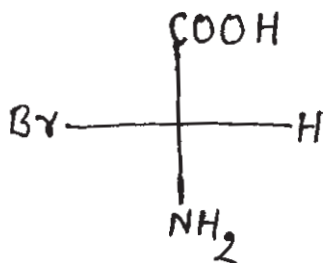


P294**[3919] - 1****F.Y. B.Sc.****BIOTECHNOLOGY****Bb - 101 : Fundamentals of Chemistry
(New) (2008 Pattern)****Time : 3 Hours]****[Max. Marks : 80****Instructions to the candidates:**

- 1) All questions are compulsory.
- 2) Draw neat and labelled diagrams wherever necessary.
- 3) Figures to the right indicate full marks.
- 4) Use of logarithmic tables and calculator is allowed.

Q1) Answer the following :**[16]**

- a) Explain the general characteristics of the gasses.
- b) Distinguish between order and molecularity.
- c) State and explain Raoult's laws.
- d) Define the terms :
 - i) Phase.
 - ii) Component.
- e) What is specific conductance and equivalent conductance? How are they related?
- f) What is emf? Why the emf is not measured by voltmeter of a cell having small potential?
- g) Assign the R and S configuration to the following compound :



- h) Explain the formation of co-ordinate bond with suitable example.

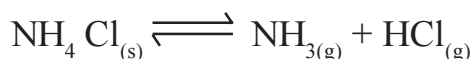
P.T.O.

Q2) Attempt ANY FOUR of the following : **[16]**

- a) State and explain Avogadro's law.
- b) What are pseudo molecular reactions? Explain your answer with suitable examples.
- c) What is osmotic pressure? How it is used to determine the molecular weight of a substance?
- d) Draw and discuss the phase diagram for the water system.
- e) Discuss the principle underlying the conductometric titrations. What are the advantages of conductometric titration over the ordinary titration.
- f) Explain the formation of H_2 and HF molecules on the basis of atomic orbital overlap.

Q3) Attempt ANY FOUR of the following : **[16]**

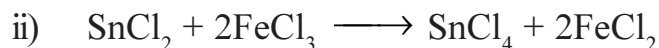
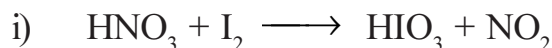
- a) What is depression in freezing point of solution? How it is determined experimentally?
- b) Explain the effect of inter and intra molecular hydrogen bonding on the following properties :
 - i) Physical state.
 - ii) Melting and boiling points.
- c) What are chemical cells? Derive an expression for emf of chemical cell without transference.
- d) The $t_{1/2}$ of a reaction is halved as the initial concentration of the reactant is doubled. What is the order of the reaction?
- e) An aqueous solution containing 0.25g of a solute dissolved in 20g water froze at $-0.42^\circ C$. Calculate the molecular weight of the solute. (Molal depression constant for 1000g of water is $1.86^\circ C$).
- f) Define the term degrees of freedom. Find the number of degrees of freedom in the following system :



Q4) Attempt ANY FOUR of the following : **[16]**

- a) Comment on the stability of the conformation of n-butane with the help of energy profile diagram.
- b) Explain the terms plane of symmetry, centre of symmetry and alternating axis of symmetry with suitable examples.
- c) What are alkenes? How they are named?

- d) Find the oxidation half reaction and reduction half reaction from the following equations :



- e) A cell having electrodes 2.1cm apart and area of cross section 3.5cm^2 is placed in the 0.05N silver nitrate solution gave resistance of 104.1 ohm. Calculate the equivalent conductance of silver nitrate solution.

- f) For the cell



$$E^\circ = 1.015\text{V}, \frac{dE}{dT} = 4.92 \times 10^{-4} \text{ V K}^{-1}$$

Calculate ΔG° and ΔS° for the cell at 25°C .

Q5) Attempt ANY TWO of the following :

[16]

- a) Write notes on :
- Direct reading potentiometer.
 - Quinhydrone electrode and pH.
- b) What are potentiometric titrations? Explain with special reference to neutralization titration. What are the advantages of potentiometric titrations.
- c) What is transference and transference number? Describe Hittorf's method for determination of transport number.



P295

[3919] - 2

F.Y. B.Sc.

BIOTECHNOLOGY

Bb - 102 : Fundamentals of Physics

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answer should be specific and to the point.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of calculator is allowed.*

Q1) Answer the following questions :

[16]

- a) Define atomic mass unit (amu).
- b) Define elastic limit.
- c) What is meant by atmospheric pressure?
- d) Distinguish between streamline and turbulent flow.
- e) Define molar heat capacity. Give its SI unit.
- f) State Brewster's law.
- g) A refrigerator operates between the temperatures 250°K and 300°K. Calculate the coefficient of performance of the refrigerator.
- h) State first law of thermodynamics.

Q2) Attempt any four :

[16]

- a) Define Kelvin. State the relationship between celcius and fahrenheit scale of temp. Express boiling point of water on Kelvin, celcius and fahrenheit scale.
- b) Explain the role of physics in life sciences.
- c) 10 liters of water are compressed by an increase in pressure of 20 atmosphere. Find the change in volume of water.

Given : Atmospheric pressure = $1.013 \times 10^5 \text{ N/m}^2$

Compressibility of water = $5 \times 10^{-10} \text{ m}^2/\text{N}$

P.T.O.

- d) State Pascal's principle and show that the work done on the input piston by the applied force is equal to the work done by the output piston in lifting the load placed on it.
- e) State and prove Bernoulli's theorem.
- f) There is a 1mm thick layer of glycerine between a flat plate of area 100cm^2 and a big plate. If the coefficient of viscosity of glycerine is 1.0kg/m-sec , then how much force is required to move the plate with a velocity of 7cm/sec .

