CENTRAL UNIVERSITY OF HARYANA

Second Semester Term End Examinations August- September 2022

Programme:	**M.Sc. Biochemistry**	**Session: 2021-22**
Semester:	**II**	**Max. Time: 3 Hours**
Course Title:	**Cell Culture Technology**	**Max. Marks: 70**
Course Code:	**SIAS BC 1201 DCEC 3104**	

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 student are required to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

a) What is embryogenesis?

b) What are the properties of embryonic stem cells?

c) What is the composition of nutrition media of plant cell culture?

d) How freezing of cells is done in liquid nitrogen.

e) Write a short note on culture and scale up.

f) Write the procedure for splitting/passaging of cell line from established primary cell line.

g) Explain the sources of contamination in cell culture.

Q 2. (2X7=14)

a) Explain somatic cell fusion with diagram.

b) What is cell line? Explain the difference between primary culture and secondary culture.

c) What are the different techniques of sterilization for animal cell culture?

Q3. (2X7=14)

a) Explain various steps involved in animal cloning.

b) What is superovulation? Discuss the role of in vitro fertilization.

c) What are industrial applications of animal cell culture?

Q 4. (2X7=14)

a) What is totipotency? Highlight importance of totipotency in plant science.

b) What is callus? Explain the regeneration and maintenance of callus.

c) What is organogenesis? Explain with suitable example.

Q 5. (2X7=14)

a) What is somoclonal variation? Discuss its importance in plants.

b) Discuss protoplast culture and fusion.

c) What are plant secondary metabolites? Give suitable examples along with their structure.

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Second Semester Term End Examinations August-September 2022

Programme: M. Sc. Biochemistry **Session: 2021-22**

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

Course Title: Bioinformatics **Max. Marks: 70**

Course Code: SIAS BC 12 04 C 3104

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 student are required to answer any two parts of each question. Each part carries seven marks.

Q 1. (4X3.5=14)

a) How is genomics useful in medicine and health applications?
b) What are major databases for nucleotide? define one major database.
c) How the ORF is useful in functional genomics? give an example.
d) Define with example, how protein structure can be predicted with prediction tools?
e) Write a note on BLAST tool and its utility in biological research.
f) Describe any one molecular structure visualization software.
g) Define protein's secondary structure prediction algorithm.

Q 2. (2X7=14)

a) How can you illustrate that Bioinformatics is an interdisciplinary science? provide major applications specially in the molecular biology-based applications
b) What are major distinctions in comparative and functional genomics in fundamentals and applications?
c) What is phylogeny? How evolutionary relationship can be deduced using different methods such distance matrix and maximum parsimony? Can mutation be predicted by phylogeny?

Q3. (2X7=14)

a) Discuss MSA, Genbank and OMIM giving examples and tools of each one.
b) Define Pubmed, NCBI and Swisprot; where are these used and how a gene/protein can be maximally defined using these tools.
c) Discuss how DNA microarray can profile number of transcripts in a system? How DNA microarray is different from RT-PCR, what are the limitations and applications of both the techniques

Q 4. (2X7=14)

a) Discuss various web based bioinformatics tools and their respective applications.
b) Write a detailed note on any popular protein database, also explain the various information that we can draw from this database.
c) What is homology modelling? Write down various steps of making a modelled structure of a protein using SWISS-MODEL tool.

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Q 5. (2X7=14)

a) Define genetic algorithms and its different components, also cite its examples.
b) Describe local and global alignment along with examples, also write down summary of Needleman-Wunsch algorithm.
c) Define Heuristic alignment algorithms, also cite the examples.

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Second Semester Term End Examinations August-September 2022

Programme: M.Sc. Biochemistry **Session: 2021-22**

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

Course Title: Enzymology & Enzyme technology **Max. Marks: 70**

Course Code: SIAS BC 12 01 C 4004

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and a 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. Answers ANY FOUR questions. (4X3.5=14)

a) Mention the similarities and differences between enzyme and chemical catalyst.

b) What is enzyme specificity? Define different type of enzyme specificity.

c) Write down the significance of Km, Kcat and Kcat/Km in enzyme catalyzed reactions.

d) Describe ribozymes and its types.

e) Write short notes on Coenzymes and cofactors.

f) What is feedback inhibition and feed forward stimulation?

g) Write short notes on biotransformation.

Q 2. (2X7=14)

a) Describe different classes of enzymes with examples as per IUB nomenclature.

b) Define activation energy and transition state theory of enzyme catalysis, also explain the method of determining activation energy.

c) Describe the Fisher's lock & key hypothesis and Koshland's induced fit hypothesis about enzyme-substrate interaction.

Q3. (2X7=14)

a) What is Michaelis-Menten equation? Write down its derivation and significance.

b) Describe the effect of pH, temperature and metal ion on enzyme activity.

c) Describe different types of enzyme inhibitions along with examples.

Q 4. (2X7=14)

a) Write in detail about the protein ligand interactions required for enzyme activity.

b) Explain in detail about different type of catalysis.

c) Explain reversible and irreversible modes of enzyme regulation.

Q 5. (2X7=14)

a) Write in detail on Applications of enzymes in diagnostics.

b) Explain the role of streptokinase and ACE inhibitor in enzyme therapy.

c) Explain the applications of enzymes in industry.

