Total No. of Questions : 3]

SEAT No. :

P3108

[Total No. of Pages :1

[5036]-101
M.Sc. - I
BIOTECHNOLOGY
BT -101 : Advanced Biological Chemistry
(2013 Pattern) (Semester - I) (Credit System)

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

Instructions to the candidates:

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

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

a) Explain the structure and function of glycoproteins.
b) Elaborate on lysosomal degradation of proteins.
c) Describe the diseased conditions due to disorder in storage of carbohydrates.
d) Explain the pharmacological activities of alkaloids.
e) Explain the different ways of enzyme regulation in metabolic reactions.
f) Discuss the representation method for qualitative and quantitatitive analysis of secondary metabolites.

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

a) Explain the process of glycosylation in protein modification.
b) Discuss the term metabolic engineering with reference to xenobiotics.
c) Explain the importance of growth hormones in growth of a cell.
d) Define metabolome. How metabolic flux and its analysis help in its understanding.
e) Comment on clinical significance of enzymes.
f) Primary metabolites act as precussor of secondary metabolites. Justify.

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

a) Explain the hierarchy in protein folding.
b) Discuss the Isopenteny pyrophosphate (IPP) pathway for synthesis of secondary metabolites.

✦ ✦ ✦

Total No. of Questions : 3]

SEAT No. :

P3109

[Total No. of Pages :1

[5036]-102
M.Sc. (Biotechnology)
BT-102 : MOLECULAR BIOLOGY
(2013 Pattern) (New) (Semester - I)

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

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.***

Q1) Write self explanatory note on <u>any four</u> of the following: **[20]**

a) Cot ½ and Rot ½
b) Organelle genome
c) Base excision repair
d) Copy choice model of DNA recombination
e) Tn A and Tn 10
f) Post transcriptional modification

Q2) Explain <u>any four</u> of the following with suitable illustrations in 10-15 sentences: **[20]**

a) Initiation complex of RNA pol II
b) Methylation and Acetylation of DNA
c) Aminoacy1 t RNA synthase
d) RNA dependent DNA polymerase
e) Leucine zippers and Zinc fingers
f) Micro and Mini satellite DNA

Q3) Explain <u>any one</u> of the following in detail with suitable illustrations: **[10]**

a) Quality control of protein folding
b) Eukaryotic replication

✓ ✓ ✓

Total No. of Questions :3]

SEAT No. :

P3110

[Total No. of Pages :2

[5036]-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) Enlist & explain sources & types of solid waste.

b) Elaborate impact of pesticides on microbial diversity of soil.

c) What is air pollution? Discuss significance of air quality standards.

d) Discuss general methodology used for environmental audit.

e) What is EIA? Write objectives of EIA.

f) What are Ecostandards? Add a note on Indian Ecostandards.

Q2) Write notes on (Any Four): **[4×5=20]**

a) Bioagumentation.

b) Recycle, reuse & recovery of solid waste.

c) Sustainable development.

d) Threats to environment.

e) ISO 14000

f) Nairobi declaration.

P.T.O.

Q3) Answer any one of the following:

a) Describe biological waste water treatment methods in detail. **[8]**

b) Discuss significance of environmental laws. **[2]**

OR

a) What is bioremediation? Explain various stratigies used to enhance biodegradation of pollutants. **[8]**

b) Give objectives of remote - sensing. **[2]**

EEE

Total No. of Questions : 3]

SEAT No. :

P3111

[Total No. of Pages :1

[5036]-104
M.Sc.
BIOTECHNOLOGY
BT - 104 : Cell Biology
(2013 Pattern) (Semester - I) (Credit System)

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: **[4 × 5 = 20]**

a) Describe briefly lipid composition of plasmamembrane with respect to structure-function relationship.

b) Give an account on structure and functions of Intermediate filaments.

c) Write a note on biogenesis of cell wall.

d) Discuss the role of peroxisomes in animal cell.

e) Write the mechanism of COP II vesicle budding and fusion with target membrane.

f) Explain the principle and working of SEM.

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

a) Describe the mechanism of protein targeting to mitochondrial matrix.

b) What are plasmodesmata. Add a note on its structure and functions.

c) Discuss intrinsic pathway of apoptosis in animals.

d) Write a note on cell cycle checkpoints.

e) Give an account on cell transformation.

f) What is terminal differentiation of cell. Explain with an example in animals.

