CENTRAL UNIVERSITY OF HARYANA

Semester Examinations- July 2023

Programme: M.Sc. Biochemistry | **Session: 2023**

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

Course Title: Genomics and Proteomics | **Max. Marks: 70**

Course Code: SIAS BC 13 01 C 3104

Instructions:

1. Question no. 1 has 7 parts and students need to answer any 4. Each part carries $3^1/2$ Marks.
2. Question no. 2 to 5 have 3 parts and student need to answer any 2 parts of each question. Each part carries 7 marks.

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

a) Write short notes on performing site directed mutagenesis in laboratory
b) Write short notes on gene over expression and gene complementation
c) What are the two prominent promiscuous enzymes used for proximity labelling and their mode of action
d) Write short notes on gene editing by homologous recombination
e) Write about role of restriction enzymes in gene cloning
f) Write about the essential components of plasmids with drawing?
g) Write basic steps involve in the Human genome sequence

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

a) What is CRISPR? Explain the mechanism of CRISPR based gene manipulation techniques.
b) Explain Yeast-2-Hybrid system in detail.
c) Write about gene cloning methods.

Q3. **(2X7=14)**

a) What is centrifugation? Describe various centrifugation techniques used for separation of biomolecules.
b) Give a detailed account on 2-D gel electrophoresis. Also write its application in proteomics and biomarker discovery.
c) Explain working, principle and application of mass spectrometry.

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

a) Describe the essential steps involved in whole genome sequencing (WGS).
b) Discuss any ONE method of high-throughput cloning and expression system.
c) Write in detail about phage display.

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

a) Write the principle and methodology involved in analyzing the proteins by LC-MS.
b) What are biomarkers? Write down the classification of biomarkers with examples.
c) Write about protein fragment complementation.

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Term End Examinations June 2023

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

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

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

Course Code: SIAS BC 12 03 C 4004

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. (4X3.5=14)

a) Write a short note on Bacteriophage.

b) Explain the role of ligases in recombinant DNA technology.

c) What are phagemids? Draw its structure.

d) Explain in brief about next generation sequencing (NGS)-polymerase chain reaction.

e) What are vectors? Describe their essential features.

f) What is the principle of His tagging of proteins?

g) How GFP helps in understanding of expression of genes?

Q 2. (2X7=14)

a) What are restriction endonucleases? Explain by giving suitable examples.

b) Explain the role of plasmids by giving suitable examples.

c) Write principle and procedure of Agarose gel electrophoresis.

Q3. (2X7=14)

a) Explain the structure and function of PAC, YAC and BAC.

b) Explain Maxam and Gilberts chemical and Sangers chain termination method.

c) Discuss the principal and application of PCR.

Q 4. (2X7=14)

a) What do you understand by gene expression? What's the usefulness of quantitative real time PCR analysis and microarray analysis?

b) Describe the principle of steps of preparation and applications of cDNA library?

c) What are the differences in genomic library, cDNA library and substrative library?

Q 5. (2X7=14)

a) What is operon concept? Explain one in detail by giving suitable example.

b) What is fusion protein? Give an example to show how protein are tags used in purification or localization of the target protein.

c) Describe how recombinant DNA technology can benefit to industry or Agriculture.

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Reappear Examinations, July 2023

Programme: M. Sc. Biochemistry
Semester: 1
Course Title: Cell and Molecular Biology — **Max. Time:** 3 Hour
Course Code: SIAS BC 11 02 C 3104 — **Max. Marks:** 70

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. Attempt any four questions **(4X3.5=14)**

(i) Define codons? Explain various characteristics of codons.
(ii) Receptor mediated endocytosis
(iii) Replication termination
(iv) Differentiate between different types of recombination
(v) What are promoter sequences? How these sequences are important for RNA synthesis?
(vi) Translation termination in prokaryotes
(vii) Define protein sorting

Q 2. Explain following: **(7x2=14)**

(i) Define membrane sorting. Also explain the process of gycosylation.
(ii) Structure and functions of plasma membrane.
(iii) Define endocytosis. Explain different types of endocytosis and their advantages.

Q 3. Give a detailed account on: **(7x2=14)**

(i) Various components of cytoskeleton elements and their advantages.
(ii) Describe various components and interactions of extracellular matrix for maintaining cellular structural integrity of a cell.
(iii) Microtubule based movement.

Q 4. Describe following: **(7x2=14)**

(i) Process of DNA replication in eukaryotes by mentioning the role of different enzymes.
(ii) Define recombination. Differentiate between homologous and site-specific recombination

(iii) Who firstly invented the DNA act as a genetic material and explain its experimental evidence using well labeled diagram? Also explain the mechanism of regulation of DNA regulation.

