CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations June, 2023

Programme: M.Sc. Biotechnology **Session: 2022-24**

Semester: Second **Max. Time: 3 Hours**

Course Title: Genetic Engineering **Max. Marks: 70**

Course Code: SIAS BT 1 2 04 C 3003

Instructions:

1. Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and student need to answer any two parts of each question. Each part carries seven marks.

Q 1. **(4X3.5=14)**

a) Provide differences between microarray and RNAseq techniques and list different approaches for transcriptome profiling
b) List essential features of cloning plasmid vector
c) Describe GoldenGate cloning approach and explain TypeIIS restriction enzyme
d) Calculate the fold change of a target gene under stress conditions compared to control conditions using the ΔΔCT method. Given that the Ct value of the target gene is 20 under control and 19 under stress, and the Ct value of the reference gene is 18 under both control and stress conditions.
e) Provide detailed classification of genetic markers
f) Describe in details the steps involved in CTAB mediated plant DNA extraction method
g) Explain steps involved in the production of recombinant protein in yeast host

Q 2. **(2X7=14)**

a) List essential requirements outlined in the MIQE guidelines and golden rules of qRT-PCR (quantitative real-time PCR).
b) Describe the one-step and two-step quantitative real-time PCR method for gene expression evaluation
c) Write the steps involved in Plasmid DNA extraction using the Alkaline lysis method

Q 3. **(2X7=14)**

a) List different types of enzymes useful for the recombinant DNA technology

b) Explain binary plasmid vector and what are the steps involved in the agrobacterium mediated plant transformation

c) Describe in details gene gun (biolistic particle delivery system) for genetic transformation

Q 4. **(2X7=14)**

a) Explain the site directed mutagenesis method to change single nucleotide in any target sequence

b) Classify different mutagens being used for the induced mutagenesis in plants

c) Explain in detail CRISPR/Cas9 based genome editing method

Q 5. **(2X7=14)**

a) What is DNA fingerprinting and list application of DNA fingerprinting

b) What are the differences between SDN1, SDN2 and SDN3 categories of genome editing as per guideline for safety assessment of genome edited plants

c) Describe in detail microsatellite (SSR) markers and list different PCR based markers

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations June, 2023

Programme: M.Sc Biotechnology **Session:** 2022-24

Semester: II[nd] **Max. Time:** 3 Hrs

Course Title: Omics in Biotechnology **Max. Marks:** 70

Course Code: SIAS BT 1 2 06 C 4004

Instructions:

Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks. Question no. 2 to 5 has three parts and student need to answer any two parts of each question. Each part carries seven marks.

Q 1. **(4 X 3.5=14)**

a) Describe the use of NGS techniques in genomics?

b) Differentiate between chain termination and chemical degradation method of sequencing?

c) Describe major steps in whole exome sequencing (WES) with flowchart illustration.

d) Provide difference between whole exome sequencing (WES) and targeted sequencing.

e) What is proteomics? What all biological achievements can be ascertained through this technology?

f) Define ionization in mass spectrometry. Explain the principle, its constituents and the applications in proteomics.

g) Define lipidomics and metabolomics.

Q 2. **(2 X 7=14)**

a) Explain the mechanism of Nanopore and Illumina sequencing methods?

b) Describe the steps involved in library preparation and analysis of genomics data?

c) Explain the applications of omics in medical biotechnology in detailed?

Q 3. **(2 X 7=14)**

a) Describe following file formats with example

1. FastQ, 2. GeneBank, 3. SAM (Sequence Alignment Map), 4. BAM (Binary Alignment/Map), 5. VCF, 6. GFF3, 7. GTF

b) Describe in details methods for exome enrichment for NGS based sequencing

c) Provide differences between Sanger Sequencing and Illumina Sequencing

Q 4. **(2 X 7=14)**

a) What is LC-MS/MS? Explain the principle and applications in proteomics.

b) What is 2DE-SDS-PAGE? Explain the principle, its methodology and the applications in proteomics.

c) Describe in detail a proteomics experiment for identification of an unknown protein. Also explain the steps for data analysis using any of the freely available software tools.

