CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, March 2023

Programme: **Biotechnology** **Semester: I**

Course work **Ph.D.**

Course Title: **Research Methodology** **Max. Time: 3 Hour**

Course Code: **SIAS BT 02 01 01 C 4004** **Max. Marks: 60**

Instruction: Attempt any five questions out of the following. Each question carries equal marks.

Q: 1. You have to take a throat sample for identification of a bacterial pathogen. What safety precautions will you follow while taking the sample? Which laboratory facilities/ containment levels are required to identify the pathogen through microbiological and molecular tools.

2. a) What is the role of IBSC, IAEC in approving the research projects for the safety of researchers.
   b) Write a brief note on disposal of biowaste and hazardous chemical waste generated in the laboratory

Q:3 Write about the layout of a Scientific Paper, explain in detail about each component, and mistakes to avoid in each component

Q:4 Write in detail about the factors to be taken into consideration while preparing for oral presentation through PPT and poster.

Q:5 Define the mean, median, mode and standard error their merits and demerits? Find the median of the following series. The hemoglobin percentage of animals was recorded 6,7,4,5,5,3 and 4 mg/100ml ?

Q:6 Write in details about the t-test and ANOVA with merits and demerits?

Q:7 What is research? How it is different from innovation? Describe one example of multi-disciplinary research problem having local, national and global perspective?

Q:8. Why to review literature? What is the major difference between forward and backward citations? What are the common sources of literatures for research?

CENTRAL UNIVERSITY OF HARYANA
End Semester Examinations-2023

Programme: M.Sc. Biotechnology
Session: 2022-23
Semester: I
Max. Time: 3 Hours

Course Title: Principles of Biochemistry **Max. Marks: 70**
Course Code: SIAS BT 1 1 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) Write short note on epimers, anomers and enantiomers with examples.

b) Explain the terms; Km, Kcat and Vmax with respect to enzyme kinetics.

c) Wild-type E. coli cells can synthesize all 20 common amino acids, but some mutants, called amino acid auxotrophs, are unable to synthesize a specific amino acid and require its addition to the culture medium for optimal growth. Besides their role in protein synthesis, some amino acids are also precursors for other nitrogenous cell products. Consider the three-amino acid auxotrophs that are unable to synthesize glycine, glutamine, and aspartate, respectively. For each mutant, what nitrogenous products other than proteins would the cell fail to synthesize?

d) Differentiate between the structure of glycogen and starch.

e) What is salvage pathway of nucleotide synthesis? Explain in details.

f) Explain the structure of ADP and ATP.

g) What are waxes? Draw a structure of typical biological wax.

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

a) Explain in details the pathway of gluconeoenesis with regulation of rate limiting steps.
b) What are aldoses and ketoses? Cite two examples of each. Write a detailed note on homo and hetero polyscachharides.
c) Describe the process of citric acid cycle. Write the final equation of the complete aerobic oxidation of one glucose molecule.

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

a) Explain beta-oxidation of fatty acids.
b) What are lipids? Write a short note on the following: phospholipids, sphingolipids and glycolipids.
c) What is FAS complex? Explain how its activity is regulated?

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

a) Describe different types of protein structure? Explain with appropriate examples.
b) What are neurotransmitters? Describe the process of synthesis of any two and explain their physiological roles.
c) What do you understand by enzyme inhibition and why it is needed in a cell? Explain any three types of enzyme inhibitions.

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

a) Explain the biochemical basis of following clinical conditions- ADA deficiency, Lesch-Nyhan syndrome, gout.
b) Explain the process of catabolism of purines
c) What kinds of structural configurations does DNA adopt in a cell? Describe in detail the best-studied model so far.

CENTRAL UNIVERSITY OF HARYANA

Term End Examination March 2023

Course Title: Analytical Techniques **Max. Time: 3 Hours**

Course Code: SIAS BT 1 1 05 C 4004 **Max. Marks: 70**

Instructions:

1. Question no. 1 has seven sub-parts and students need to answer any four. Each sub-part carries three and half marks.
2. 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 No 1. Brief note on the followings (4 × 3.5=14)

a) What do you mean by resolution? How can one determine the resolving power of a microscope?
b) Describe the function of APS, TEMED, and SDS in SDS-Polyacrylamide Gel Electrophoresis?
c) Write principle and applications of centrifugation techniques and write difference between relative centrifugal force (RCF) and revolutions per minute (rpm)
d) What are the types of paper chromatography, write its principle and applications?
e) Write differences between thin layer chromatography and paper chromatography.
f) Explain Electrophoretic mobility shift assay (EMSA) and its applications.
g) Explain metal chelate chromatography?

