

Total No. of Questions : 7]

SEAT No. :

P187

[Total No. of Pages : 2

[4219] - 301

T.Y. B.Sc. (Sem. - III)

BIOTECHNOLOGY

Bb - 331 : Microbial Biotechnology

(Common to Old & New Course )

*Time :3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

- 1) *Question No. 1 and 7 are compulsory.*
- 2) *Attempt any three questions of the remaining.*
- 3) *Draw neat labelled diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*

**Q1)** Answer all questions in 2 - 4 lines:

**[20]**

- a) Mention any two contributions of Louis Pasteur in vaccine development.
- b) Enlist any two genes of lac operon with their function.
- c) What is false presumptive test in coliform detection?
- d) "Chemolithotrophs have role to play in nitrogen cycle". Justify.
- e) Write any two examples of GMOs in therapeutic protein production.
- f) State the principle of chlorination in water treatment.
- g) What is ropiness of milk?
- h) What are GRAS foods? Give any two examples.
- i) Mention any two properties of ideal chemotherapeutic agent.
- j) Calculate the substrate consumed in a batch process if the  $y_p$  is 0.5 and the product produced is 4 gm / litre.

**P.T.O.**

- Q2)** a) Explain the molecular adaptations in psychrophiles. [15]  
b) Write about attenuation in trp operon.  
c) Compare & contrast aerobic and anaerobic metabolism in microorganisms.
- Q3)** a) What are auxotrophic mutants? Explain their role in strain improvement with examples. [8]  
b) Explain the gene mapping by transformation. [7]
- Q4)** a) Explain in brief food poisoning by staphylococcus aureus. [7]  
b) Comment on the tests done for microbiological grading of milk. [8]
- Q5)** a) Explain the 'activated sludge' process of waste water treatment. [10]  
b) Write a note on the tests to differentiate faecal and non faecal coliforms. [5]
- Q6)** a) Explain the clinical manifestations of AIDS. [8]  
b) Which are the nucleic acid analogues used as chemotherapeutic agents? Explain the mode of action. [7]
- Q7)** Write short note on: [15]  
a) Fed batch culture.  
b) Mechanism of botulinum toxin.  
c) Role of normal gut flora.



Total No. of Questions : 8]

SEAT No. :

P188

[Total No. of Pages : 2

[4219] - 302

T.Y. B.Sc. (Semester - III)

BIOTECHNOLOGY

Bb - 332 : Animal & Plant Development

(2008 Pattern)

*Time :3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

- 1) *Answers to each section should be written in separate answer books.*
- 2) *Q.No.1 and Q.No.5 are compulsory. From remaining questions attempt any two from each section.*

**SECTION - I**

**(Animal Development)**

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

- a) Competence
- b) Differentiation
- c) Hensen's Node
- d) Stem Cells
- e) Apoptosis

**Q2)** a) Describe the cleavage patterns on the basis of quantity & distribution of yolk. **[8]**

b) Describe about Immunoglobulin genes organizations. **[7]**

**Q3)** a) Describe the types and methods of animal cloning? Add a note on their application. **[8]**

b) Describe the process of Gastrulation in frog and add a note on fate of three germinal layers. **[7]**

**P.T.O**

- Q4)** a) What are teratogens? Explain the role of any one teratogen in abnormal development of an embryo [8]
- b) With the help of model system *Drosophila* / any other explain the role of zygotic genes in patterning. [7]

**SECTION - II**  
**(Plant Development)**

- Q5)** Explain the terms with reference to plant development. [10]
- a) STM gene
- b) HOBBIT gene
- c) Radial patterning
- d) Quiescent centre
- e) Promeristem
- Q6)** a) Give an account of developmental plasticity in plants with suitable example. [8]
- b) Define phyto hormones and give its different types. Explain the role of cytokinin in process of plant development. [7]
- Q7)** a) Explain cell lineage in plants with suitable examples. [8]
- b) Elaborate on Root & shoot patterning in plants with suitable diagram. [7]
- Q8)** a) Describe various stages of somatic embryogenesis and give its significance. [8]
- b) Give an account on ABC model of floral patterning. [7]



Total No. of Questions : 7]

SEAT No. :

P189

[Total No. of Pages : 2

[4219] - 303

T.Y. B.Sc. (Sem. - III)

BIOTECHNOLOGY

Bb - 333 : Biodiversity and Systematics

(2008 Pattern)

*Time :3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

- 1) *Question No. 1 is compulsory.*
- 2) *Out of remaining questions attempt any four.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Explain the following in 2 - 4 lines:

**[10 × 2 = 20]**

- a)  $\beta$  - diversity.
- b) Hot Spots.
- c) Ecophenes.
- d) Carrying capacity.
- e) Allee's principle.
- f) Key stone species.
- g) Circadian rhythm.
- h) Distinguish between sympatric and allopatric species.
- i) IUCN green data book.
- j) Serotaxonomy.

**Q2)** a) Describe in brief the steps involved in bioprospecting microorganisms for therapeutic agents. **[8]**

b) Elaborate strategies of in situ conservation of plants and animals and add a note on advantages and limitations. **[7]**

**P.T.O.**

- Q3)** a) Define biome. Compare and contrast the floral and faunal characteristics of tropical rain forest and grass land. [8]  
b) Describe negative interactions with suitable examples. [7]
- Q4)** a) Illustrate the changes in behavioural pattern in response to environmental stimuli. [8]  
b) Define population dynamics and describe various characteristics of population. [7]
- Q5)** a) Describe the scheme of wild life protection act 1972 in detail. [8]  
b) Why is 16s rRNA analysis a strong tool in biosystematics of microorganisms. [7]
- Q6)** a) Explain the concept that “Biosystematics in modern era is a multidisciplinary synthetic discipline of biological sciences. [8]  
b) What is species diversity index? Enlist biodiversity indices. Add notes on its applications. [7]
- Q7)** Write notes on (Any 3): [15]  
a) Niche and its type.  
b) Molecular chronometers.  
c) Biogeography of India.  
d) Endemic species.



Total No. of Questions : 7]

SEAT No. :

P190

[Total No. of Pages : 2

[4219] - 32

T.Y. B.Sc.

BIOTECHNOLOGY

Bb - 332 : Recombinant DNA Technology

(2004 Pattern) (Sem. - 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) State the role of alkaline phosphatase in cloning.
- b) Mention the role of iso-amyl alcohol & chloroform in DNA extraction.
- c) What are phagemids? Mention any two properties of phagemids as vectors.
- d) Enlist any four discoveries in recombinant DNA technology.
- e) What is ideal host? Justify E.coli as an ideal host.
- f) Write any two applications of genetic engineering.
- g) What are shuttle vectors?
- h) Write any two applications of Northern Blotting.
- i) What are restriction enzymes? Give any two examples.
- j) A 260/280 ratio is used to check the purity of DNA justify.

**Q2)** Explain in detail DNA sequencing by Sanger's Method.

**[15]**

**P.T.O**

- Q3)** a) Explain the factors affecting the PCR efficiency. [7]  
b) Explain in brief the construction of c-DNA library. [8]
- Q4)** a) Explain the role of site directed mutagenesis. [7]  
b) Explain in detail blue - white screening method. [8]
- Q5)** Write short notes (any three): [15]  
a) Southern Blotting.  
b) DNA fingerprinting.  
c) Chromosome walking.  
d) Distinguish between RFLP & RAPD.
- Q6)** a) Explain in detail the plasmids, their properties & their role as vectors. [8]  
b) Explain in brief the method of RNA purification. [7]
- Q7)** a) Write an account on the use of reverse transcriptase in molecular cloning. [8]  
b) Describe  $\alpha$  - complementation in details. [7]





Total No. of Questions : 6]

SEAT No. :

**P191**

[Total No. of Pages : 2

**[4219] - 33**

**T.Y. B.Sc.**

**BIOTECHNOLOGY**

**Bb - 333 : Biodiversity and Systematics**

**(2004 Pattern) (Sem. - III)**

*Time :3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

- 1) *Question No. 1 is compulsory.*
- 2) *Answer any 4 out of the remaining questions.*
- 3) *Figures to the right indicate full marks.*

**Q1)** Attempt the following:

**[20]**

- a) What is 'Gaussian Principle'?
- b) Explain the concept of 'Ecological Population'.
- c) Define 'Numerical Taxonomy'.
- d) What is Edge effect?
- e) Mention the mathematical formula used to calculate 'Simpson's Index' with appropriate explanation of the terms used in it.
- f) What is stratification?
- g) Define Taxon.
- h) What is 'Biosphere Reserve'? Give one example.
- i) Define Habitat.
- j) Explain symbiotic association with suitable example.

