

Total No. of Questions : 5]

SEAT No. :

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F.Y.B.Sc.

BIOTECHNOLOGY

**Bb - 101 : Fundamentals of Chemistry
(2013 Pattern)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Neat diagrams must be drawn whenever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *All questions carry equal marks.*
- 4) *Use of logarithmic table and calculator is allowed.*
- 5) *All questions are compulsory.*

Q1) Answer the following:

[8 × 2 = 16]

- a) Define :
 - i) Mean free path
 - ii) Vapour pressure.
- b) State and explain the pseudomolecular reactions.
- c) Explain the colligative properties of NaCl are higher than urea at the equimolar solutions.
- d) Determine the number of phases, components and degree of freedom for the following system in closed vessel.
 - i) $\text{CaCO}_{3(s)} \rightleftharpoons \text{CaO}_{(s)} + \text{CO}_{2(g)}$
 - ii) An aqueous solution of NaCl.
- e) Calculate the pH of 10^{-8} M HCl solution.
- f) What are the advantages of potentiometric titrations.

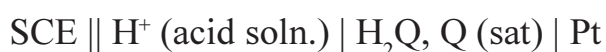
P.T.O.

- g) Draw the E & Z isomers of 1 bromo 2 butene.
- h) Draw the resonating structures of HNO_3 and NO_3^- and identify more stable species.

Q2) Answer the following: (Any four)

[4 × 4 = 16]

- a) Explain the different types of molecular velocities and obtain the relation between them.
- b) The half life period of first order reaction was found to be 277.2 min when the initial concentration of reactant is 0.12 mole/lit, how long will it take for concentration of reactant to drop to 0.02 mole/lit.
- c) What is meant by cryoscopic constant? Explain how elevation of boiling point of solvent may be used to determine the molecular weight of dissolved substance.
- d) Find the pH of acidic solution at 298K for the following cell.



$$\text{Given : } E_{\text{ox(cal)}} = -0.2415\text{V} \quad E_{\text{red(QH)}} = 0.6997\text{V}$$

and the observed e.m.f. of cell = 0.283 V.

- e) What is optical activity? Give the necessary conditions for a molecule to be optically active. Illustrate with suitable example.
- f) Define paramagnetism and explain the diamagnetic nature of fluorine molecule with the help of molecular orbital energy level diagram.

Q3) Answer the following (Any Four)

[4 × 4 = 16]

- a) State Charles Law. Show that K.E. of an ideal gas depends only upon the temperature.
- b) Find the molecular weight of sucrose, if a 2% sucrose has an osmotic pressure 986 mm at 12°C.

- c) Draw and discuss the phase diagram for the lead-silver system.
- d) What is single electrode potential? Derive Nernst equation for the following cell reaction
- $$aA + bB \rightleftharpoons cC + dD$$
- e) What is conformational isomerism? Explain the conformational isomerism in n-propane using energy profile diagram.
- f) Explain the formation of H₂ & HF molecules on the basis of atomic orbital overlap.

Q4) Attempt the following (Any two) **[2 × 8 = 16]**

- a) Derive the integrated form of Arrhenius equation and explain how determine the energy of activation of a reaction by graphical method.
- b) Draw a neat diagram of water system and explain the areas, curves and triple point with reference to phase rule.
- c) What are concentration cells? Explain the electrode concentration cell and electrolyte concentration cell without transference.

Q5) Attempt the following (Any One) **[1 × 16 = 16]**

- a) Define an equivalent conductance and cell constant. State and explain Kohlrausch's law of independent migration of ions. What is Debye-Huckel-Onsagar equation? Give it and explain the meaning of terms involved in it.
- b) Explain the following types of organic reactions.
- i) Oxidation and reduction reactions.
 - ii) Elimination reactions.
 - iii) Addition reactions.
 - iv) Substitution reaction.



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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) *Figures to the right indicate full marks.*
- 3) *Use of calculator is allowed.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of the following:

[16]

- a) Define a standard. Define standard used for length.
- b) What do you understand by the limit of elasticity.
- c) State Pascal's Principle.
- d) Define surface tension. Give its S.I. unit.
- e) Define heat. Give its unit.
- f) A refrigerator works under reversible cycle between the temperatures 450°K & 600°K . Calculate the coefficient of performance.
- g) What do you understand by interference?
- h) Define magnetic flux and give its S.I. unit.

Q2) Answer any four of the following:

[16]

- a) Write a note on system of units.
- b) Explain the terms elastic limit, breaking stress and breaking point with the help of stress -strain curve.

P.T.O.

- c) Write a note on open-tube manometer.
- d) The pressure inside a soap bubble of radius 2cm balances a 1.5 mm column of oil having density 0.8 gm/cm^3 . Find the surface tension of soap solution.
- e) A motor car approaches towards a crossing with a velocity of 75km/hr. A policeman standing at the crossing hears a horn of frequency 260 cycles per second from the car. What is the original frequency of the horn? ($V = 332\text{m/sec}$).
- f) Explain the role of physics in life sciences.

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

- a) State and explain Zeroth law of thermodynamics.
- b) Explain the change in entropy during a reversible cyclic process.
- c) Explain the air compression refrigeration cycle.
- d) State and explain Brewster's law.
- e) A source of alternating e.m.f. $e = 300 \sin wt$ is connected to a lamp whose filament is of resistance 1000Ω .
Calculate
 - i) peak current
 - ii) r.m.s. current passing through the lamp.
- f) What is biomagnetism? How it is useful in healthcare.