Q 5. Explain following: **(7x2=14)**

(i) Why one amino acid is encoded by more than one codon? Describe the process of activation of amino acid for the initiation of translation.

(ii) Process of RNA synthesis in eukaryotes.

(iii) Mechanism of translation termination in prokaryotes. Also describe the role of guanine nucleotide in control of translation.

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Term End Examinations July-2023

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

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

Course Title: Cell Culture technology **Max. Marks: 70**

Course Code: SIAS BC 12 01 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 students are required to answer any two parts of each question. Each part carries seven marks.***

Q 1. Attempt any four questions **(4X3.5=14)**

(a) Superovulation

(b) Artificial seed production

(c) Cryopreservation

(d) Micropropagation

(e) Embryo rescue

(f) Types of culture processes

(g) Ti plasmid

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

(a) Define scale up. Describe its various approaches by mentioning their merits and demerits.

(b) Explain methods of somatic cell fusion. Also discuss the different steps involved in monolyer subculture.

(c) Define cell lines. Differentiate between finite and continuous cell lines with examples. Also discuss the criteria for the selection of cell lines.

Q 3. Give a detailed account on following **(2X7=14)**

(a) Describe various approaches of in vitro fertilization and embryo transfer in animals.

(b) What are stem cells? Describe the methods of stem cell culturing and characterization.

(c) Define cell cloning. Explain various strategies of cell cloning.

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

(a) Process of embryo culture and its applications

(b) Process of plant regeneration

(c) Differentiate between callus culture and suspension culture. Also write the functions of essential components used for establishing a cell culture.

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

(a) Discuss the various approaches of generation of exclusive male plants and homozygous cell lines. Also discuss various approaches of selection of homozygous plants and significance of production of homozygous plants.

(b) Describe the process of inducing genetic variation in *in vitro* cultured cells. Why genetic variations are induced in *in vitro* cultured cells?

(c) Discuss various steps of somatic hybridization based on protoplast and its application.

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Re-appear Examinations-July 2023

Programme: M.Sc. Biochemistry **Session: 2022-23**
Semester: 1st **Max. Time: 3 Hours**
Course Title: Analytical Biochemistry **Max. Marks: 70**
Course Code: SIAS BC 11 03 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 students are required to answer any two parts of each question. Each part carries seven marks.

Q 1. Attempt any FOUR of the following. **(4X3.5=14)**

a) Define the mirror image rule of fluorescence.
b) How does the wavelength affect resolution?
c) What is Beer-Lambert's Law?
d) What is the function of Grating in a Spectrophotometer.
e) Write the equation related to relative centrifugal force (rcf) and revolution per minute (rpm)
f) Name of the two dyes used in agarose gel electrophoresis.
g) What are Bed volume and Void volume?

Q 2. Attempt any TWO of the following. **(2X7=14)**

a) Draw a ray diagram of the Phase contrast microscope. How does a Phase contrast Microscope acquire a contrast image?
b) What is SEM? How does SEM form a three-dimensional (3D) image?
c) Define Lens aberration and its types.

Q3. Attempt any TWO of the following. **(2X7=14)**

a) How does SDS-PAGE gel prepare? How do we visualize protein samples on SDS-PAGE?
b) Write Agarose gel electrophoresis for the separation of DNA samples.
c) What are gradient centrifugation and its types?

Q 4. Attempt any TWO of the following **(2X7=14)**

a) Define Chromatography. How does ion exchange chromatography work?
b) Write short notes on, Void volume vs Bed Volume, Eluent vs Eluate, Retention factor, and retention time.
c) Diagrammatically discuss the major parts of HPLC and their role in purification.

Q 5. Attempt any TWO of the following. **(2X7=14)**

a) What does stand for ELISA? Discuss any two types of ELISA.
b) Draw a ray diagram of a double-beam Spectrophotometer. Discuss the major component of the spectrophotometer.
c) What is mass spectroscopy. How does MALDI help in mass analysis?

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End Semester Examinations -July 2023

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

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

Course Title: Protein Biochemistry **Max. Marks: 70**

Course Code: SIAS BC 11 04 C 3104

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) Explain the hierarchical pathway of protein folding.
b) Explain the circular proteins with an example.
c) What is peptide bond, how it is formed, write the reaction.
d) Why geometry is important for biological molecules.
e) Write about Anfinsen's experiment to demonstrate protein refolding.
f) Explain the varieties of lipid motions which creates disorder in the fluid lipd bilayer.
g) What are the major classes of membrane proteins, how do they interact with membrane lipids.

