

Total No. of Questions : 7]

SEAT No. :

PE-4748

[Total No. of Pages : 2

[6519]-1

M.Sc. (Part - I)

BIOTECHNOLOGY

BT - 501 MJ : Bacteriology, Parasitology and Virology
(2023 Pattern) (CBCS) (Semester - I)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any Four questions from Q.2 to Q.7.
- 3) Questions 2 to 7 carry equal marks.

Q1) Solve any five of the following:

[5 × 2 = 10]

- a) What is Prophage?
- b) Give importance of Biofilm.
- c) Explain the term definitive and intermediate host.
- d) State two examples of helminths as human parasite.
- e) What are nucleoside analogs? Give its role.
- f) Explain the term evolutionary chronometer.

Q2) a) What are infectivity assays? Describe its role in viral diagnosis of viral infections. [7]

b) Explain the concept of parasitism. Discuss cellular basis of host-parasite interactions. [5]

Q3) a) Give structure of endospore and explain the process of sporulation in bacteria. [7]

b) Discuss role of interferon. [5]

Q4) a) Give epidemiology of Malaria. [7]

b) Explain the term generation time and growth rate in bacteria. [5]

P.T.O.

- Q5)** a) Elaborate on polyphasic bacterial taxonomy. [7]
b) Give different measures of microbial diversity. [5]
- Q6)** a) Explain the mechanism of replication in viruses having reverse transcriptase enzyme. [7]
b) Comment on 'Unculturable bacteria'. [5]
- Q7)** Write short notes on any two of the following. [12]
a) Antibiotic resistance
b) Baltimore system
c) Siderophore.



Total No. of Questions : 5]

SEAT No. :

PE-4749

[Total No. of Pages : 2

[6519]-2

M.Sc. (Part - I)

BIOTECHNOLOGY

BT - 502 MJ : Advanced Cell Biology

(2023 Pattern) (Semester - I)(CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any Three questions from Q.2 to Q.5*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve any Five of the following: [5]

- a) What are CAMs? Give examples.
- b) Define symport and antiport.
- c) Enlist secondary signaling molecules.
- d) State role of cytochrome C in apoptosis.
- e) What are mechano - gated channels.
- f) Enlist causes of cancer.

Q2) a) Explain the protein sorting and transport pathway in Endoplasmic reticulum. [6]

b) Explain the mechanism of cell division occurring in Somatic Cells. [4]

Q3) a) Elaborate on regulation of cell cycle w.r.t. checkpoints. [6]

b) What are cytoskeletal elements? Explain their role in cell division. [4]

Q4) a) How cell communicate through cell junctions? Explain any two cell junctions in detail. [6]

b) What is apoptosis? Explain extrinsic pathway of it. [4]

P.T.O.

Q5) Write short notes on any two of the following:

[10]

- a) Oncogenes & tumor suppressor genes
- b) RAS - MAP Kinase
- c) Mechanism of nerve transmission



Total No. of Questions : 5]

SEAT No. :

PE-4750

[Total No. of Pages : 2

[6519]-3
M.Sc. - I
BIOTECHNOLOGY
BT 503 MJ : Advanced Molecular Biology
(2023 Pattern) (CBCS) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question No. 1 is compulsory.
- 2) Solve any three questions from Q.No. 2 to Q.No. 5.
- 3) Question No. 2 to Question No. 5 carry equal marks.

Q1) Solve any FIVE of the following.

[5]

- a) Define central dogma of molecular biology.
- b) Enlist inhibitors of RNA polymerase II.
- c) What are giant chromosomes
- d) Mention the role of Topoisomerase II
- e) What do you mean by 'Codon'
- f) State the significance of "enhancers" and "silencers"

Q2) a) Explain the process of replication of leading and lagging strand **[6]**

b) Give significance of Wobble Hypothesis. **[4]**

Q3) a) Describe positive and negative regulation of lac operon **[6]**

b) Comment on different types of mutagens **[4]**

P.T.O.

- Q4)** a) Discuss organization of eukaryotic genome in detail [6]
b) What do you mean by 'post - translational modifications'? Add a note on Glycosylation. [4]

Q5) Write short notes on (ANY 2) [10]

- a) Splicing mechanism
- b) Photoreactivation
- c) Euchromatin & Heterochromatin



Total No. of Questions : 5]

SEAT No. :

PE-4751

[Total No. of Pages : 2

[6519]-4
M.Sc. (Part - I)
BIOTECHNOLOGY
BT 504 MJ : Advanced Immunology
(2023 Pattern) (CBCS) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question No. 1 is compulsory.
- 2) Solve any three questions from Que.2 to Que.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any Five of the following.

[5]

- a) What is active immunization?
- b) State the Functions of IgG.
- c) What are immunogens.
- d) Enlist the cells involved in phagocytosis.
- e) Give applications of ELISA.
- f) What is class switching?

Q2) a) Explain the process of B cell activation, maturation and differentiation.

[6]

b) Comment on lympho proliferation assay.

[4]

Q3) a) What is transplantation immunology? Explain the mechanism of graft rejection.

[6]

b) Give an account on Hypersensitivity.

[4]

P.T.O.

- Q4)** a) Explain the classical pathway of complement activation. [6]
b) Elaborate on flow cytometry and immunoelectron microscopy. [4]

Q5) Write short notes on any Two of the following: [10]

- a) Central and peripheral tolerance of immune system
- b) MHC molecules
- c) Mechanism of autoimmunity



Total No. of Questions : 5]

SEAT No. :

PE-4752

[Total No. of Pages : 2

[6519]-5

M.Sc. (Part - I)

BIOTECHNOLOGY

BT - 507 MJ : Environmental Biotechnology
(2023 Pattern) (Semester - I)(CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any Three questions from Q.2 to Q.5
- 3) Question 2 to 5 carry equal marks.

Q1) Solve any Five of the following: [5]

- a) Define Biodiversity. Give its types.
- b) Enlist two examples Biofuel with its definition.
- c) Which compounds are called as Xenobiotics? Give one example.
- d) Give two objectives of Montreal Protocol.
- e) What is Global Warming? State any two causes.
- f) Write down two advantages of ex-situ bioremediation.

Q2) a) What is Solid Waste Management? Discuss in detail about the limitations encountered during the process. [6]

b) Explain the concept of GIS and list down its applications in agriculture.[4]

Q3) a) Explain water pollution in detail. Give an account of all the pollutants responsible for it. [6]

b) Give details about 'The Environment Protection Act 1986'. [4]

Q4) a) Discuss the future scenario of the global environment and briefly describe the consequence of climate change on ocean water level. [6]

b) Explain the industrial process of Bioethanol production. [4]

P.T.O.