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

a) Give a detailed account of cyclic and non-cyclic photophosphorylation. Add a note on its significance.

b) Elaborate the MAP kinase pathway of signal transduction.

Total No. of Questions :3]

SEAT No. :

P3112

[Total No. of Pages :1

[5036]-201

M.Sc.

BIOTECHNOLOGY

BT - 201:Genetic Engineering

(2013 Pattern) (Credit System)

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

Instructions to the candidates:

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

Q1) Write self explainatory notes on any four: **[20]**

a) Cosmids and Phagmids.

b) Virus mediated gene transfer

c) Nested PCR

d) In-vivo Gene therapy

e) Sub unit vaccines

f) GUS system.

Q2) Attempt the following in 10-15 lines(any four) **[20]**

a) Chemical cleavage method in DNA sequencing is difficult to automate, justify.

b) Explain the superiority of AFLP over RFLP.

c) Describe the steps involved in cDNA library construction.

d) Enlist the significance of detecting and diagnosing genetic diseases.

e) Discuss the procedure in of PCR giving the significance

f) Mention different types of RNA ases used in genetic enigneering.

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

a) Explain different strategies employed in Biopharming with suitable examples.

b) Describe in details the use of CaMV and Baculavirus in genetic engineering.

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Total No. of Questions : 2]

SEAT No. : ____

P3113

[Total No. of Pages :1

[5036] - 202
M. Sc. - II
BIOTECHNOLOGY
BT - 202: IMMUNOLOGY
(2013 Pattern) (Semester -II) (Credit System)

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 neat and labelled diagram wherever necessary.***

Q1) Answer any three : **[3×5=15]**

a) Give a brief account of the structure and function of lymph node.

b) Cell - mediated immunity is MHC - restricted - Explain.

c) Describe the role of regulatory proteins in complement system.

d) Write the principle of FACS and it's application.

e) Write a short note on Hypersensitivity reaction.

Q2) Answer any one:

a) What is autoimmunity? Explain one organ specific and one systemic autoimmune disease of your choice. **[5]**

b) Explain the mechanism of Allograft - rejection. **[5]**

OR

a) Explain Various types of chimeric antibodies and write their applications. **[5]**

b) How recombinant Vector vaccines are produced? Add a note on its advantage. **[5]**

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Total No. of Questions :4]

SEAT No. :

P3114

[Total No. of Pages :2

[5036]-203

M.Sc.

BIOTECHNOLOGY

BT - 203: Principles of Bacteriology and Virology

(2013 Pattern) (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.***
4) ***Answers to the two sections must be written in separate books.***

SECTION -I

Q1) Answer any three questions: **[3×5=15]**

a) Describe the proteins involved in binary fission.

b) Explain molecular adaptations to thermophily.

c) Describe the ultrastructure of bacterial flagella.

d) 'Mannitol salt agar is selective and differential media'. Justify.

e) Write a note on metabollic diversity of sulphur bacteria.

Q2) Attempt any one question: **[10]**

a) Describe in detail the steps involved and micro organisms involved in biological nitrogen fixation.

b) Discuss the causative agent, pathogenesis and treatment of tuberculosis.

P.T.O.

SECTION -II

Q3) Answer any three: **[3×5=15]**

a) Classify DNA viruses with example of each.

b) Describe morphology and symmetry of viruses.

c) Explain the replication of Retrovirus.

d) Write a note on DNA Vaccine.

e) Give a brief account of transmission of plant virus.

Q4) Attempt any one: **[1×10=10]**

a) Describe in detail the mode of action of various antivirals.

OR

b) Differentiate between Acute and persistent infection. Describe in detail any one type of infection of your choice.

EEE

Total No. of Questions : 3]

SEAT No. :

P3115

[Total No. of Pages : 1

[5036]-204
M.Sc.
BIOTECHNOLOGY
BT-204: Plant Biotechnology
(2013 Pattern) (Semester - II) (Credit System)

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: **[4 × 5 = 20]**

a) Discuss the advantages of micropropagation over conventional propagation methods.
b) Compare and contrast vertical and horizontal gene transfer.
c) Explain with diagram the procedure for production of artificial seeds.
d) Discuss the role of biotechnology in fungal strain improvement.
e) Write a short note on in vitro androgenesis.
f) Justify that agrobacterium is a natural genetic engineer.