Q3) Attempt any four : [16]

- a) Define critical constants P_c , V_c , T_c and critical coeff. of the gas.
- b) A Carnot engine working as a refrigerator between 240°K and 300°K receives 1000 calories of heat from the reservoir at lower temperature. Calculate the efficiency of engine and amount of heat rejected to the reservoir at higher temperature.
- c) Explain the steps involved in the air compression refrigeration cycle.
- d) The permeability of some material is 0.130 T-m/A . Find the value of relative permeability and magnetic susceptibility of the material. (Given : $\mu_0 = 4\pi \times 10^{-7} \text{ T-m/A}$).
- e) What is nuclear magnetism? Give its applications in the field of medicine.
- f) State and explain properties of laser.

Q4) Attempt any two : [16]

- a) With the help of suitable diagram explain the principle, construction and working of a venturimeter.
- b) Describe Quincke's method to determine surface tension of mercury.
- c) Show that in a closed organ pipe, only odd harmonics are present. What is the frequency of fundamental tone without and with end correction.

Q5) a) Give applications of Doppler's effect. A motor car approaches towards a crossing with a velocity of 75km/hr . A policeman standing the crossing hears a horn of frequency 260 per sec from the car. What is the original frequency of the horn

(Given : Velocity of sound, $V = 332 \text{ m/s}$).

- b) What is the origin of energy bands in the solid? With the help of energy band diagram distinguish between conductors, insulators and semi-conductors. A battery circulate $1000\mu\text{C}$ charge per millisecond in the circuit. Find the value of current flowing through the circuit. **[16]**

OR

- a) Show that entropy of a system remains constant in an adiabatic change. An ideal gas absorbs 1000K cal of heat from the source and does an amount of work 8400 joules during its expansion. How much is the increase in energy?
- b) Show that interference of two waves of same frequency travelling in the same direction gives minimum intensity when phase difference between them is $\pi, 3\pi, 5\pi, \dots$ etc. Hence show that $I_{\min} = (a_1 - a_2)^2$ where I is resultant intensity a_1, a_2 are amplitudes of waves.



Total No. of Questions : 8]

[Total No. of Pages : 3

P296

[3919] - 3

F.Y. B.Sc.

BIOTECHNOLOGY

Bb - 103 : Basic Biosciences

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Draw neat and labelled diagram wherever necessary.*
- 3) Answers to the two sections should be written in two separate answer books.*
- 4) Figures to the right indicate full marks.*

SECTION - I

(Botany)

Q1) Answer the following questions :

[8]

- a) Define in-vivo morphogenesis.
- b) State two biotechnologically important Bryophytes.
- c) What is secretory tissues?
- d) Define aestivation.
- e) What is Rhizome?
- f) Explain seed.
- g) Name any two growth promoting plant hormone.
- h) Give two examples of day neutral plant.

Q2) Write short notes on any three of the following :

[12]

- a) Reproduction in pteridophytes.
- b) Auxins.
- c) Complex tissues of plants.
- d) Special inflorescence.

P.T.O.

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

- a) Describe light reaction in photosynthesis.
- b) Describe the economic importance of algae.
- c) Explain the concept of phytochrome.
- d) Describe simple types of fruit.

Q4) Define fungi give classification of fungi and state distinguishing character of each division. **[10]**

OR

Describe salient features of angiosperm and explain life cycle of angiosperm with suitable example.

SECTION - II

(Zoology)

Q5) Answer the following : **[8]**

- a) Define aquaculture.
- b) Write any two characteristics of phylum porifera.
- c) Define commensalism and give example.
- d) Enlist any two useful Arthropods.
- e) Enlist two characteristics of Amphibia.
- f) Give application of integument in animals.
- g) Give two respiratory organs in vertebrates.
- h) Give two useful insects of commercial value.

Q6) Write short notes on any three : **[12]**

- a) Vermiculture.
- b) Salient features of phylum coelenterata.
- c) Plathelminthes Digestive in phylum.
- d) Symptoms and control measures of sugar cane leaf hopper.

Q7) Attempt any two :

[10]

- a) Comparative account on excretory system in animals.
- b) Describe types of host.
- c) Sketch and label life cycle of Jawar stem borer and describe its life cycle.

Q8) Attempt the following :

[10]

- a) Describe colony organization of Apis dorsata.

OR

- b) Describe in detail Blood circulation in Earth worm.



P297**[3919] - 4****F.Y. B.Sc.****BIOTECHNOLOGY****Bb - 104 : Mathematics and Statistical Methods for Biologists
(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) *Use of non-programmable scientific calculators is allowed.*
- 4) *Solve each section on separate answer paper.*

SECTION - I**Q1)** Attempt each of the following :**[5 × 2 = 10]**

- a) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 3 & 2 \end{bmatrix}$ then find a matrix X such that $2A - B + X = I_2$.
- b) Find $\lim_{x \rightarrow 0} \frac{6^x - 3^x}{4^x - 1}$.
- c) Find real and imaginary part of $\frac{\sqrt{2} + \sqrt{3}i}{\sqrt{3} - \sqrt{2}i}$.
- d) State whether the sequence $\langle a_n \rangle$ where $a_n = n [1 + (-1)^{n/n}]$ is oscillatory. Justify.
- e) If $u = \frac{x}{y} + \frac{y}{z} + \frac{z}{x}$ then find u_x and u_y .