Q5) Write short notes on any two of the following.

[10]

- a) Role of biotechnology in mitigation of climate change.
- b) Vermicomposting.
- c) Biomass as an energy source.



Total No. of Questions : 5]

SEAT No. :

PE-4753

[Total No. of Pages : 2

[6519]-6

M.Sc. (Part - I)

BIOTECHNOLOGY

BT - 508 MJ : Food Biotechnology

(2023 Pattern) (Semester - I) (CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any Three questions from Q.2 to Q.5.
- 3) Question 2 to 5 carry equal marks.

Q1) Solve any Five of the following: [5]

- a) Write the difference between Probiotics and Prebiotics.
- b) Write the role of Vit B12 in our diet.
- c) Describe microbial spoilage of the milk.
- d) What are Functional Foods?
- e) Write any two applications of amylase in food processing.
- f) What is HACCP?

Q2) a) Explain How to process for bakery products. [6]

b) Discuss Indian and International quality system and standards for Food.[4]

Q3) a) Compare and contrast between Food infection and Food intoxication.[6]

b) Describe different types of Food Flavour enhancers in food additives.[4]

Q4) a) Explain different types of physical methods used in Food Preservation.[6]

b) Discuss the significance of bioactive peptides in health application. [4]

P.T.O.

Q5) Write short note on any two of the following.

[10]

- a) Golden rice
- b) Food Laws and regulations.
- c) Concept of nutrigenomics.



Total No. of Questions : 5]

SEAT No. :

PE-4754

[Total No. of Pages : 2

[6519]-7

M.Sc. (Part - I)

BIOTECHNOLOGY

BT-509-MJ : Biostatistics

(2023 Pattern) (CBCS) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.
- 4) Use of scientific calculator is allowed.

Q1) Solve any Five of the following :

[5]

- a) Define 'Level of significance'.
- b) Calculate coefficient of Kurtosis if $\mu_2 = 4$ and $\mu_4 = 2.4$. Comment on your result.
- c) Explain the term 'treatment' in design of experiment.
- d) The following figures represent the number of insects observed per leaf on a plant :
10, 15, 13, 18, 20
Calculate the median for the above data.
- e) Explain the term 'Variance'.
- f) Write the mathematical model for randomized block design (RBD).

Q2) a) Describe 'Simple random sampling' in detail.

[6]

- b) Two groups of certain types of patients A and B, each consisting of 200 people are used to test the effectiveness of a new serum. Both groups are treated identically except that group A was given serum while group B was not. It was found that 140 and 120 of group A and B respectively recover from the disease. Is the observed result sufficient evidence for the conclusion that the new serum helps to cure the disease, if we are willing to take risk of 0.01? {Table value; 2.706}.

[4]

P.T.O.

- Q3)** a) Explain 'One-way ANOVA' in detail. [6]
b) A drug was administered to 10 patients and increments in their blood pressure were recorded to be -2, -3, 0, 4, 4, 6, 3, 2, 6, 1. Is it reasonable to believe that the drug has no effect on change of blood pressure? Use 5% level of significance. {Table value : 2.26}. [4]
- Q4)** a) Discuss the term 'correction'. Also, explain its types with an example. [6]
b) A machine is designed to produce sugar coating with average thickness of 0.025 cm. A random sample of 10 capsules was found to have an average thickness of 0.024 cm with s.d. 0.02 cm. Test the significance of deviation. {Table value : 2.262} [4]
- Q5) Write short notes on any two of the following :** [10]
a) Randomization and Local control in design of experiment.
b) Spearman's rank correlation coefficient.
c) Type I and Type II errors.



Total No. of Questions : 5]

SEAT No. :

PE-4755

[Total No. of Pages : 2

[6519]-8

M.Sc.

BIOTECHNOLOGY

BT - 510 MJ : Rasayana : An Ancient Gerontology
(2023 Pattern) (Semester - I) (CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any Three questions from Q.2 to Q.5
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any Five of the following: [5]

- a) What is Shrikamya?
- b) What is Ajastrika?
- c) Explain Kamya rasayana.
- d) What is Probiotic?
- e) Give the role of rasayana in gerontology.
- f) What is immunity?

Q2) a) Describe neuroendocrine theory in detail. [6]

b) Explain Tridosha theory. [4]

Q3) a) Explain glucation theory of ageing and discuss its implications on cellular health. [6]

b) Describe Shrikamya rasayana and its significance in ayurveda. [4]

Q4) a) Rasayana Provides "Enhanced Instre" to rejuvenate the skin. Explain[6]

b) Explain mental competence. [4]

P.T.O.

Q5) Write a short notes on any two of the following.

[10]

- a) Immunity against disease.
- b) Wear and tear theory.
- c) Medhakamya.



Total No. of Questions : 5]

SEAT No. :

PE-4756

[Total No. of Pages : 2

[6519]-9

M.Sc.

BIOTECHNOLOGY

BT-511-RM : Research Methodology

(2023 Pattern) (CBCS) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any Five of the following :

[5]

- a) Define research.
- b) What do you mean by critical thinking?
- c) Enlist various method for secondary data collection.
- d) What is journal impact factor?
- e) Give importance of scientific communication.
- f) What is Bibliography?

Q2) a) Enlist different types of data. Explain in detail methods of primary data collection.

[6]

b) Discuss significance of literature review in research.

[4]

Q3) a) Explain in detail various modes of scientific communication with suitable example.

[6]

b) Discuss plagiarism detection softwares.

[4]

Q4) a) Discuss different research philosophies.

[6]

b) What is research hypothesis? How it is formulated?

[4]

P.T.O.

Q5) Write a short note on any Two of the following :

[10]

- a) Research Ethics.
- b) Parametric test of data analysis.
- c) Experimental design.



Total No. of Questions : 7]

SEAT No. :

PE-4757

[Total No. of Pages : 2

[6519]-21
M.Sc. I
BIOTECHNOLOGY
BT-551-MJ : Advanced Biological Chemistry
(2023 Pattern) (CBCS) (Semester - II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any five questions from Q.2 to Q.7.
- 3) Questions 2 to 7 carry equal marks.

Q1) Solve any Five of the following : **[10]**

- a) Define Turnover number.
- b) D and L configuration.
- c) Role of FMN/FAD.
- d) Phospholipids.
- e) Coenzymes and cofactors.
- f) Role of Glycogenin.

