Total No. of Questions :3]

SEAT No. :

P1865

[Total No. of Pages :2

[4936]-101
M.Sc.
BIOTECHNOLOGY
BT-101:Advanced Biological Chemistry (4C)
(Credit System) (Semester - I)

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

Instructions:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

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

a) Describe any two methods of post translational modification.

b) Explain the structure function of glycoprotein & glycolipids.

c) Give the types of enzyme regulation with suitable example.

d) Explain the diseases caused in inform errors of glycogen storage.

e) Comment on the pharmacological activity of terpenoids.

f) Enlist the most important building blocks used in secondary metabolite synthesis.

Q2) Answer any 4 of the following. **[20]**

a) Discuss the role of chaperons in assisted protein folding.

b) Write a note on sequential model of allosterism.

c) Discuss the approaches for metabolic engineering of plants.

d) Explain the fate of pyruvate under aerobic and anaerobic condition.

e) Comment on the concept of turnover of secondary metabolites.

f) Explain the hormonal regulation of glycolysis. and gluconeogenesis pathway.

P.T.O.

Q3) Answer any one of the following. **[10]**

a) Explain the heirarchy in the process of protein folding.

b) What are alkaloids. Explain the shikimate biosynthetic pathway.

x x x

Total No. of Questions :3]

SEAT No. :

P1866

[Total No. of Pages :2

[4936]-102
M.Sc.
BIOTECHNOLOGY
BT-102:Molecular Biology (Credit System)
(Semester - I)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Answer any four questions. **[20]**

a) Differentiate between sigma and rho factor. How they influence prokaryotic transcription.

b) Write a note on subunits of eukaryotic RNA polymerase.

c) Explain the structure and organisation of Beta globin gene family.

d) Write notes on:–

i) Replicative mechanism of transposition.

ii) Role of Rec A protein in homologous recombination

e) Describe the structure of eukaryotic translation initiation factor –2 (eIF-2) and discuss its importance as a modular of global gene expression.

f) Enlist five differences between prokaryotic and eukaryotic replication.

Q2) Answer any four questions. **[20]**

a) Outline salient features of

i) Telomere and Telomerase ii) Nucleosome core

b) Justify the statement, "Higher the Cot ½ higher is the sequence complexity of DNA."

P.T.O.

c) What are IS elements? What distinguishes the simple from the complex class of bacterial transposon?

d) Write a note on

i) Holliday junction ii) Satellite DNA

e) Why is it necessary to have both positive and negative regulation of lac operon is E.coli.

f) Describe the structure, and function of Amino-acyl tRNA synthetase enzyme.

Q3) Answer any one question: **[10]**

a) What are different functions attributed to 5' cap of mRNA and poly- A binding protein (PABP). How does these two interact during translation.

b) What is sigma factor? What is its role in transcription? How can transcription be regulated by changing sigma factor from holoenzyme.

x x x

Total No. of Questions :3]

SEAT No. :

P1867

[Total No. of Pages :2

[4936]-103
M.Sc. I
BIOTECHNOLOGY
BT-103:Environmental Biotechnology
(2013 pattern) (Credit System) (Semester - I)

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

Instructions to the candidates:

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

Q1) Attempt any four of the following **[4×5=20]**

a) Give an overview of Iso 14000 series.

b) Write down proceedings of Rio conference.

c) Explain biochemical mechanism of oxidation ponds for sewage. Enlist suitable bacteria used for the same.

d) Explain types of remote sensing. Enlist their applications.

e) Write a note on Genetically modified organism for effluent bioremediation.

f) Give importance of mycorrhizal association of plants at a tool for remediation.

Q2) Write any five of the following **[5×4=20]**

a) Root zone treatment.

b) Carbon credits.

c) Thermal Inversion.

d) Application of Remote sensing in disaster assessment.

e) Ex-situ Bioremediation of nuclear waste.

f) Biosensors.

P.T.O.

Q3) Answer any one of the following:

a) i) Give overview of Environment protection Act 1986. **[8]**

ii) Enlist importances of PGPRs in soil restoration. **[2]**

b) i) Elaborate on aerobic biological treatment strategies used for treatment of an effluent. **[8]**

ii) Enlist methods used for nitrogen removal from waste water. **[2]**

x x x

Total No. of Questions :3]

SEAT No. :

P1868

[Total No. of Pages :2

[4936]-104
M.Sc.
BIOTECHNOLOGY
BT-104:Cell Biology (4C)
(Credit System) (Semester - I) (2013 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Answer any 4 questions. **[4×5=20]**

a) Discuss lysosomal enzymes and their functions.

b) Describe with examples voltage-gated channels.

c) Give an account of export through the nuclear pore complex.

d) Describe the intrinsic pathway of programmed cell death.

e) Explain the role of hormones in cell differentiation in animals with an example.

f) Discuss the importance of cell transformation studies in understanding the etiology of cancer.