Q2) Attempt any four of the following :**[4 × 2½ = 10]**

- a) Prove that $(-1 + i)^7 = -8(1 + i)$.
- b) Test the convergence of the series $\sum_{n=1}^{\infty} \frac{1}{n^n}$.
- c) If $u = x^y$ then show that $\frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^3 u}{\partial x \partial y \partial x}$.

P.T.O.

- d) Solve $(e^y + 1) \cos x \, dx + e^y \sin x \, dy = 0$.
- e) Solve the following system of linear equations.
 $5x_1 - 2x_2 + 6x_3 = 0$.
 $-2x_1 + x_2 + 3x_3 = 1$.
- f) Show that the vectors $(1, -1, 2)$, $(2, 3, 1)$, $(-3, 3, 6)$ are linearly dependent.

Q3) Attempt any two of the following : **[2 × 5 = 10]**

- a) Find the conditions that b_i 's must satisfy for the system given below to be consistent.

$$\begin{aligned} x_1 - 2x_2 + 5x_3 &= b_1 \\ 4x_1 - 5x_2 + 8x_3 &= b_2 \\ -3x_1 + 3x_2 - 3x_3 &= b_3 \end{aligned}$$

- b) Solve the following differential equation $\frac{dx}{dy} - \frac{1}{y}x = 2y^2$.

- c) Prove that, for $z_1, z_2 \in \mathbb{C}$, If $\left| \frac{z_1 - z_2}{1 - \bar{z}_1 z_2} \right| = 1$ then either $|z_1| = 1$ or $|z_2| = 1$.

Q4) Attempt any one of the following : **[1 × 10 = 10]**

- a) Determine whether the matrix A is diagonalizable. If so, find P and P^{-1}

$$\text{AP., where } A = \begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}.$$

- b) Find the stationary points and examine for maximum and minimum value for the function, $f(x, y) = x^2 + y^2 + 3xy$.

SECTION - II

Q5) Attempt the following : **[5 × 2 = 10]**

- a) The temperatures (in °C) at particular place on the 8 randomly selected days in a month are as follows :
 25.9, 26.2, 20.7, 22.8, 23.4, 28, 24.1, 21.9. Find the median temperature.
- b) Define standard deviation.
- c) State two properties of arithmetic mean.
- d) Define multiple correlation.
- e) Define probability of an event.

Q6) Attempt any four :

[4 × 2½ = 10]

- a) Following is a distribution of 170 fish according to their lengths (in mm) :

Length	17-18	19-20	21-22	23-24	25-26	27-28	29-30
No. of fish	5	40	70	45	6	2	2

Compute the mode.

- b) A firm finds that 5% of the test wells it drills, yield a deposit of natural gas. If it drills 6 wells, find the probability that at least one well will yield gas.
- c) There are 70 male and 30 female workers in a factory. The average weekly wages paid to male and female workers are Rs.750 and Rs.700 respectively. Find the average weekly wage of males and females taken together.
- d) Y and Z are uncorrelated variables with variance 4 each correlation coefficient between x and z = 0.46 and between x and y = 0.59. Calculate $r_{xy.z}$.
- e) Define Poisson distribution and state its mean and variance.

Q7) Attempt any two :

[2 × 5 = 10]

- a) The average daily sales of 500 branches of a pharmaceutical company was Rs.150 thousand with S.D. of Rs.15 thousand. Assuming that sales are normally distributed, find the probability that a randomly selected branch has sales between Rs.120 thousand and Rs.145 thousand.
- b) An ambulance service claims that it takes on an average 8.9 minutes to reach its destination. To check this claim, the agency that gives permits, collected 5 observations. The mean time required was 9.3 minutes with a S.D of 1.6 minutes. Can we conclude that the claim of ambulance service is true? (use $\alpha = 0.05$).
- c) Find the missing frequencies in the following data :

Class	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120
Frequency	4	8	-	16	6	-	2	2

It's known that the median is 72.5 and total number of observations is 50.

Q8) Attempt any one :

[1 × 10 = 10]

- a) The price (X) and demand (Y) of a commodity are given below :

X	10	12	14	16	18	20
Y	80	72	60	51	45	38

Draw scatter diagram and obtain the value of r_{xy} .

- b) Two types of powders were tested for their lives. The following results were obtained :

Type of powder	Sample size	Mean life (in months)	SD
Q	9	600	11
V	8	640	12

Is there any significant difference between their average lives? (Use 5% I.o.s.).

XXXX

Total No. of Questions : 5]

[Total No. of Pages : 2

P298

[3919] - 5

F.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 105 : Fundamentals of Biological Chemistry
(2008 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*

Q1) Answer the following :

[16]

- a) Define the term Apoenzyme, Holoenzyme, Coenzyme, Cofactor.
- b) Write the structure of Met-Val-Ala-Phe.
- c) What is the difference between amphipathic biomolecules and ampholytes? Give example.
- d) List out the reagents that are used in determination of N terminal amino acid and sequencing of protein.
- e) What is LDL and HDL? Give their significance.
- f) Define saponification number and give its significance.
- g) Give the coenzyme forms of pyridoxine and Niacin. Write the reactions which require them.
- h) What is the role of bile salts in our body.

Q2) Answer any four of the following :

[16]

- a) Define the terms Nucleophile and Electrophile. Give a suitable example for nucleophilic substitution reaction.
- b) Draw the clover leaf structure of tRNA and give the significance of each part.
- c) Differentiate between reducing and non reducing sugars.
- d) Give the biological significance of proteins.
- e) Write note on active site of enzymes.

P.T.O.

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

- a) How does Ramchandram plot help to predict the structure of proteins?
- b) Differentiate between NATIVE PAGE and SDS-PAGE.
- c) Draw a neat diagram of animal cell and give the significance of each part of the cell.
- d) Give the significance of storage and structural polysaccharides.
- e) How to eliminate salts from protein solution using dialysis technique.