Q2) a) Discuss 2 phases of HMP pathway and its significance. **[7]**

b) Explain the Beta-oxidation of even chain saturated fatty acids. **[5]**

Q3) a) What is multienzyme complex? Explain the reactions catalysed by pyruvate Dehydrogenase Complex. **[7]**

b) Explain transamination with suitable examples. **[5]**

Q4) a) Describe different types of Reversible enzyme inhibition with suitable examples. **[7]**

b) Explain the significance of EMP pathway. How EMP pathway is regulated? **[5]**

P.T.O.

- Q5)** a) Explain titration curve of Glycine to determine its PI. [7]
b) What are storage polysaccharides? Explain structure of any one storage polysaccharide in detail? [5]
- Q6)** a) Explain various bypasses of Gluconeogenesis and reciprocal regulation of Glycolysis and Gluconeogenesis. [7]
b) Elaborate Lineweaver-Burk plot in presence of competitive inhibitor. [5]
- Q7) Write short note on any two of the following :** [12]
a) Energetics of complete oxidation of glucose molecule.
b) Fatty acid synthase complex.
c) Acid-Base catalysis.



Total No. of Questions : 7]

SEAT No. :

PE-4758

[Total No. of Pages : 2

[6519]-22
M.Sc. (Part - I)
BIOTECHNOLOGY
BT-552-MJ : Genetic Engineering
(2023 Credit Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any five questions from Q.2 to Q.7.
- 3) Questions 2 to 7 carry equal marks.

Q1) Solve any five of the following : **[10]**

- a) State the importance of cos sites in cosmid vector.
- b) Define anchor PCR.
- c) Enlist non-vector mediated gene transfer method.
- d) Define S_1 nuclease.
- e) Define Restriction modification system.
- f) What are Lambda replacement vectors?

Q2) a) What is alpha complementation? Explain with a suitable example. **[7]**

b) Comment on Electroporation method of gene transfer. **[5]**

Q3) a) Discuss various types of expression vectors and add a note on its applications. **[7]**

b) Comment on YAC as an high capacity vectors. **[5]**

Q4) a) Describe in detail any one method of nucleic acid hybridization. **[7]**

b) Explain any two DNA modifying enzymes in detail. **[5]**

P.T.O.

Q5) a) Give a detailed account on generalized and specialized transduction method of gene transfer. [7]

b) Comment on features of good host. [5]

Q6) a) Explain in detail real time PCR. Add a note on its application. [7]

b) Discuss various applications of transgenic plants with a suitable example. [5]

Q7) Write a short note on any two of the following : [12]

a) Adapters and Linkers.

b) Action of mechanism of DNases and RNases.

c) Agrobacterium mediated gene transfer.



Total No. of Questions : 5]

SEAT No. :

PE-4759

[Total No. of Pages : 2

[6519]-23
M.Sc. (Part - I)
BIOTECHNOLOGY
BT - 553 MJ : Advanced Genetics
(2023 Credit Pattern) (Semester - II)(CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any 3 questions from Q.2 to Q.5*
- 3) *Question 2 to 5 carry equal marks.*

Q1) Solve any 5 of the following: **[5]**

- a) Write any two applications of Pedigree analysis.
- b) Define Monohybrid Cross.
- c) What is polygenic inheritance?
- d) Write one use of complementation test.
- e) Mention the significance of genetic maps.
- f) What is Loss of function mutation?

Q2) a) Describe the procedure of restriction mapping & give its significance in constructing genetic maps. **[6]**

b) Explain the concept of Pseudo - autosomal regions. **[4]**

Q3) a) Define Muller's morphs and categorize the types based on functional characteristics. **[6]**

b) Write a note on 'FISH' **[4]**

Q4) a) Explain complementation test with a suitable example. **[6]**

b) Give differences somatic and Germline mutations. **[4]**

P.T.O.

Q5) short notes (any two)

[10]

- a) Complete Linkage.
- b) Morphological and Lethal Mutants.
- c) Explain test Cross.



Total No. of Questions : 5]

SEAT No. :

PE-4760

[Total No. of Pages : 2

[6519]-24
M.Sc. - I
BIOTECHNOLOGY
BT-560-MJ : Nanotechnology
(CBCS) (2023 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. 1 is compulsory*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Answer Any Five of the following :

[5]

- a) Define quantum dots.
- b) What does 'nano' means?
- c) Who is known as father of nanotechnology,
- d) Which property of nanomaterial makes them different from bulk material?
- e) Name any one method of Top-down approach in nanoparticle synthesis
- f) Name a common reducing agent used in chemical synthesis method.

Q2) a) Describe in detail sol-gel method and its advantages.

[6]

- b) Write the principle of UV- visible spectroscopy and its applications in nanotechnology.

[4]

P.T.O.

Q3) a) Describe green synthesis of nanoparticles. Write its benefits over chemical and physical method. [6]

b) Discuss the environmental and health impact of nanoparticles. [4]

Q4) a) Explain a physical method involves microwave assisted technique and its advantages. [6]

b) Discuss the principle of FTIR and its applications in nanotechnology.[4]

Q5) Write short notes on any two of the following : [10]

a) Nanoparticle - cell interactions

b) Nanosensors

c) Nano technology in Agriculture.



Total No. of Questions : 5]

SEAT No. :

PE-4761

[Total No. of Pages : 2

[6519]-25

M.Sc. (Part - I)

BIOTECHNOLOGY

BT - 562 MJ : Stem Cells and Regenerative Technology
(2023 Pattern) (Semester - II)(CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any 3 questions from Q.2 to Q.5
- 3) Question 2 to 5 carry equal marks.

Q1) Solve any five of the following: [5]

- a) Define multipotent stem cells. Give one example.
- b) Mention two important milestones in stem cell research.
- c) Define symmetric partitioning in stem cell niche.
- d) Write two similarities between embryonic stem cells and induced pluripotent stem cells.
- e) Give two examples of adult stem cells.
- f) Explain concept of regenerative medicine.

Q2) a) Define stem cells. Give their characteristics. Add a note on embryonic stem cells. [6]

b) Comment on hematopoietic stem cell lineage. [4]

Q3) a) Explain concept of stem cell niche with suitable example. [6]

b) Mention various strategies for promoting organ regeneration using stem cells. [4]

P.T.O.

- Q4)** a) Elaborate any one method used for reprogramming of somatic cells into induced pluripotent stem cells. **[6]**
- b) What are cardiac stem cells? Mention their role in heart repair. **[4]**

Q5) Write short notes on any two of the following. **[10]**

- a) Ethical challenges in stem cell research.
- b) Cancer immunotherapy
- c) Tissue homeostasis & stem cells.