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

- a) With the help of energy band diagrams, distinguish between the conductors, insulators and semiconductors.
- b) Differentiate between Fraunhofer diffraction and Fresnel Diffraction.

A slit of variable width is illuminated by red light of wavelength 6500 \AA .
At what width of the slit the first minimum will fall at $\theta = 30^\circ$?

c) State Bernoulli's theorem.

How is the Pitot's tube used to measure the rate of flow of liquid through a horizontal tube.

d) What is Poisson's ratio? Show that its maximum value is 0.5.

Why Poisson's ratio can not take negative value?

Q5) Answer any one of the following:

[16]

a) State and explain Doppler effect in sound.

Derive expression for apparent frequency in following cases.

i) Source moving and observer stationary.

ii) Observer moving and source stationary.

iii) Both source and observer are moving.

OR

b) Explain the terms:

i) Isobaric change

ii) Isochoric change

iii) Adiabatic change

iv) Isothermal change

What is an isolated system?



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F.Y.B.Sc.

BIOTECHNOLOGY

Bb - 103 : Basics of Plant and Animal Science

(Semester - I)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Answer to the two sections should be written in separate answer book.*
- 2) *All questions are compulsory.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*

SECTION - I

Q1) Answer the following questions: **[8]**

- a) Define essential elements.
- b) Give 2 modifications of stem with example.
- c) Define osmotic pressure.
- d) Explain the term vernalization.

Q2) Write short notes on (Any two) **[8]**

- a) Mechanism of ascent of sap.
- b) Modifications in roots.
- c) Plant movements of curvature.

Q3) Attempt the following (Any two) **[8]**

- a) Define inflorescence. Describe racemose inflorescence.
- b) Describe anatomy of dicot leaf.
- c) Explain photoperiodism and give its significance.

Q4) Answer in detail (Any two) **[16]**

- a) Explain the increasing complexity in organization of plant body of algae.
- b) Explain the steps involved in glycolysis pathway.
- c) Define growth hormone. Enlist the growth hormone & give role of any two.

P.T.O.

SECTION - II

(Zoology)

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

- a) Write two characteristics of phylum Arthropoda.
- b) Define parasitism.
- c) What is Bee venom?
- d) Enlist two examples of phylum platyhelminthes.
- e) Define Ammonoterism.
- f) Enlist two characteristics of class Amphibia.
- g) Enlist two functions of integument.
- h) Define Apiculture.

Q6) Write short notes on (Any 3) **[12]**

- a) Vermicompost.
- b) Host-parasite relationship with examples.
- c) Salient features of class Mammalia.
- d) Symptoms & control measures of Malaria.

Q7) Attempt the following (Any 2) **[10]**

- a) Comment On “Honey bee is a social insect”.
- b) Sketch and label life cycle of silk moth.
- c) Note on harmful insects.

Q8) Describe the life cycle of Taenia Solium. **[10]**

OR

Give detail account on salient features of Echinodermata with examples and add a note on Regenerative capacity of the same.



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SEAT No. :

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F.Y.B.Sc.

BIOTECHNOLOGY

Bb - 104 : Mathematics and Statistical Methods for Biologists

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 calculator is allowed.*
- 4) *Solve each section on separate answer paper.*

SECTION - I

(Mathematics)

Q1) Attempt each of the following:

[5 × 2 = 10]

- a) Write modulus and principal argument of $\frac{(1+i)^2}{2i}$.
- b) If $z = \tan^{-1}xy$, then find $z_x + z_y$.
- c) Find adjoint of the matrix

$$A = \begin{bmatrix} 1 & 0 & 5 \\ -1 & 2 & 3 \\ 4 & 1 & 2 \end{bmatrix}$$

- d) Show that the sequence $a_n = 1 + \frac{1}{1!} + \dots + \frac{1}{n!}$ is monotonically increasing.
- e) Examine the convergence of the series $\sum_{n=0}^{\infty} \left(\frac{3}{7}\right)^n$.

P.T.O.

Q2) Attempt any four of the following:

[4 × 2½ = 10]

- a) Find rank of the matrix

$$A = \begin{bmatrix} 1 & 3 & 5 & 4 \\ 4 & -7 & -3 & -1 \\ 3 & 2 & 7 & 8 \end{bmatrix}$$

- b) Examine convergence of the series $\sum_{n=0}^{\infty} \frac{5^n}{n!}$.
- c) Check whether the vectors (1, 2, 3), (0, -1, 2), (0, 3, 1) are linearly dependent.
- d) Check for exactness and hence solve the following differential equation $(3x + 2y^2)dx = 2xy dy$.
- e) Solve : $x^5 - 1 = 0$.
- f) If $u = x \log(xy)$, find $\frac{\partial^3 u}{\partial x^2 \partial y}$.

Q3) Attempt any two of the following:

[2 × 5 = 10]

- a) Solve the following system of linear equations.

$$x + y + z = 1$$

$$x + y - 2z = 3$$

$$2x + y + z = 2$$

- b) Find the stationary points and determine the nature of the given function $f(x, y) = x^2 + 3y + y^2$.
- c) Discuss convergence of the sequence $\sqrt{3}, \sqrt{3\sqrt{3}}, \sqrt{3\sqrt{3\sqrt{3}}}, \dots$

Q4) Attempt any one of the following:

[1 × 10 = 10]

- a) Find all eigenvalues and eigenvectors of A. Also find P (if it exists) that diagonalizes A.

$$A = \begin{bmatrix} 2 & 0 & -2 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

- b) i) State and prove De Moivre's theorem for positive integers.
- ii) Solve $\frac{dy}{dx} = \frac{y-x}{y+x}$.