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

- a) Classify lipids with suitable examples.
- b) Discuss competitive and non competitive inhibition of enzymes.
- c) Explain the principle, procedure and applications of affinity chromatography.

Q5) Answer any two of the following : **[16]**

- a) Describe the steps involved in determination of primary structure of proteins.
- b) Elaborate on allosteric enzymes and their significance in enzyme regulation.
- c) Explain the titration curve of any one amino acid.



P299

[3919] - 6

F.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 106 : Biophysics and Instrumentation
(New Course)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following :

[16]

- a) State the Pauli's exclusion principle and discuss its applications.
- b) What is Radio wave? State its application.
- c) State application of IR spectroscopy.
- d) Explain term :
 - i) Nuclear mass.
 - ii) Nuclear density.
- e) Give medicinal use of radioisotopes.
- f) State and explain types of system.
- g) Define Helmholtz free energy.
- h) State principle of N.M.R.

Q2) Answer any four of following :

[16]

- a) State failures of Bohr's theory.
- b) What do you mean by fluorescent spectroscopy?
- c) State Lambert-Beer's law and explain use of colourimetry.
- d) Write short note on liquid drop model.
- e) State and explain any four units used for radioactive dose.
- f) Write a short note on chemical potential.

P.T.O.

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

- a) Write short note on ECG.
- b) Explain the principle and working of thermoelectric thermometer.
- c) Write a short note on Atom Absorption spectroscopy.
- d) Describe the construction and working of platinum resistance thermometer.
- e) Explain Rayleigh's criteria for limit of resolution of two point objects.
- f) What is difference between enthalpy and entropy?

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

- a) Explain transmission electron microscope with schematic diagram.
- b)
 - i) Give an expression for calculation of decay constant and hence derive an expression for half life period.
 - ii) One gram of radium is retires by 2.1mg in 5 years by α -decay. Calculate half-life period of radium.
- c) Discuss vibration spectra of diatomic molecules.

Q5) a) Explain rotational spectra of non rigid molecule. **[8]**

b) State the principle and explain the working of centrifuge machine. **[8]**

OR

a) Explain emission spectra of the sodium (Na) atom. **[8]**

b) Discuss chemical composition of plasma membrane in brief. **[8]**



P300

[3919] - 7

F.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 107 : Microbiology
(New)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat and labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following :

[16]

- a) Define a basic stain with suitable example.
- b) What are Todd Phages? Give an example.
- c) State two characteristics and examples of protozoa.
- d) What is meant by Pulvinate colony?
- e) Define : Acidophiles with an example.
- f) Define : Rhizosphere.
- g) What is meant by co-culture?
- h) State the importance of pure culture in microbiology laboratory.

Q2) Attempt the following any four :

[16]

- a) Following data was obtained while analysing a pond water sample for TVC. Calculate CFU/ml.
 - i) Dilution plated = 10^{-4} .
 - ii) Colonies 52.
 - iii) Volume plated = 0.1 ml.
- b) State the contributions of Robert Koch in Microbiology.
- c) What is a selective medium? Explain with suitable example.
- d) State the principle and uses of centrifuge.
- e) Describe colony formation pattern of bacteria with respect to elevation and margin.
- f) Draw a neat and labelled diagram of typical bacterial growth curve.

P.T.O.

Q3) Attempt the following any four : **[16]**

- a) Describe septate and non-septate fungal hyphae.
- b) State the use of incubator in microbiology laboratory.
- c) What is peptone? State its use in culture media.
- d) How can we use turbidity measurement to determine bacterial cell mass?
- e) What is parasitism? Describe with suitable diagram.
- f) Describe the structure of T₄ Bacteriophage.

Q4) Attempt any two : **[16]**

- a) Justify : Biofilm is a novel colony formation pattern.
- b) Describe nodulation roots of leguminous plants.
- c) Describe the various lesions on plants caused by plant pathogens.

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

- a) Describe bacterial flagella with respect to
 - i) Ultrastructure.
 - ii) Composition.
 - iii) Location in cell wall.
 - iv) Arrangement.
- b) Describe in detail the nutritional forms of bacteria.



P301

[3919] - 8

F.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 108 : Use of Computers
(New)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat and labelled diagrams whenever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt all of the following :

[16]

- a) Define the terms :
 - i) RAM.
 - ii) Software.
- b) Write note on menubar.
- c) Define the term biometrics.
- d) What is multimedia?
- e) State true or false. Justify your answer.
 - i) Search engine is use to search file on harddisk.
 - ii) Batch processing executes the request online.
- f) State the symbols used for ERD and brief them.
- g) Explain the following terms :
 - i) Mainframe.
 - ii) Virtual memory.
- h) What is modem?

Q2) Attempt any four of the following :

[16]

- a) Write note on services provided by operating system.
- b) Explain how to convert algorithm to flowchart.
- c) Write note on ISO-OSI model.
- d) Explain the steps to use mail-merge feature of MS-Word.
- e) Write in brief applications of bioinformatics in various fields.

P.T.O.

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

- a) Write note on firewall.
- b) Explain the bibliographic databases.
- c) Distinguish between personal computer and workstation.
- d) Explain different types of data models.
- e) Brief the components of LAN.

Q4) Attempt any two of the following : **[16]**

- a) What is taskbar? Explain features of windows O.S.?
- b) What is MS-Excel? Explain menu of Excel. State the steps to create piechart.
- c) Explain the distinction among the terms primary key, candidate key, and super key.