Q 5. **(2 X 7=14)**

a) What do you understand by Metabolomics?. Describe in details with major types and steps of metabolomics.

b) Describe the Human Metabolome database (HMDB) in details. What is software commonly used for metabolomics data analysis? Write with its key features.

c) What are the various applications of Metabolomics in Agricultural and medical biotechnology? Explain in details.

CENTRAL UNIVERSITY OF HARYANA
End Semester Examinations-2023

Programme: M.Sc. Biotechnology
Session: 2022-23

Semester: II
Max. Time: 3 Hours
Course Title: Immunology
Max. Marks: 70
Course Code: SIAS BT 1 2 02 C 4004

Instructions:
1. Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.
2. Question no. 2 to 5 have three parts and student need to answer any two parts of each question. Each part carries seven marks.

Question 1. **(4X3.5=14)**

a) Explain the following terms: ELISA, Immunohistochemistry.

b) What do you understand by the term ADCC? Explain with apropriate figures/ diagram.

c) What is auto-immunity? Write a note on "Privileged sites".

d) What are epitope, paratope, hapten and adjuvant?

e) Explain the structure of a TCR.

f) What is a humoral immune response? Explain the differences bettween T-dependent vs independent reposne.

g) What do you understand by antigen processing and presentation? Explain any one such pathway.

Question 2. **(2X7=14)**

a) Define Antigen? How it is different from an immunogen? Explain the immunological properties of antigen and the factors that determine antigenicity.

b) What are different types of antibodies found in the organisms based on types of heavy chain? Describe the main features of each type.

c) Describe in detail about PRRs and various types? What is the function of PRRs?

Question 3. **(2X7=14)**

a) What is a B cell receptor and BCR complex? Explain its detailed structure.
b) Write a detailed note of western blot technique.
c) What do you understand by antibody diversity and how it is generated?

Question 4 **(2X7=14)**

a) What does the term MHC stand for? What are the different types of MHCs present in immune system? Describe their structure and tabulate the differences among them.
b) What is complement system and its pathways? Explain the detailed pathway, which was discovered first. How it is different from others?
c) What are effector T cells and how many types of such cells are present in immune system? Explain the two possible pathways of apoptosis initiated in the target cells?

Question 5 **(2X7=14)**

a) What is hypersensitivity? Define its types. Explain the detailed mechanism of Type IV hypersensitivity.
b) Define vaccine and its different types. Describe in details about DNA vaccines.
c) Define tolerance and its types. Describe the mechanism of induction of central B cell tolerance.

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations June/July. 2023

Programme: M.Sc Biotechnology **Session: 2021-23**

Semester:3rd **Max. Time: 3 Hours**

Course Title: Fermentation and Bioprocess Technology **Max. Marks: 70**

Course Code: SIAS BT 1 3 04 C 4004

Instructions:

1. Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students need to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

a) What is fermentation? How it is useful in product formation.

b) Differentiate batch and fed batch fermentation.

c) What is generation time. How it is calculated.

d) What is biological mixture. Enlist soluble and insoluble components of a biological mixture.

e) Draw well labelled diagram of stirred tank fermenter.

f) Write short note on sedimentation.

g) Differentiate primary and secondary metabolites with examples.

Q 2. (2X7=14)

a) Differentiate solid state and submerged fermentation with examples.

b) Explain the effects of pH, temperature and oxygen on the production of microbial products.

c) Describe the structure and function of air-lift fermenter.

Q3. (2X7=14)

a) What is sterilization. Explain any two methods of sterilization of glassware.

b) Describe the role of computer in a bioprocess technology.

c) Explain the microbial growth under batch cultivation.

Q 4. (2X7=14)

a) What are industrially important microorganisms. How will you isolate such microorganisms from a given soil sample.

b) Explain the role of mutations in improving yields of microbial products.

c) Describe the process for the production of antibiotic by a microorganism.