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

a) What are torsion angles, Explain Ramachandran plot with torsion angles related to alpha helix, triple helix and beta sheets.
b) Explain in detail about the different non-covalent interactions between molecules and compare their strength.
c) Write about the classification of amino acids based on their properties.

Q3. **(2X7=14)**

a) Explain in detail about the secondary structure of proteins.
b) Explain amino acid propensities for the secondary structure of proteins.

c) What are the tertiary and quaternary structure of proteins, What is a domain, what different interactions maintain these levels of structure of protein?

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

a) Write in detail about the chaperone and chaperonin assisted Protein folding.

b) Explain the thermodynamics of protein folding in detail.

c) What is protein melting curve and how we can determine the fraction of unfolded protein using these curves.

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

a) Explain the mechanism of the development of amyloidoses and prion associated diseases in detail with respect to protein folding.

b) How does Mass spectrometry work and explain the methods of ionization?

c) Write about different methods of protein engineering with examples.

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Third Semester Re-Appear Examination Examinations June 2023

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

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

Course Title: Plant Biochemistry **Max. Marks: 70**

Course Code: SIAS BC 13 08 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) Photosystem-I.
b) Plasmodesmata.
c) Write down differences among C3, and C4 metabolism.
d) Write a note on Nodulins.
e) Non cyclic phosphorylation.
f) Define stress and its coping system in plants.
g) Write a short note on terpenoids.

Q 2. (2X7=14)

a) What are different photosynthetic molecules involved in photosynthesis? describe their properties.
b) Write note on different types of light reactions in photosynthesis.
c) Write down about different variation of C4 cycle.

Q3. (2X7=14)

a) Describe Biochemistry of nitrogen fixation, also mention nitrogenase enzyme complex.
b) Describe various steps of nodulation, bacterial attachment, and infection in legumes by symbiotic bacteria.
c) Write in details about Ammonia assimilation and transamination in plants.

Q 4. (2X7=14)

a) Describe the various biological roles of plant phenolics.
b) Describe different classes of flavonoids and their functions.
c) Write about different benzoic acid derivatives and their mechanism of function.

Q 5. (2X7=14)

a) Describe the response of plants towards insects and also mention different resistance strategies.
b) Write in details about mechanisms of resistance against abiotic stresses.
c) What are ROS? Write down their damaging role in plants.

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Term End Examinations June 2023

Programme: M.Sc. Biochemistry | **Session: 2022-23**
Semester: 2nd | **Max. Time: 3 Hours**
Course Title: Enzymology and 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 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. Attempt any **FOUR** of the following. **(4X3.5=14)**

a) Comment on proximity, orientation effect, Strain, and distortion theory.
b) Write the Lineweaver-Burk (LB) equation and also draw its (LB) plot.
c) How does cofactor concentration affect enzyme activity (υ_0)? Represent this relationship diagrammatically.
d) Mark the difference between non-competitive and mixed inhibition.
e) Why do allosteric enzymes not follow the Michalis- Mention equation?
f) Comment on SGPT and SGOT.
g) State the condition at which Km equals to Kd.

Q 2. Attempt any TWO of the following. **(2X7=14)**

a) Discuss the classification of enzymes.
b) Define enzyme activity, specificity activity, turnover number (Kcat), and Relevance of Rate limiting step of a reaction.
c) Define Apoenzyme, and Holoenzyme. Despite of equilibrium state, what other factors remain unchanged in the enzymatic catalysis?

Q3. Attempt any TWO of the following. **(2X7=14)**

a) Derive the Michaelis-Menten equation. What are the merits and demerits of the Michaelis-Menten equation?
b) Discuss the temperature-dependent activity of an enzyme. How will you assess the temperature (thermal) stability of an enzyme?
c) Define and also mention the significance of Km, Vmax, and Kcat/Km.

Q 4. Attempt any TWO of the following **(2X7=14)**

a) What is the acid-base catalysis mechanism? How does lysozyme catalyze the reaction?
b) Briefly discuss the regulatory mechanism of Glutamine synthetase.
c) What are allosteric enzymes? Discuss different models of allosteric regulation.

Q 5. Attempt any TWO of the following. **(2X7=14)**

a) What are isozymes? Discuss different isoforms of lactate dehydrogenase (LDH).
b) What are marker enzymes? Discuss any two marker enzymes used in diagnosis.
c) Define enzyme immobilization? Write about the entrapment and encapsulation methods of enzyme immobilization.