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

a) Define somatic embryogenesis. Enlist various factors affecting it.
b) Comment on molecular farming.
c) Write a short note on production of biopesticides.
d) Discuss biotechnological approaches for yield improvement in economically important algae.
e) Discuss transgenic approaches for production of plant based neutra centicals.
f) Discuss briefly the methods available for production of cybrids.

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

a) Discuss in detail plant metabolic engineering approaches for conferring abiotic stress tolerance.
b) Give a detailed account on clonal propagation of forest trees.

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Total No. of Questions : 3]

SEAT No. :

P3116

[Total No. of Pages :1

[5036]-301
M.Sc.
BIOTECHNOLOGY
BT - 301 : Animal Biotechnology
(2013 Pattern) (Semester - III) (Credit System)

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 the following (Any four) **[20]**

a) Write a note on use of cell culture in vaccine production.
b) Explain the use of animal genomics as a tool for characterization of animal cells.
c) Describe the method of enzymatic disaggregation to establish cell culture and its advantage over non-enzymatic methods.
d) What is cryptic contamination? Comment on different methods to detect the cryptic contamination.
e) Elaborate the concept of scale up of animal cell culture.
f) Explain any one method of artifical insemination in cattle.

Q2) Write short notes on (Any four) **[20]**

a) Conditional gene expresion system.
b) Characterization and application of adult stem cells.
c) Cryopreservation of animal cells.
d) Role of CO_2 in animal cell cultures.
e) Biosafety issues associated with transgenic animals.
f) Comparison between chimeric and transgenic animals.

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

OR

Explain in detail methods of long term maintenance of embryonic stem cells and their characterization. **[10]**

Total No. of Questions : 3]

SEAT No. :

P3117

[Total No. of Pages : 2

[5036]-302
M.Sc.
BIOTECHNOLOGY
BT - 302 : Bioprocess Engineering and Fermentation Technology
(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 wherever necessary***
3) ***Figures to the right indicate full marks.***

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

a) Enlist the non-mechanically agitated bioreactors used in fermentation industry. Describe the working and applications of fluidised bed reactor

b) Define Kha. Discuss the effect of

i) Microbial biomars &

ii) Agitation on Kha.

c) 'Auxotrophic mutants can improve the quality and yield of products' Justify giving examples.

d) What is the importance of realtime estimation of microbial biomass during fermentation? Discuss different methods of realtime estimation of biomass.

e) Why is cross flow filtration considered as more efficient method of filtration than conventional filtration? Explain.

f) Discuss giving examples the role of Precurssors in fermentation media.

Q2) Answer the following (any Four) **[20]**

a) What are Non-Newtonian fluids? Discuss different types of Non-Newtonian fluids with their rheogram giving their significance in fermentation.

b) Define / Attempt the following:

i) Variable volume fed Batch culture

ii) C_{crit}

P.T.O.

iii) Oxygen uptake rate

iv) Scale up

v) Ks

c) How is a batch sterilization process designed for fermentation?

d) Design the effluent disposal strategy for a dye Industry.

e) Discuss giving examples how recombinant DNA technology has contributed in strain improvement of a production strain.

f) Explain the classification of agitators on the basis of the flow patterns generated. What is the basis of selection of an Impellor for a particular process?

Q3) Answer the following question (any One) **[10]**

a) Describe a typical power curve for a baffeled vessel agitated by a falt blade turbine and give the relationship between Reynold's number, power numer and Power requirement in each regime.

b) discuss the strategy of down stream processing for

i) An antibiotic and

ii) Enzyme

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Total No. of Questions :2]

SEAT No. :

P3118

[Total No. of Pages :1

[5036]-303

M.Sc.

BIOTECHNOLOGY

BT - 303: Database Management and Intellectual Property Rights in Biotechnology

(2013 Pattern) (Credit System) (Semester - III)

Time : 1½ Hours] *[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 diagram wherever necessary.***

Q1) Answer any three: **[3×5=15]**

a) What is industrial design? Explain with suitable examples.

b) Write a note on IPR agencies and convention.

c) Give conditions for grant of breeder's rights.

d) Draw a flowchart for reporting serious and non -serious adverse events.

e) State the principle and types of data mining.

