

Total No. of Questions : 6]

SEAT No. :

P1719

[5132]-11

[Total No. of Pages : 2

M.Sc.

BIOTECHNOLOGY

**BT - 11 : Advanced Biological Chemistry
(2008 Pattern) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Question No.1 is compulsory.*
- 2) *Answer any Four from the remaining questions.*
- 3) *Marks are given in Parentheses.*

Q1) Briefly describe any **FOUR** of the following: **[4×5=20]**

- a) Give the Principle of IR Spectroscopy with its applications.
- b) What do you mean by protein denaturation? Explain in brief.
- c) Describe the Pharmacological activities of terpenoids.
- d) Explain the concept of Metabolomics.
- e) Give the reciprocal regulation of glycolysis and gluconeogenesis.

Q2) a) Justify 'Haemoglobin as a complete allosteric model'. **[8]**

b) Give the principle and applications of Fluorescence Spectroscopy. **[7]**

Q3) a) Explain the principle of SDS-PAGE. Give its significance. **[7]**

b) Describe the pathway for synthesis of terpenoids. **[8]**

Q4) Answer the following:

a) Explain β -Structure of protein. **[5]**

b) Comment on manipulation of metabolic pathway at whole cell level. **[5]**

c) What are the objectives of regulation of herbal medicines? **[5]**

P.T.O.

- Q5)** a) Explain in brief protein micro array with its applications. [8]
b) What do you mean by metabolic Flux analysis? Mention, suitable example, its significance. [7]

Q6) Define 'Relative Centrifugal Force' (RCF). Describe the types of centrifuges and its applications. [15]



Total No. of Questions : 6]

SEAT No. :

P1720

[5132]-12

[Total No. of Pages : 2

M.Sc.

BIOTECHNOLOGY

**BT - 12 : Molecular and Cell Biology
(2008 Pattern) (New) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Answer to the sections must be written on separate answer sheets.*
- 2) All questions are compulsory.*
- 3) Figures to the right indicate full marks.*
- 4) Use of color pencil restricted to diagrams.*

SECTION - I

Q1) Attempt the following in two to three sentences:

[08]

- a) Write the name of cell organelle involved in phagocytosis.
- b) Draw the ultra structure of RER and Golgi complex.
- c) passive transport.
- d) Oxygen evolving complex.

Q2) Write self explanatory note on any two of the following:

[16]

- a) Phospholipase C and DAG as signal transducer molecules.
- b) Cyclic and non cyclic photophosphorylation.
- c) Feedback regulation of pituitary and hypothalamic hormones.

Q3) Explain any two of the following in details with suitable illustrations:[16]

- a) Role of *cdc 2* , cyclin and *wee* protein in cell cycle regulation.
- b) Response of plants to environmental challenges.
- c) Thread milling of tubulin monomers in microtubules.

P.T.O.

SECTION - II

Q4) Attempt the following in two to three sentences: [08]

- a) Enlist the difference between RNA pol I, RNA pol II, RNA pol III.
- b) Draw the structure of initiation closed complex of transcription in bacteria.
- c) Distinguish between prokaryotic and eukaryotic ribosome.
- d) Write four post translational modifications of proteins.

Q5) Write self explanatory note on any two of the following: [16]

- a) Origin of Replication.
- b) Mutations caused by Alkylating agents and nitrogen mustard.
- c) Compare the translation factors of prokaryotes and eukaryotes.

Q6) Explain any two of the following in details with suitable illustrations: [16]

- a) DNA and its role in Heredity.
- b) Genetic variability and evolution.
- c) Pharmacogenomics.



Total No. of Questions : 6]

SEAT No. :

P1721

[5132]-13

[Total No. of Pages : 2

M.Sc.-I

BIOTECHNOLOGY

**BT - 13 : Environmental Biotechnology
(2008 Pattern) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Question No.1 is compulsory. Solve any Four out of remaining five questions.*
- 2) *Draw neat and labelled diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Write notes on any **FOUR** of the following:

[4×5=20]

- a) Bioenergy.
- b) PM₁₀
- c) Tertiary treatment of waste water.
- d) Sedimentation operation in WTP.
- e) Bioremediation of heavy metals.