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Term End Examination (Regular)

Programme: M.Sc. (Biochemistry) Session: 2021-2022
Semester: II Duration: 3 hours
Course Title: Immunology Max. Marks: 70
Course Code: SIAL BC 1 2 02 C4004

Instructions:

1. Question No. 1 has seven subparts and students need to answer any **four** questions.
2. Question No. 2 to 5 have three subparts and students need to answer any **two subparts from each question**.
3. Provide clear Diagrams/Illustrations wherever possible.

Question 1: Briefly Explain the Following **(4 x 3.5 marks = 14)**

1. Explain the postulates of Clonal Selection Theory with a clear illustration.
2. If a child were born without a thymus, what cells and functions would be deficient? Explain. Sketch the Developmental pathways of various hematopoietic cells from pluripotential bone marrow stem cells.
3. Using examples explain what are (1) Haptens (ii) Mitogens (iii) Adjuvants. Provide Examples
4. What are Superantigens? Explain their significance with Example and an illustration.
5. State unique properties of (i) effector T cells (ii) cytotoxic T cells (Tc), (iii) natural killer cells (iv) NKT cells and (v) antibody dependent cellular cytotoxicity (ADCC).
6. Differentiate active and passive immunization and Explain the types of vaccines available. Provide names of any two vaccines that you are vaccinated for.
7. Provide salient features of SCID with a diagram showing that Defects in cell interaction and signaling can lead to severe immunodeficiency.

Question 2: **(2 x 7 =14)**

i. Discuss immune system and cell types involved in defence mechanism of the body.

ii. Mode of Processing and presentation of exogenous and endogenous antigens are not same. Justify your answer using a clear illustration.

iii. What are epitopes? As T-cells and B-cells exhibit fundamental differences in antigen recognition, explain the properties of B-Cell Epitopes and T-Cell Epitopes.

Question 3: **(2 x 7 =14)**

i. Explain the principle of common immunological techniques.

ii. Activation and differentiation of B cells in response to thymus-dependent (TD) antigens requires TH cells, whereas the B-cell response to thymus-independent (TI) antigens does not.

a. Discuss the differences in the structure of TD, TI-1, and TI-2 antigens and the characteristics of the humoral responses induced by them.
b. Binding of which classes of antigen to mIg provides an effective competence signal for B-cell activation?

iii. A. Treatment of antibodies with a particular protease clips the heavy chains in half, releasing the two arms of the Y-shaped molecule. How might the antibodies continue to function?
B. Provide the Structure of classes of Immunoglobins (Ig) with the antigenic determinants on Ig family and the Multigenic organization of the Ig locus with the mechanism of V region DNA rearrangement that leads to number of ways of antibody diversification.

Question 4: **(2 x 7 =14)**

i. A. Suppose that a snake handler bitten by a particular venomous snake species was treated with antivenin. Why might the same treatment for a second such bite have different results?
B. Provide the general organization and inheritance pattern of MHC and Explain the role of MHC class I and class II proteins with their pathways of antigen processing and presentation.

ii. Give the structure of T cell receptor and coreceptor with their roles in Immunity. Explain the processes of T cell development, generation of receptor diversity, selection and differentiation.

iii. Enumerate the Complement activation by classical, alternate and MB lectin pathways. Provide the biological consequences of complement activation and regulation. Explain complement deficiencies with suitable examples.

Question 5: **(2 x 7 =14)**

i. A. In myasthenia gravis, antibodies bind to and block certain receptors on muscle cells, preventing muscle contraction. Is this disease best classified as an immunodeficiency disease, an autoimmune disease, or an allergic reaction? Explain.
B. Explain the mechanism of tolerance and write about organ specific and systemic autoimmune diseases with examples. What are the possible mechanisms of induction of autoimmunity.

ii. Explain and Differentiate Type I to Type IV hypersensitivities. Provide the significance of each of these types.

iii. Explain the Immunological basis of graft rejection and their clinical manifestations. Enumerate the immunosuppressive therapy with example.

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Second Semester Term End Examinations August-September 2022

Programme: M.Sc. Biochemistry **Session: 2021-22**

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

Course Title: Recombinant DNA Technology **Max. Marks: 70**

Course Code: SIAS BC 13 01 C 3104

Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and a 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. Answers ANY FOUR questions. (4X3.5=14)

a) Define Cosmid. How does Cosmid vector use as a cloning vector?

b) What is a genomic library? Write the essential steps involved in the construction of a genomic library.

c) Comments on *pac*, *lox*P sites, and *cre* genes related to P1-derived artificial Chromosome (PAC)

d) Write short notes on the uses of the components of TAE buffer.

e) Write about the regulatory elements in Lac operon.

f) What are Isoschizomers, neoschizomers and Isocaudomers?

g) What are expression vectors?

Q 2. (2X7=14)

a) Write in detail about Pulse Field gel electrophoresis

b) Write in detail about Poly Acrylamide Gel electrophoresis

c) What are restriction endonucleases? Explain the mechanism of recognition and cleavage of nucleic acids by RE.

Q3. (2X7=14)

a) Explain different strategies to express heterogeneous proteins in E. coli

b) Explain in detail about the structure and regulation of Tryptophan operon.

c) Explain about Tetracycline resistance operon and its application in studying biological processes.

Q 4. (2X7=14)

a) Mark difference between Genomic and cDNA library.

b) What is DNA microarray and how does it use for gene expression analysis?

c) How can cDNA library be prepared? What are the advantages of cDNA library?

Q 5. (2X7=14)

a) Describe PCR and how it can be used for cloning an amplified insert?

b) What is next generations sequencing? Discuss its applications.

c) Write down Maxam-Gilbert and Sanger's method of DNA sequencing.