Q2) Answer any one: **[1×10=10]**

a) What is a patent? Give the procedure for obtaining a microbial patent in detail.

b) Describe the concept of database and database management with appropriate examples.

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Total No. of Questions : 3]

SEAT No. :

P3119

[Total No. of Pages :2

[5036]-304
M.Sc. - II
BIOTECHNOLOGY
BT - 304 : Advanced Genetics
(2013 Pattern) (Semester - III) (Credit System)

Time : 2½Hours] *[Max. Marks :38*

Instructions to the candidates:

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

Q1) Answer any two: **[2 × 5 = 10]**

a) Write the significance of Robert sonian Translocation in Human Clinical genetics.

b) Describe two conventional method of human aneuploid detection.

c) Write a note on Broad sense and Narrow sense heritability. Give limitation of heritability estimation.

d) Explain various pathways for activation of oncogene.

Q2) Answer any four: **[4 × 5 = 20]**

a) Give Karyotypic symbols (8-10) used in human clinical genetics.

b) In united state approximately one child in 10,000 is born with PKu (Phenylketoneuria) a syndrome that affects individuals homozygous for recessine alleles.

i) Calculate the frequency of normal allele.

ii) Calculate the frequency of homozygous allele in the population.

iii) Calculate the percentage of carriers of the trait within the population.

P.T.O.

c) Define somaclonal variations. Explain various genetic and epigenetic factors involved in production of somaclonal variants.

d) What is extranuclear inheritance? Discuss inheritance of traits through chloropast genome.

e) Enlist various genes involved in depicting self incompatibility in plants. Add a note on their mechanism.

f) Discuss the role of morphogenetic markers in identifying apomietic development.

Q3) Answer any one **[1 × 8 = 8]**

a) State Hardy weinberg principle. If all assumptions are met with show with suitable example that the law hold true for nuclear genes with 2 allels, multiple allels & sexlinked alleles.

b) Drosophila is used as Genetic model for human diseases - discuss.

Total No. of Questions :2]

SEAT No. :

P3120

[Total No. of Pages :1

[5036] - 305

M.Sc.

BIOTECHNOLOGY

BT - 305 : Bioinformatics

(2013 Pattern) (Part - II) (Semester - III)

Time : 1½ Hours] *[Max. Marks :25*

Instructions to the candidates :

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

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

a) What is scoring matrix? Discuss BLOSUM in detail.

b) How molecular interactions are simulated using structure?

c) Explain protein profiles and give its applications.

d) Explain role of immunoinformatics in vaccinology.

e) Write short note on

i) Pub Med central

ii) P I R

Q2) Solve any one of the following. **[10]**

a) What is phylogeny? Explain Neighbour Joining method of free construction. Give its advantages.

b) What is FASTA? Write its role in homology searching. Give its advantages and limitations.

Total No. of Questions :3]

SEAT No. :

P3121

[Total No. of Pages :2

[5036]-401

M.Sc.

BIOTECHNOLOGY

BT - 401: Genomics and Proteomics

(2013 Pattern) (Semester - IV)(Credit System)

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

Instructions to the candidates:

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

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

a) Explain the complenity of genome in Eukaryotic system.

b) Discuss the role of whole genome analysis in completion of Human genome project.

c) Define transcriptonics. Explain its applicability for understanding the gene expression status of genetic diseases.

d) Explain the principle and working of DNA microarray.

e) Write short notes on:

i) Metagenomics

ii) SAGE

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

a) Proteome represents some subset of all possible gene products. Justify.

b) What are the different methods of protein digestion used in mass spectrometer.

c) How will you achieve protein separation by Iso electric focussing.

d) Discuss the methods used in physical characterization of proteins.

e) Explain the concept of biomarken with respect to proteins in disease diagnosis.

P.T.O.

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

a) With a representative example explain the fact that damage to DNA affects its product protein. How will you study it?

b) Explain the different electrophoresis techniques used to study the genes and the protiens.