Total No. of Questions : 5]

SEAT No. :

PE-4762

[Total No. of Pages : 2

[6519]-26
M.Sc. - I
BIOTECHNOLOGY
BT-564-MJ : Tissue Engineering
(2023 Pattern) (CBCS) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any five of the following : **[5]**

- a) What is bioglass?
- b) Write contribution of Alexis carrel in Tissue Engineering (TE).
- c) Name any one computational modeling based approach for cell mechanics.
- d) Give any two suitable scaffold material for corneal tissue Engineering.
- e) Name any two cells sources for tissue engineering.
- f) Mention any two growth factor for Tissue Engineering.

Q2) a) Describe the methods used to measure rheological properties of tissue engineering constructs. **[6]**

b) Write the role of media components in cellular differentiation in tissue engineering. **[4]**

Q3) a) Compare and contrast of different types of Biomaterials used in tissue engineering. Discuss there advantages and limitations. **[6]**

b) What are hydrogels? Mention their properties. **[4]**

Q4) a) Enlist applications of tissue engineering. Elaborate in detail any two of them. **[6]**

b) Explain the process of fabrication of scaffold. **[4]**

P.T.O.

Q5) Solve any two from the following :

[10]

- a) Organ-on-chip.
- b) Artificial skin substitutes.
- c) GMP practices in tissue engineering.



Total No. of Questions : 5]

SEAT No. :

PE-5411

[Total No. of Pages : 2

[6519]-27
M.Sc.-I
BIOTECHNOLOGY
BT-566-MJ : Herbal Medicine
(CBCS) (2023 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Question 2 to 5 carry equal marks.*

Q1) Solve any Five of the following : **[5]**

- a) Give classification of plant secondary metabolites.
- b) What are primary metabolites of plants?
- c) Enlist any two alkaloid drugs.
- d) Give application of anthracene derivatives.
- e) Enlist any two example of essential oils as herbal drug.
- f) Give examples of pigments as herbal medicine.

Q2) a) Describe the analytical methods for analysing secondary metabolites of plants. **[6]**

b) What are Flavanoids? Give its application. **[4]**

Q3) a) Discuss guidelines for manufacturing of herbal drugs. **[6]**

b) Give an account on morphine. **[4]**

P.T.O.

Q4) a) What are different methods to evaluate efficacy of secondary metabolites? Explain. **[6]**

b) Give application of Cannabinoids and Kavapyrones. **[4]**

Q5) Write short notes on any two : **[10]**

a) Cardiac glycoside drugs

b) Marketing of herbal drugs

c) Extraction of secondary metabolites.



Total No. of Questions : 7]

SEAT No. :

PE-4763

[Total No. of Pages : 2

[6519]-31
M.Sc. (Part - II)
BIOTECHNOLOGY
BT - 601 MJ : Physiology
(2023 Pattern) (CBCS) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any Five questions from Q.2 to Q.7*
- 3) *Questions 2 to 7 carry equal marks.*

Q1) Solve any Five of the following: **[10]**

- a) Explain Blue Light Photoreceptor.
- b) What is mechanoreceptor?
- c) Define vernalisation.
- d) What is Trail following?
- e) Enlist examples of short day plants.
- f) What is photoreceptor?

Q2) a) Describe role of hormones in maintaining salt and water balance. **[7]**

b) Discuss characteristics of phytochrome induced responses. **[5]**

Q3) a) Explain different types of drought resistance mechanisms. **[7]**

b) Discuss the role of ions generating membrane potential. **[5]**

Q4) a) Discuss in detail the role of calcium with respect to contractile muscle protein. **[7]**

b) Describe the importance of Blue light stimulated responses. Add a note on its photophysiology. **[5]**

P.T.O.

- Q5)** a) Describe the role of long-distance signaling in flowering including role of florigen. [7]
b) Discuss in detail magnetoreceptor and importance of adaptive navigation in animal. [5]
- Q6)** a) Explain the functions of phytochromes in plant development. [7]
b) Comment on insect metamorphosis. [5]
- Q7)** Write a short notes on any two of the following. [12]
a) Mechanism of adaptation to high light stress.
b) Factors affecting synaptic transmission.
c) Hormones of Hypothalamus.



Total No. of Questions : 5]

SEAT No. :

PE-4764

[Total No. of Pages : 2

[6519]-32
M.Sc. - II
BIOTECHNOLOGY
BT-602-MJ : Plant Biotechnology
(2023 Pattern) (CBCS) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any five of the following : **[5]**

- a) Define somatic embryogenesis.
- b) Give two examples of GM crops.
- c) Enlist different stages of micro propagation.
- d) What is selectable marker?
- e) Write any two example of industrially important secondary metabolites.
- f) What do you mean by molecular farming?

Q2) a) What is transformation? Discuss direct methods of the transformation in detail. **[6]**

b) Give applications of organogenesis. **[4]**

Q3) a) "Transgenic technology is used for enhanced production of secondary metabolites". Explain with suitable example. **[6]**

b) What is endosperm? Give applications of endosperm culture. **[4]**

Q4) a) Describe role of genetic engineering in improving quality and quantity of algae biomass. Discuss some examples of genetically modified algae with enhanced trait. **[6]**

b) Diagrammatically explain Ti plasmid. **[4]**

P.T.O.

Q5) Write a short note on any Two of the following :

[10]

- a) Suspension culture.
- b) QTL
- c) Marker free transgenics.



Total No. of Questions : 5]

SEAT No. :

PE-4765

[Total No. of Pages : 2

[6519]-33
M.Sc. (Part - II)
BIOTECHNOLOGY
BT-603-MJ : Animal Biotechnology
(2023 Pattern) (CBCS) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve Any Five of the following :

[5]

- a) Give two Examples of molecular drug produced using animal cell culture.
- b) Define pronuclear microinjection.
- c) Mention the contribution of any two scientist in the history of Animal tissue culture.
- d) What are the characteristics of biomaterials?
- e) Write any two bioethical issues associated with human cloning.
- f) Give difference between knock out and knock in animals.

Q2) a) What are monoclonal antibodies? Explain the production of monoclonal antibodies using hybridoma technology.

[6]

- b) Elaborate the types of animal tissue culture with their characteristics. Differentiate between monolayer and suspension culture.

[4]

P.T.O.