Q2) a) Explain in detail dispersion models for gaseous diffusion with Gaussian Plume model. **[7]**

b) Elaborate on the fate of insecticides and pesticides in soil with appropriate example. **[8]**

Q3) a) Illustrate causes, effects and abatement strategies of Noise pollution. **[8]**

b) Give an account of Phytoremediation with appropriate examples. **[7]**

Q4) Write notes on any Three:

[3×5=15]

- a) ISO 14000.
- b) Nitrogen removal in ETP.
- c) Use of GMO in Bioremediation.
- d) Ecotoxicology.

P.T.O.

Q5) Elaborate on Biological treatment strategies of effluent treatment with suitable examples. **[15]**

Q6) a) Give an account of Non- conventional energy sources. Add a note on nuclear energy. **[7]**

b) Explain the working and applications of Biosensors in Environmental monitoring. **[8]**



Total No. of Questions : 8]

SEAT No. :

P1722

[5132]-21

[Total No. of Pages : 2

M.Sc.

BIOTECHNOLOGY

BT - 21 : Genetic Engineering

(2008 Pattern) (Semester - II) (New)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt a total of Five questions selecting at least two questions from each section.*
- 2) *Answers to the sections should be written on separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) What are cohesive and blunt end generated DNA fragments by type II restriction endonuclease? Explain their cloning strategies. [8]
b) Draw a neat labeled schematic map of YAC vector. [8]
- Q2)** Explain procedure, advantages, applications and limitation of RFLP and RAPD. [16]
- Q3)** a) With two suitable examples, explain biologics and their synthesis using recombinant DNA technology. [8]
b) Describe transducing particle mediated Gene transfer in detail. [8]
- Q4)** Write self - explanatory notes on any two of the following: [16]
a) Alkaline phosphatase and polynucleotide kinase.
b) Cosmids and phagemids.
c) Transfection and transformation.

P.T.O.

SECTION - II

Q5) Explain the significance of construction of BAC library in Human genome sequencing. **[16]**

Q6) Compare and contrast the following: **[16]**

- a) *Ex-vivo* and *in-vivo* Gene therapy.
- b) Maxam-Gilbert and Sanger's method of Gene sequencing.

Q7) Write self-explanatory notes on any two of the following: **[16]**

- a) Gene annotation.
- b) Genetic mapping.
- c) Transgenic plants.

Q8) a) Explain giving reasons the steps involved in manufacturing of genetically engineered vaccines. **[8]**

b) Designing and optimization of PCR. **[8]**

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Total No. of Questions : 8]

SEAT No. :

P1723

[5132]-22

[Total No. of Pages : 2

M.Sc.

BIOTECHNOLOGY

BT - 22 : Bioinformatics

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt not more than 5 questions of which at least 2 questions must be from each section.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

Q1) Write short notes on: **[16]**

- a) PAM
- b) Ramachandran Plot.
- c) SMILE notation.
- d) Protein Databases.

Q2) a) Justify: FASTA is an alignment tool for finding relatedness between closely related organisms. **[8]**

b) Define database and write their basic classification & characterisation with example. **[8]**

Q3) a) Define Bioinformatics. Discuss its role in genomic data analysis. **[8]**

b) Explain gene expression informatics. Give the method & application of microarray in gene expression analysis. **[8]**

Q4) Explain chemoinformatics. Describe the role of chemoinformatics in drug designing with example. **[16]**

P.T.O.