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

- a) Write note on pub med.

OR

Distinguish between static hashing and dynamic hashing.

- b) Explain the features and various toolbars in Ms-Word.

OR

Write an algorithm to find maximum and minimum of n numbers also draw flowchart.



Total No. of Questions : 5]

[Total No. of Pages : 2

P302

[3919]-101

S.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 211 : Genetics and Immunology
(2008 Pattern) (Old & New) (Sem. - 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) Draw neat labelled diagrams wherever necessary.*

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

- a) Differentiate between wildtype and mutant phenotype.
- b) What are tautomers?
- c) Define multiple alleles.
- d) What is surface plasma resonance?
- e) Differentiate between innate and adaptive immunity.
- f) Define isochromosomes.
- g) What is antigenicity?
- h) Define epitope.
- i) What are barr bodies?
- j) What is major histocompatibility complex?

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

- a) Describe the structure of insertion sequences in bacteria. Add a note on their mechanism of transposition.
- b) Explain the process of bacterial conjugation as a means of genetic exchange.
- c) With a suitable diagram, explain specialized transduction.

P.T.O.

Q3) Attempt the following any four : **[16]**

- a) Explain in brief, radio immunoassay.
- b) Describe in detail live attenuated vaccines. Add a note on their advantages and disadvantages.
- c) Write a note on production of monoclonal antibodies.
- d) Describe the process of opsonization. Add a note on its significance.
- e) Write a note on humoral immunity.

Q4) Attempt any four of the following : **[16]**

- a) What are supplementary genes? How they influence mendelian ratios?
- b) Write a note on linkage.
- c) Describe in detail attenuation of tryptophan operon.
- d) Explain frame shift mutations with a suitable example.
- e) In a maternity ward, four babies become accidentally mixed up. The ABO types of the four babies are known to be O, A, B & AB. The ABO types of the four sets of parents are determined. Indicate which baby belongs to each set of parents :
 - i) AB & O.
 - ii) A & O.
 - iii) A & AB.
 - iv) O & O.

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

- a) Explain the anatomical barriers and their role in non-specific host defenses.
- b) What are T cells? Enlist various classes of T cells and explain any two?
- c) What do you mean by clonal selection theory?



Total No. of Questions : 5]

[Total No. of Pages : 2

P303

[3919]-102

S.Y. B.Sc.

BIOTECHNOLOGY

Bb - 212 : Cell Biology

(2008 Pattern) (Sem. - 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) Draw neat and labelled diagram wherever necessary.*

Q1) Answer any eight of the following :

[16]

- a) With suitable example give types of cell shape.
- b) Write the structural components of golgi complex.
- c) Explain bulk transport by endoplasmic reticulum.
- d) What are collagen molecules?
- e) How actin and myosin are organised in cytoskelton?
- f) Write the role of cytochrome in energy generation.
- g) What do you understand by fascilitated diffusion?
- h) Explain the principle of centrifugation.
- i) Distinguish between striated muscle fibre and smoth muscle fibre.
- j) How does amoeba engulf solid food particles?

Q2) Write short notes on any four :

[16]

- a) Desmosomes.
- b) Role of oncogenes in cancer.
- c) Stages of cell death.
- d) Epithelial tissue.
- e) Structure of centriole and basal body.

P.T.O.

Q3) Answer any four :

[16]

- a) Give structure and function of nucleus.
- b) How carrier mediated transport takes place across the membrane?
- c) Write the role of cyclin-dependent protein kinases in cell cycle.
- d) What are symplasmic complex where they are formed?
- e) Explain types of cell signalling.

Q4) Attempt any two of the following :

[16]

- a) Discuss in detail inner membrane of mitochondria and relate with its function.
- b) Write the process of assembly and disassembly of microtubules in detail.
- c) With labelled diagram explain the fluid mosaic model of membrane.

Q5) Attempt any two :

[16]

- a) Explain the process of cell differentiation with example.
- b) Write in detail types of plant tissue.
- c) Give the process of equational division in detail with suitable diagrams.



Total No. of Questions : 5]

[Total No. of Pages : 2

P304

[3919]-103

S.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 213 : Molecular Biology
(2008 Pattern) (Sem. - I)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory and carry equal marks.*
- 2) Use of color pencils restricted to diagrams.*

Q1) Attempt the following questions in 2-3 sentences :

[16]

- a) Draw a well labelled diagram of bacteriophage, used in Hershy and chase experiment.
- b) Give salient features of eukaryotic mRNA.
- c) Define :
 - i) LINES.
 - ii) SINES.
 - iii) LTRs and
 - iv) Transposons.
- d) What are glycosylases?
- e) Draw the structure of A and T hydrogen bonded.
- f) Draw the structure of kinenatochore and give the sequence of CEDI, II and III.
- g) What is solenoid structure?
- h) How and where are correct disulphide bonds formed in mature polypeptide chain.

Q2) Write short notes on :

[16]

- a) Spontaneous mutations and Hot spots.
- b) Postulates of genetic code.
- c) Copping and polyadenylation.
- d) Chromosome ultrastructure.
- e) Monocistron and polycistron.

P.T.O.

Q3) Give diagramatic representation of (any four) : **[16]**

- a) Initiation complex of RNA pol III (transcribing t-RNA, 5.8s rRNA and u-6-snRNA).
- b) Attenuation.
- c) Rho dependent and Rho independent termination.
- d) Conservative and semiconservative replication.
- e) 80s initiation complex.