**Q2)** a) What is 'Ex - Situ' conservation? Describe various methods to achieve it. **[8]**

b) Describe various laws / acts implemented for conservation. **[7]**

**P.T.O.**

- Q3)** a) Describe phylogenetic classification in detail with suitable examples. [8]  
b) Describe in detail the 'J' shaped growth form. [7]
- Q4)** a) Explain the role of embryology in plant classification. Give suitable examples. [8]  
b) What is 'Circadian Rhythm'? Describe in detail with suitable examples. [7]
- Q5)** a) What is age structure? Describe the characteristics of stable population. [8]  
b) What are Biomes? Describe any two biomes in detail. [7]
- Q6)** Write short notes on: [15]  
a) Fecundity.  
b) Uses of 'Mathematical Modeling'.  
c) Various levels of Biodiversity.



Total No. of Questions : 7]

SEAT No. :

P192

[Total No. of Pages : 2

[4219] - 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 a bioprocess? Give two examples.
- b) Define Nabla factor used in media sterilization.
- c) What are steroid transformations? Write one example.
- d) What is wholebroth processing?
- e) Mention the use of load cells as process sensors.
- f) State the principle of LAL test.
- g) What are baffles? Write their function.
- h) Mention the vitamins produced by microorganisms.
- i) Write any two advantages of RSM over plackett and Burmann design.
- j) What is dilatant rheology?

**Q2)** a) Explain the design & working of an airlift fermenter.

**[8]**

b) Explain the design & function of impellers with a note on factors affecting.

**[7]**

**P.T.O.**

- Q3)** a) Explain the monitoring of biomass in a bioprocess. [7]  
b) What is  $K_L a$ ? Explain the factors affecting  $K_L a$ . [8]
- Q4)** a) Define immobilization. Write the advantages and applications of immobilized enzymes. [8]  
b) Write a note on media design for animal cell & microorganism based bioprocess. [7]
- Q5)** a) Explain the fermentative production of ethanol with the help of flow sheet. [10]  
b) Mention the measures for economising a bioprocess. [5]
- Q6)** a) Explain the solvent extraction used in product recovery. [8]  
b) Compare and contrast batch & continuous sterilization. [7]
- Q7)** Write short note on: [15]  
a) SOPs.  
b) Monod Model.  
c) Mass balance in bioprocess.



Total No. of Questions : 8]

SEAT No. :

P193

[Total No. of Pages : 2

[4219] - 402

T.Y. B.Sc.

BIOTECHNOLOGY

Bb - 342 : Biotechnology in Agriculture and Health  
(2008 Pattern) (Sem. - IV)

*Time :3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

- 1) *Q.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 right indicate full marks.*
- 5) *Draw neat and labelled diagram, if necessary.*

**SECTION - I**

**(Agriculture)**

**Q1)** Define or explain the following terms:

**[10]**

- a) Cybrid
- b) GM Crop
- c) IPR
- d) Trademarks
- e) Ti - Plasmid

**Q2)** a) Define Molecular marker. Describe various types of molecular markers used in plant biotechnology. **[8]**

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

**Q3)** a) Define cryopreservation. Write in detail the technique of cryopreservation and its applications. **[8]**

b) 'Bt - toxins are used as biopesticides' – Explain. Write advantages and disadvantages of transgenic plants with Bt - genes. **[7]**

**P.T.O.**

- Q4)** Write short notes on (any three): **[15]**
- a) Haploids in agriculture.
  - b) Shuttle Vector.
  - c) Electroporation.
  - d) Metabolic engineering.

**SECTION - II**  
**(Health)**

- Q5)** Attempt the following: **[10]**
- a) Enlist applications of Animal Cell Culture.
  - b) What is tissue engineering?
  - c) State the use of PCR as a diagnostic tool.
  - d) What are biosensors?
  - e) What is clone?
- Q6)** a) What is hybridoma? Explain the steps involved in production of hybridoma clone. **[8]**
- b) Describe in brief about Human Genome Project and its implications in health & disease. **[7]**
- Q7)** a) What are molecular markers. Explain their role in diagnostics. **[8]**
- b) Differentiate between Live & killed vaccines & write advantages & disadvantages of these vaccines. **[7]**
- Q8)** Write short notes (any three): **[15]**
- a) Role of biosensors in diagnostics.
  - b) Recombinant vaccines.
  - c) Scale up of suspension culture.
  - d) Distinguish between serum containing medium & serum free medium.



Total No. of Questions : 7]

SEAT No. :

**P194**

[Total No. of Pages : 2

**[4219] - 403**

**T.Y. B.Sc. (Semester - IV)**

**BIOTECHNOLOGY**

**Bb - 343 : Recombinant DNA Technology**

**(2008 Pattern)**

*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 Taq polymerase in molecular cloning.
- b) Enlist different methods of cell lysis.
- c) Write any two applications of recombinant DNA technology.
- d) Enlist four major break through discoveries in genetic engineering.
- e) What is the difference between probe and primer?
- f) What is site directed mutagenesis?
- g) What is insertional inactivation?
- h) What are expression vectors?
- i) Write four characteristics of pUC 18 as a vector.
- j) Name the membranes used in blotting technique.

**Q2)** Explain in detail the Maxam - Gilbert method of sequencing of DNA.

**[15]**

**Q3)** a) Explain in details RNA purification.

**[8]**

b) Explain different factors which affect PCR reaction at various steps. **[7]**

**P.T.O**

- Q4)** a) Explain the mechanism of action & applications of following enzymes in genetic engineering. [8]
- i) Alkaline phosphatase                      ii) DNA ligase
  - iii) DNA polymerase                        iv) Polynucleotide kinase
- b) What are BAC vectors? Write a note on their properties & use. [7]
- Q5)** a) Explain different methods of inserting foreign DNA in eukaryotic & prokaryotic cells. [10]
- b) Distinguish between cDNA library and genomic library. [5]
- Q6)** a) Explain in details different types of restriction enzymes. [7]
- b) Explain any one method of genome mapping. [8]
- Q7)** Write short notes : [15]
- a) Colony hybridization.
  - b) Chromosome walking.
  - c) Western blotting.





Total No. of Questions : 8]

SEAT No. :

**P195**

[Total No. of Pages : 2

**[4219] - 42**

**T.Y. B.Sc. (Sem. - IV)**

**BIOTECHNOLOGY**

**Bb - 342 : Applications of Biotechnology in Agricultural and Health  
(2004 Pattern)**

*Time :3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

- 1) Answer's to each section should be written in separate answer books.*
- 2) Question no.1 from each section is compulsory. From remaining questions attempt any two from each section.*

**SECTION - I**

**(Agriculture)**

**Q1)** Explain the term:

**[10]**

- a) CaMV
- b) Green home technology
- c) Trade marks
- d) Vitrification
- e) Clonal propagation

**Q2)** a) What is plant transformation? Describe its application in selection of desirable phenotype. **[8]**

b) Explain green house technology of flowering & vegetable plants. Give application of green house technology. **[7]**

**Q3)** a) What are Ti plasmids? How can this plasmids can be manipulated for introduction of desired gene. **[8]**

b) Describe the steps of cryopreservation for plant tissue cultured shoot tip & give application of it. **[7]**

**P.T.O.**

- Q4)** Write notes on: **[15]**
- a) IPR
  - b) Genetically Modified Crops.
  - c) Ethical & Social aspects of GM crops.