SECTION - II

Q5) Attempt each of the following: **[5 × 2]**

- a) State the classical definition of probability.
- b) Define : median.
- c) Explain the term Type II error.
- d) State additive property of Poisson distribution.
- e) Define kurtosis.

Q6) Attempt any four of the following: **[4 × 2.5]**

- a) Four cards are drawn at random from a well shuffled pack of 52 cards. Find probability that all cards are of same suit.
- b) What is multiple and partial correlation.
- c) Write a short note on discrete probability distribution.
- d) State merits of arithmetic mean.
- e) Explain hypothesis with illustration.
- f) Find range and median of the data given 55, 75, 80, 95, 120, 200, 250, 100, 67, 90.

Q7) Attempt any two : **[2 × 5]**

- a) Define Gaussian distribution & state its additive property.
- b) Compute standard deviation of the following frequency data.

Marks	10-20	20-30	30-40	40-50	50-60	60-70
No.of Students	6	5	4	6	3	1

- c) Write a short note on random sampling.

Q8) Attempt any one of the following: **[1 × 10]**

- a) Describe the test procedure for testing equality of means and variances of two populations.
- b) What do you mean by analysis of variance (ANOVA) technique.



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F.Y.B.Sc.

BIOTECHNOLOGY

Bb - 105 : Fundamentals of Biological Chemistry

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.*

Q1) Attempt the following :

[16]

- a) Write Lineweaver - Burk equation.
- b) Name coenzymes of pyridoxine and folic acid.
- c) What are non essential amino acids? Give examples.
- d) Define pKa.
- e) Distinguish between nucleotides and nucleosides.
- f) Give the name of Sanger and Edman reagent used for protein sequencing.
- g) Write the structure of sucrose and lactose.
- h) Define zwitter ion.

Q2) Answer any four of the following:

[16]

- a) Distinguish between tertiary and quaternary structure of proteins with examples.
- b) Give the reaction mechanism of electrophilic substitution reaction.
- c) Write a note on plasma lipoproteins.
- d) Explain transition state hypothesis of an enzyme.
- e) Explain proteoglycan matrix.

P.T.O.

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

- a) Write a note on Ramachandran plot.
- b) How are aminoacids separated by thin layer chromatography?
- c) Discuss the various factors affecting on enzyme activity.
- d) Comment on compound lipids.
- e) Discuss the various forces stabilizes nucleic acid structure.

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

- a) Explain the principle, procedure and applications of Gelfiltration chromatography.
- b) Discuss Urey & Miller's experiment.
- c) Define Iodine number, acid value and saponification number. Give its significance.

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

- a) Classify polysaccharides with its examples and significance.
- b) Discuss competitive and uncompetitive inhibition of enzymes.
- c) Explain transport of ions and molecules across the membrane.



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[5117] - 6

F.Y.B.Sc.

BIOTECHNOLOGY

Bb-106: Biophysics and Instrumentation

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

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

Q1) Answer the following:

[16]

- a) State Beer's and Lambert's Law.
- b) State different series in alkali (Na) atoms.
- c) Enlist the application of radiowave and microwave.
- d) Define isotopes and give examples.
- e) Define passive transport.
- f) What is linear magnification.
- g) Define pH and give its relationship with pOH.
- h) Enlist four quantum numbers.

Q2) Answer any four of the following:

[16]

- a) Discuss various regions of electromagnetic spectrum.
- b) Explain Bright field microscope with ray diagram.
- c) Explain the importance of radioactive isotopes in biological sciences.
- d) Prove that radii of n^{th} Bohr's orbit of an atom is directly proportional to square of principle quantum number.
- e) Explain Nernst equation with respect to membrane potential.
- f) Explain the principle and working of clinical thermometer.

P.T.O.

Q3) Answer any four of the following:

- a) Calculate the time required for 20% of sample of thorium to disintegrate (Given $T_{1/2}$ of thorium = 1.4×10^{10} years).
- b) Write a note on Atomic Absorption spectroscopy.
- c) Explain phase contrast microscope and give its application.
- d) What is biopotential. Explain electroencephalogram (EEG).
- e) Write advantages and disadvantages of bimetallic thermometer.
- f) Explain the importance of ion channels in membrane potential.

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

- a) Explain principle, construction and working of G.M. counter.
- b) Explain scanning electron microscope (SEM) in detail.
- c) Explain emission spectra of sodium (Na) atom.

Q5) a) What is rigid molecule? Derive expression for energy of rigid rotator. **[8]**

- b) Comment on action potential and explain Na^+ , K^+ ATPase system in detail. **[8]**

OR

- a) Explain the construction and working of Bain bridge mass spectrometer. **[8]**

- b) Describe in detail mechanism and application of radioimmunoassay (RIA). **[8]**



Total No. of Questions :5]

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F.Y.B.Sc.

BIOTECHNOLOGY

Bb-107:Microbiology

(2013 Pattern)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to right indicate full marks.*
- 3) Use of colour pencils restricted to diagrams.*

Q1) Attempt the following in two-three sentences:

[8×2=16]

- a) Obligate aerobe shows the presence (+) and absence (–) of the following enzyme
 - i) SOD (+) Catalase (+)
 - ii) SOD (+) Catalase (–)
 - iii) SOD (–) Catalase (+)
 - iv) SOD (–) Catalase (–)
- b) Sketch the bacterial colony morphology growing on agar plate exhibiting following:
Form: Spindle; Elevation: Flat; Margin: Undulate.
- c) State any two characters of *Aspergillus* which characterize it as fungi.
- d) With example define selective media.
- e) Enlist two names of acidic stains used in Microbiology laboratory.
- f) Define: ultrahigh-temperature (UHT).
- g) Distinguish between: sanitization and sterilization.
- h) Give names of two pathogens that cause disease in plants and animals respectively.