SECTION - II

Q5) Give comparative account between SCOP & CATH. Give its application in protein structure analysis. **[16]**

Q6) a) Define structural bioinformatics. Explain the importance of 3D structure prediction of protein. **[8]**

b) What is Homology? Write main steps of Homology modeling. **[8]**

Q7) a) Describe the Indian scenario with respect to bioinformatics research and business. **[8]**

b) Explain energy optimization techniques in molecular modeling. **[8]**

Q8) Write short notes on: **[16]**

a) Genetic algorithm.

b) BLAST.

c) Protein structure-function relationship.

d) Multiple sequence alignment methods.



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P1724

[5132]-23

M.Sc. - I

BIOTECHNOLOGY

BT - 23 : Plant Biotechnology

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt a total of five questions selecting at least two questions from each section.*
- 2) *Answer to the sections should be written on separate answer books.*
- 3) *Draw neat labeled diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

Q1) Comment on Somaclonal variation? Give an account on methods used for selection of Somaclonal variants. **[16]**

Q2) a) Comment on generation of pure lines for plant breeding is easier & less time consuming by plant tissue culture techniques. **[8]**

b) Enlist different stages of Micropropagation? Comment on significance of hardening process. **[8]**

Q3) a) Discuss use of Biotechnology for qualitative improvement of economically important algae. **[8]**

b) Discuss the genetic engineering strategies used to develop virus resistant plants. **[8]**

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

- a) Hormonal regulation in in vitro organogenesis.
- b) Single cell protein.
- c) Plant derived vaccines.

P.T.O.

SECTION - II

- Q5)** Give an account on various strategies used for development of herbicide resistant plants. **[16]**
- Q6)** a) Discuss various methods used for protoplast fusion. **[8]**
b) Define somatic embryogenesis? Comment on factors affecting somatic embryogenesis. **[8]**
- Q7)** a) How transgenic approach can be applied for phytoremediation. **[8]**
b) What is gene transformation? Write in detail Agrobacterium mediated gene transfer. **[8]**
- Q8)** Write notes on any two of the following: **[16]**
- a) Synthetic seeds.
 - b) Biofertilizers.
 - c) In vitro production of secondary metabolites.



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P1725

[5132]-31

M.Sc. - II

BIOTECHNOLOGY

BT - 31 : Animal Biotechnology

(2008 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt a total of 5 questions selecting atleast two questions from each section.*
- 2) *Answers to the sections must be written on seperate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

Q1) Describe different methods to establish organ culture. Write a note on advantages of organ culture. **[16]**

Q2) a) Write a note on Cryo preservation of cells. **[8]**

b) Explain embryo transfer technology in animal husbandary. **[8]**

Q3) Write note on any **two**: **[16]**

a) Comparative account of serum free and serum containing media.

b) Any two methods of cell sorting.

c) Application of animal cell culture in production of pharmaceuticals.

Q4) a) Write different methods of identification of stem cells. **[8]**

b) Discuss different methods of artificial breeding. **[8]**

P.T.O.

SECTION - II

Q5) Give comparative account of chimeric and transgenic animals. [16]

Q6) Give a detailed account of transgenic mouse model for cancer studies. [16]

Q7) a) Write a note on subculturing of adherent cells. [8]

b) Describe the growth kinetics of cells in culture. [8]

Q8) Write short notes on any **two**: [16]

a) Enzymic markers of cell characterization.

b) Cross Contamination.

c) Gene banking.



Total No. of Questions : 8]

SEAT No. :

[Total No. of Pages : 2

P1726

[5132]-32

M.Sc.

BIOTECHNOLOGY

BT - 32 : Fermentation Technology

(2008 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Attempt a total of five questions selecting atleast two questions from each section.*
- 2) *Answer to the two sections must be written on separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

Q1) With the help of suitable diagram describe different types of aerators and agitators used in a bioreactor and add a note on choice of construction material used for bioreactor design. **[16]**

Q2) a) Discuss the effect of agitation and rheology on oxygen transfer. **[8]**

b) What are growth linked products? Derive an equation to prove that rate of product formation increases with growth rate. **[8]**

Q3) Write explanatory notes on any two of the following: **[16]**

a) Applications of animal cells in Bioprocess.

b) Immobilised cell reactors.

c) Fed batch culture.