**SECTION - II**  
**(Health)**

- Q1)** Answer the following: **[10]**
- a) What is cell cloning?
  - b) Define molecular markers. Give its role.
  - c) What is hybridoma? Give its significance.
  - d) Give the limitation of organ culture technique.
  - e) Enlist the recombinant product useful for human health.

- Q2)** a) Explain tissue engineering with its importance. **[8]**  
b) Describe the application of PCR in health diagnostic technology. **[7]**

- Q3)** a) Discuss in detail the application of animal cell culture technique. **[8]**  
b) Give the principle and application of Biosensors. **[7]**

- Q4)** Write notes on: **[15]**
- a) Monoclonal antibodies.
  - b) Advantages of serum free media.
  - c) Attenuation.



Total No. of Questions : 8]

SEAT No. :

P196

[Total No. of Pages : 2

[4219] - 43

T.Y. B.Sc. (Sem. - IV)

BIOTECHNOLOGY

Bb - 343 : Animal and Plant Development  
(2004 Pattern)

*Time :3 Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

- 1) *Question no.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 on separate answer books.*
- 4) *Figures to right indicate full marks.*
- 5) *Draw neat & labelled diagram if necessary.*

**SECTION - I**

**(Animal Development)**

- Q1)** Explain the terms: **[10]**
- a) Stem cells.
  - b) Transgenic animals.
  - c) Vitellogenesis.
  - d) Invagination & delamination.
  - e) Antibodies.
- Q2)** a) Explain in detail the process of gastrulation in frog embryos. **[8]**  
b) Describe the process of oogenesis and explain the structure of mature ovum. **[7]**
- Q3)** a) Describe the process of regeneration with one appropriate example. **[7]**  
b) Describe how distribution of yolk governs the cleavage patterns. **[8]**

**P.T.O.**

- Q4)** Write short notes on: [15]
- a) Apoptosis.
  - b) Teratogenesis.
  - c) Significance of primitive streak formation.

**SECTION - II**  
**(Plant Development)**

- Q1)** Explain the terms with reference to plant development: [10]
- a) Redifferentiation.
  - b) Gibberelic acid.
  - c) Shoot apical meristem.
  - d) Radial patterning.
  - e) Ageing.

- Q2)** a) What is auxin? Explain its role in plant development. [8]  
b) Describe the strategies for development of transgenic plants. [7]

- Q3)** a) Explain embryogeny in dicot plants. [8]  
b) Explain the organisation of shoot apical meristem and root apical meristem during plant development. [7]

- Q4)** Write notes on: [15]
- a) Floral patterning.
  - b) Lateral meristem.
  - c) Organogenesis.



Total No. of Questions : 5]

SEAT No. :

**P169**

[Total No. of Pages : 2

[4219] - 1

**F.Y.B.Sc.**

**BIOTECHNOLOGY**

**Bb - 101 : Fundamentals of Chemistry**

**(2008 Pattern)**

*Time :3Hours]*

*[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 table and calculator is allowed.*

**Q1)** Answer the following:

**[16]**

- a) Calculate the moles of hydrogen ( $H_2$ ) present in 500 ml sample of hydrogen gas at a pressure of 1 bar and  $27^\circ C$ .
- b) State and explain 'law of mass action'.
- c) State and explain Raoult's law.
- d) Define and explain the term metastable equilibrium.
- e) Define the term 'Specific conductance'. What is effect of dilution on specific conductance?
- f) What are the advantages of potentiometric titrations?
- g) Explain the representation of an organic molecule by using 'Saw Horse Formula'.
- h) Explain the formation of co-ordinate bond with suitable example.

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

**[16]**

- a) Derive an expression for Kinetic theory of gasses.
- b) Derive the equation for the rate constant of first order reaction.
- c) Describe Berkley and Hartley method for the determination of Osmotic Pressure of a solution.
- d) State and explain 'water system' on the basis of phase rule.
- e) What are buffer solutions? Explain the mechanism of basic buffer.
- f) What is hydrogen bond? What are the different types of hydrogen bond?

**P.T.O.**

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

- State phase rule and explain the terms involved in it.
- What are Van der Waal's forces? Explain the types and origin of Van der Waal's forces.
- What are chemical cells? Derive an expression for emf of chemical cell without transference.
- 50% of the first order reaction is complete in 25 minutes. Calculate the time required to complete the 75% of reaction.
- The average Osmotic pressure of sea water is 25.0 atm at 25°C. Calculate the molar concentration of an aqueous solution of urea ( $\text{NH}_2\text{CONH}_2$ ) that is isotonic with sea water.
- Explain the experimental determination of depression of freezing point.

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

- Write explanatory note on 'optical isomerism'.
- Explain in brief about:
  - D and L nomenclature system and
  - R and S nomenclature system.
- Explain the synthesis of following organic molecules:
  - Aspirin and
  - Paracetamol
- Balance the following equation by oxidation number method:  
 $\text{H}_2\text{S} + \text{SO}_2 \rightarrow \text{S} + \text{H}_2\text{O}$
- The equivalent conductance of LiCl in 0.01N solution is 93.6  $\text{Ohm}^{-1} \text{cm}^2$ . Calculate the specific conductance of the solution at the given dilution.
- Calculate the emf of the cell:  
 $\text{Zn}|\text{Zn}^{2+}_{(0.001\text{M})}||\text{Ag}^{+}_{(0.1\text{M})}|\text{Ag}$ .  
The standard potential of Ag/Ag<sup>+</sup> half-cell is +0.80V and Zn/Zn<sup>++</sup> is -0.76V.

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

- What do you mean by single electrode potential? Describe the construction and working of glass electrode. How it is used in measurement of pH of solution?
- Write notes on the following:
  - Standard cell and
  - Liquid-Liquid junction potential.
- What is transference and transference number? Explain the determination of transference number by the moving boundary method.



Total No. of Questions : 5]

SEAT No. :

P170

[Total No. of Pages : 3

[4219] - 2

**F.Y.B.Sc. (Biotechnology)**

**PHYSICS**

**Bb - 102 : Fundamentals of Physics  
(2008 Pattern)**

*Time :3Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

- 1) *All questions are compulsory.*
- 2) *Answers 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) What are the base units in S.I. system?
- b) What is Reynold's number? Give its significance.
- c) Define surface tension in terms of energy. Give its S.I. unit.
- d) What is plane polarized light?
- e) What do you mean by International Practical Temperature scale?
- f) The temperature of 4 gm of air is raised from 0°C to 1°C at constant volume. Calculate the increase in its internal energy specific heat of air at constant volume is 0.172 cal/gm/°C.
- g) Briefly explain fraunhofer diffraction.
- h) A bar magnet made up of iron has magnetic moment 2.0 A-m<sup>2</sup> and mass  $5 \times 10^{-3}$  kg. If the density of iron is  $6 \times 10^3$  kg/m<sup>3</sup>, find the magnetization.

**Q2)** Attempt any four:

**[16]**

- a) Define pressure. Obtain an expression for hydrostatic pressure as a function of depth.
- b) A capillary tube of 0.50 mm in diameter has its lower end immersed in a liquid whose surface tension is  $54 \times 10^{-3}$  N/m. The density of the liquid is  $0.86 \times 10^3$  kg/m<sup>3</sup>. Calculate the height at which the liquid rises. (Angle of contact is 28°)
- c) State Doppler's effect and give its applications.

**P.T.O.**

- d) Calculate the change in entropy when 1 mole of an ideal gas is allowed to expand from a volume of 1 litre to a volume of 10 litres at 27°C.
- e) Discuss nuclear magnetism? Give its applications in the field of medicine.
- f) Which fields are included in the life sciences? Briefly discuss the interrelationship between physics and life sciences.

