrates.

**Total No. of Questions : 8]** **SEAT No. :**

**P2307** **[Total No. of Pages : 2**

# [4830]-302
# M.Sc. (Semester - III)
# MICROBIOLOGY
# MB - 702 : Molecular Biology - I
# (2013 Pattern) (Credit System)

***Time : 3 Hours]*** ***[Max. Marks : 50***

***Instructions to the candidates:***

1) ***Attempt any three questions from 1 to 4 (Core Credit)***
2) ***Attempt any two questions from 5 to 8 (Non-Core Credit)***
3) ***All questions carry equal marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of log tables/graph papers/scientific calculator is allowed.***
7) ***Assume suitable data if necessary.***

***Q1)*** Attempt any two of the following : **[10]**

a) What is phage display system? Give its applications.

b) Comment on : Activity gel assay as a tool in molecular biology.

c) Explain DNA finger printing technique.

***Q2)*** Attempt any two of the following : **[10]**

a) State the importance of CAP and cAMP in a positive regulation of an operon.

b) Comment on : Riboswitch.

c) Explain SPO1 infection in B. *subtilis*.

***Q3)*** Attempt any two of the following : **[10]**

a) Justify, 'Polyadenylation is an essential step in eukaryotic m RNA processing'

b) How are t RNAs processed in eukaryote?

c) Comment on : Non – coding RNAs

***Q4)*** Attempt any two of the following : **[10]**

a) State the significance of RFLP in genetic studies.

b) Justify : 'Repressor protein has dual function in fine control of *lac* operon'.

c) Justify the need of mRNA processing in eukaryotes.

***P.T.O.***

***Q5)*** Attempt any two of the following : **[10]**

a) Explain structure of an IS element.

b) How is TnA transposition controlled?

c) Give salient features of a Retroposon.

***Q6)*** Attempt any two of the following : **[10]**

a) Elaborate on Isoelectric focusing technique.

b) Explain post translational modifications in a protein with suitable examples.

c) Elaborate on immunoassays in protein detection and quantitation.

***Q7)*** Attempt any two of the following : **[10]**

a) Give applications of PCR.

b) Diagrammatically illustrate RT-PCR

c) Comment on DNA microarray.

***Q8)*** Attempt any two of the following : **[10]**

a) Explain Ty elements in yeast.

b) Comment on Diagnostic proteomics.

c) Elaborate on quantification of DNA in Real Time PCR.

Total No. of Questions : 8] SEAT No. :

**P2308** [Total No. of Pages : 2

# [4830]-303
# M.Sc. (Semester - III)
# MICROBIOLOGY
# MB - 703 : INDUSTRIAL WASTE WATER TREATMENT
# (2013 Pattern)

*Time : 3 Hours]* *[Max. Marks : 50*

***Instructions to the candidates:***

1) ***Attempt any three from Q.1 to Q.4.***
2) ***Attempt any two from Q.5 to Q.8.***
3) ***All questions carry equal marks.***
4) ***Draw neat-labelled diagrams wherever necessary.***
5) ***Use of logarithmic tables and scientific calculators is allowed.***
6) ***Assume suitable data if necessary.***
7) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any two of the following : **[10]**

a) Describe the parameters for measuring pollution load of waste water.

b) Explain the significance of waste water treatment.

c) Describe any two odorous compounds associated with waste water.

***Q2)*** Attempt any two of the following : **[10]**

a) Explain off-line flow equalization with suitable diagram.

b) Enlist the different chemicals used during flocculation. Describe the mode of action of any one in detail.

c) Describe the various granular medium employed in filtration.

***Q3)*** Attempt any two of the following : **[10]**

a) Enlist the various aerobic biological processes used in waste water treatment. Describe activated sludge process in detail.

b) Describe the unit operations used for nitrification and denitrification.

c) The BOD/COD ratio and the TSS of an industrial effluent were found to be 0.2 and 35 mg/dm$^3$. Suggest the suitable biological treatment to be given along with justification.

***P.T.O.***

***Q4)*** Attempt any two of the following : **[10]**

a) Explain the parameters used for determining wastewater treatment efficacy.

b) Describe the process of floatation.

c) A industrial wastewater having a BOD of 250 mg/L is to be treated by a two stage trickling filter. The discharge limit is 20 mg/L of BOD. 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 removal at both stages of the filter is the same.
Determine the BOD loading for both the filters.

***Q5)*** Attempt any two of the following : **[10]**

a) With the help of flow chart, explain the processes used in the treatment of effluent from paper industry.

b) Describe the physico - Chemical treatment processes for dairy industry.

c) How is colour removed from effluent of dyeing industry.

***Q6)*** Attempt any two of the following : **[10]**

a) Describe the significance of EIA.

b) Explain briefly the type of impacts and their attributes.

c) Explain phase II, EIA study.

***Q7)*** Attempt any two of the following : **[10]**

a) Explain the principle and working of SAFF.

b) Describe the advantages of MBRs.

c) Draw a schematic diagram of typical RBC and explain its functioning.