Question No. 2. (2 × 7=14)

a) Explain the working of phase-contrast and confocal microscopes? Draw suitable diagrams of each.
b) What is differential staining in the field of Microbiology. Write various types of differential staining with examples.
c) Explain working of Transmission and Scanning Electron Microscopes with suitable diagrams.

Question No. 3. (2 × 7=14)

a) Enlist different blotting techniques with their principles. Describe Western blotting techniques.
b) What is iso-electric focusing (IEF), how it is used in 2-Dimensional (2D) gel electrophoresis and describe the steps in 2D Gel electrophoresis.
c) Describe flow cytometry technique in detail and Explain its principle and applications

Question No. 4. (2 × 7=14)

a) Write principle of column chromatography. Explain gel filtration and ion exchange chromatography.

b) Explain instrumental assembly of high performance liquid chromatography (HPLC) and provide its principle and applications.

c) Describe gas chromatography (GC) and provide its principle and applications

Question No. 5. (2 × 7=14)

a) Explain yeast one-hybrid (Y1H), yeast two-hybrid (Y2H), yeast three-hybrid (Y3H) techniques.

b) Describe phage display technique and provide schematic overview of library construction

c) Describe chromatin immunoprecipitation (CHIP) and DNA foot-printing techniques.

CENTRAL UNIVERSITY OF HARYANA

END SEMESTER EXAMINATIONS MARCH, 2023

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

Semester: First **Max. Time: 3 h**

Course Title: Introduction to Microbiology **Max. Marks: 70**

Course Code: SIAS BT 1 1 03 C 4004

Instructions: Question no. 1 has seven parts and students need to answer any four. Each part carries equal (3.5) marks. Question no. 2 to 5 have three parts and students need to answer any two parts of each question. Each question carries seven marks.

Q.1. Answer the following questions **3.5x4=14**

i. Write short note on phycobillisome with diagram.

ii. Ram took two flasks containing potato dextrose broth from a laboratory. He kept both flasks at 30 °C for 24 h and observed microbial growth in one flask only. Discuss any two reasons behind this observation.

iii. Explain with examples how protein misfolding is responsible for health problems.

iv. Draw well labelled diagrams of cell wall of Gram-positive and Gram-negative bacteria.

v. Briefly explain the role of microbial enzymes in bioremediation.

vi. Why drug is taken after disease development and vaccine before disease. Explain it.

vii. What are probiotics, prebiotics and xenobiotic. Give examples.

Q.2. a) Mohan isolated various bacteria from water sample. Explain how will you guide Mohan for differentiating these bacteria on the basis of any two staining techniques. 7

b) Explain the contributions of Alexander Fleming, Antonie van Leeuwenhoek and Robert Koch in microbiology 7

c) You have been given a soil sample. Explain a suitable process for the enumeration of bacteria in the given soil sample with diagram. 7

Q.3. a) How archaea are identified. Explain the cellular organisation of archaea with diagram. 7

b) Draw a labelled diagram of yeast cell. How it is different from bacterial cell? 7

c) Explain any three strategies for the identification of a fungal culture isolated from air. 7

Q.4. a) Explain five specific features of (any two) i) lactic acid bacteria ii) cyanobacteria and iii) methanogens 7

b) Bacterial culture of *E. coli* was grown in LB broth for 72 hours at 37 °C and 200 rpm under batch fermentation for antibiotic production. Explain with diagram the growth profile of the bacterial culture under these conditions. 7

c) What are abiotic factors. Explain any five abiotic which affect the growth and metabolism of microorganisms. 7

Q.5. a) Explain the roles of microorganisms in degradation of organic matter and recycling of carbon and nitrogen. 7

b) Write short note on (any two) i) phosphorus biofertilizer, ii) antibiotics and iii) microbial hydrolases. 7

c) Write short note on vaccines and SCP. 7

CENTRAL UNIVERSITY OF HARYANA

First Semester Term End Examinations March 2023

Course Title: Introduction to Biotechnology **Max. Time: 3 Hours**

Course Code: SIAS BT 1 1 01 C 2002 **Max. Marks: 35**

Instructions:

1. Question no. 1 has four sub-parts and students need to answer any two. Each sub-part carries three and Half Marks.
2. 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 three and half Marks.

Question No 1. Write short notes on the followings (2 × 3.5=7)

a) Ethical issues in biotechnology
b) Types of vectors
c) Restriction Enzymes
d) Applications of nano biotechnology in disease diagnosis

Question No. 2. (2 × 3.5=7)

a) Differentiate between old and new biotechnology with one example of each. Describe in brief with examples about Red, Blue and Green Biotechnology.
b) Enumerate five techniques used in animal improvement using biotechnological approach. Briefly describe five major applications of animal biotechnology with examples.
c) What are the steps in making a recombinant DNA? How to get a target gene for it? How to screen recombinant molecules?