**Q3)** Attempt any four:

**[16]**

- a) Define standard units for length & time.
- b) Show that the relationship between Young's modulus, modulus of rigidity and Poisson's ratio is  $Y = 2\eta(1 + \sigma)$ .
- c) With the help of suitable diagram explain the principle, construction and working of open-tube manometer.
- d) Two horizontal pipes of diameters 3 cm and 6 cm, are connected together. In the first pipe speed of water is 4 m/s and the pressure is  $2.0 \times 10^4$  N/m<sup>2</sup>. Calculate the speed and pressure of water in the second pipe.
- e) Explain the air compression refrigeration cycle.
- f) Define coefficient of performance. Find the efficiency of a refrigerator if coefficient of performance is 9.

**Q4)** Attempt any two:

**[16]**

- a) With the help of suitable diagram, explain the principle, construction and working of venturimeter. Derive the necessary formula.
- b) Show that an organ pipe open at both ends produces both even and the odd harmonics.

Two open organ pipes open at both the ends sounding simultaneously produce 5 beats per second. If the smaller pipe is 66 cm long then determine the length of the bigger organ pipe (speed of sound in air is 330 m/s).

- c) Obtain the relationship between S.T., excess pressure and radii of curvature of a thin film of a liquid. Hence determine the excess pressure in
  - i) Spherical soap bubble in air.
  - ii) Spherical drop of liquid.



**Q5) a)** Define the three critical constants of the gas. Obtain the critical constants in terms of Van der Waal's constants.

b) Define

i) Magnetisation

ii) Magnetic intensity

iii) Magnetic permeability

iv) Magnetic susceptibility.

Obtain the relationship between  $\bar{B}$ ,  $\bar{M}$  &  $\bar{H}$

[16]

OR

a) State coulomb's law in electrostatics. Discuss its vector form.

Three point charges  $+1\mu\text{C}$ ,  $+2\mu\text{C}$  and  $+3\mu\text{C}$  are at the vertices of an equilateral triangle of side 10 cm. Find the magnitude of the resultant force acting on the  $+3\mu\text{C}$  charge.

b) Explain the construction and the working of Nicol Prism.

State and explain Brewster's law. Hence show that at the polarizing angle, the reflected ray and refracted ray are perpendicular to each other.

[16]



Total No. of Questions : 8]

SEAT No. :

P171

[Total No. of Pages : 2

**[4219] - 3**  
**F.Y.B.Sc.**  
**BIOTECHNOLOGY**  
**Bb - 103 : Basic Biosciences**  
**(2008 Pattern)**

*Time :3Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

- 1) *All questions are compulsory.*
- 2) *Draw neat and labelled diagrams wherever necessary.*
- 3) *Answer 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) What is saprophytes?
- b) Give two examples of root modifications which perform physiological function.
- c) Give key characters of plant cell.
- d) Define photosynthesis.
- e) Explain Aggregate fruit.
- f) Define phytohormone.
- g) Explain photoperiodism.
- h) Define permanent tissue.

**Q2)** Write short notes on any three of the following: **[12]**

- a) Epidermal tissue system.
- b) In-Vivo morphogenesis.
- c) Role of cytokinin in plant growth.
- d) Economic importance of Bryophytes.

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

- a) Explain nitrogen metabolism in plants.
- b) Key characters of gymnosperm plants.
- c) Explain seed dormancy and factors responsible for it.
- d) Sexual reproduction in fungi.

**P.T.O.**

**Q4)** Define inflorescence and describe different types of it. [10]

OR

Give classification of pteridophytes and explain its life cycle with suitable example.

**SECTION - II**

**(Zoology)**

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

- a) Give types of body symmetry.
- b) Define commensalism.
- c) Give two uses of lac.
- d) Give importance of circulatory system.
- e) Give examples of phylum coelenterata.
- f) Define host specificity.
- g) Enlist any two characters of class Aves.
- h) Define Monoculture.

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

- a) Characters of phylum Mollusca.
- b) Evolution of Vertebrates heart.
- c) Symptoms and control measures of Rice Weevil.
- d) Aqua culture.

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

- a) Describe integument in cockroach and its function.
- b) Explain vermiculture technique and essential factors required for it.
- c) Give comparative account on excretory system in animals.

**Q8)** Attempt the following: [10]

- a) Describe in detail the life cycle of Fasciola hepatica with diagram.

OR

- b) Describe different species of honey bees and Honey bees stages of life. Add a note on their colony organization.



Total No. of Questions : 7]

SEAT No. :

P172

[Total No. of Pages : 3

[4219] - 4

F.Y.B.Sc.

BIOTECHNOLOGY

**Bb - 104 : Mathematics and Statistical Methods for Biologists  
(2008 Pattern)**

*Time :3Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

- 1) *All questions are compulsory.*
- 2) *Use separate answer books for each section.*
- 3) *Use of scientific calculator and statistical table is allowed.*
- 4) *Figures to the right indicate full marks.*

**SECTION - I**

**Q1)** Attempt each of the following:

**[4 × 2 = 8]**

- a) If  $x^2y + y^2z + z^2x = 0$  then find  $\frac{\partial z}{\partial x}$ .
- b) If  $A = \begin{bmatrix} -1 & 4 & 2 \\ 3 & 0 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 2 & 1 \\ -1 & 3 \\ 0 & 2 \end{bmatrix}$  then find AB and BA.
- c) Find real and imaginary part of  $\frac{1+i+i^2}{1-i}$
- d) Determine whether the vectors (3, -15), (4, 8) and (-2.5, 1.3) are linearly dependent in  $R^2$ .

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

**[4 × 4 = 16]**

- a) Find the rank of a matrix  $A = \begin{bmatrix} 3 & 4 & -1 & 2 \\ 1 & -2 & 3 & 1 \\ 3 & 14 & -11 & 1 \end{bmatrix}$
- b) Solve  $x^4 - i = 0$  using De Moivre's theorem.
- c) If  $z = \sin^{-1}(xy)$  then find  $\frac{\partial z}{\partial x}$  and  $\frac{\partial z}{\partial y}$ . Is  $\frac{\partial z}{\partial x} = \frac{\partial z}{\partial y}$ ?

**P.T.O.**

- d) Solve the following system of linear equations.  
 $2x + 3y - z = 5,$   
 $4x + 4y - 3z = 3,$   
 $2x - 3y + 2z = 2.$
- e) Show that the following sequence is convergent.  
 $\sqrt{7}, \sqrt{7\sqrt{7}}, \sqrt{7\sqrt{7\sqrt{7}}}, \dots$
- f) Test the convergence of the series  $\sum_{n=1}^{\infty} \frac{2n+1}{3n-5}.$

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

**[2 × 8 = 16]**

- a) Solve the following differential equation.  
 $(4x + 6y + 5) dx - (2x + 3y + 4) dy = 0.$
- b) Verify Cayley - Hamilton theorem for the matrix

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

- c) Find stationary points and examine for maximum and minimum value for the function  $f(x, y) = x^2 + y^2 + 3xy - 5.$
- d) i) Test the convergence of the series  $\sum_{n=1}^{\infty} \frac{5}{n^n}.$
- ii) Find eigenvector corresponding to the largest eigenvalue of the

$$\text{matrix } A = \begin{bmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}$$

**SECTION - II**

**Q4)** Attempt the following:

**[5 × 2 = 10]**

- a) The following figures represent the quantity of a Fertilizer (in kgs) sold by a wholesaler on 12 different days:  
 108, 98, 75, 80, 102, 270, 100, 94, 75, 96, 200, 175.  
 Calculate median of the data.
- b) Define variance of a raw data.
- c) State properties of coefficient of correlation.
- d) Define classical probability of an event.
- e) Define multiple correlation.

**Q5)** Attempt any four

[4 × 2½ = 10]

a) Find mode of the following data:

Daily Expenditure	Below 30	31-40	41-50	51-60	61-70	71-80	Above 80
No-of Persons	69	167	207	65	58	27	10

b) A bag contains 5% non-germinating seeds. What is the probability that none of the ten seeds sown germinate?

c) The probability that a patient does not recover from a disease after the treatment is 0.07. What is the probability that exactly 5 out of 60 patients treated will not recover after the treatment?

d) Explain how do you study correlation with the help of scatter diagram.

e) Following is the probability distribution of a random variable X:

X	0	1	2	3	4
P[X = x]	K	2K	3K	4K	5K

i) Find K.

ii) Find P[X ≤ 2].