***Q8)*** Attempt any two of the following : **[10]**

a) Delineate the characteristics of food processing industry effluent.

b) Explain the steps involved in arriving at the findings of an EIA study.

c) Differentiate between SAFF and activated sludge process.

Total No. of Questions : 8] SEAT No. :

**P2309** [Total No. of Pages : 2

# [4830]-401
# M.Sc. (Semester - IV)
# MICROBIOLOGY
# MB - 801 : PHARMACEUTICAL & MEDICAL MICROBIOLOGY
# (2013 Pattern) (Credit System)

*Time : 3 Hours]* *[Max. Marks : 50*

***Instructions to the candidates:***

1) ***Attempt any three questions from 1 to 4 (Core Credits)***
2) ***Attempt any two questions from 5 to 8 (Non-Core Credits)***
3) ***All questions carry equal marks.***
4) ***Draw neat-labeled diagrams wherever necessary.***
5) ***Use of logarithmic tables and scientific calculators is allowed.***
6) ***Figures to the right indicate full marks.***

***Q1)*** Attempt any two of the following : **[10]**

a) Give and explain, Paul Ehrlich's postulates related to drug discovery and development.

b) Justify, "Structure activity relationship is the basis of rational drug discovery".

c) Describe the objectives and outcome of post-marketing clinical studies.

***Q2)*** Attempt any two of the following : **[10]**

a) Explain the advantages of Kirby-Bauer technique over agar gradient plate technique.

b) What is a therapeutic ratio? Explain its significance in clinical medicine.

c) Discuss in brief, the susceptibility testing methods used for mycobacteria.

***Q3)*** Attempt any two of the following : **[10]**

a) How pathogenic bacteria invade intact epithelial cell barriers of host?

b) Explain role of pili in bacterial pathogenesis.

c) Explain in vitro detection and quantification of diphtheria toxin.

***P.T.O.***

***Q4)*** Attempt any two of the following : **[10]**

a) In drug discovery process, what is the significance of the events viz. lead discovery, lead optimization and candidate selection?

b) Explain in brief, CLSI guidelines for susceptibility testing of clinical isolates.

c) Justify, "Presence of virulent genes contributes to the pathogenicity".

***Q5)*** Attempt any two of the following : **[10]**

a) Describe the antagonistic, synergistic and additive interactions of drugs and the methods to study these interactions.

b) Explain use of electrical resistance methods for evaluation of antimicrobial agents.

c) List the drugs targeting DNA replication in bacteria. Diagrammatically illustrate the mechanism of action for any one.

***Q6)*** Attempt any two of the following : **[10]**

a) Explain the principles of in vitro and in vivo methods used to determine pyrogenicity of a drug formulation.

b) In what situations drug combinations are used for treatment? What are the risks/benefits associated with such drug combinations?

c) How creditability of drug manufacturing process be established?

***Q7)*** Attempt any two of the following : **[10]**

a) How release of a drug in body can be prolonged? Explain giving suitable examples.

b) What is pharmacokinetics of a drug? Explain how it is studied.

c) Explain role of FDA in drug development process.

***Q8)*** Attempt any two of the following : **[10]**

a) What are the mechanisms of drug resistance development by bacterial pathogens? Explain giving examples of ESBL producers.

b) Give significance of using microorganisms as weapons in biological warfare.

c) What are epidemiological approaches in study of SARS?

Total No. of Questions : 8] SEAT No. :

**P2310** [Total No. of Pages : 2

# [4830]-402
# M.Sc. (Semester - IV)
# MICROBIOLOGY
# MB - 802 : MOLECULAR BIOLOGY - II
# (2013 Pattern) (Credit System)

*Time : 3 Hours]* *[Max. Marks : 50*

***Instructions to the candidates:***

1) ***Attempt any three questions from 1 to 4 (Core Credits)***
2) ***Attempt any two questions from 5 to 8 (Non-Core Credits)***
3) ***All questions carry equal marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of log tables/graph papers/scientific calculators is allowed.***
7) ***Assume suitable data if necessary.***

***Q1)*** Attempt any two of the following : **[10]**

a) Explain the principle of Sanger's method of genome sequencing.

b) What impact will pharmacogenomics have on clinical trials for a new drug?

c) What are epigenetic mechanisms that can lead to gene silencing? Explain their salient features.

***Q2)*** Attempt any two of the following : **[10]**

a) What are genome libraries? How are they constructed for a particular genome?

b) What methods are used to introduce genes into plant cell? How are these methods different from those used to introduce genes into animals?

c) What features are required in all vectors used to propagate cloned DNA?

***Q3)*** Attempt any two of the following : **[10]**

a) What are peptide antibiotics? Give a flow sheet for synthesis of peptide antibiotics using RDT.

b) Explain the role of RDT in the synthesis of ascorbic acid.

c) Justify : 'Rubber can be synthesized using recombinant DNA system'.