Question No. 3. (2 × 3.5=7)

a) What is plant biotechnology? Enumerate five applications of plant biotechnology. Why we need herbicide tolerant crop?
b) What is pharmaceutical biotechnology? Explain five human disease and their specific pharmaceutical biotechnology products for treatment.
c) Write commonly available four genetic techniques used for the detection of human diseases. Explain four genetic disorder of human which can be detected by amniocentesis.

Question No. 4. (2 × 3.5=7)

a) What are the targets of Indian bioeconomy? Briefly describe the major roles of Department of Biotechnology, Govt. of India in research and industries?

b) What is food biotechnology? Explain five examples of successful transgenic technology in food across globe.

c) Differentiate between Genome Edited Organism (GEO) and Genetically Modified Organism (GMO). Describe the advantages and risk associated with genome edited crop variety development.

Question No. 5. (2 × 3.5=7)

a) What is nanobiotechnology? Classify the nanomaterials with examples.

b) What are the nanoscale effects/properties of nanoparticle useful for biotechnological applications?

c) What is phytoremediation? Briefly describe its various methods.

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, March 2023

Programme: PhD Biotechnology
Course Title: Omics Technologies
Course Code: SIAS BT 2 1 01 DCEC 4004

Semester: Course work
Max. Time: 3 Hour
Max. Marks: 60

Instruction: Attempt any five questions out of the following. Each question carries equal marks.

Q:1 What is proteomics? What are the different techniques available in modern era to achieve the comprehensive proteome maps of a cell? Describe in details.

Q:2 In *E.coli*, a protein 'X ' is showing overexpression under thermal stress and may prove to be important candidate to investigate further. However its amino acid composition is not known. Design an experimental strategy to decipher the sequence of this protein X.

Q:3 A plant protein named kinase1 is responsible to trigger a signaling cascade leading to speedy seed germination process. However the proteins involved inn the cascade are not known so far. Design an experiment to decipher the targets of kinase1 and map the sites of phosphorylations on these targets.

Q:4 What is metabolomics? Describe its types and explain the detailed process for an experiment involving such discovery studies.

Q:5 Describe major genome sequencing projects in different domains of life science and provide detailed prospective on human genome sequencing project.

Q:6 Provide essential attributes of following file formats with example

1) FASTAQ, 2) VCF, 3) GFF, 4) GTF, 5) SAM, 6) BAM

Q:7 What is transcriptomics? Enlist different transcriptomics techniques and provide work flow of RNAseq transcriptome profiling.

Q:8. Describe in details QTL mapping, Genome wide association study (GWAS) and Genomic Selection (GS)

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, March 2023

Programme: **Biotechnology** **Semester: I**

Course work **Ph.D.**

Course Title: **Advanced Analytical Techniques** **Max. Time: 3 Hour**

Course Code: SIAS BT 02 01 02 C4004 **Max. Marks: 60**

Instruction: Attempt any five questions out of the following. Each question carries equal marks.

Q:1 How will you define plasmid based on copy numbers? Write the important factors responsible for plasmid stability. How does a plasmid maintain its copy numbers in the host?

Q:2 What do you understand by Next-generation sequencing (NGS)? Describe the sequence by synthesis method of NSG.

Q:3 An enzyme needs to be purified in its native state. Describe in detail about the principle and detailed procedure of the best chromatographic technique of choice to accomplish the objective.

Q:4 Describe the experimental procedure with details of the methodology to be used to identify the protein sequence of an unknown protein. How can its cellular localization be determined?

Q:5 Discuss fed-batch fermentation process and compare it with continuous and batch fermentation processes.

Q:6 Describe the principles and applications of Atomic Force microscopy or Flow cytometry.

Q:7 Write in detail about the GC-MS/MS technique with a suitable diagram, components, applications, and demerits?

Q:8.Write in detail about the X-Ray Diffraction technique with a suitable diagram, components, applications, and demerits?