Q4) Discuss different methods of measurement and control of **[16]**

a) Dissolved oxygen and

b) pH during fermentation.

P.T.O.

SECTION - II

- Q5)** Explain the use of chromatography in down stream processing of a fermentation product using suitable examples. **[16]**
- Q6)** a) What is biotransformation? Give one example each of application of biotransformation in medicine and agriculture. **[8]**
b) Discuss Advanced biomethanation process. **[8]**
- Q7)** a) Explain using suitable example how alteration of cell membrane permeability can be used for over production of a metabolite. **[8]**
b) Describe the process of recovery of alcohol from fermentation broth. **[8]**
- Q8)** Write explanatory notes on any two of the following: **[16]**
- a) Role of inducers in improving product quality.
b) Application of mixed culture in fermentation.
c) Role of Recombinant DNA technology for strain improvement.



Total No. of Questions : 6]

SEAT No :

P1727

[5132] - 33

[Total No. of Pages :1

M.Sc.

BIOTECHNOLOGY

(BT-33a) : Principles of Virology

(2008 Pattern) (Semester - III)

Time : 1½ Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *Answer a total of four questions selecting at least two questions from each section.*
- 2) *Answers to the sections must be written on separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** a) Classify and characterize DNA Virus families with example. [5]
b) Explain ultrastructure of Influenza Virus. [5]
- Q2)** a) Discuss lysogenic cycle of bacteriophages and its significance. [5]
b) Explain replication of HIV. [5]
- Q3)** Write explanatory note on : [10]
a) Mode of action of antivirals.
b) Subunit vaccines.

SECTION-II

- Q4)** a) Write principle of Epidemiology. Discuss its impact on public health.[5]
b) Discuss the role of Ebola Virus as an agent of new emerging disease.[5]
- Q5)** a) Explain the immunopathogenesis of Measle Virus. [5]
b) Discuss morphology and replication of TMV. [5]
- Q6)** Write explanatory note on : [10]
a) Foot and Mouth disease.
b) bird flu.



Total No. of Questions : 6]

SEAT No. :

[Total No. of Pages : 2

P1728

[5132]-34

M.Sc.

BIOTECHNOLOGY

BT-33b: Advanced Immunology

(2008 Pattern) (Semester - III)

Time : 1½ Hours]

[Max. Marks : 40]

Instructions to the candidates:

- 1) Attempt total of four questions selecting at least two questions from each section.*
- 2) Answers to the sections must be written on separate answers book.*
- 3) Neat diagram must be drawn wherever necessary.*
- 4) Figures to the right indicate full marks.*

SECTION-I

Q1) a) Describe the structure and role of thymus. **[5]**

b) Give a brief account of Toll-Like receptors and signal transduction in innate immune response. **[5]**

Q2) a) Explain the Alternative pathway of complement activation. **[5]**

b) All the antigens are not immunogens–Justify **[5]**

Q3) Write explanatory notes on:

a) Chronic rejection of graft. **[5]**

b) Rheumatoid arthritis. **[5]**

P.T.O.

SECTION-II

- Q4)** a) Give a concise account of any one animal model in immunology. [5]
b) What is combined vaccine? Give atleast two examples of it. Write its advantages. [5]
- Q5)** a) Define stem cells. Describe their types in brief. Mention two uses of stem cells. [5]
b) Write at least five important criteria needed to be considered to develop an efficient vaccine. [5]
- Q6)** Write explanatory notes on: [10]
a) Antibody engineering.
b) Immunodiagnostics.



Total No. of Questions : 8]

SEAT No. :

P1729

[5132]-41

[Total No. of Pages : 2

M.Sc.