Q4) a) What are induced mutations? Explain any two types of chemical mutagens and give their mechanisms. **[8]**

OR

Explain in detail SOS repair mechanism. **[8]**

b) Give a detailed account of splicing with molecular mechanism. **[8]**

OR

How RNA polymerase II initiates transcription? **[8]**

OR

Discuss in detail the prokaryotic transcription. **[8]**

Q5) Explain in detail the prokaryotic replication, initiation and termination. **[16]**

OR

Write notes on (any two) : **[16]**

- a) Aminoacyl t-RNA synthase.
- b) 70s ribosomes initiation complex.
- c) Translational termination.



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[3919]-206

S.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 222 : Plant and Animal Tissue Culture
(2004 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) *Draw neat and labelled diagrams wherever necessary.*
- 4) *Each section must be attempted on separate answer sheets.*

SECTION - I

(Plant Tissue Culture)

Q1) Attempt the following (any four) : **[4 × 2 = 8]**

- a) What is dedifferentiation?
- b) What is the use of Laminar Air Flow in plant tissue culture?
- c) What is Biotransformation?
- d) Explain the term cybrids.
- e) Explain the use of mercuric chloride in plant tissue culture?

Q2) Attempt any four : **[4 × 4 = 16]**

- a) Write a note of somatic hybridization.
- b) What are suspension cultures? Give two applications.
- c) Describe the types of morphogenesis in plant tissue culture.
- d) Write a note on particle bombardment method of direct gene transfer in plants.
- e) Discuss the role of precursors in secondary metabolite production using plant cells.

Q3) Attempt any two : **[2 × 8 = 16]**

- a) What is somatic embryogenesis? Give the procedure for inducing somatic embryogenesis. Also give the application of this regeneration system.

- b) What are secondary metabolites? How are they induced in vitro cultures? What are the applications of this procedure.
- c) What is Agrobacterium mediated gene transfer? Describe the procedure in detail. Give two application of this methodology.
- d) Give the composition of plant tissue culture media and describe the role of component, with special reference to plant growth regulators.

SECTION - II

(Animal tissue culture)

Q4) Attempt the following (Any four) : **[4 × 2 = 8]**

- a) ATC working area should be secluded. Justify.
- b) What is a “Policeman” (cell scraper). Write its application.
- c) Define primary explant culture.
- d) Cells grown in vitro are genetically instable. Explain.
- e) Define :
 - i) Subculture.
 - ii) Cell line.

Q5) Attempt the following (Any 4) : **[4 × 4 = 16]**

- a) Write a note on transformation of cells in culture.
- b) What are cell repositories. Add a note on their function.
- c) Write a note on karyotyping. Mention its application in characterization of a cell line.
- d) Write a note on evolution of cell line in vitro.
- e) Write a note on nutrients in serum.

Q6) Attempt the following (Any 2) : **[2 × 8 = 16]**

- a) Write a note on :
 - i) Primary cell culture.
 - ii) Application of cell culture.
- b) Compare and contrast between serum containing media and serum free media.
- c) Explain in detail the procedure of maintenance of lymphocyte culture and its application.



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[3919]-401

T.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 341 : Large Scale Manufacturing Processes
(2008 Pattern) (Sem. - IV)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Q.1 and Q.7 are compulsory.*
- 2) *Attempt any three questions from the remaining.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer in 2-4 lines : **[20]**

- a) What is bioprocess engineering?
- b) State the role of decimal reduction time in bioprocessing.
- c) Enlist the substrates used in SSF and products produced from them.
- d) State the principle of covalent bonding of enzyme immobilization.
- e) What is the relation of OUR and $K_L a$.
- f) Mention the role of flocculation in product recovery.
- g) Enlist the commercial applications of lipases in industry.
- h) What is depreciation? State its effect on economics of a bioprocess.
- i) What are the seals used in a bioreactor design?
- j) Enlist the tests done for quality assurance of SCP.

Q2) a) Explain the production of penicillin with a flow sheet. **[10]**

b) Write a note on validation of air-filters. **[5]**

Q3) a) Aminoacids & antibiotics are recovered by chromatography. Explain the methods used in detail. **[8]**

b) Diagrammatically represent the foam sensor add a note on its working & principle. **[7]**

- Q4)** a) What is biotransformation? Explain the commercial bioprocess based on biotransformation with applications. [8]
b) Explain the production of DPT vaccine. [7]
- Q5)** a) Explain with the help of a diagram the working of a computer controlled bioreactor. [8]
b) Explain in brief the criteria of scale-up. [7]
- Q6)** a) Diagrammatically represent the air-lift fermenter & add a note on its working and applications. [8]
b) Explain the factors affecting the pricing of a product of a bioprocess. [7]
- Q7)** Write short notes on (any three) : [15]
a) Plackett - Burmann design.
b) Role of mass balances in bioprocess.
c) Multichamber centrifuge in product recovery.
d) I MPeller design in bioreactor.
e) LAL Test.



P318

[3919]-402

T.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 342 : Biotechnology in Agriculture and Health
(2008 Pattern) (Semester - IV)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Question No.1 and Q.5 are compulsory.*
- 2) Attempt any two remaining from each section.*
- 3) Answer to each section should be written on separate answer books.*
- 4) Figures on the right indicate full marks.*
- 5) Draw neat and labelled diagram if necessary.*

SECTION - I

(Agriculture)

Q1) Explain or define the following term : **[10]**

- a) Hybrid.
- b) Haploids.
- c) Ti plasmid.
- d) QTL.
- e) Trade Secretes.

Q2) a) Define IPR. Explain in details the process of patent & characteristics of patents. **[8]**

b) Describe plant transformation & different methods of used for transformation. **[7]**

Q3) a) Explain molecular markers & give its role in plant biotechnology. **[8]**

b) Describe the green house technology and precision cultivation and its application in agriculture. **[7]**

Q4) Write short notes on : **[15]**

- a) Application of Micropropagation.
- b) Risk assessment for GM product.
- c) Cryopreservation.