P.T.O.

Q2) Attempt any four of the following:

[4×4=16]

- a) Which disinfectants or antiseptics would be used to treat the following: oral thermometer, laboratory bench top, drinking water, patch of skin before surgery, small medical instruments (probes, forceps, etc.)?
- b) Until relatively recently, spoiled milk was responsible for a significant proportion of infant death.
 - i) Why is untreated milk easily spoiled?
 - ii) Why is boiling milk over prolonged periods not desirable?
- c) Describe and contrast the ways in which flagella and cilia propel microorganisms through the water.
- d) Describe the process of Biofilm formation.
- e) Fungi lead a saprophytic mode of life, justify.
- f) What do understand by Chemolithoautotrophy?

Q3) Write self-explanatory notes on any four of the following:

[4×4=16]

- a) Lipopolysaccharide.
- b) Inclusion bodies of bacteria.
- c) Whittaker's system of Classification.
- d) Mycorrhiza.
- e) Freeze drying techniques.
- f) Bacterial flagella.

Q4) Attempt any two of the following:

[2×8=16]

- a) Distinguish between acid fast and non-acid fast staining.
- b) What are depth filters and membrane filters, and how are they used to sterilize liquids?
- c) Describe the operation of a biological safety cabinet.

Q5) Describe the following kinds of media and their uses: defined or synthetic media, complex media, general purpose media, enriched media, selective media, and differential media. Give an example of each kind. **[16]**

OR

Explain glycolysis and TCA cycle in detail. Add a note on its energetics.



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F.Y.B.Sc.

BIOTECHNOLOGY

**Bb-108: Computers and Applications
(2013 Pattern)**

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

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

Q1) Attempt all of the following:

[8×2=16]

- a) What is a computer worm?
- b) What is minicomputer? Where it is used?
- c) State True /False. Justify.
“Data can be accessed randomly from magnetic tape”.
- d) List different types of an operating system.
- e) What is a Hub? Give its use.
- f) Explain hierarchical data model.
- g) What is high level programming language? Give it’s example.
- h) What are magnetic storage devices? Give example.

Q2) Attempt any four of the following:

[4×4=16]

- a) What is topology? Explain any one type in detail.
- b) What is DBMS? Give its advantages.
- c) Explain structure of co-axial cable. Give its advantages.
- d) Explain different types of computer viruses.
- e) What is an attribute? Explain its types with example.

P.T.O.

Q3) Attempt any four of the following:

[4×4=16]

- a) Explain working of an optical mouse.
- b) Give features and advantages of linux OS.
- c) What is a firewall? Why it is needed?
- d) Explain 4 features of MS-Power Point.
- e) What are various storages devices used in computer? Compare them with respect to capacity and access time.

Q4) Attempt any Two of the following:

[2×8=16]

- a) Give features of MS-Excel. How a Bar-chart is draw in MS-Excel? Write steps for it.
- b) Explain Google search engine and Yahoo search engine in detail.
- c) Explain different generations of computers.

Q5) Attempt all of the following:

[2×8=16]

- a) Write an algorithm and draw a flowchart to check whether a given number is palidrome or not.

OR

Write an algorithm and draw a flowchart to compute x^y .

- b) What is an operating system? Explain various functions of an operating system.

OR

Write an algorithm and draw a flow chart to find reverse of a number.



Total No. of Questions :6]

SEAT No. :

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[5117] - 101

S.Y.B.Sc.

BIOTECHNOLOGY

Bb-211: Genetics & Immunology

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

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

Q1) Attempt the following in 2-3 sentences:

[10×2=20]

- a) Differentiate between back cross and test cross.
- b) What are lethal genes?
- c) Define allele.
- d) Enlist characteristic features of Turner's Syndrome.
- e) What are Hfr plasmids?
- f) Draw any four symbols for pedigree analysis.
- g) What are acridine dyes?
- h) Define euploidy.
- i) What are repressible operons?
- j) Define conjugation.

Q2) Answer the following in 2-3 sentences:

[5×2=10]

- a) Give significance of IgG.
- b) Differentiate between idiootype & isotype.
- c) Define adjuvant.
- d) What is the role of natural killer cells?
- e) Define phagocytosis.

P.T.O.

Q3) Attempt any three from the following: **[3×5=15]**

- a) What are base substitutions? How they bring about change in nucleotide sequence?
- b) Describe dominant epistasis in detail, along with example.
- c) Explain Ac/Ds system of transposons operating in plants.
- d) Describe with example genotype & allele frequencies.

Q4) Attempt any three: **[3×5=15]**

- a) What are duplications? Describe types of duplications and their significance.
- b) Write a note on generalized transduction.
- c) What is linkage? Explain complete and incomplete linkage with suitable examples.
- d) Explain with suitable example, in complete dominance.

Q5) Attempt any one: **[1×10=10]**

- a) What is an operon? Describe arabinose operon in detail. Add a note on its regulation.
- b) Explain the process of bacterial transformation.