Q 5. (2X7=14)

a) Describe physical methods used in the lysis of a bacterial culture.

b) What is product drying. Explain any two methods used for the drying of industrial products.

c) Write short notes on any two: i) Gel filtration chromatography, ii) Protein precipitation, iii) Liquid-liquid extraction

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, June 2023

Programme: M.Sc. Biotechnology **Session: 2022-2023**

Course Title: Biosafety, Bioethics and IPR **Max. Time: 3 Hrs**

Course Code: SIAS BT 1 2 03 C 3003 **Max. Marks: 70**

Instructions:

Question no. 1 has seven sub-parts and students need to answer any four. Each sub-part carries three and Half Marks. Question no. 2 to 5 have three sub-parts and students need to answer any two sub-parts of each question. Each sub-part carries Seven Marks.

Question No1. Brief note on the followings (4 × 3.5=14)

a) Define Bio-security & its importance in research institutions.
b) Role of Codex Alimentarius.
c) Role of IBSC
d) Ethical issues in Organ Transplantation.
e) Define Bioethics.
f) Role of National Biodiversity Authority (NBA)
g) USPTO

Question No. 2. (2 × 7=14)

a) What do you mean by Biosafety and its various levels? What are the 'risk group' w.r.t infectious agents and animals?.
b) What are the various regulation agencies in India ensuring Biosafety and Biosecurity.
c) What is Cartagena protocol; Explain Environment Protection Act (EPA) in details.

Question No. 3. (2 × 7=14)

a) Defines major principles of Bioethics. Explain Bioethics in health care with suitable examples.
b) What is role of Bioethics in research? Explain bioethics in cloning and stem cell research.
c) Detailed note on (i) Informed Consent (ii) Euthansia.

Question No. 4. (2 × 7=14)

a) Define patent with its salient features. What are the various types of patents?

b) What do you mean by PCT and its main advantages for a patentee? Draw a flowchart of PCT application procedure.

c) (i) Indian Patent Act 1970 (ii) Non-patentable items/subjects.

Question No. 5. (2 × 7=14)

a) Explain Patent infringement. Give any two cases with examples.

b) Brief note on (i) Royalty (ii) Licensing (iii) Credits Sharing among parties.

c) Explain the process of patent granting in India. Draw a flowchart to explain all major steps of the whole process.

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations June, 2023

Programme: M.Sc. Biotechnology **Session: 2022-24**

Semester: Second **Max. Time: 3 Hours**

Course Title: Pharmaceutical Biotechnology **Max. Marks: 70**

Course Code: SIAS BT 1 2 01 DCEC 3003

Instructions:

1. Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and student need to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

a. Discuss why biosimilars are not biogeneric?

b. Describe how biotechnology contributing in diagnostics?

c. Write a short note on traditional drug discovery?

d. Discuss the role of penicillin amidase in drugs development with example?

e. Write a short note on biopharmaceuticals with examples?

f. Distinguish between recombinant glycosylated and recombinant non-glycosylated proteins?

g. Describe illumina sequencing technology?

Q 2. (2X7=14)

a) Explain the role of plant biotechnology in edible vaccine development with example?

b) Write a detailed note on traditional drug discovery and rational drug discovery?

c) Explain concept of target based drug design and target discovery?

Q3. (2X7=14)

a) Explain the role of biotechnology in pharmaceutical industry for:

(i) Antibiotics

(ii) Vaccines

(iii) Antibodies

b) What do you understand by 'biopharmaceuticals'? How biotechnology contributing in pharma sector for biopharmaceuticals with example?

c) Describe the mechanism of insulin production in pharmaceutical industry and commercial aspects?

Q 4. (2X7=14)

a) Discuss the role of enzymes for drugs development:

(i) Lipase

(ii) Nitrilase

(iii) Penicillin amidase

(b) Write a detailed note on "Approved follow-on-protein/Biosimilars?

(c) Write a detailed note on "Industries dealing with Biogeneric and market value"?

Q 5. (2X7=14)

a) Explain the mechanism of Illumina and Nanopore sequencing methods with diagram?

b) What do you understand by gene expression? Explain gene expression comparison methods?

c) Write a detailed note on sequencing comparison methods?