BIOTECHNOLOGY

BT - 41 : Genomics & Proteomics

(2008 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 60

Instructions to the candidates:

- 1) Attempt a total of five questions selecting at least two questions from each section.*
- 2) Neat diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

SECTION - I

Q1) What is 'Comparative Genomics'? Explain its methods and scope. [12]

Q2) Discuss High throughput sequencing methods and explain any one in details.[12]

Q3) Write short note on : Any two [2×6=12]

- a) DNA microarray.
- b) Pharmacogenomics.
- c) Global analysis of gene expression.

Q4) a) Discuss applications of microarray technology in functional genomics.[6]

b) Explain significance of databases in genomics studies. [6]

SECTION - II

Q5) Explain Proteome and Proteomics in details. Add a note on significance of proteomics in biotechnology. [12]

Q6) Give principle and working of 2D gel electrophoresis and give any two applications. [12]

P.T.O.

Q7) Write a short note on: Any two

[2×6=12]

- a) Protein structure databases.
- b) Protein microarray.
- c) Protein - protein interaction studies.

Q8) a) Discuss applications of Proteomics with appropriate examples. **[6]**

b) Explain Ramachandran plot and its role in protein structure prediction. **[6]**

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Total No. of Questions : 8]

SEAT No. :

P1730

[5132]-42

[Total No. of Pages : 2

M.Sc.

BIOTECHNOLOGY

**BT - 42 : Legal and Ethical Aspects in Biotechnology and IPR
(2008 Pattern) (Semester - IV)**

Time : 3 Hours]

[Max. Marks : 60

Instructions to the candidates:

- 1) *Attempt a total of five questions selecting atleast two questions from each section.*
- 2) *Answer to the two sections must be written on separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

Q1) What are intellectual property rights? Discuss different forms of IPR. [12]

Q2) Describe a procedure for obtaining a patent on computer program in detail.[12]

Q3) Write short notes on:

- a) Indian Patent Act 1970. [6]
- b) Copyright infringement. [6]

Q4) a) Give role of WTO in safeguarding Intellectual Property Rights. [6]

b) Write the significance of geographical indications with examples. [6]

SECTION - II

Q5) Describe TRIPS, IPR agencies and conventions in detail. [12]

P.T.O.

Q6) Discuss the role of International union for protection of new varieties of plants.
Add a note on plant breeder's rights. **[12]**

Q7) Write short notes on-

a) Farmer's right act 2001. **[6]**

b) Budapest Treaty. **[6]**

Q8) a) State the three laws of patentability with their act. **[6]**

b) Draw a flowchart for registration procedure for design patent. **[6]**



Total No. of Questions : 6]

SEAT No. :

P1731

[5132]-43

[Total No. of Pages : 1

M.Sc. - II

BIOTECHNOLOGY

BT - 43 : Clinical Research and Database Management

(2008 Pattern) (Semester - IV)

Time : 1½ Hours]

[Max. Marks : 40

Instructions to the candidates:

- 1) *Attempt a total of four questions selecting at least two questions from each section.*
- 2) *Answer to each section must be written on separate answer books.*
- 3) *Neat diagram must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

- Q1)** Explain the Research and Development activities involved in launching of a medical device in the market. **[10]**
- Q2)** What is FDA? What is the purpose of establishing FDA? Give the functions of FDA. **[10]**
- Q3)** Write notes on any two of the following: **[10]**
- a) Serious adverse event.
 - b) Research and development of Biologics.
 - c) Importance of GLPs in pharmaceutical manufacture.

SECTION - II

- Q4)** Explain the process of designing and development of a protocol for clinical trial. **[10]**
- Q5)** What is a data base? Explain the process involved in Clinical data Management and add a note on its significance. **[10]**
- Q6)** Write notes on any two of the following: **[10]**
- a) Query resolution.
 - b) Preclinical trials.
 - c) Principles of data management.