- Q3)** a) What are stem cells? Describe its type based on potency and sources with examples. Add a note of stem cell maintenance. **[6]**
- b) Discuss the recent development in the use of tissue Engineering in therapeutics in context to skin & bones. **[4]**
- Q4)** a) Explain in detail the mechanism of CRISPR/CAS9 for targeted genome editing to generate knockout mouse model. **[6]**
- b) What do you understand by biosafety? Explain the types of biosafety levels in biotechnology. Add a note of its significance in animal biotechnology. **[4]**
- Q5)** Write short note on any two of the following : **[10]**
- a) 3D Printing
- b) Cloning in animal biotechnology
- c) IVF



Total No. of Questions : 5]

SEAT No. :

PE-4766

[Total No. of Pages : 2

[6519]-34

M.Sc. (Part - II)

BIOTECHNOLOGY

BT - 604 MJ : Emerging Trends in Biotechnology
(2023 Pattern) (Semester - III)(CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any 3 questions from Q.2 to Q.5
- 3) Question 2 to 5 carry equal marks.

Q1) Solve any five of the following: [5]

- a) Enlist the methods of single cell isolation.
- b) What are the sources of Mesenchymal stem cells?
- c) Define GMA'S
- d) What are bioinks?
- e) Enlist the applications of pharmacogenomics.
- f) Aqua advantage Salmon.

Q2) a) What is CAR-T cell therapy? Explain its applications in medicine. [6]

- b) Explain the advantages of Robots and drones in crop monitoring and precision spraying. [4]

Q3) a) What is single cell sequencing? Describe the key steps involved in single cell sequencing. [6]

- b) What are advantages of vertical farming compared to traditional farming. [4]

P.T.O.

- Q4)** a) Explain 16s rRNA Sequencing and its application in microbiome analysis? **[6]**
- b) Describe the advantages of 3D Bioprinted tissue and organs. **[4]**

Q5) Write short note on any two of the following. **[10]**

- a) Plants with altered oil composition.
- b) Machine learning and AI in Biomarker discovery.
- c) Mesenchymal stem cell therapy.



Total No. of Questions : 5]

SEAT No. :

PE-4767

[Total No. of Pages : 2

[6519]-35
M.Sc. (Part - II)
BIOTECHNOLOGY
BT-610-MJ : Molecular Diagnostics
(2023 Pattern) (CBCS) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve any Five of the following :

[5]

- a) State factors responsible for onset of type II diabetes.
- b) What are predictive biomarkers?
- c) Mention the use of CSGE in diagnostics,
- d) What is a function of amelogenin?
- e) Give any two biomarkers for diagnosis of COVID.
- f) Mention any two advantages of molecular diagnosis over traditional methods of diagnosis.

Q2) a) Discuss in detail molecular polymorphism in pathogens. Write its implication in diagnosis of infectious diseases. **[6]**

b) Give in detail methods of prenatal diagnosis of genetic diseases. **[4]**

P.T.O.

Q3) a) What is ARMS-PCR? Write in detail its methodology and application in diagnosis. [6]

b) Discuss in brief Y-STR typing and its significance. [4]

Q4) a) Write in detail etiology of eahcer. Add a note any one method of detection. [6]

b) Describe MALDI-TOF and its applications in diagnosis. [4]

Q5) Write note on any two : [10]

a) Diagnosis of sickle cell anemia

b) Quantitative ELISA

c) DHPLC in diagnosis.



Total No. of Questions : 5]

SEAT No. :

PE-4768

[Total No. of Pages : 2

[6519]-36
M.Sc. (Part - II)
BIOTECHNOLOGY
BT-612-MJ : Infectious Diseases and Vaccine Technology
(2023 Pattern) (CBCS) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve any Five of the following :

[5]

- a) Enlist any two modes of transmission of infections.
- b) Explain the concept of syndromic approach in infectious diseases
- c) Write any two ectoparasite diseases.
- d) Define passive immunization.
- e) Name any two common disinfectants use to control diseases.
- f) Write any two factors which make a host special for susceptibility to infections.

Q2) a) Describe any two bacterial diseases with reference to mode of transmission, pathogenesis and treatment. **[6]**

b) “Cancer patients have increased risk of acquiring infections” Justify. **[4]**

P.T.O.

- Q3)** a) Describe different microscopic methods used in diagnosis of infectious disease with suitable example. **[6]**
- b) Explain any two common fungal diseases in detail in immunocompromised host. **[4]**
- Q4)** a) Enlist different emerging and reemerging diseases, explain any one in detail. **[6]**
- b) Explain how to prevent hospital acquired infections. **[4]**
- Q5)** Write short note on any two of the following : **[10]**
- a) Herd immunity.
- b) Epidemic alert
- c) Challenges in vaccine development process.



Total No. of Questions : 5]

SEAT No. :

PE-4769

[Total No. of Pages : 2

[6519]-37
M.Sc. (Part - II)
BIOTECHNOLOGY
BT-614-MJ : Biofuel Technology
(2023 Pattern) (CBCS) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve Any Five of the following :

[5]

- a) What is biofuel?
- b) Name different types of biogas digesters.
- c) Explain the term fusel oil.
- d) Enlist applications of bio-oil.
- e) Explain first generation biofuel.
- f) What is carbon foot printing,

Q2) a) Give an account on molasses-based bioethanol production.

[6]

b) Discuss steps involved in biodiesel purification.

[4]

P.T.O.

Q3) a) Enlist and explain different methods of saccharification. **[6]**

b) Mention criteria for selection of yeast strain in bioethanol production. **[4]**

Q4) a) Describe steps involved in biodiesel production. **[6]**

b) What is distillation? Explain its utility and importance in alcohol production. **[4]**

Q5) Write a short note on any two of the following : **[10]**

a) Environmental aspects of biofuel.

b) Upgradation of biogas to biomethane

c) Gasification process



Total No. of Questions : 5]

SEAT No. :

PE-4770

[Total No. of Pages : 2

[6519]-38
M.Sc. (Part - II)
BIOTECHNOLOGY
BT-616-MJ : Biotechnology for Sustainable Development
(2023 Pattern) (CBCS) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve Any Five of the following :

[5]

- a) Name any one renewable energy source that contributes to sustainable development.
- b) Write composition of biogas.
- c) Give 2 examples of microorganisms used in bioleaching.
- d) Enlist primary feed-stocks used for bioethanol.
- e) Enlist applications of biofertilizers.
- f) Give examples of microbial strains used in degradation of aromatic hydrocarbons.

Q2) a) Describe the general moodess of uranium bioleaching from ore to recovery.

[6]

- b) What is Acrylamide? Give its applications.

[4]

P.T.O.

Q3) a) Explain how do you compare the effectiveness of MEOR over traditional oil recovery methods. **[6]**

b) Explain how waste material serve as substrate for ethenol production. **[4]**

Q4) a) Discuss the use of nanotechnology in development of biodegradable material. **[6]**

b) Describe potential benefits of GMO in agriculture. **[4]**

Q5) Write short notes on any two of the following : **[10]**

a) Organic farming

b) Bioconversion

c) Golden rice.