Total No. of Questions : 3]

SEAT No. :

P3122

[Total No. of Pages : 1

[5036]-402
M.Sc.
BIOTECHNOLOGY
BT-402: Advanced Biochemical and Biophysical Techniques
(2013 Pattern) (Semester - IV) (Credit System)

Time : 3 Hours] *[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 indicates full marks.***

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

a) Explain with a schematic the principle and application of gas liquid chromatography.

b) Define Half life and comment on radioactive decay.

c) Write a short note on FISH.

d) Give the applications of circular dichroism.

e) Comment on immunoflurorescence with its significance.

f) Discuss single cell imaging.

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

a) Describe principle and working of ESR.

b) Explain the principle of ELISA. Give its applications.

c) Write a short note on confocal microscopy.

d) Comment or Immunoblotting.

e) Enlist the applications of GC-MS.

f) Explain the principle at uv visible spectroscopy. Comment on the various types of detectors used in uv visible spectroscopy.

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

a) Explain the principle, working and applications of IR in the study of Biomolecules.

b) Describe in detail principle, working and applications of 2-D gel electrophoresis.

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Total No. of Questions :2]

SEAT No. :

P3123

[Total No. of Pages :1

[5036]-403

M.Sc.

BIOTECHNOLOGY

BT - 404: Nanobiotechnology

(2013 Pattern) (Credit System) (Semester - IV)

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) Define nanoparticles. What are the different forms of nanoparticles used.

b) Discuss the sol-gel method for synthesis of nanoparticles.

c) How biological material is used in synthesis of nanoparticles.

d) With appropriate example explain how the magnetic & electrical properties of nanoparticles be utilized.

e) Enlist the methods of characterization of nanoparticles. Explain any one in detail.

Q2) a) Why is functionalization of nanoparticles essential for its use in biological system? **[10]**

OR

b) Discuss the application of nanoparticle use in the field of chemical, physical and life sciences.

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Total No. of Questions : 3]

SEAT No. :

P3124

[Total No. of Pages : 1

[5036]-404
M.Sc.
BIOTECHNOLOGY
BT-405: Animal Development and Stem Cell Technology
(2013 Pattern) (Semester - IV)

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

a) Neurulation is a result of primary induction. Justify.

b) Write a note on early and late responses during egg metabolic activation.

c) Enlist different morphogenetic movements. Explain their role in gastrulation.

d) Explain how the amount of yolk affects cleavage pattern.

e) Write a note on epigenetic gene regulation during early development.

f) Write a note on liver regeneration in humans.

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

a) What are induced pluripotent stem cells. Give their therapeutic applications.

b) Explain "retrovirus mediated gene insertion" in stem cells.

c) Give different parameters and methods of characterization of stem cells.

d) Write a note on stem cell plasticity.

e) Write a note on cloning and its bioethical considerations.

f) Define neuronal lineage. Add a note on neuronal lineage identification.

Q3) Answer any one **[1 × 10 = 10]**

a) Give a comparative account of oogenesis and spermatogenesis.

b) Explain in detail the concept of gene therapy and explain any one in detail.

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Total No. of Questions :3]

SEAT No. :

P3125

[Total No. of Pages :2

[5036] - 405

M.Sc.

BIOTECHNOLOGY

BT - 406 : Agricultural Biotechnology

(2013 Pattern) (Credit System) (Semester - IV)

Time : 3 Hours] *[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) Discuss the role of induced polyembryony in crop improvement.

b) Explain the technique for production of homozygous plants through anther cultures.

c) What are microsatellites? Explain their role in marker assisted selection.

d) Define the term apomixis. Describe its importance in agrobiotech.

e) Discuss the role of genetic engineering in production of high yielding crops.

f) Explain the use of somaclonal variations for crop improvement.

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

a) What is RFLP? Explain the methodology to carry out RFLP.

b) Explain with a flow chart the methodology involved in chloroplast engineering .

P.T.O.

c) Discuss with suitable examples, the role of biotechnological interventions in improvement of oil seed crops.

d) Explain the term agrobusiness. Give its significance.

e) What is antibiotic selection of transformants? Add a note on marker-free selection.

f) What is virus indexing? Explain any one method used for virus indexing?

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

a) What are transgenic plants? Mention their applications and explain in detail any one application.

b) Explain the use of bioreactors in large scale plant production and scaling up. Discuss their advantages and limitations.