Q2) Answer any 4 questions **[4×5=20]**

a) Describe the structure of G protein. Add a note on its function.

b) Give a brief account of structure and functions of tight junctions.

c) Discuss the mechanism of assembly and disassembly of actin filaments.

P.T.O.

d) Describe the structure of secondary cell wall.

e) Give an account of the role of cAMP as second messenger.

f) Explain the different cell cycle check points.

Q3) Answer any 1 question. **[1×10=10]**

a) Discuss the chemiosmotic hypothesis of oxidative phosphorylation.

b) Discuss the MAP kinase pathway of signal transduction in eukaryotes.

Total No. of Questions :3]

SEAT No. :

P1869

[Total No. of Pages :2

[4936]-201
M.Sc.
BIOTECHNOLOGY
BT-201:Genetic Engineering
(2013 Pattern) (Credit System) (Semester - II) (Credit:4c)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams to be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

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

a) Explain the characteristic features of phagemids.

b) Illustrate the application of alkaline phosphatase and polynucleotide kinase in molecular cloning.

c) Write a note on SCAR and CAPs as variants of RAPD.

d) Describe the success of gene therapy in treatment of ADA deficiency in children's.

e) Discuss the strategy for synthesis of complementary DNA.

f) Write a note on genetically engineered biotherapeutics.

Q2) Answer the following.(any 4) **[20]**

a) Define Transfection. Give its significance.

b) Changes in the number and magnitude of genes expressed by cells in different conditions can give vital clues to the cellular response. Justify.

c) Explain the use of T7 Promoter system in the pET vector system.

d) Discuss the use of Bacillus as an efficient expression system.

e) Give a comparative account on traditional PCR and quantitative PCR.

f) Explain the expression strategy for production of industrially important proteins.

P.T.O.

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

a) DNA sequencing can be greatly increased by replacing slab gel with capillary array electrophoresis (automated). Discuss.

b) Design an experiment using colony hybridization to find a colony among the transformed population that contains a plasmid with Lac Z gene.

x x x

Total No. of Questions :2]

SEAT No. :

P1870

[Total No. of Pages :1

[4936]-202
M.Sc. - I
BIOTECHNOLOGY
BT-202:Immunology
(2013 Pattern) (Credit System) (Semester - II)

Time : 1½ Hours] *[Max. Marks :25*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates full marks.***
3) ***Draw the sketches wherever necessary.***

Q1) Attempt any three of the following:– **[15]**

a) Describe the structure and function of Lymph nodes in human immune system.

b) Discuss innate Vs acquired immunity.

c) How complement activation is regulated?

d) Give a brief account of Flow cytometry and its chimical application.

e) Write immunopathogenesis of myasthenia gravis.

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

a) What do you mean by Antibody engineering? Describe various types of engineered antibodies and mention their chimical potential.

b) Explain any two animal models used for immunological experiments?

x x x

Total No. of Questions :3]

SEAT No. :

P1871

[Total No. of Pages :2

[4936]-203
M.Sc.
BIOTECHNOLOGY
BT-203:Principles of Bacteriology and Virology
(2013 Pattern) (Credit System) (Semester - II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt any four out of the following: **[20]**

a) 'Viral capsid binding to host receptors and antibodies can have varying and often unpredictable effects on infection.' Justify.

b) Explain in - ovo technique for cultivation of viruses.

c) Enlist the general rules of ICTV.

d) 'The surface components of bacterial cells are major determinants of virulence for many pathogens.' Explain

e) Compare and contrast various physical methods of sterilization.

f) Specify the adaptations that bacteria undergo to survive in hot springs and hydrothermal vents.

Q2) Attempt any four out of the following: **[20]**

a) Explain the technique of DNA analysis using genetic probes for the bacterial identification.

b) In recent years, xenobiotics has intensified in the contaminated environments. Explain how bacteria help in cleaning up such environments.

P.T.O.

c) Illustrate diagrammatically the structure and the formation of endospore.

d) Taking a suitable example, explain the principles of epidemiology with regard to public health.

e) Describe the mode of transmission, symptoms and prevention of the disease caused by poultry viruses (any one)

f) Enlist the serological diagnostic methods for viruses Describe any one.