P.T.O.

SECTION - II

(Health)

- Q5)** Attempt the following : **[10]**
- a) Describe molecular markers.
 - b) Enlist two applications of animal cell culture.
 - c) Write briefly on diagnostic applications of PCR.
 - d) Give four disadvantages of growing cells in serum.
 - e) Give two applications of RFLP.
- Q6)** a) What is the difference between passive and active immunization? Describe different classes of common vaccines for humans. **[8]**
- b) Describe the purpose of human genome project. Add a note on it's current status. **[7]**
- Q7)** a) Describe the principles and applications of biosensors. **[8]**
- b) Describe the different approaches for producing monoclonal antibodies. **[7]**
- Q8)** Write short notes on : **[15]**
- a) Conditions for improving clonal growth in animal cell culture.
 - b) Methods of micromanipulation.
 - c) Subunit vaccines.



P319

[3919]-403

T.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 343 : Recombinant DNA Technology
(2008 Pattern) (Sem. - IV)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Q.1 and Q.7 are compulsory.*
- 2) *Attempt any three questions from the remaining.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer in 2 - 4 lines : **[20]**

- a) State the role of ligases as a molecular tool with an example.
- b) Mention any two characters of an ideal vector with two examples.
- c) A 260/280 ratio is used to check the purity of DNA. Justify.
- d) State the role of CHCl_3 used in nucleic acid purification.
- e) Mention any two applications of genetic engineering in agriculture.
- f) State the role of SDS & EDTA in cell lysis buffer.
- g) What are the radioactive labels used in cloning?
- h) Mention any four mile stones in genetic engineering.
- i) Enlist the methods of characterising the transformants.
- j) Give any four applications of southern blotting.

Q2) Explain in detail DNA sequencing by Sanger's method. **[15]**

Q3) a) Explain in brief the construction of cDNA library. **[10]**

b) What are YAC vectors? Write the properties & use in cloning. **[5]**

Q4) a) Explain colony hybridization used in selection of desired clone. **[8]**

b) Compare & contrast the types of polymerases. **[7]**

- Q5)** a) Explain in brief the construction of microsatellite markers used in DNA fingerprinting. [8]
b) Explain the factors influencing the efficiency of PCR. [7]
- Q6)** a) Explain the methods of inserting a foreign gene in eukaryotes. [8]
b) Explain the role of site directed mutagenesis in molecular cloning. [7]
- Q7)** Write short notes (any three) : [15]
a) Northern blotting.
b) α - complimentation.
c) RAPD versus RFLP.
d) Guidelines in RDT.
e) FISH.



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[3919]-702

T.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 332 : Recombinant DNA Technology
(2004 Pattern) (Old Course) (Semester - III)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Attempt any four from the remaining questions.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer in 2 - 4 lines : **[20]**

- a) What are phagemids? Mention any two properties of phagemids as vectors.
- b) State the use of linkers in recombinant DNA technology.
- c) What is insertional inactivation?
- d) Enlist any four probes used in DNA labelling.
- e) What is a shuttle vector? Give one example.
- f) Write any two properties of an ideal host with two examples.
- g) What is the role of CHCl_3 & lysozyme in DNA extraction.
- h) What are the recognition sites of Hind III & BamH I.
- i) Mention any two application of DNA finger printing.
- j) What is the role of alkaline phosphate in molecular cloning.

Q2) Explain in detail Maxam-Gilbert's of DNA sequencing. **[15]**

Q3) a) Explain the purification methods of RNA. **[7]**

b) Compare & contrast cloning & expression vectors. **[8]**

Q4) a) Describe in detail the cDNA synthesis. **[8]**

b) Distinguish between RFLP & RAPD. **[7]**

- Q5)** a) Explain the factors affecting the PCR efficiency. [8]
b) Explain the site directed mutagenesis in cloning. [7]
- Q6)** a) Explain in detail the blue white screening method. [7]
b) Explain the construction of probe in Southern Hybridization. [8]
- Q7)** Write short notes : [15]
a) Northern blotting.
b) Modification of cut ends of DNA.
c) Animal cell cloning vectors.



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[3919]-703

T.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 333 : Biodiversity & Systematics
(2004 Pattern) (Old Course)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Q.1 and Q.6 are compulsory.*
- 2) *Attempt any three questions from Q2, Q.3, Q4, Q5.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following : **[20]**

- a) Define Palenology.
- b) What are circadian rhythms?
- c) Define Biodiversity hotspots.
- d) What is 'Tm' value? State it's significance in taxonomy.
- e) Enlist two organizations involved in conservation of biodiversity.
- f) State Gaussian principle of competitive exclusion.
- g) State the objectives of taxonomy.
- h) Give two examples of biosphere reserves in India.
- i) What is IUCN red data book?
- j) What is molecular taxonomy?

Q2) a) Mention, with suitable example, the limitations of the morphology based in Animal classification. **[8]**

b) What is meant by age distribution of a population? How does this distribution govern the population size? **[7]**

Q3) a) What is a Biome? Enlist types of Biomes and elaborate on characteristics of temperate and tropical forests. **[8]**

b) Elaborate on laws of conservation of Biodiversity. **[7]**

- Q4)** a) What are types of interactions in population? Explain the interactions giving suitable examples. [8]
b) What are different tools used in analysis of Biodiversity. [7]
- Q5)** a) What are biodiversity hotspots? Explain briefly criteria used for deciding biodiversity hotspots. [8]
b) What are territories? Why do animals defend territories? [7]
- Q6)** Write notes on (Any three) : [15]
a) Biological clocks.
b) Numerical taxonomy.
c) Bioprospecting with special reference to microbes.
d) Growth forms of population.
e) Undangered species.