Q6) Attempt any two: **[2×5=10]**

- a) Differentiate between humeral and cellular immunity.
- b) Describe structure & function of spleen.
- c) Write a note on DNA vaccines.
- d) Give a brief account of western blot.



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[5117] - 102

S.Y.B.Sc.

BIOTECHNOLOGY

Bb-212: Cell Biology

(2013 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) Draw neat labelled diagrams wherever necessary.*

Q1) Answer in brief:

[10×2=20]

- a) Differentiate between simple and facilitated diffusion.
- b) Cellular diversity.
- c) What is membrane asymmetry?
- d) Explain co-transport with example.
- e) What is glycocalyx?
- f) Functions of lysosomes.
- g) What are coated vesicles?
- h) Functions of tight junctions.
- i) Give structure of intermediate filaments.
- j) Role of G Protein Coupled Receptors (GPCR).

Q2) Short notes on (Any three):

[3×5=15]

- a) Role of ion channels in transmission of nerve impulse.
- b) Protein import into the nucleus.
- c) Functions of Endoplasmic Reticulum.
- d) Plasmodesmata.

P.T.O.

Q3) Attempt any three:

[3×5=15]

- a) Discuss metaphase to anaphase transition in mitosis.
- b) Comment on the structure and functions of Golgi Apparatus.
- c) Explain working of Na⁺ - K⁺ ATPase.
- d) Discuss C3 pathway of CO₂ fixation in plants.

Q4) a) Describe the events of meiosis I and its significance. **[7]**

- b) Give an account on role of proto-oncogenes and anti-oncogenes in tumorigenesis. **[8]**

OR

- a) Discuss cell cycle regulation. Add a note on cell cycle checkpoints and its significance. **[7]**

- b) Describe the role of caspases in the process of programmed cell death. **[8]**

Q5) a) Describe the structure and function of TOM and TIM complex in mitochondria. **[7]**

- b) Illustrate the structure and function of different types of cell junctions. **[8]**

OR

- a) Elaborate on the process of non-cyclic photophosphorylation in plants. **[7]**

- b) Explain receptor - mediated endocytosis with suitable examples. **[8]**



Total No. of Questions : 5]

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S.Y. B.Sc.

BIOTECHNOLOGY

Bb - 213 : Environmental Biology and Biotechnology

(2013 Pattern) (Semester - I)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

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

Q1) Answer the following in short (2-3 sentences):

[10 × 2 = 20]

- a) Define Ecesis.
- b) Give pictorial presentation of structure of atmosphere.
- c) Enlist strata in trophic structure.
- d) Compare and contrast : Food Chain & Food Web.
- e) Define with example 'Reservoir pool of Nutrients'.
- f) Enlist any four applications of remote sensing in Wildlife Management.
- g) What is Bioremediation?
- h) Explain : Environmental Audit.
- i) Give mechanism of acid rain formation.
- j) What is meant by 'Germ Plasm'?

Q2) Write notes on (Any three):

[3 × 5 = 15]

- a) Red data book.
- b) Microbial degradation of hydrocarbons.
- c) Structure of Lithosphere.
- d) Carbon cycle.

P.T.O.

- Q3)** a) What is bioremediation? Add a note on types of bioremediation strategies with any one. Example. [8]
- b) Give an account of causes, mechanism and consequences of Ozone layer depletion. [7]

OR

- a) Give an account of causes, Effects and control measures of soil pollution. [8]
- b) Elaborate on role of Biotechnology in conservation of biodiversity. [7]

- Q4)** a) Explain in detail stages of Environmental Impact Assessment of an industrial project. [7]
- b) Write a note on constituents, hazards and treatment strategies for biomedical waste. [8]

OR

- a) Illustrate international efforts taken for environmental Wellbeing. Add a note on Earth Summit. [7]
- b) Explain stages of evolution of an ecosystem. Add a note on Xerosere. [8]

Q5) Write notes on (Any three): [3 × 5 = 15]

- a) Forest Conservation Act. (1992).
- b) Energy budget of Ecosystem.
- c) Biogeography of India.
- d) Eutrophication.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

P722

[5117]-201

S.Y. B.Sc.

BIOTECHNOLOGY

**Bb - 221 : Molecular Biology
(2013 Pattern) (Semester - II)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

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

Q1) Answer in 2-3 sentences:

[10 × 2 = 20]

- a) Write the findings of Avery-MacLeod-McCarty's experiment.
- b) Give salient features of clover leaf structure of tRNA.
- c) Define: Pseudogenes.
- d) What is Centromere?
- e) Give the role of DNA polymerase III enzyme.
- f) What is ubiquitination?
- g) What is codon bias?
- h) Give two examples of inhibitors of translation.
- i) What is transversion?
- j) What is promoter?

Q2) Write short notes on (any three):

[3 × 5 = 15]

- a) Non coding RNA.
- b) Chromatin material.
- c) Characteristics of viral genome.
- d) DNA damage.

P.T.O.

Q3) Answer the following (any three): **[3 × 5 = 15]**

- a) Explain the process of co-translational translocation of protein.
- b) Describe initiation of transcription in prokaryotes.
- c) What is central dogma of molecular biology? Add a note.
- d) Describe tryptophan operon with attenuation process.