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

a) Write a critical account on conventional vaccines versus recombinant vaccines.

b) Explain the diversity in metabolic strategies that bacteria have evolved to obtain energy.

x x x

Total No. of Questions :3]

SEAT No. :

P1872

[Total No. of Pages :2

[4936]-204
M.Sc.
BIOTECHNOLOGY
BT-204:Plant Biotechnology
(2013 Pattern) (Credit System) (Semester - II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt any four of the following: **[4×5=20]**

a) Elucidate the role of transgenic technology in development of edible vaccines.

b) 'Pure lines can be generated in tissue culture' Justify.

c) Summarize the strategies for qualitative improvement of Dunaliella sp. for increased yields of β - carotene.

d) Citing suitable examples, explain the significance of horizontal gene transfer.

e) Give the advantages and limitations of using micropropagation for commercial production of economically important crops.

f) Write a note on vector mediated transformation methods.

Q2) Attempt any four of the following: **[4×5=20]**

a) Give the methodology for the generation of interspecific/intergeneri hybrids in vitro.

b) Write a note on the biotechnological potential of fungi.

P.T.O.

c) Discuss the use of hairy root culture for production of secondary metabolites.

d) Summarise the role of algal transgenics for the generation of biofuels.

e) Describe the various stages of micropropagation.

f) Comment on the role of transgenic technology in the improvement of plant proteins.

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

a) 'Efficiency of photosynthesis increases productivity.' Give a detailed account for the various approaches used for manipulation of photosynthesis.

b) 'Transgenic technology can be used to combat biotic stresses'. Explain giving suitable examples.

x x x

Total No. of Questions :3]

SEAT No. :

P1873

[Total No. of Pages :2

[4936]-301
M.Sc.
BIOTECHNOLOGY
BT-301:Animal Biotechnology
(2013 Pattern) (Credit System) (Semester - III)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Answer the following: (Any four) **[20]**

a) For mass production of monoclonal antibodies, $HGPRT^-/TK^-$ myeloma cells are used. Justify.

b) Write a note on molecular marker assisted breeding of livestock.

c) Explain the concept of organotypic culture and mention its advantage over monolayer culture.

d) Comment on buffer systems used in animal cell culture media.

e) Write any two methods of cell sorting based on surface antigens.

f) What are the different issues associated with maintenance and therapeutic usage of embryonic stem cells?

Q2) Write Sort Notes on: (Any four) **[20]**

a) Transgenic fish: Methods and Applications.

b) Induced Pleuripotent stem cells.

c) Germ cell storage.

P.T.O.

d) Cross-contamination.

e) Factors affecting success of animal breeding.

f) Serum free media.

Q3) Explain in detail any one mouse model to study human progressive degenerative disorder. **[10]**

OR

Explain in detail different methods to purify and characterize stem cells.

x x x

Total No. of Questions : 3]

SEAT No. :

P1874

[Total No. of Pages : 2

[4936]-302
M.Sc.
BIOTECHNOLOGY
BT - 302 : Bioprocess Engineering and Fermentation Technology
(2013 Pattern) (Semester-III) (Credit System)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

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

a) Enlist different type of immobilized cell bioreactors and explain any one.

b) Justify that change in cell permeability can improve yield of a fermentation product.

c) Explain different methods for measurement and control for flow of liquids during fermentation.

d) Describe the working of double drum drier.Mention the advantages of drying a fermentation product.

e) Discuss giving examples role of inducer in fermentation.

f) Explain the significance of K_{La} and discuss the effect of rheology on it.

Q2) Answer the following (any four): **[20]**

a) Mention the reasons for the foam formation in submerged fermentation.What are the consequences of excessive foaming.

b) Define/ Attempt the following:

i) Specific growth rate in continuous culture.

ii) Gas hold up

iii) Oxygen transfer rate

iv) Impellor flooding

v) Qp

P.T.O.

c) What is the significance of Del factor in medium sterilization? Add a note on kinetics on distruction of micro organisms during sterilization.

d) "Microbial mix culture play a significant role in food industry" explain giving any one example

e) Discuss the methods useds for screening of analogue resistant mutants.

f) Define power number & Reynold's number and explain their significance in fermentation.

.***Q3)*** Answer the following(any one): **[10]**

a) Describe two film theory and derive an equation fas gas-liquid mass transfer.

b) Discuss the strategy for downstream processing of

i) An amino acid

ii) Exopolysaccharide

Total No. of Questions : 2]

SEAT No. :

P1875

[Total No. of Pages : 1

[4936]-303
M.Sc.
BIOTECHNOLOGY
BT - 303 : Database Management and Intellectual Property Rights
(2013 Pattern)(Credit System)(Semester-III)

Time : 1½Hours] *[Max. Marks : 25*

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 any three: **[3×5=15]**

a) What is patent co-operation Treaty? Give its salient features.

b) State the rights of plant breeder.

c) Give procedure for obtaining a patent.

d) Write a note on organization of database management system.

e) What are the serious and non-serious adverse events? Describe in brief.