P322

[3919]-801

T.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 341 : Large Scale Manufacturing Processes
(2004 Pattern) (Old Course) (Sem. - IV)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Attempt any four from the remaining questions.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer in 2-4 lines : **[20]**

- a) Define a bioprocess with two examples.
- b) Write any two surface treatments given to steel used in bioreactor design with their role.
- c) Enlist the factors which influence air filtration.
- d) Mention any two methods used in quantification of a product with its principle.
- e) What is Monod's equation? State its role in bioprocess.
- f) Write any two applications of immobilized cells.
- g) Define quality assurance of bioproducts.
- h) Enlist the methods of cell disruption by solid shear.
- i) What is SCP? Mention two examples with advantages.
- j) What is scale-up? State the levels of scale of a bioprocess.

Q2) a) Explain with the help of a flowsheet the production of any one anti-biotic. **[10]**

b) What is SSF? Write a note on factors affecting this process. **[5]**

Q3) a) Explain the measures to economise a bioprocess. **[7]**

b) Diagrammatically represent a bioreactor with the functions of each part & their specifications. **[8]**

- Q4)** a) Explain the methods used in flow rate measurement. [8]
b) Explain the filtration, a method of product recovery. [7]
- Q5)** a) Explain the production of FMD vaccine. [7]
b) Explain media optimisation by Plackett Burmann design. [8]
- Q6)** a) Explain covalent binding of immobilization of enzymes. [8]
b) What is del factor? Explain its role as a criterion of sterilization. [7]
- Q7)** Write short notes : [15]
a) $K_L a$.
b) LAL test.
c) Air lift fermenter.



P323

[3919]-802

T.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 342 : Applications of Biotechnology in Agriculture and Health
(2004 Pattern) (Old & New Course)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answer to each section should be written in separate answer book.*
- 2) Question No.1 and Q.5 is compulsory.*
- 3) From remaining questions attempt any two from each section.*

SECTION - I

(Agriculture)

Q1) Explain the terms : **[10]**

- a) Trade Marks.
- b) DMSO.
- c) Clonal propagation.
- d) Cybrids.
- e) Shuttle vectors.

Q2) a) Describe different gene transfer methods used in plants. **[8]**

b) Explain cryopreservation steps in detail & give its application. **[7]**

Q3) a) What is IPR? Explain the procedure of patent filing with suitable example. **[8]**

b) Explain use of Micropropagation in Agriculture. **[7]**

Q4) Write notes on (any three) : **[15]**

- a) GM food.
- b) AFLP.
- c) Green house technology.
- d) Risk assessment.
- e) Metabolic engineering.

SECTION - II

(Health)

Q5) Answer the following : **[10]**

- a) State two advantages of serum free media.
- b) Give two applications of biosensors.
- c) Define monoclonal antibodies.
- d) Give two applications of RFLP.
- e) What is organ culture? Give two examples.

Q6) a) Define vaccines. Describe the common agents for active and passive immunization. **[8]**

b) What is epidemiology? What are different ways of disease transmission? **[7]**

Q7) a) Give importance of recombinant products for human health with examples. **[8]**

b) Give principle of PCR. Describe its diagnostic applications. **[7]**

Q8) Write notes on (any three) : **[15]**

- a) Scale up of suspension culture.
- b) Methods of micromanipulation.
- c) Cell culture.
- d) Applications of biosensors.
- e) Molecular markers.



P324

[3919]-803

T.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 343 : Animal and Plant Development
(2004 Pattern) (Old & New Course)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Q.1 from each section is compulsory.*
- 2) *Attempt any two questions out of Q2, Q3 and Q4 from each section.*
- 3) *Answers to each section should be written in separate answer books.*
- 4) *Figures to the right indicate full marks.*
- 5) *Draw neat and labelled diagrams if necessary.*

SECTION - I

(Animal Development)

Q1) Explain the terms : **[10]**

- a) Organizer.
- b) Polyspermy
- c) Vitellogenesis.
- d) Transgenic animals.
- e) Stem cells.

Q2) a) Describe various types of eggs on the basis of quantity and distribution of yolk. Add a note on the type of cleavage in each type. **[8]**

b) Write a note on process of ageing. **[7]**

Q3) a) Describe in details the process and significance of process of fertilization of ovum. **[8]**

b) Explain the process of development of chick upto formation of three germ layers. **[7]**

Q4) a) What is apoptosis? Explain the significance of apoptosis process during development. **[7]**

b) Describe different methods of animal cloning. What are the applications of animal cloning? **[8]**

P.T.O.

SECTION - II
(Plant Development)

- Q1)** Explain the terms with respect to plant development. **[10]**
- a) Proclerm.
 - b) De differentiation.
 - c) Cytokinin.
 - d) Cell lineages.
 - e) Transgenic plant.
- Q2)** a) Define plant hormone? Explain the role of Auxins & Gibberlic acid during plant development. **[8]**
- b) Illustrate an embryogenesis in dicotyledons plant with suitable diagram. **[7]**
- Q3)** a) Describe the role of floral identity genes in floral patterning in Arabidopsis thaliana with suitable diagram. **[8]**
- b) Describe shoot patterning with diagram. **[7]**
- Q4)** Write short notes : **[15]**
- a) Apoptosis in plant cells.
 - b) Distinguish growth pattern in animal & plant development.
 - c) Regeneration of plants through protoplast.