**Q6)** Attempt any two:

[2 × 5 = 10]

a) The weight of onion bulbs is normally distributed with mean 200 gms and standard deviation 30 gms. What is the probability that a bulb selected randomly has weight between 250 gms and 300 gms?

b) Dissolving times (in sec) of a drug in gastric juice are 42.7, 43.4, 44.6, 45.1, 46.8. Can we conclude that the population mean is 45 seconds? Use 5% l.o.s.

c) Calculate the value of  $r_{12,3}$  and  $R_{1,23}$  if  $r_{12} = r_{23} = r_{13} = 0.7$ .

**Q7)** Attempt any one:

[1 × 10 = 10]

a) Following data is available after taking 20 observations on two variables X and Y:

$$n = 20, \Sigma X = 80, \Sigma Y = 40, \Sigma X^2 = 1680, \Sigma Y^2 = 320, \Sigma XY = 480.$$

i) Calculate the value of correlation coefficient between X and Y.

ii) Obtain the two linear regression equations.

iii) Estimate the value of Y when X = 5.

b) The following data relate to the heights (in cms) of the two different varieties of wheat plants:

Variety I : 92, 100, 85, 94, 95, 98, 96, 100.

Variety II : 75, 70, 80, 85, 78, 80.

Test the hypothesis that the mean heights of plants of both the varieties are equal. Use 5% l.o.s.



Total No. of Questions : 5]

SEAT No. :

P173

[Total No. of Pages : 2

**[4219] - 5**  
**F.Y.B.Sc.**  
**BIOTECHNOLOGY**  
**Bb - 105 : Fundamentals of Biological Chemistry**  
**(2008 Pattern)**

*Time :3Hours]*

*[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) Define nucleotide give example.
- b) What is a Prosthetic group.
- c) How do Zwitter ions behave in electric field?
- d) Write significance of  $k_m$  value of enzymes.
- e) Name two non-reducing Carbohydrates.
- f) List out 4 functions of proteins.
- g) Write the structure of Palmitic and Oleic acids.
- h) What is Sanger's reagent? Give its significance.

**Q2)** Answer any four of the following:

**[16]**

- a) What are electrophiles and nucleophiles? Give the mechanism of electrophilic substitution reaction.
- b) What are amphipathic lipids? Why are they suitable to form membrane structure?
- c) Write note on end terminal analysis of proteins.
- d) Differentiate between Prokaryotes and Eukaryotes.
- e) How bile salts help in digestion of lipids?

**Q3)** Answer any four of the following:

**[16]**

- a) Write note on allosteric enzymes.
- b) Draw the clover leaf structure of tRNA and explain the features.
- c) List out the forces that stabilise tertiary structure of proteins and give their significance.
- d) Write note on Coenzymes of Riboflavin and Niacin.
- e) Give details of rancidity of lipids.

**P.T.O.**

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

- a) Classify carbohydrates with suitable examples.
- b) Explain Principle, Procedure and applications of Ion exchange chromatography.
- c) Discuss enzyme inhibition.

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

- a) Discuss the formation of biological polymers.
- b) Explain different types of transport across cell membrane.
- c) Discuss the steps involved in dialysis and give the principle involved in the technique.





Total No. of Questions : 5]

SEAT No. :

P174

[Total No. of Pages : 2

[4219] - 6

F.Y.B.Sc.

BIOTECHNOLOGY

Bb - 106 : Biophysics and Instrumentation

(2008 Pattern)

*Time :3Hours]*

*[Max. Marks :80*

*Instructions to the candidates:-*

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

**Q1)** Answer the following:

**[16]**

- a) State different series in alkali (Na) atoms.
- b) State application of IR spectroscopy.
- c) State advantages and limitations of Radioimmunoassay.
- d) State the basic properties of nucleus.
- e) State the units of Radioactivity. Give units of radioactive dosage.
- f) State first and second Law of thermodynamics.
- g) State physical significance of Entropy.
- h) State principle and application of centrifuge.

**Q2)** Answer any four of the following:

**[16]**

- a) The Wavelength of the first member of Balmer series is  $6563\text{Å}$ . Calculate the wavelength of second member of Lyman series.
- b) State properties of electromagnetic wave.
- c) Calculate the time required for 10% of a sample of thorium to disintegrate. Assume the half life of thorium to be  $1.4 \times 10^{10}$  years.
- d) State and explain different types of molecular spectra.
- e) Explain biological effect of radiation.
- f) Explain sandwich model of plasma membrane with help of neat diagram.

**Q3)** Answer any four of the following:

**[16]**

- a) Write short note on EMG.
- b) Explain principle, construction and working of clinical thermometer.
- c) Explain Nuclear Magnetic Resonance.
- d) State advantages and disadvantages of thermocouple.
- e) Explain Dissecting microscope with neat labeled diagram.
- f) Write short notes on half cell potential.

**P.T.O.**

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

- a) Explain transmission electron microscope with schematic diagram of TEM.
- b) Explain principle, construction and working of scintillation counters.
- c) Discuss vibration spectra of simple harmonic oscillator.

**Q5)** a) Explain working of fluorescent-spectrometer with help of schematic diagram. **[8]**

- b) Explain principle, construction and working of pH meter. **[8]**

OR

a) What is the basis of the origin of vector atom model? Explain salient features in brief. **[8]**

- b) Explain the terms. **[8]**

- i) Resting potential.
- ii) Action potential.



Total No. of Questions : 5]

SEAT No. :

P175

[Total No. of Pages : 2

[4219] - 7

F.Y.B.Sc.

**BIOTECHNOLOGY**

**Bb - 107 : Microbiology**

**(2008 Pattern)**

*Time :3Hours]*

*[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 Rhizosphere.
- b) State two characters of T even phages.
- c) Define Mordant and give suitable example.
- d) State the names of two Gram positive bacteria.
- e) What is meant by Golden era of Microbiology?
- f) State two important characters of Algae.
- g) State two uses of inoculating needle.
- h) State Beer's law.

**Q2)** Attempt any four:

**[16]**

- a) Calculate the TVC of the water sample when 0.1 ml of  $10^3$  diluted sample gives 160 colonies on 24 hrs of incubation.
- b) Describe the working and uses of Hot air oven.
- c) Describe Negative staining with suitable example.
- d) Describe a suitable method to isolate bacteria present in few numbers in a mixed culture.
- e) Classify Bacteria depending upon their optimum Oxygen requirement for growth.
- f) Describe a method to preserve a suspension of fungal spores.

**Q3)** Attempt any four:

**[16]**

- a) State the importance of Bergey's manual in Microbiology.
- b) Classify viruses depending upon their genetic material.
- c) Justify: Blood Agar can be called an enriched as well as differential medium.
- d) State the structure of Bacterial cell-membrane.
- e) Describe the spores of fungi used for asexual Reproduction.
- f) What is meant by photoautotrophy? Give suitable example.

**P.T.O.**

- Q4)** Attempt any two: **[16]**
- a) What are Biofilms? Describe their formation and interactions found in Biofilms.
  - b) Describe different types of symptoms seen in plants due to plant pathogens.
  - c) How will you enumerate bacteria using a Neubauer chamber?

- Q5)** Attempt any one: **[16]**
- a) Describe endospore of Bacteria with respect to
    - i) Structure
    - ii) Location
    - iii) Formation
  - b) Describe the principle, working and uses of an Autoclave.



Total No. of Questions : 5]

SEAT No. :

P176

[Total No. of Pages : 2

**[4219]-101**  
**S.Y. B.Sc. (Semester - I)**  
**BIOTECHNOLOGY**  
**Bb - 211 : Genetics and Immunology**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates :*

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

**Q1)** Attempt the following :

**[10 × 2 = 20]**

- a) What is transposon?
- b) What is tautomerism?
- c) Define lethal genes with example.
- d) Define :
  - i) Aneuploidy.
  - ii) Polyploidy.
- e) What is transition and transversion?
- f) Define :
  - i) Hapten.
  - ii) Epitope.
- g) Write the names of different genes and their products in Lac operon.
- h) Differentiate between monoclonal and polyclonal antibodies.
- i) Define vaccines and enlist the types of vaccines.
- j) What are helper T-Cells.