Total No. of Questions : 5]

SEAT No. :

PE-4771

[Total No. of Pages : 2

[6519]-39

M.Sc. - II

BIOTECHNOLOGY

BT-618-MJ : Biosensor Technology

(2023 Credit Pattern) (CBCS) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Answer any five of the following : [5]

- a) Nor contact Biosensor.
- b) Sol-gel materials.
- c) Semiconductors used in Biosensors.
- d) Acoustic wave detection method.
- e) Zeolites used in biosensors.
- f) Aptamers in biosensors.

Q2) a) Comment on the ideal materials used in Biosensors. [6]

b) Explain the role of biosensors in agriculture. [4]

Q3) a) What is the role of transducers in biosensors. Explain any two types.[6]

b) Discuss on cell - based biosensors. [4]

Q4) a) Explain the fluorescence based method for detection of signals in biosensors. [6]

b) Comment on DNA as biological recognition system for biosensor.[4]

P.T.O.

Q5) Write short notes on any Two of the following :

[10]

- a) Applications of biosensors in medicine and health care
- b) Chemiluminiscence based biosensors.
- c) Generations of biosensors.



Total No. of Questions : 5]

SEAT No. :

PE-4772

[Total No. of Pages : 2

[6519]-40

M.Sc. (Part - II)

BIOTECHNOLOGY

BT-620-MJ : Intellectual Property Right (IPR)
(2023 Pattern) (CBCS) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any five of the following : **[5]**

- a) Which organization oversees international IPR issues?
- b) What is the purpose of TRIPS?
- c) What are broad costing rights?
- d) Enlist criteria of patentability.
- e) Define IP.
- f) What is the purpose of Trademark?

Q2) a) Discuss patentability of microorganism. Comment on Budapest treaty and IDA. **[6]**

b) Discuss Biological Diversity Act, 2002. **[4]**

Q3) a) What is copyright? Describe the process of registration of copyright in India. **[6]**

b) Elaborate on provisional and complete specifications. **[4]**

Q4) a) Discuss registration of plant varieties and essentially derived variety comment on Benefit sharing. **[6]**

b) What is Trade secret? Discuss its importance in Biotechnology. **[4]**

P.T.O.

Q5) Write short notes on any Two of the following :

[10]

- a) Patent infringement & Remedies.
- b) Industrial Designs.
- c) Indian Perspectives of patents.



Total No. of Questions : 5]

SEAT No. :

PE-4773

[Total No. of Pages : 2

[6519]-41

M.Sc. - (Part - II)

BIOTECHNOLOGY

**BT-622-MJ : Biofertilizer and Biopesticide Technology
(2023 Pattern) (CBCS) (Semester - III)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any five of the following : **[5]**

- a) What are biorational pesticides?
- b) Give example of any 2 symbiotic N₂ fixers.
- c) What is Solubalization Index (SI)? Give its formula.
- d) Define Regulon.
- e) Mention Negative Regulator of Nif gene.
- f) Name any 2 Bacterial biopesticides.

Q2) a) Give an account of NPV biopesticides production along with its mode of action. **[6]**

b) Explain classification of biopesticides. **[4]**

Q3) a) Discuss different Steps involved in strain selection and development. **[6]**

b) Mention Government policies for biofertilizers. **[4]**

Q4) a) What is PGPB? Write its significance and advantages in agriculture. **[6]**

b) Comment on "Role of microorganisms as biocontrol agent. **[4]**

P.T.O.

Q5) Write a short note on any Two of the following :

[10]

- a) Scope of biopesticides.
- b) Application technology for seed & seedling biopertilizer.
- c) Biofumigants as Biopesticides.



Total No. of Questions : 5]

SEAT No. :

PE-4774

[Total No. of Pages : 2

[6519]-42

M.Sc. - II

BIOTECHNOLOGY

**BT-624-MJ : Machine Learning and Data Science
(2023 Pattern) (CBCS) (Semester - III)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question No. 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions No. 2 to 5 carry equal marks.

Q1) Solve any five of the following : **[5]**

- a) Define Artificial Intelligence.
- b) State the different types of data.
- c) Give any one task involved in predictive type.
- d) Give any two issues in machine learning.
- e) What do you mean by semi-supervised machine learning?
- f) What is neuron?

Q2) a) Explain importance of feature engineering in biotechnological data.**[6]**

b) Give real -life example of reinforcement learning. **[4]**

Q3) a) Differentiate between supervised learning and unsupervised learning.**[6]**

b) Compare feature selection with feature extraction. **[4]**

Q4) a) Explain the Data Visualization Technique **[6]**

i) Scatter Plot

ii) Box Plot

b) What do you mean by image analysis? **[4]**

P.T.O.

Q5) Write short notes on (any Two) :

[10]

- a) Applications of machine learning in drug design.
- b) Applications of machine learning in Sequence Analysis.
- c) Descriptive tasks in machine learning.



Total No. of Questions : 5]

SEAT No. :

PE-4775

[Total No. of Pages : 1

[6519]-51
M.Sc. (Part - II
BIOTECHNOLOGY
BT-651-MJ : Bioprocess Engineering
(2023 Pattern) (CBCS) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Attempt any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any five of the following : **[5]**

- a) What do you understand by bioprocess engineering?
- b) Define Delfactor.
- c) Ion exchange chromatography is purification.
- d) Write Monod equation.
- e) What are chelators?
- f) Write about Anerobic fermentation.

Q2) a) Draw a well labelled diagram of a fermenter and explain its main components with their functions. **[6]**

b) Differentiate between upstream and downstream processing. **[4]**

Q3) a) How do areation and agitation takes place is fermenter?
What is the importance of areation and agitation in fermenter. **[6]**

b) Explain the principle and application of two phase aqueous extraction. **[4]**

Q4) a) What is cell disruption? Why it is attempted? Describe the various methods of cell disruption in detail. **[6]**

b) Compare between batch and continuous fermentation processes. **[4]**

Q5) Solve any two: **[10]**

- a) P.I.D. controller.
- b) Oxygen transfer rate.
- c) KLa.



Total No. of Questions : 5]

SEAT No. :

PE-4776

[Total No. of Pages : 1

[6519]-52
M.Sc. (Part - II)
BIOTECHNOLOGY
BT-652-MJ : Genomics
(2023 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Attempt any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any five of the following : **[5]**

- a) Define epigenetics.
- b) What are the types of non-coding RNA's?
- c) Which technique is for studying dynamics of chromosomes.
- d) Enlist types of Histone modifications.
- e) What is western blotting.
- f) Define genomics?