Q4) a) Compare and contrast prokaryotic and eukaryotic protein synthesis. **[15]**

OR

- b) Explain in detail the process of replication in prokaryotes. **[15]**

Q5) a) What is chromosome condensation? Explain different levels of chromosome condensation. **[8]**

- b) What is 'Q' independent transcription termination in prokaryotes? Add a note on it. **[7]**

OR

- a) How type I introns are spliced out during maturation of mRNA in eukaryotes? **[8]**

- b) Write a note on ' ρ ' dependent termination of transcription in prokaryotes. **[7]**



Total No. of Questions : 6]

SEAT No. :

P723

[5117]-202

[Total No. of Pages : 2

S.Y. B.Sc.

BIOTECHNOLOGY

Bb - 222 : Plant & Animal Development

(2013 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written on separate answer sheets.*
- 3) *Draw neat diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

Plant Development

Q1) Answer in 2-3 sentences:

[5 × 2 = 10]

- a) Define tapetum.
- b) What is campylotropous ovule?
- c) Define redifferentiation.
- d) What is double fertilization and triple fusion?
- e) Define megasporogenesis.

Q2) Answer any four of the following:

[4 × 5 = 20]

- a) Explain programmed cell death as a developmental process in plants.
- b) Enlist and explain types of endosperms in plants.
- c) Write a note on SAM.
- d) Describe role of in vitro organ culture with reference to plant development.
- e) Elaborate on role of various genes involved in vegetative patterning.
- f) Explain ABC model of floral patterning.

P.T.O.

Q3) Attempt any one: **[1 × 10 = 10]**

- a) Give detailed account of use of Fucus as a model system to study plant development.
- b) With the help of neat, labelled diagrams, explain development of monocotyledonous embryo.

SECTION - II

Animal Development

Q4) Answer the following: **[5 × 2 = 10]**

- a) What is the role of dorsal lip of blastopore during amphibian embryo development?
- b) Explain two theories of ageing.
- c) Define the term holoblastic cleavage.
- d) Write two characteristics of stem cells.
- e) Define the term Differentiation.

Q5) Attempt the following (any 4): **[4 × 5 = 20]**

- a) Describe the process of spermatogenesis.
- b) Explain the Mechanism of slow block during fertilisation.
- c) Describe the role of zygotic genes in pattern formation.
- d) Write a note on cell lineage with any one of the suitable example.
- e) What is teratogenesis? Explain the role of any one teratogen in abnormal development of an embryo.
- f) What is apoptosis? Describe the role of Apoptosis in limb development.

Q6) Attempt any one of the following: **[1 × 10 = 10]**

- a) Describe the process of gastrulation in frog and add a note on fate of 3 germinal layers.
- b) Explain the concept of animal regeneration. Enlist the different patterns of regeneration and elaborate any one pattern of regeneration with an example.



Total No. of Questions : 3]

SEAT No. :

P724

[5117]-203

[Total No. of Pages : 1

S.Y. B.Sc.

BIOTECHNOLOGY

Bb - 223 : Scientific Writing and Communication

(2013 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer in brief:

[5 × 2 = 10]

- a) What is meant by review of Literature?
- b) Enlist the components of 'Acknowledgements' in a research article.
- c) Differentiate between research article and review article.
- d) Give the uses of simple present tense.
- e) What is a suffix? Give an example.

Q2) Write short notes on (any 4):

[4 × 5 = 20]

- a) Name-year system of literature citation with examples.
- b) Sequence of Discussion in a Research article.
- c) Deductive and Inductive reasoning.
- d) Synonyms and antonyms.
- e) Factors affecting fluency during oral presentation.
- f) Significance of - Standard Deviation.

Q3) Attempt any one of the following:

[1 × 10 = 10]

What is Scientific presentation? Explain oral and poster presentation in detail.

OR

Prepare a Curriculum Vitae (CV) for the post of a Trainee in a Biotechnology start-up.



Total No. of Questions : 3]

SEAT No. :

P725

[5117]-204

[Total No. of Pages : 1

S.Y. B.Sc.

BIOTECHNOLOGY

Bb - 224 : Metabolic Pathways

(2013 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer in 2-3 sentences:

[5 × 2 = 10]

- a) Define Turnover number.
- b) What are lyases. Give an example.
- c) What do you mean by substrate level phosphorylation.
- d) Define essential aminoacids. Give example.
- e) What are ketone bodies?

Q2) Attempt any four:

[4 × 5 = 20]

- a) Draw the structure of cholesterol. Mention its significance. Write the rate limiting step in cholesterol biosynthesis.
- b) Describe the regulation of glycogen metabolism.
- c) Fatty Acid Synthase is a multienzyme complex. Explain.
- d) Write a short note on deamination of amino acids.
- e) Explain the significance and reaction catalyzed by the enzymes: Isocitrate dehydrogenase and Isocitrate lyase.
- f) TCA Cycle is amphibolic. Justify.

Q3) Attempt any one:

[1 × 10 = 10]

- a) Explain in detail C3 pathway of photosynthesis.
- b) Explain the process of gluconeogenesis and write a note on its ATP expenses.



Total No. of Questions : 5]

SEAT No :

[Total No. of Pages :2

P726

[5117]-301

T.Y.B.Sc.

BIOTECHNOLOGY

Bb-331: Microbial Biotechnology

(2013 Pattern) (Semester-III)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

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

Q1) Answer all the following in 2-4 lines.

[20]

- a) Define yield coefficient and state its significance in microbial growth.
- b) Give classification of microorganisms on the basis of pH requirement.
- c) What are Biosensors ? Mention any two types.
- d) Mention the use of GMOs in medicine with examples.
- e) What is TDT ? Mention its role in food preservation.
- f) What is biotransformation. Comment on Indigo biotransformation.
- g) BOD is the important criterion of effluent treatment. Justify it.
- h) Mention the use of microorganisms in metal extraction.
- i) Define enzyme immobilization and state its advantages in industrial usages.
- j) What are indicators of faecal pollution? State their significance with examples.