**P.T.O.**

**Q2)** a) Explain the negative gene regulation in Arabinose operon. [7]

OR

What are the plasmids? Describe the properties of plasmid in brief and comment on their selectable markers.

b) Describe the Griffith's experiment of transformation. [8]

OR

Describe the mutation caused by UV-radiations in details.

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

- a) Explain pleiotropism in details with one example.
- b) 'Blood groups are the example of multiple allelism'. Explain.
- c) Give the reasons for success of Mendel in his experiments.
- d) State advantages and drawbacks of active and passive immunization.
- e) Describe the mechanism of phagocytosis.

**Q4)** a) Explain the cells involved in the innate and adaptive immunity. [7]

OR

Describe the different antigen binding sites on immunoglobulins.

b) Describe the process of monoclonal antibody production with neat-labelled diagram. [8]

OR

What are precipitation and agglutination reactions? Describe their applications in diagnosis.

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

- a) HAT selection.
- b) Competitive ELISA.
- c) Competence state in transformation.
- d) Specialized transduction.
- e) Structure of IgM antibody with its significance.



Total No. of Questions : 5]

SEAT No. :

P177

[Total No. of Pages : 2

**[4219]-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 indicates full marks.*
- 3) *Draw neat and labelled diagrams wherever necessary.*

**Q1)** Answer the following in 2-3 sentences :

**[10 × 2 = 20]**

- a) Give role of  $F_1$  particle in respiration.
- b) What is the numerical aperture of microscope?
- c) What are micro filament?
- d) State the functions of rough endoplasmic reticulum.
- e) Enlist types of animal tissue with suitable example.
- f) Explain the term pinocytosis.
- g) Write principle of phase contrast microscope.
- h) What are desmosomes?
- i) Comment on role of cytoskeleton in mitosis.
- j) What are the salient features of cell theory?

**Q2)** a) Explain organization of mitochondria and add a note on oxidative phosphorylation. **[8]**

OR

Describe the types of membrane transports with suitable example.

b) What is tissue? Describe meristematic tissue in detail. **[7]**

OR

What is apoptosis? Explain the central regulators of apoptosis.

**P.T.O.**

**Q3)** Answer the following in brief (any three) : **[15]**

- a) Comment on “cell cycle is highly regulated”.
- b) Give the structure and function of gap junction.
- c) Give a brief account of energy transfer in chloroplast.
- d) Describe structure and function of golgi complex.

**Q4)** a) What is cell signalling? Explain signalling molecules and their receptors in detail. **[8]**

OR

Explain assembly and disassembly of actin filament.

b) What is active transport? Explain mechanism in detail. **[7]**

OR

Explain meiosis is reduction division with suitable example.

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

- a) Connective tissues.
- b) Role of cdk cyclins in cell cycle.
- c) Structure, composition and role of phloem.
- d) Lysosome organization and various acid hydrolases.
- e) Mechanism of vesicular transport.

☒☒☒☒



Total No. of Questions : 5]

SEAT No. :

P178

[Total No. of Pages : 2

**[4219]-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.*
- 2) *Figures to the right indicate full marks.*
- 3) *Draw neat and labelled diagrams wherever necessary.*

**Q1)** Answer the following in 2-3 sentences : **[10 × 2 = 20]**

- a) What is Shine-Dalgarno sequence?
- b) Give distinguishing features of DNA polymerase and RNA polymerase.
- c) State mechanism of action of alkylating agents in mutagenesis.
- d) Describe different binding sites found on tRNA.
- e) What is TATA box?
- f) Define Cistron and Gene.
- g) Enlist different polypeptides found in DNA pol III of E.coli.
- h) State contribution of Khorana in deciphering of genetic code.
- i) What is photoreactivation repair system?
- j) What is central dogma of molecular Biology?

**Q2)** a) What is nucleosome? Describe structure and functions. **[7]**

OR

Elaborate structure and functions of prokaryotic and eukaryotic m RNAs.

b) Describe Griffith's experiment with its significance. **[8]**

OR

Explain with diagram replication in linear DNA molecules.

**P.T.O.**

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

- a) Describe regulation of transcription in prokaryotes.
- b) Justify : Genetic code in  $\phi$  X-174 phage is overlapping in nature.
- c) Describe translation process in eukaryotes.
- d) Differentiate between euchromatin and heterochromatin.
- e) Describe folded fibre model of E.coli genome.

**Q4)** a) Justify : Survival with mutations is better to no survival is the principle in SOS repair system. **[7]**

OR

Explain with diagram the mutations caused by U.V. irradiations.

b) Describe how the genetic code is deciphered? **[8]**

OR

Take an account of DNA replication in E.coli.

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

- a) Different forms of DNA.
- b) Organization and replication of organelle genome.
- c) Nonhistone proteins and their significance.
- d) Dark repair mechanism.
- e) Mechanism in the transport of proteins.

☒☒☒☒

Total No. of Questions : 5]

SEAT No. :

P179

[Total No. of Pages : 2

**[4219]-104**  
**S.Y. B.Sc. (Sem. - I)**  
**BIOTECHNOLOGY**  
**Bb - 213 : Metabolic Pathways**  
**(2008 Pattern)**

*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)** Attempt the following in 2-3 sentences :

**[8 × 2 = 16]**

- a) Define Anapleurotic reactions.
- b) Distinguish between catabolic and anabolic reaction.
- c) What do you understand by endergonic reactions?
- d) Name the coenzymes that participate in one carbon metabolism and carboxylation reactions.
- e) Enlist the enzymes taking part in glyoxylate pathway.
- f) Why NADPH is referred to as reducing power?
- g) How many ATP molecules are generated? When glucose is completely oxidized to CO<sub>2</sub>?
- h) What are essential and non essential aminoacids?

**Q2)** Write short notes on (any four) :

**[4 × 4 = 16]**

- a) Transaldolases.
- b) Gibbs free energy.
- c) Competitive inhibition.
- d) Covalent modification.
- e) Zymogens.

**P.T.O.**

- Q3)** a) Write an account on TCA cycle. [8]  
b) Describe the biosynthesis of purine. [8]

OR

Explain the functioning of urea cycle and its collaboration with central metabolic pathways. [16]

- Q4)** Write in details the  $\beta$  oxidation of palmitic acid. [16]

OR

Explain HMP pathway in details. [16]

- Q5)** Describe the reciprocal regulation of glycogen metabolism. [16]

OR

- a) Derive the equation for Lineweaver - Burk plot. [8]  
b) Explain regulation of glycolysis. [8]

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Total No. of Questions : 5]

SEAT No. :

P180

[Total No. of Pages : 2

[4219]-105

S.Y. B.Sc. (Semester - I)

BIOTECHNOLOGY

Bb - 214 : Fundamentals of Ecology and Environment  
(2008 Pattern) (Theory)

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 brief :

[10 × 2 = 20]

- a) What is Food-Chain?
- b) Define atmosphere.
- c) What is ecosystem?
- d) What are zooplanktons?
- e) Define pyramid of number.
- f) What is phytoremediation?
- g) Define producers.
- h) Enlist two causes of soil-pollution.
- i) Significance of BOD.
- j) Green house effect.

Q2) Attempt any three of the following :

[3 × 5 = 15]

- a) Explain nitrogen cycle with suitable examples.
- b) Comment on cybernetics and homeostasis.
- c) Explain energy flow in an ecosystem.
- d) Give an account of sources of water pollution with examples.

Q3) a) Give in detail the scope of ecological study with suitable examples.

OR

Describe lentic ecosystem with suitable examples.

[8]

b) Explain the biotic and abiotic components of an ecosystem.

[7]

P.T.O.