Total No. of Questions : 3]

SEAT No. :

[Total No. of Pages : 1

P1732

[5132]-44

M.Sc. - II

BIOTECHNOLOGY

BT - 44A : Nanobiotechnology

(2008 Pattern) (Semester - IV)

Time : 1½ Hours]

[Max. Marks : 40

Instructions to the candidates:

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

Q1) Answer the following (any 4): **[20]**

- a) Explain the hydrothermal process for chemical synthesis of nanoparticles.
- b) Functionalization of nanoparticles.
- c) Applications of nanoparticles in chemical sciences.
- d) Electrical and optical properties of nanoparticles.
- e) Nanoparticle synthesis using microorganisms.
- f) Spectroscopic analysis of nanoparticles.

Q2) Answer the following (any 1) **[10]**

- a) Explain characterization tools for thin film nanoparticles.
- b) Discuss the factors affecting the size of nanoparticle during synthesis process.

Q3) Answer the following (any 1) **[10]**

- a) Discuss the applications of nanotechnology in smart materials.
- b) Explain microanalysis of nanomaterials by using electron microscopy.



Total No. of Questions : 8]

SEAT No. :

P1733

[5132]-45

[Total No. of Pages : 2

M.Sc.

BIOTECHNOLOGY

**BT - 44b : Stem Cell Technology and Regenerative Medicines
(2008 Pattern) (Semester - IV)**

Time : 3 Hours]

[Max. Marks : 60

Instructions to the candidates:

- 1) *Attempt a total of Five questions selecting atleast two questions from each section.*
- 2) *Answers to the sections must be written on separate answer book.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

Q1) Describe the process of Oogenesis. Add a note on structure of OVUM. [12]

Q2) a) Explain in brief slow block to polyspermy. [6]

b) Describe in detail the process of spermiogenesis. [6]

Q3) a) Give the role of Zygotic genes in pattern formation of Drosophila. [6]

b) Explain the structure of Hensen's node and its role in Embryonic induction. [6]

Q4) Write short notes on any two of the following: [12]

a) Haemopoetic stem cell lincage.

b) Characteristics of embryonic stem cell.

c) Mechanism of cell differentiation.

P.T.O.

SECTION - II

Q5) What are Knockouts. Give an emphasis on their applications. [12]

Q6) Describe in brief bioethical issues involved in human cloning. [12]

Q7) Enlist different types of stem cells. Emphasize their characteristics features.[12]

Q8) Write short notes on any two of the following: [12]

- a) Methods of transgenesis.
- b) Gene Therapy.
- c) Embryonic stem cell technology.



Total No. of Questions : 8]

SEAT No. :

P1734

[5132]-46

[Total No. of Pages : 2

M.Sc.

BIOTECHNOLOGY

BT - 44C : Agricultural Biotechnology

(2008 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 60

Instructions to the candidates:

- 1) *Attempt a total of Five questions selecting atleast two questions from each section.*
- 2) *Answers to the sections must be written on separate answer books.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*

SECTION - I

Q1) What is apomixis? Describe types of apomixis. Add a note on its significance. **[12]**

Q2) With a suitable example, explain micropropagation of oil seed crops. **[12]**

Q3) Explain in detail embryo culture technique. How it is used to rescue hybrid embryos? **[12]**

Q4) Write notes on any two of the following: **[12]**

- a) Virus indexing-technique and importance.
- b) Induced polyembryony.
- c) Significance of endosperm culture.

SECTION - II

Q5) Describe significance of transgenic plants. How transgenic plants are developed to combat drought? **[12]**

Q6) What are bioreactors? Explain various types of bioreactors used for large scale production of plants through different pathways. **[12]**

P.T.O.

Q7) Write notes on any two of the following: **[12]**

- a) Gametoclonal variation.
- b) Marker assisted selection.
- c) Biopesticides.

Q8) a) Discuss advantages and limitations of edible vaccines over conventionally produced vaccines. **[6]**

b) With a suitable example, explain metabolic engineering. **[6]**