***P.T.O.***

***Q4)*** Attempt any two of the following : **[10]**

a) Elaborate on the 'one gene many proteins' concept.

b) Explain protein engineering using suitable example.

c) Justify – Unconventional microbial systems are prepared by RDT for the production of secondary metabolites.

***Q5)*** Attempt any two of the following : **[10]**

a) What are GM plants? Compare properties of a wild variety of a plant with that of a genetically engineered plant.

b) Elaborate on the uses of transgenic animals.

c) Give a comparative account of various physical methods used for transferring desired genes into plants.

***Q6)*** Attempt any two of the following : **[10]**

a) Justify why *Zymomonas* mobilis has greater potential in alcohol production from sugars than *Saccharomyces*.

b) Give flowchart for the enzymatic biodegradation of cellulose using genetically modified cellulolytic *E.coli*.

c) Comment on the potential role of *Pseudomonas* in degradation of xenobiotic compounds.

***Q7)*** Attempt any two of the following : **[10]**

a) What are the salient features of human genome project?

b) What is meant by gene annotation? Give a protocol of gene annotation

c) Comment on genome project of *Drosophila*.

***Q8)*** Attempt any two of the following : **[10]**

a) Comment on various mechanisms involved in gene therapy.

b) Enlist various raw materials that supply starch for the production of alcohols. Explain use of GEMOs in degradation of starch.

c) What strategies are used in sequencing human genome?

**Total No. of Questions : 8]** **SEAT No. :**

**P2311** **[Total No. of Pages : 3**

# [4830]-403
# M.Sc. (Semester - IV)
# MICROBIOLOGY
# MB - 803 : MICROBIAL TECHNOLOGY
# (2013 Pattern) (Credit System)

***Time : 3 Hours]*** ***[Max. Marks : 50***

***Instructions to the candidates:***

1) ***Attempt any THREE questions from 1 to 4 (Core Credits)***
2) ***Attempt any TWO questions from 5 to 8 (Non-Core Credits)***
3) ***All questions carry equal marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Figures to the right indicate full marks.***
6) ***Use of logarithmic tables/scientific calculator is allowed.***
7) ***Assume suitable data if necessary.***

***Q1)*** Attempt any two of the following : **[10]**

a) With the help of a diagram, describe the construction of a CSTR. State the situations in which such a bioreactor is used.

b) Elaborate 'In batch culture growth rate decreases due to depletion of essential nutrients'.

c) Describe types of Turbines and propellers used in fermenters.

***Q2)*** Attempt any two of the following : **[10]**

a) What is '2-film theory of oxygen transfer'? Explain with a suitable diagram.

b) What is NRe? Explain its significance in determining power requirements during fermentation.

c) Explain the principle, construction and operation of a cell-mass sensor.

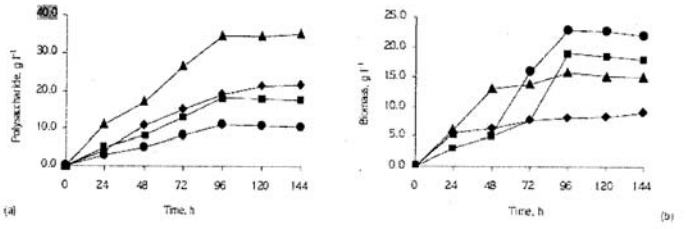
***Q3)*** Attempt any two of the following : **[10]**

a) Describe production of chitinase.

b) Production of Pullulan From Beet Molasses and Synthetic Medium by *Aureobasidium pullulans* was examined in this study.

***P.T.O.***

Results obtained are as shown in figure,




Igure 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 $l^{-1}$).

Interprete the results and answer the following:

i) Which medium is most productive for the pullulan and why?

ii) Which medium is most suitable for the biomass generation why?

c) Describe patents and designs of IPR.

***Q4)*** Attempt any two of the following : **[10]**

a) Describe construction of Air lift bioreactor, state situations in which air lift bioreactor is used.

b) What is 'OTR' and 'OUR' in context with a fermentation process? Explain with a suitable example.

c) Graphically represent the production of protease and leakage of cells during batch fermentation by immobilized cells for the consequtive three cycles.

***Q5)*** Attempt any two of the following : **[10]**

a) Describe concept of secondary metabolites and their control.

b) Why the mycellial filamentous growth during fermentation is important in context with product yield.

c) How the cell proliferation can be affected by shearing of cells.

***Q6)*** Attempt any two of the following : **[10]**

a) Describe fungi as biocontrol agent with the suitable example.

b) Describe use of fungi in food industry and biosensor.

c) Explain architecture of fungal cell wall.

***Q7)*** Attempt any two of the following : **[10]**

a) Describe production of recombinant hepatitis B vaccine.

b) Explain production of recombinant restriction endonuclease enzyme.

c) Diagrammatically illustrate production of monodonal antibody.

***Q8)*** Attempt any two of the following : **[10]**

a) Write short note on SOP preparation.

b) Explain the concept of ISO certification.

c) Give the validation protocol for quality control.