Q2) a) Give in detail account on chromosome conformation capture technique. **[6]**

b) Write in brief on chromatin modification. **[4]**

Q3) a) Give in detail account on sanger sequencing, explain the advantages of sanger sequencing over chemical method of DNA sequencing. [6]

b) Explain the role of DNA methylation with respect to gene expression.[4]

Q4) a) Explain Bisulphite sequencing & its working in DNA methylation analysis. [6]

b) Give a brief account on pharmacogenomics. **[4]**

Q5) Write short note on any two of the following : **[10]**

- a) Bioinformatics tools & databases.
- b) Toxicogenomics.
- c) Ethical & legal issues in genomics.



Total No. of Questions : 5]

SEAT No. :

PE-4777

[Total No. of Pages : 1

[6519]-53
M.Sc. (Part - II)
BIOTECHNOLOGY
BT-653-MJ : Proteomics
(2023 Credit Pattern) (CBCS) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve any five of the following : **[5]**

- a) Define annotation.
- b) Function of PSI-BLAST in Proteomics.
- c) Amino acid sequence database.
- d) Structural Proteomics.
- e) What is time of flight?
- f) Name 2 tools used for Pathway mapping.

Q2) a) Comment on the first dimension used for separation of proteins using 2D gel electrophoresis. **[6]**

b) After ionization and fragmentation what does a MS do to provide a mass spectrum. **[4]**

Q3) a) Explain the steps involved in predicting the function of an unknown protein using conserved domain. **[6]**

b) Discuss the methods used to detect the protein-protein interaction. **[4]**

Q4) a) Discuss the method of Edman degradation for elucidating the primary structure of protein. **[6]**

b) Comment on the advantages of using SEQUEST in Proteomics as compared to standard sequence alignment tools. **[4]**

Q5) Write short notes on any 2 of the following : **[10]**

- a) Protein folding
- b) Drug target discovery
- c) De novo Peptide sequence information.



Total No. of Questions : 5]

SEAT No. :

PE-4778

[Total No. of Pages : 2

[6519]-54

M.Sc. (Part - II)

BIOTECHNOLOGY

BT - 654 MJ : Bioinformatics and Structural Biology
(2023 Pattern) (Semester - IV)(CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any 3 questions from Q.2 to Q.5
- 3) Question 2 to 5 carry equal marks.

Q1) Answer any five of the following: [5]

- a) Enlist any two types of bonds in Biomolecules.
- b) What is TEM.
- c) Name the methods of tertiary structure prediction of proteins.
- d) What is PSA?
- e) Enlist any two structural databases.
- f) What is glycosidic linkage?

Q2) a) What is Ramchandran plot? Describe its different regions and how it is used in protein structure validation. [6]

b) Describe any one computational method used for binding pocket prediction. [4]

Q3) a) Describe lipid classification. Explain function and structure of each class.[6]

b) Discuss the steps involved in integrative modelling. [4]

P.T.O.

- Q4)** a) Explain the role of structural databases in structural alignment of proteins. [6]
b) Discuss the methods of RNA tertiary structure prediction. [4]

- Q5)** Write short note on any two of the following. [10]
a) EM and its applications
b) HMM and Neural network
c) Structural organisation of Nucleic acids.



Total No. of Questions : 5]

SEAT No. :

PE-4779

[Total No. of Pages : 2

[6519]-55
M.Sc. (Part - II)
BIOTECHNOLOGY
BT - 660 MJ : System Biology
(2023 Pattern) (Semester - IV)(CBCS)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any 3 questions from Q.2 to Q.5*
- 3) *Question 2 to 5 carry equal marks.*

Q1) Solve any Five of the following: **[5]**

- a) What is the function of the "Plot" command in MATLAB?
- b) What type of network is used to represent interaction between genes & their regulatory elements.
- c) Define Host-pathogen interaction modelling.
- d) Define Network motifs.
- e) What is biological network?
- f) What is PYGMO?

Q2) a) Describe how MATLAB can be used to implement and simulate of biological system. provide examples of how to use MATLAB. **[6]**

b) How does PYGMO enhance evolutionary computation. **[4]**

Q3) a) Discuss the use of the COBRA tool box in studying in metabolic network and How does this method help in understanding metabolic disorders.**[6]**

b) What does robustness mean in biological system. **[4]**

P.T.O.

- Q4)** a) Discuss the significance of modeling in drug development and the role of computational methods in optimizing drug design. **[6]**
- b) What is the direct search method in parameter estimation? **[4]**

- Q5)** Write short note on: **[10]**
- a) Flux balance analysis.
- b) Cytoscape
- c) Genetic algorithms.



Total No. of Questions : 5]

SEAT No. :

PE-4780

[Total No. of Pages : 1

[6519]-56
M.Sc. (Part - II)
BIOTECHNOLOGY
BT-662-MJ : Synthetic Biology
(2023 Credit Pattern) (CBCS) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any five of the following : **[5]**

- a) What are toggle switches?
- b) Define Xenobiology.
- c) Give any two commercial synthetic biology products.
- d) Enlist any two genome editing software.
- e) What is synthetic vaccine?
- f) What do you mean by terminators?

Q2) a) Describe mechanism of action of CAR T-cell therapy. How do CAR T-cell recognize & eliminate cancer cell. **[6]**

b) Discuss Flux balance analysis in synthetic biology. **[4]**

Q3) a) Discuss features and applications of specific database resource used in synthetic biology. **[6]**

b) Describe importance of standardization in synthetic biology protocols. **[4]**

Q4) a) What is artificial life? How does it differ from traditional biology? Discuss the potential applications and implications of artificial life research. **[6]**

b) Explain design principle of genetic circuit. **[4]**

Q5) Write short notes on any two of the following : **[10]**

- a) Ethical consideration in synthetic biology.
- b) CRISPR-cas g technology.
- c) Logic gates.



Total No. of Questions : 5]

SEAT No. :

PE-4781

[Total No. of Pages : 1

[6519]-57
M.Sc. (Part - II)
BIOTECHNOLOGY
BT-664-MJ : Biologics and Biosimilars
(2023 Pattern) (CBCS) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any five of the following : **[5]**

- a) What is Biologics?
- b) State role of cell culture in biologics development.
- c) Define pharmacokinetics.
- d) What do you mean by biosimilars?
- e) Enlist emerging biotherapies.
- f) What CAR-T stands for?