Q2) Attempt the following questions (any three).

[3×5=15]

- a) Describe the role of compatible solutes in adaptation of Halophiles in extreme conditions.
- b) Explain in brief benefits of normal flora to humans.
- c) Describe trickling filter for treatment of wastewater.
- d) Compare and contrast continuous culture and batch fed culture.

P.T.O.

Q3) Write short notes on: (any three)

[3×5=15]

- a) Phosphatase test.
- b) Use of chemicals in food preservation.
- c) Biosafety norms in Biotechnology.
- d) Bioplastic - Biopol.

Q4) a) Give an account of drinking water purification methods with reference to sedimentation, coagulation and filtration. **[8]**

OR

With the help of flow diagram give routine Bacteriological analysis of water for potability. **[8]**

b) Describe food intoxication and infection caused by salmonella typhi. **[7]**

Q5) Attempt any one of the following.

[15]

- a) Discuss the tuberculosis with respect to
 - i) Causative agent
 - ii) Symptoms
 - iii) Pathogenesis
 - iv) Treatment
 - v) Prophalaxis
- b) Enlist different methods of pasteurization and discuss the process of grading of milk. Brucella ring test and Mastitis test - Give significance.

→ → →

Total No. of Questions : 6]

SEAT No :

P727

[5117]-302

[Total No. of Pages :2

T.Y.B.Sc.

BIOTECHNOLOGY

**Bb-332: Plant and Animal Tissue Culture
(2013 Pattern) (Semester-III)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Answer to each section should be written in separate answer book.*

SECTION-I

Plant Tissue Culture

Q1) Answer in brief

[5×2=10]

- a) What is hardening ?
- b) What is meristem culture ?
- c) Enlist any two applications of endosperm culture ?
- d) What is meant by conversion of a somatic embryo ?
- e) Explain the use of ascorbic acid and coconut milk in media.

Q2) Answer any four.

[4×5=20]

- a) What is Somatic hybridization ? Give its applications.
- b) What is organogenesis. Describe the various types of organogenesis in detail.
- c) Write a note on embryo culture. Give its applications .
- d) What is surface sterilization. Discuss the general protocol.
- e) Give the various applications of Plant Tissue Culture.
- f) Explain the procedure for generation of androgenic haploids.

P.T.O.

Q3) Answer any one.

[1×10=10]

- a) What are suspension cultures. Describe the various bioreactor types to obtain optimal growth. Add a note on methods of synchronization.
- b) Enlist the various equipments used in a plant tissue culture laboratory. Explain the role of each in invitro culture.

SECTION-II

Animal Tissue Culture

Q4) Answer the following in 2-3 lines.

[5×2=10]

- a) Enlist the components of TPVG & give their role.
- b) Define cell line.
- c) Write the role of albumin in serum.
- d) Give the specific culture conditions of insect cell lines.
- e) Write any two therapeutic applications of animal cell culture.

Q5) Write short notes on (any 4).

[4×5=20]

- a) Comparative account of finite Vs infinite cell lines.
- b) Disadvantages of serum in ATC medium.
- c) Physico-chemical requirements of animal cells growing in vitro.
- d) Histotypic culture.
- e) Determination of viable cell count.
- f) Aseptic culture conditions.

Q6) a) Define enzymic markers. Describe in detail how these markers can be used for characterization of cells. **[10]**

OR

b) Enlist different methods of cell disaggregation. Explain any one in detail. **[10]**

→ → →

Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :2

P728

[5117] - 303

T.Y.B.Sc.

BIOTECHNOLOGY

Bb-333: Biodiversity & Systematics

(2013 Pattern) (Semester - III)

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) Answer in 2-3 lines:

[10×2=20]

- a) Define with example species diversity.
- b) What is meant by species richness?
- c) Enlist importances of biodiversity databases with example.
- d) Compare and contrast proto-cooperation & commensalism.
- e) Define Niche with appropriate example.
- f) What is Red data book?
- g) Define sympatric speciation.
- h) What is serotyping?
- i) Define Altruism with example.
- j) Define Entrainment.

Q2) Write notes on (any three):

[3×5=15]

- a) Shannon's index for biodiversity analysis.
- b) Cold desert biome.
- c) Growth forms of population.
- d) Competition model.

P.T.O.

Q3) Write in brief (any three): **[3×5=15]**

- a) Animal mating behaviour.
- b) Earth summit.
- c) Livestock diversity of India.
- d) Change in biodiversity over space and time.

Q4) a) Justify: Insitu conservation is always preferred over exsitu conservation. Add a note on techniques used for Insitu conservation. **[8]**

- b) Explain the importance of traditional knowledge in conservation of biodiversity. **[7]**

OR

a) Explain the need for classification. Add note on molecular techniques used for classification. **[8]**

- b) Illustrate interspecific interactions of organisms. **[7]**

Q5) Write notes on (any three): **[3×5=15]**

- a) Circadian Rhythm.
- b) Chemotaxonomy
- c) β -diversity.
- d) Biodiversity hotspots in Asia.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :2

P729

[5117] - 401

T.Y.B.Sc.