**Q4)** a) Describe microbial detection of environmental pollution.

OR

What are carcinogens? Explain their role in environmental pollution. [8]

b) What are limiting factors? State principles pertaining limiting factors.  
Add a note on any one limiting factor. [7]

**Q5)** a) Explain food-spoilage with reference to causes and preventive measure. [8]

b) What is biotransformation? Add a note on bio-degradable plastic. [7]

OR

a) Describe pollution indicators and detecting system of pollution. [8]

b) Give an account of cell-immobilization techniques in waste water treatment. [7]

☒☒☒☒

Total No. of Questions : 5]

SEAT No. :

P181

[Total No. of Pages : 2

[4219]-201

S.Y. B.Sc.

BIOTECHNOLOGY

Bb - 221 : Environmental Biology & Biotechnology

(2008 Pattern) (Sem. - 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.*

**Q1)** Answer the following in brief :

**[20]**

- a) What do you understand by Net primary productivity?
- b) With suitable example explain inverted pyramid.
- c) What is hydrosphere?
- d) Write scope of space ecology.
- e) Draw a labelled diagram to show horizons of soil profile.
- f) What is a perfect cycle? Give example.
- g) Define ecological niche with suitable example.
- h) Explain the term pedogenesis.
- i) What are Biocides?
- j) Define the term Bioventing.

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

**[15]**

- a) Write in detail ecological effects of pesticides.
- b) Explain biotransformation of aromatic compound.
- c) Write about biological control of chemical environment.
- d) Describe shelford's law of minimum.
- e) Discuss various methods to dispose solid waste material.

**P.T.O.**

**Q3)** Write short notes on any three : **[15]**

- a) Types of succession.
- b) Marine Ecosystem.
- c) Ecological efficiency.
- d) Y shaped energy flow in ecosystem.
- e) Carbon cycle.

**Q4)** Answer any two : **[15]**

- a) Write in detail various methods for determination of constituents of air pollution.
- b) What is bioremediation? Describe different technologies used in bioremediation.
- c) Describe application of Biotechnology in environmental protection and preservation.

**Q5)** What is sedimentary cycle? Describe N<sub>2</sub> cycle. **[15]**

OR

Describe food chain and food web in fresh water ecosystem.





Total No. of Questions : 6]

SEAT No. :

P182

[Total No. of Pages : 2

[4219]-202

S.Y. B.Sc. (Semester - II)

BIOTECHNOLOGY

Bb - 222 : Plant and Animal Tissue Culture

(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) *Answers to both the sections should be written on separate answer sheets.*

**SECTION - I**

**Q1)** Attempt the following (any four) :

**[4 × 2 = 8]**

- a) Distinguish between micro and macro nutrients.
- b) Define - totipotency.
- c) State the applications of plant tissue culture.
- d) Enlist the advantages of micropropagation.
- e) What is somatic embryogenesis?

**Q2)** a) Enlist various types of suspension culture. Explain the parameters to assess the growth of suspension. **[8]**

b) Write step wise the procedure for root tip and shoot tip culture. **[8]**

**Q3)** Write self explanatory notes on (any four) :

**[4 × 4 = 16]**

- a) Nurse culture.
- b) Heterokaryon.
- c) Biotransformations.
- d) Somaclonal variants.
- e) Organ culture.

**P.T.O.**

**SECTION - II**

- Q4)** Attempt the following any four of the following : **[4 × 2 = 8]**
- a) Distinguish between monolayer and suspension culture.
  - b) Define explant culture.
  - c) State significance of papain and EDTA.
  - d) Enlist the advantages of serum free media.
  - e) What is holding media?
- Q5)** a) Explain different methods used for characterization of cell lines, add a note on its significance. **[8]**
- b) Describe the procedure involved in organ culture in detail. **[8]**
- Q6)** Write selfexplanatory notes on (any four) : **[4 × 4 = 16]**
- a) Insect cell lines.
  - b) Cryopreservation.
  - c) Immortal cell culture.
  - d) Tissue disaggregation.
  - e) Inverted microscopes.



Total No. of Questions : 5]

SEAT No. :

P183

[Total No. of Pages : 4

[4219]-203

S.Y. B.Sc. (Semester - II)

BIOTECHNOLOGY

Bb - 223 : English

(Old & New Course)

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates :*

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

**Q1)** a) Read the passage carefully and answer the questions given.

Small landholders that cannot afford the high investment demanded by the new technology send their women to work as labourers on other's farms and use their income as capital for investing in mechanisation. The increased earnings, generated in technology intensive agricultural belts, have also increased women's traditional work burdens: tasks like fuel collection and cooking have become more onerous because women are expected to feed the hired labour on their farms, apart from their own family members. Similarly, since mechanisation has pushed women into the most difficult, physically exhausting activities, they complained of having to work harder and for longer hours than before.

Social problems of women have also been aggravated in such areas, and this is one of the indirect consequences of technology on women's situation. Studies have shown that the new affluence in Green Revolution belts has not necessarily led to greater expenditure on basic needs-food and shelter, but on things like liquor, drugs and gambling. The latter have increased the incidence of wife beating, rape, molestation and other forms of violence against women.

**Questions :**

1. For what purpose do the small landholders use income of their women?[2]
2. Why do the women complain of having to work harder and longer? [2]
3. What are the social problems in Green Revolution belts aggravated by technology? [2]
4. What is the cause of increase in traditional work burden for women?[2]

**P.T.O.**

- b) Expand any one of the following ideas. [8]
- i. Discipline means success, anarchy means ruins.
  - ii. Prevention is better than cure.

- Q2) a) Complete the table using noun, verb and adjective forms of the words given. [6]

Noun	Verb	Adjective
	hesitate	
calculation		
		observable
demonstration		
	clarify	
		competent

- b) Provide a word for the following groups of words (any four) : [4]
- i) The building of an educational institute and land around it.
  - ii) A film or a radio or a television programme giving facts about something.
  - iii) Impossible or very difficult to believe.
  - iv) A person who doesn't believe in God.
  - v) To take air, smoke gas etc. into your lungs as you breathe.
- c) Use correct forms of verbs and complete the sentences (any four) : [4]
- i) My brother (have + be) working on computer last night.
  - ii) He (open) an account in the State Bank of India last week.
  - iii) My friend (work) in a multinational company as a Microbiologist.
  - iv) I was (watch) the chemical reaction whereas my friend was reading something.
  - v) This morning a cat (creep) into my room..
- d) Use articles *a, an, the* wherever necessary. [2]

It was ----- interesting end of the test match. There was ----- pin drop silence among the spectators. As ----- last batsman came in, the bowler talked to the captain. One run was needed and it was the last ball. As ----- batsman tried to hit for a boundary, he missed it and was bowled out. It turned out to be the first test draw.

- Q3)** a) Use your imaginative and creative power and convert the following information into a paragraph of about 20 sentences. [8]

**Average time spent by Ranjit, a T. Y. B.Sc. student on a day.**

Rest - 7 hours; Recreation - 2 hrs; Work on computer - 2 hrs; College - 7 hrs; Self study - reading - 1 hr; notes and journal - 2 hrs; Library work - 2 hrs; Communication and other activities - 1 hr.