Q2) Answer any one: **[1×10=10]**

a) Enlist the types of databases relevrant to Biotechnology. Explain any two in detail.

b) What is industrial design? Explain its procedure for registration.

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Total No. of Questions : 3]

SEAT No. :

P1876

[Total No. of Pages : 2

[4936]-304
M.Sc.-II
BIOTECHNOLOGY
BT - 304 : Advanced Genetics
(2013 Pattern)(Credit Course)(Semester-III)

Time : 2.5Hours] *[Max. Marks : 38*

Instructions to the candidates:

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

Q1) Answer any two: **[2×5=10]**

a) Explain duplications of chromosome and its consequences in humans.

b) How routine diagnostic of mother's blood helps in aneuploid detection?

c) What is inbreeding coefficient? How it is estimated? Discuss its advantages and limitations.

d) Write a note on S-locus involved in self in compatibility.

Q2) Answer any four: **[4×5=20]**

a) Describe the individual with triple-x syndrome.

b) In plant species, the ability to grow in soil contaminated with nickel is determined by a dominant allele. If 60% of the seeds in a randomly making population are able to germinate in contaminated soil, what is the frequency of resistant allele? What is the frequency of homozygous plants that germinate?

c) Write a note on genetic mechanisms involved in apomixis.

d) Write a note on cytoplasmic male sterility in plants.

e) Discuss role of pre-existing genetic variation in production of somaclonal variants.

f) Explain post-zygotic incompatibility in plants.

P.T.O.

Q3) Answer any one: **[1×8=8]**

a) Arabidopsis is used as a model system in genetic studies-Discuss.

b) With a suitable example, discuss multistep nature of cancer.

Total No. of Questions : 2]

SEAT No. :

P1877

[Total No. of Pages : 1

[4936]-305
M.Sc.
BIOTECHNOLOGY
BT - 305 : Bioinformatics
(2013 Pattern)(Part-II)(Semester-III)

Time : 1½Hours] *[Max. Marks : 25*

Instructions to the candidates:

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

Q1) Solve any three of the following: **[3×5=15]**

a) What is bioinformatics? Explain its scope in various fields.

b) What is biological database? Discuss types of biological databases.

c) Give detail account of Multiple sequence alignment and its applications.

d) Write a short note on energy optimization methods.

e) Ramchandran plot is an important tool in structural bioinformatics. Justify.

Q2) Solve any one of the following: **[1×10=10]**

a) What is homology Modelling & Explain its role in structure prediction of novel protein.

b) What is phylogeny? Explain UPGMA method of the construction.Give its advantages.

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Total No. of Questions : 3]

SEAT No. :

P1878

[Total No. of Pages : 2

[4936]-401
M.Sc.
BIOTECHNOLOGY
BT - 401 : Genomics & Proteomics
(2013 Pattern) (Semester-IV) (Credit System)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat labelled diagrams must be drawn wherever necessary.***

Q1) Answer any four of the following: **[4×5=20]**

a) Define transcriptomics. Add a note on application of microarrays in transcriptome studies.

b) Explain any two methods applied in Human genome sequencing .Give their advantages & limitations.

c) What is the importance of studying model organisms in comparative genomics? Explain with example.

d) Enlist different techniques used in functional genomics & explain any one in detail.

e) Explain the use & importance of microarray in pharmacogenomics.

f) Write a note on:

i) SNPs

ii) Bioinformatics in -omics studies

Q2) Attempt any four of the following: **[4×5=20]**

a) Explain 2D gel electrophoresis and write its applications giving examples.

b) Describe the strategies applied in proteomics studies with example.

c) What is structural proteomics? Explain any one important technique used in structural proteomics.

P.T.O.

d) Enlist modification of mass spectrometry & explain MALDI-TOF.

e) What is Mud PIT? Give its method and advantages.

f) Write short notes on:

i) Microarray in proteomic studies

ii) Yeast two hybrid ratio

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

a) Explain: -omics studies help us to get the complete picture of systems biology than any other classical methods.

b) Give role and importance of databases and bioinformatics tools in understanding the working of a biological cell via -omics studies.