Q2) a) Give a brief account on drug targets for biologics. **[6]**

b) Explain biomimics and biobetters. **[4]**

Q3) a) Elaborate on pharmacovigilance of new biosimilars. Comment on challenges in pharmacovigilance. **[6]**

b) Explain immune checkpoint antagonism. **[4]**

Q4) a) Elaborate on downstream processing and purification techniques of biologics. **[6]**

b) Explain major classes of biotherapeutics. **[4]**

Q5) Write short notes on any two of the following : **[10]**

- a) Biologics Licence Application.
- b) Ethical standards for biologics.
- c) Regulatory guidelines of biosimilars.



Total No. of Questions : 5]

SEAT No. :

PE-4782

[Total No. of Pages : 1

[6519]-58
M.Sc. (Part - II)
BIOTECHNOLOGY
BT-666-MJ : Quality Control and Biosafety
(2023 Pattern) (CBCS) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Answer any five of the following : **[5]**

- a) What is role of GEAC?
- b) State any two importance of validation elements.
- c) Enlist laboratory associated infections.
- d) State the significance of Audit.
- e) What are the personal protective equipments.
- f) Define Quality planning.

Q2) a) Describe safety considerations in clinical trials. **[6]**

b) Comment on scheduling & tracking of documents. **[4]**

Q3) a) Explain importance of calibration procedures. **[6]**

b) Discuss on regulatory requirements for pharma product development. **[4]**

Q4) a) Prepare HACCP based SOP's for Agriculture based product. **[6]**

b) Elaborate on fire prevention methods. **[4]**

Q5) Write short note on any 2 of the following : **[10]**

- a) Chemical & Radiation Hazards.
- b) Laboratory management procedure.
- c) Regulation of clinical trials.



Total No. of Questions : 5]

SEAT No. :

PE-4783

[Total No. of Pages : 2

[6519]-59

M.Sc. (Part - II)

BIOTECHNOLOGY

BT-668-MJ : Bio-entrepreneurship

(2023 Pattern) (CBCS) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) **Question 1 is compulsory.**
- 2) **Solve any three questions from Q2 to Q5.**
- 3) **Questions 2 to 5 carry equal marks.**

Q1) Solve any five of the following :

[5]

- a) Idea generation
- b) Role of Department of Biotechnology, GoI.
- c) Define Bio learning.
- d) Define Entrepreneur.
- e) What is risk management in a startup.
- f) Incubation centre.

Q2) a) Discuss the process of evolution and growth of entrepreneurship in India.

[6]

b) Comment on the role of Government agencies to boost entrepreneurial environment.

[4]

Q3) a) Discuss the emerging industries of Bioentrepreneurs in environmental biotechnology.

[6]

b) Comment on the concept and techniques of divergent thinking.

[4]

P.T.O.

- Q4)** a) Define contract Research Organization and discuss its role in the incubation of innovative ideas. [6]
b) Comment on the pillars of bioentrepreneurship. [4]

Q5) Write short notes on any two of the following : [10]

- a) Elements of entrepreneurial opportunities.
- b) Key components of a business plan for a venture.
- c) Impact of technological advancement on the future of bioentrepreneurship.



Total No. of Questions : 5]

SEAT No. :

PE-4784

[Total No. of Pages : 2

[6519]-60
M.Sc. (Part -II)
BIOTECHNOLOGY
BT-670-MJ : Rational Drug Discovery and Development
(CBCS) (2023 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve any Five of the following :

[5]

- a) What is polypharmacology?
- b) State importance of phase zero of clinical trials.
- c) What is NDA? State its importance.
- d) Define pharmacophore.
- e) State role of small molecules in drug designing.
- f) Enlist databases of drugs.

Q2) a) Explain ligand based drug design approach in drug development.

[6]

b) Explain need, importance and process of personalized medicine.

[4]

P.T.O.

Q3) a) Describe various phases of clinical trials. Justify the need of post marketing surveillance. [6]

b) Explain QSAR model in drug designing. [4]

Q4) a) Give a brief account on identification and validation of drug targets. Comment on druggability. [6]

b) What are small molecules? Explain small molecule databases. [4]

Q5) Write short notes on any two of the following : [10]

a) HTS and Assay development

b) Need and use of animal studies

c) Rules of drug likeness



Total No. of Questions : 5]

SEAT No. :

PE-4785

[Total No. of Pages : 2

[6519]-61
M.Sc. (Part -II)
BIOTECHNOLOGY
BT-672-MJ : Agriculture Biotechnology
(CBCS) (2023 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Answer Any Five of the following :

[5]

- a) Define somaclonal variations.
- b) Enlist beneficial microorganisms in agriculture.
- c) How can homozygous diploid plant be produced?
- d) What is flavr savr tomato?
- e) Define virus indexing.
- f) What are therapeutic proteins?

Q2) a) Describe the role of R-DNA technology in improvement of crop quality with suitable example. **[6]**

- b) State and comment on the importance of agriculture in national economy. **[4]**

P.T.O.

- Q3)** a) Describe a case study on commercial propagation of Banana plant. [6]
b) Comment on endosperm culture and state its application. [4]
- Q4)** a) Explain in detail somatic hybridization and its applications in Agriculture. [6]
b) Elaborate on the role of bioreactor in plant production. [4]
- Q5)** Write short notes on any two of the following : [10]
a) Scale up and commercialization of plant product
b) Embryo rescue in rearing viable hybrid embryo's
c) Stages of micropropagation.



Total No. of Questions : 4]

SEAT No. :

PE-4786

[Total No. of Pages : 2

[6519]-62
M.Sc. (Part -II)
BIOTECHNOLOGY
BT-674-MJ : Medical Biotechnology
(CBCS) (2023 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Solve any three questions from Q. 2 to Q. 5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Solve Any Five of the following :

[5]

- a) What are monoclonal antibodies?
- b) Justify the name sickle cell anemia.
- c) Mention the molecular therapy for diabetes.
- d) What are stem cells?
- e) Define ribozymes.
- f) State two advantages of modern vaccine technology.

Q2) a) Describe polygenic disorders with suitable examples.

[6]

b) Discuss enzyme therapy with suitable example.

[4]

P.T.O.

Q3) a) Explain the term gene therapy. Discuss Ex-vivo and In-vivo gene therapy. **[6]**

b) Justify significance of biosensors in clinical diagnosis. **[4]**

Q4) a) Elaborate on the role of PCR and microarray technology in disease diagnosis. **[6]**

b) Illustrate genetic counseling. **[4]**

Q5) Write short notes on any two of the following : **[10]**

a) Properties of stem cells.

b) Strategies of gene therapy.

c) Type - I diabetes.