BIOTECHNOLOGY

Bb-341: Large Scale Manufacturing Process

(2013 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

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

Q1) Answer the following in 2-3 lines:

[10×2=20]

- a) Define depreciation.
- b) Define precursor. Give suitable example.
- c) State the factors affecting filtration.
- d) What is meant by Inoculum and production medium?
- e) What is mutant with altered permeability. Give suitable example.
- f) Define sparger. State its types.
- g) What is scale up of fermentation process.
- h) Enlist two culture collection centres of industrially important micro-organisms.
- i) State the role of cane and sugar beet molasses in a fermentation medium.
- j) Describe in brief the depth filter.

Q2) Write short notes on (any three):

[3×5=15]

- a) Pressure cycle fermenter.
- b) LAL Test.
- c) Inoculum build up (Bacterial) for industrial fermentation.
- d) Affinity chromatography.

P.T.O.

Q3) Attempt any three of the following:

[3×5=15]

- a) Describe the role of rotary vacuum filter in down stream processing of fermentation product.
- b) Describe the concept of good manufacturing processes in large scale manufacture process.
- c) Explain co-current and counter current liquid-liquid extraction method.
- d) Describe in brief the bubble column fermenter.

Q4) a) What is ion-exchange chromatography? Describe the recovery of streptomycin by ion-exchange chromatography. **[7]**

OR

Describe the use of computers in a bioprocess.

- b) Describe the large scale production of amylase and state the applications of amylase. **[8]**

OR

Describe the monitoring and control of foam in a fermentation process.

Q5) Describe the large scale production of amino-acids acids with respect to producer organism, production medium, auxotrophic mutants and fermentation process. **[15]**

OR

Describe the construction and working of a typical fermenter with the help of a neat labelled diagram.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :3

P730

[5117] - 402

T.Y.B.Sc.

BIOTECHNOLOGY

BB-342: Biochemical and Biophysical Techniques

(2013 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

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

Q1) Answer all the following in 2-4 lines:

[20]

- a) What is molarity?
- b) What are fluorophores?
- c) What are polyprotic acids?
- d) What is the relation between g and RPM in centrifugation?
- e) What is retention factor (RF) in chromatography?
- f) What is molar extinction coefficient?
- g) Define pH.
- h) Define wavelength.
- i) What is the dual nature of electro magnetic radiation?
- j) What is the meaning of fixing of biological samples for microscopy?

P.T.O.

Q2) Attempt the following questions (any three): **[3×5=15]**

- a) What is thin layer chromatography (TLC)? Give the principle and applications of this technique.
- b) Define Beers and Lamberts law. Distinguish between absorbance and transmission of light.
- c) Explain the different methods for specimen preparation for light microscopy.
- d) How will you prepare-
 - i) Solution A of strength 0.5M volume 400 ml if the molecular weight of the solute is 125.
 - ii) Using the above solution prepare 0.3M solution with a final volume of 600 ml.

Q3) Write short notes on any three: **[3×5=15]**

- a) Capillary Electrophoresis.
- b) Rotor types in centrifugation.
- c) Phase contrast microscopy.
- d) Electromagnetic Radiation.

Q4) a) Distinguish between SDS and native PAGE. What is activity staining?**[8]**

- b) Explain the principle of Ion Exchange chromatography and describe the exchangers. **[7]**

OR

- a) What is density gradient centrifugation? Explain the principle and give the applications of this technique. **[8]**

- b) What is laboratory safety? Explain the various precautions taken in a laboratory during experimentation. **[7]**

Q5) Attempt any one:

[15]

- a) What is column chromatography? Give a detailed account of affinity chromatography. Add a note on its applications.
- b) Discuss microscopy with respect to
 - i) Resolving power.
 - ii) Magnification.
 - iii) Illumination sources and Kohlers Illumination.
 - iv) Light field and dark field microscopy.
 - v) Stains and specimens.



Total No. of Questions :5]

SEAT No. :

[Total No. of Pages :2

P731

[5117] - 403

T.Y.B.Sc.

BIOTECHNOLOGY

Bb-343: Recombinant DNA Technology

(2013 Pattern) (Semester - IV)

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 in 2-4 lines:

[20]

- a) Mention the contribution of Boliver & Rodrigues in the field of genetic engineering.
- b) What is the activity of alkaline phosphatase?
- c) Mention any 2 properties of vectors used for cloning large DNA molecules.
- d) What are linkers?
- e) Enlist any 4 safety precautions in RDT.
- f) Describe how UV spectrophotometry helps in determining purity of nucleic acids.
- g) Write any four applications of genetic engineering.
- h) Explain the use of biotin- streptavidin in RDT.
- i) Why are S1 nucleases used as molecular tools in RDT.
- j) What are universal primers?

P.T.O.

Q2) Write short notes on (Any 3): **[3×5=15]**

- a) Structure and application of PVC.
- b) Two methods of selection of transformants.
- c) Strategy to avoid protein contamination while isolating plasmid DNA.
- d) DNA finger printing.

Q3) Write short notes on (Any 3): **[3×5=15]**

- a) Expression vectors.
- b) Different nucleases in RDT.
- c) Structure of UTP & dTTP (draw the structure)
- d) cDNA library.

Q4) a) Describe various methods used for transformation of plant cells. [7]

b) Comment on different types of restriction enzymes & their roles in genetic engineering. **[8]**

OR

a) Write a note on 'RNA as a tool in RDT'. **[7]**

b) Explain in detail the method of Southern Hybridization. **[8]**

Q5) a) Give a comparative account of different DNA sequencing methods.[15]

OR

b) Give a detailed account of RT-PCR. Add a note on various factors governing the amplification in RT-PCR. **[15]**