CENTRAL UNIVERSITY OF HARYANA
End Semester Examinations-2023

Programme: M.Sc. Biotechnology
Session: 2022-23
Semester: I
Max. Time: 3 Hours
Course Title: Genetics
Max. Marks: 70
Course Code: SIAS BT 1 1 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 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 with appropriate examples- co-dominance and incomplete dominance.

b) Mendel crossed pea plants that produced round seeds with those that produced wrinkled seeds and self-fertilized the progeny. In the F2, he observed 5474 round seeds and 1850 wrinkled seeds. Using the letters W and w for the seed texture alleles, draw Mendel's crosses, showing the genotypes of the plants in each generation. Are the results consistent with the Principle of Segregation?

c) Why the recombination frequency and genetic map distance are not linear over 20 cM?

d) Drosophila females heterozygous for three recessive X-linked markers, y (yellow body), ct (cut wings), and m (miniature wings), and their wild-type alleles were crossed to y ct m males. The following progeny (listed in the accompanying table) were obtained:

Phenotypic Class	Number
1. yellow, cut, miniature	30
2. wild-type	33
3. yellow	10
4. cut, miniature	12
5. miniature	8
6. yellow, cut	5
7. yellow, miniature	1
8. cut	1
	Total: 100

i) Which classes are parental classes?
ii) Which classes represents double crossovers?
iii) Construct the genetic map.

e) How is a replica plating experiment performed? List one application of this experiment.

f) Write a note on Polytene and lamp brush chromosomes.
g) Explain the terms transformation, conjugation and transduction with examples.

Question 2.
(2X7=14)

a) Two true breeding strains of peas, one with tall vines and violet flowers and the other with dwarf vines and white flowers, were crossed. All the F1 plants were tall and produced violet flowers. When these plants were back crossed to the dwarf, white parent strain, the following offsring were obtained: 53 tall-violet, 48 tall-white, 47 dwarf-violet, 52 dwarf-white. Do the genes that control vine length and flower colour assort independently? Hint: chi square table, 5% critical value

D.F.	5% CRITICAL VALUE
1	3.841
2	5.991
3	7.815
4	9.488

b) A plant heterozygous for three independently assorting genes, Aa Bb Cc, is self-fertilized. Among the offsprings, predict the frequency of (i) AA BB CC individuals, (ii) aa bb cc individuals, (iii) individuals that are either AA BB CC or aa bb cc, (iv) Aa Bb Cc individuals, (v) individuals that are not heterozygous for all three genes.

c) Differentiate between dominant and recessive epistasis. Explain in detail at the genetic as well as molecular level.

Question3. **(2X7=14)**

a) Explain sex determination and dosage compensation in mammals and in drosophila.

b) The A-B-O blood types of 1000 people from an isolated village were determined to obtain the following data:

Blood Type	Number of People
A	42
B	672
AB	36
O	250

Estimate the frequencies of the IA, IB, and i alleles of the A-B-O blood group gene from these data.

c) Write a detailed note on the quantitative inheritance in plants and human.

Question4 **(2X7=14)**

a) Explain in details the different types of mutations and their molecular basis?

b) Explain different mechanisms of induced mutations and spontaneous mutations. Also provide the suitable examples.

c) Write a note on Numerical alterations of chromosomes and their genetic implications.

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

a) Explain the structure of telomere and centromere.

b) Explain different levels of chromatin organization.

c) Explain the molecular basis of the lytic-lysogeny switch in phage lambda.

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations March, 2023

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

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

Course Title: Principles of Biotechnology **Max. Marks: 70**

Course Code: SIAS BT 1 1 01 GEC 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. Write names of the most commonly used microbes in industry?

b. What do you understand by cloning?

c. Differentiate between conjugate vaccine and subunit vaccine?

d. Name the microbes useful in agriculture?

e. Describe somatic gene therapy and germ line gene therapy with examples.

f. Explain principle & application of PCR.

g. Write a short note on Bioremediation and its types?

Q 2. (2X7=14)

a) Give a detailed note on scope and importance of biotechnology.

b) Describe gene cloning. Give description of procedures used in the recombinant DNA technology along with associated molecular enzymes.

c) Explain the role of microbes in the industry and agriculture.

Q3. (2X7=14)

a) What is plant tissue culture? Describe composition of media used in plant tissue culture. Write applications of plant tissue culture.

b) What do you understand by transgenic plants? Explain physical and chemical methods of gene transfer.

c) Write notes on in vitro-fertilization, embryo transfer in humans and transgenic animals.

Q 4. (2X7=14)

a) Write a detailed note on different level of biodiversity and its conservation? (7 marks)

b) What do you understand by the Stem cell therapy? Explain stem cell characteristics and stem cell differentiation? (7 marks)

c) Write a note on Ex-vivo and In-Vivo gene therapy with examples. Discuss classification of vectors in gene therapy? (7 marks)

Q 5. (2X7=14)

a) What do you understand by insight and intervention into nano-world? Explain societal issue and ethical issues in Nanotechnology? (7 marks)

b) Write a note on IPR. Explain procedure of filing and grant of an invention. How Biotechnology contribute in the development of a country? (7 marks)

c) Write a detailed note on "important development in nanotechnology". Discuss applications of nano-biotechnology in five different areas with examples? (7 marks)