- b) Explain the procedure for Vital staining to determine live cells in about 12 to 16 sentences. [8]

- Q4)** a) Write a précis of the following paragraph to its one third length. Suggest a suitable title. Provide a rough draft also. [8]

The city of Troy was captured by the Greeks. The conquerors, after the first excitements of mistake of attack had died down, began to feel pity for the misfortune of those defeated. They made a proclamation that every free born citizen should be permitted to take away with him any one thing which he valued more highly than all else which had belonged to him. Upon this, Aeneas surrendered everything else in order to have the possession of his household gods. This behaviour of Aeneas, however, excited a very high admiration of piety in the minds of the Greeks. Impressed by the conduct, they gave him further leave to take away what he now valued most highly of all the things that remained. Immediately, he took upon his shoulders his aged father who was so infirmed as to be unable to escape without assistance and carried him out of the burning town. The evidence of filial affection raised still more highly the admiration of the Victors and they allowed him to take everything which he had possessed. They declared that it would be unnatural for them to be enemies to men who gave such a proof of piety to the gods and dutiful affection for parents. (206)

- b) Edit the following dialogue making corrections in spelling and punctuation. [8]

suraj whts the hury

anurag don't you remember its milinds marriage cermony

suraj oh my god I forgot it

anurag whats the matter anything wrong that you forget it

suraj no nothing im ok lets go early

OR

- c) Write a report of various activities conducted in your college on eve of Annual Social Festival. [8]

**Q5)** a) You are the class representative and your class visited NDA recently. Write a letter to the Director of NDA about your experiences and thank him for allowing you to visit the academy. **[8]**

b) Form new words with the following prefixes. **[8]**

Prefixes : tele- ; under- ; anti-; de-

Suffixes : -ee; -ance; -ify; -proof



Total No. of Questions : 5]

SEAT No. :

P184

[Total No. of Pages : 2

**[4219]-204**  
**S.Y. B.Sc. (Sem. - II)**  
**BIOTECHNOLOGY**  
**Bb - 224 : Metabolic Pathways**  
**(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 color pencils restricted to diagrams.*

**Q1)** Define the following terms :

**[8 × 2 = 16]**

- a) Gibb's free energy.
- b) Spontaneous reactions.
- c) Pacemaker enzyme.
- d) Salvage pathway.
- e) Multienzyme complex.
- f) Substrate level phosphorylation.
- g) G-proteins.
- h) RTKases (Receptor Tyrosine Kinases).

**Q2)** Draw the diagrams for the following (any four) :

**[4 × 4 = 16]**

- a) Cori cycle.
- b) Chloroplast ultrastructure.
- c) Mitochondrial electron transport chain.
- d) Two purines and two pyrimidines.
- e) F<sub>0</sub> - F<sub>1</sub> ATPase.

**P.T.O.**

**Q3)** Write only the reactions for the four metabolic pathways. **[4 × 4 = 16]**

- a) Transamination reactions catalyzed by SGPT, SGOT.
- b) Fates of pyruvate.
- c) Denovo synthesis of pyrimidine.
- d) Anaerobic glycolysis.
- e) C<sub>2</sub> pathway.

**[2 × 8 = 16]**

**Q4)** a) Illustrate in detail the amphibolic nature of krebs cycle.  
b) Describe anapleurotic reactions fill in the missing intermediates.

OR

- a) Explain in detail gluconeogenesis.
- b) Describe urea cycle in detail.

**Q5)** a) Discuss how glycolysis is regulated. **[8]**

b) Explain in detail β oxidation of palmitic acid. **[8]**

OR

a) Describe the synthesis of fatty acids in liver cells. **[8]**

b) Explain how light is trapped and transduced to chemical energy during photosynthesis. **[8]**





Total No. of Questions : 5]

SEAT No. :

P185

[Total No. of Pages : 2

**[4219]-205**  
**S.Y. B.Sc. (Sem. - II)**  
**BIOTECHNOLOGY**  
**Bb - 213 : Molecular Biology**  
**(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.*

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

**[8 × 2 = 16]**

- a) Distinguish between base excision and nucleotide excision repair.
- b) RNA polymerase of E coli.
- c) What is heterochromatin and euchromatin?
- d) Draw the structure of nucleosome assembly.
- e) Enlist the inhibitors of transcription.
- f) Name the different types of RNA polymerase found in yeast cells.
- g) What is capping and splicing.
- h) Write two properties each of DNA pol I, pol II and pol III.

**Q2)** Write short notes on (any four) :

**[4 × 4 = 16]**

- a) DNA as genetic material.
- b) Antitermination.
- c) Hershey and chase experiment.
- d) Meselson and stahl experiment.
- e) Genetic code.

**P.T.O.**

**Q3)** Draw the diagrams of (any four) : **[4 × 4 = 16]**

- a) Eukaryotic ribosome.
- b) t-RNA.
- c) Attenuation.
- d) Initiation complex of RNA pol II.
- e) Initiation complex of translation.

**Q4)** a) Explain in detail the different promoter sequences used in eukaryotic systems. **[8]**

b) Discuss the post translation events in eukaryotic cells. **[8]**

OR

Explain translation in detail. **[16]**

**Q5)** Explain in detail the DNA replication of eukaryotic cells. **[16]**

OR

Describe mutations caused by : **[16]**

- a) Base analogues.
- b) Alkylating agents.
- c) Acridine dyes.
- d) uv radiations.

☒☒☒☒

Total No. of Questions : 6]

SEAT No. :

P186

[Total No. of Pages : 2

**[4219]-206**  
**S.Y. B.Sc. (Semester - II)**  
**BIOTECHNOLOGY**  
**Plant and Animal Tissue Culture**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates :*

- 1) Answer each section on a separate answer book.*
- 2) All questions are compulsory.*
- 3) Figures to the right indicate full marks.*
- 4) Draw a neat labelled diagram wherever necessary.*
- 5) Use of colour pencils restricted to diagrams.*

**SECTION - I**

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

- a) Explain the principle of Laminar Air Flow.
- b) Write 2 applications of root tip culture.
- c) What is callus?
- d) Differentiate between hybrids and cybrids.

**Q2)** a) What are the different techniques used for the production of haploids in vitro? Explain any one. Add a note on its significance. **[8]**

- b) Describe the different steps involved in somatic embryogenesis. Add a note on artificial seeds. **[8]**

**Q3)** Write short notes on the following : **[16]**

- a) Protocol for shoot tip and meristem culture.
- b) Enlist various types of suspension culture. Explain the parameters to assess growth of suspension.
- c) Limitations of micropropagation.
- d) What is subculture? Why it is so important?

**P.T.O.**

**SECTION - II**

**Q4)** Attempt the following : **[8]**

- a) Balanced Salt Solution.
- b) What is Karyotyping?
- c) Define cell line and cell strain.
- d) Feeder layer.

**Q5)** a) What are cell lines? Explain different methods for characterization of cell lines. **[8]**

b) What are serum free media? Discuss advantages and disadvantages of such media. **[8]**

**Q6)** Write notes on the following : **[16]**

- a) Applications of Animal Tissue Culture.
- b) Cryopreservation.
- c) Various microbial contaminants encountered in ATC? How they are detected.
- d) Insect cell lines.



Total No. of Questions : 5]

SEAT No. :

P274

[Total No. of Pages : 2

**[4219] - 8**  
**F.Y.B.Sc.**  
**BIOTECHNOLOGY**  
**Bb - 108 : Use of Computers**  
**(2008 Pattern)**

*Time :3Hours]*

*[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 whenever necessary.*

**Q1)** Attempt all of the following:

**[8 × 2 = 16]**

- a) Define terms
  - i) RAM
  - ii) MICR
- b) State the functions of operating system.
- c) What is MAN?
- d) How to protect your system from virus?
- e) Enlist the various applications of UNIX.
- f) What is biometrics?
- g) List various features of microcomputer.
- h) What is multimedia?

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

**[4 × 4 = 16]**

- a) Explain neat diagram, components of network.
- b) Compare multimedia and biological databases.
- c) Describe B-tree indexed file.
- d) Explain following data models.
  - i) Network
  - ii) Hierarchical
- e) Compare Hub and Router.

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

**[4 × 4 = 16]**

- a) Describe nature of biological data.
- b) Draw a flowchart to find factorial of a number.
- c) What is search engine? Explain Google search engine in detail.
- d) Explain Bus topology with neat diagram.
- e) What is relationship and entity? Explain with diagram.

**P.T.O.**

**Q4)** Attempt any two of the following: **[2 × 8 = 16]**

- a) Explain the features of windows O.S.. How GUI is better than text based O.S.?
- b) Compare between Realtime and Batch processing.
- c) Write note on power point and explain steps to prepare presentation.

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

- a) Write an algorithm and draw flowchart to find maximum and minimum of 10 numbers.

OR

Explain the advantages of databases.

- b) Write note on multimedia database.

OR

List the symbols used for flowchart drawing.