Total No. of Questions : 3]

SEAT No. :

P1879

[Total No. of Pages : 2

[4936]-402
M.Sc.
BIOTECHNOLOGY
BT - 402 : Advanced Biochemical and Biophysical Techniques
(2013 Pattern) (Semester-IV) (Credit System)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat labelled diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

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

a) Explain the principle of HPLC and detectors used in it.

b) Give the safety aspects of use of radioisotopes.

c) Explain principle and instrumentation required for the x-ray crystallography.

d) Write a short note on FISH technique.

e) Comment on resolving power of microscope.

f) Explain why liquid scintillation counter is more efficient than GM counter?

Q2) Answer the following (any four): **[20]**

a) Enlist the applications of infra red spectroscopy.

b) Discuss Radioimmuno assay with its applications.

c) What are the components of MALDI-TOF-MS? Write the function of any four components in brief.

d) Write a short note on immunofluorescence.

e) Explain the technique of protein separation based on pI value.

f) Describe the principle and working of flow cytometry.

P.T.O.

Q3) Answer the following(any one): **[10]**

a) Discuss the principle,working and applications of affinity chromatography.

b) Explain the principle, working and applications of scanning electron microscopy(SEM).

Total No. of Questions : 2]

SEAT No. :

P1880

[Total No. of Pages : 1

[4936]-403
M.Sc.
BIOTECHNOLOGY
BT - 404 : Nanobiotechnology
(2013 Pattern)(Credit System)(Semester-IV)

Time :1½Hours] *[Max. Marks : 25*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates full marks.***
3) ***Draw the sketches wherever necessary.***

Q1) Attempt any three of the following: **[15]**

a) Explain the principle electron microscopy used for characterization of nanoparticles.

b) Discuss how the biomoleculer like protein be used for the synthesis of nanoparticles.

c) Explain how the nanoparticles can be used as biosensors.

d) Multilayer nanoparticles has helped in tissue regeneration. Justify.

e) Discuss the application of nanoparticles in chemical sciences.

Q2) Compare and contrast between the chemical physical and biological methods of nanoparticles synthesies. **[10]**

OR

What is functionalization of nanoparticles. Why is it necessary. Give any 2 representative examples?

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Total No. of Questions : 3]

SEAT No. :

P1881

[Total No. of Pages : 2

[4936]-404
M.Sc.
BIOTECHNOLOGY
BT - 405 : Animal Development and Stem Cell Technology
(2013 Pattern) (Semester-IV)

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

Instructions to the candidates:

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

Q1) Answer the following(any four): **[4×5=20]**

a) Write a note on concept of Fate Map.

b) Define,cytoplasmic rearrangments'. Explain with suitable example.

c) Explain the process of gastrulation in sea urchin.

d) Describe the role of homeotic genes in early development.

e) Write a note on cleavage

f) Enlist different models of regenaration. Explain any one in detail.

Q2) Answer the following (any four): **[4×5=20]**

a) Give a comparative account of embryonic stem cells and adult stem cells.

b) Explain one method of targeted gene insertion.

c) Write a note on cell lineage tracing.

d) Write a note on regulation of cell cycle in stem cells.

e) Explain the concept of cloning and give its applications.

f) Write a note on stem cell niche in adult organisms.

P.T.O.

Q3) Answer any one: **[1×10=10]**

a) Explain in detail various subcellular and molecular event during spermiogenesis.

b) What is tissue engineering. Explain in detail with the help of appropriate example.

Total No. of Questions : 3]

SEAT No. :

P1882

[Total No. of Pages : 2

[4936]-405
M.Sc.
BIOTECHNOLOGY
BT - 406 : Agricultural Biotechnology
(2013 Pattern) (Semester-IV)(Credit System)

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

Instructions to the candidates:

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

Q1) Attempt any four of the following: **[4×5=20]**

a) What is QTL? Explain the technique of QTL construction.

b) Discuss the significance of endosperm culture in crop improvement.

c) What is virus indexing? Explain its significance in large scale plant propagation.

d) Elaborate on methods used to induce polyembryony in crop plants for their improvement.

e) What are somaclonal variations? Explain how somaclonal variants can be obtained.

f) Explain the concept of Apomixis justify its role in agrobiotechnology.

Q2) Attempt any four of the following: **[4×5=20]**

a) Explain, citing suitable examples, the role of biotechnological manipulations in improvement of pulses.

b) What are DNA markers? Explain their role in marker assisted selection.

c) Write a note on future crops and their importance

d) Discuss the risks associated with production and release of transgenic crops.

e) Explain how embryo rescue is an effective way to produce viable plants.

f) Discuss various types of bioreactors used for large scal plant production.

P.T.O.

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

a) Discuss in detail with suitable examples or case studies, the production of biotic stress tolerant crops via transgenic technology.

b) Explain the methods available for chloroplast transformation. Discuss the importance of chloroplast engineering in production of the peutic proteins.