CENTRAL UNIVERSITY OF HARYANA

Term End Semester Examinations June-July 2023

Programme: M.Sc. Biotechnology **Session:** 2022-23

Semester: II **Max. Time:** 3 Hours

Course Title: Environmental Biotechnology **Max. Marks:** 70

Course Code: SIAS BT 1 2 03 DCEC 3003

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and students are required to answer any two parts of each question. Each part carries seven marks.

Q 1.

a) Cometabolism

b). Mineralization

c). Adsorption

d). BOD

e). Complexation

f). *In situ* bioremediation

g). Oxide of sulphur (SOx)

h). Eutrophication (4X3.5=14)

Q 2. (2X7=14)

a) What are different sources of air and soil pollutants? Discuss the role of biotechnology in abatement of these pollutants from air and soils.

b) Describe the various sources of heavy metal pollution in soil. Discuss its remediation by the plants and microbial system.

c) Write in brief on the following:

i)Natural and engineered bioremediation ii) Effect of pollutants on flora and fauna

Q3. (2X7=14)

a) Differentiate between aerobic and anaerobic treatment of industrial waste water with the help of suitable examples. Also describe the microbiology of waste water treatment

b) Describe in detail about the treatment of effluents coming from dye and pharmaceutical industries

c) Write short notes on the following:

i) Membrane technology ii) Bioreactors for treatment of waste water.

Q 4. (2X7=14)

a) What do you mean by solid waste treatment? Give the characteristics of different types of solid wastes. Describe the physical and chemical methods used in treatment of solid waste.

b) How methane gas is produced from solid wastes? Describe the role of microorganism in methane production. Also give its composition.

c) What is bioremediation? Give its types? Explain the bioremediation of contaminated soil and waste land.

Q 5. (2X7=14)

a) What are xenobiotic compounds? Describe the mechanism of degradation of polycyclic aromatic compounds and pesticides.

b) Give detailed account on microbial treatment of oil spill.

c) What are biofertilizers? Describe the various fertilizers which can be used as a supplement to the chemical fertilizers in Indian agriculture system.

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations June, 2023

Programme: M.Sc Biotechnology **Session: 2022-24**

Semester: Second **Max. Time: 3 Hours**

Course Title: Cell and Molecular Biology **Max. Marks: 70**

Course Code: SIAS BT 1 2 01 C 4004

Instructions:

1. Question no. 1 has seven parts and students need to answer any four. Each part carries three and half Marks.

2. Question no. 2 to 5 have three parts and student need to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

a. Discuss semiconservative proof of DNA replication?

b. Draw the structures of various phospholopids present in plasma membrane?

c. Distinguish between microtubules and microfilaments?

d. Differentiate between transformation and transduction?

e. What do you understand by supercoiling of DNA and chromosome?

f. Distinguish between RNA splicing and polyadenylation?

g. Differentiate between bacteria and archae?

Q 2. (2X7=14)

a) Write a note on nuclear protein import and export? Explain the regulation of nuclear protein import and export?

b) Explain the structure and function of mitochondria and chloroplast with diagram?

c) Write a detailed note on active and passive transport across cell membrane?

Q3. (2X7=14)

a) Describe adherence junctions, tight junctions and gap junctions in detailed?

b) What do you understand by 'cell signalling'? Explain the role of G-protein coupled receptors, tyrosine receptors and IP3 in signalling?

c) Write a note on cytoskeleton and its proteins?

Q 4. (2X7=14)

a) Discuss the mechanism of DNA replication in eukaryotes and prokaryotes?

(b) Explain theta model of DNA replication and trombone model of DNA replication?

(c) Explain the detailed mechanism of DNA repair (base excision and nucleotide excision repair)?

Q 5. (2X7=14)

a) Write a detailed note on regulatory RNA (non-coding RNAs, siRNAs and miRNAs)?

b) Describe the mechanism of gene regulation at post-transcriptional level?

c) Explain the detailed mechanism of translation in eukaryotes?