

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations March 2023

Programme: PhD Biochemistry

Semester: Course Work

Course Title: Advanced Immunology

Max. Time: 3 Hours

Course Code: SIAS BC 02 01 01 C 4004

Max. Marks: 60

Instructions:

Answer any **FIVE** questions Each question carries **EQUAL (12 marks each) Marks.**

Q 1. Innate and Adaptive Immunity, two arms of the Immune system

(i) are extremely interconnected with each other. Justify and Explain

(ii) have independent pathogen recognition and response mechanisms. Justify and elaborate.

Q 2. (i) Explain how genomic organization of Immunoglobulins (Ig) genes allows the variation amongst immunoglobulins and brings about structural diversity and aid in class switching.

(ii) Give your opinion on the immune responses during pregnancies.

Q 3. List some (atleast five) of the defects and deficiencies of (i) Innate Immune cells and (ii) adaptive immune cells and consequences of them. Elaborate the following in detail with associated treatments:

(i) SCID (ii) Myasthenia Gravis (iii) Guillain-Barre syndrome

Q 4. Explain and Differentiate Type I to Type IV hypersensitivities. Provide the significance of each of these types

Q 5. What is an autoimmune disease? Elaborate on T-Cell mediated autoimmune diseases and antibody-mediated autoimmune diseases.

Q 6. Gut Microbiome has a major role on regulating the immune responses. Justify and elaborate.

Q 7. Cancer cells, Stem cells and Immune cells have a strong interaction amongst them. Provide your opinion on it with examples of recent developments.

Q 8. Elaborate the role of complement system in connecting the innate and adaptive system. Describe the immunological events and consequences following inflammation and autoinflammation.

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations March 2023

Programme: M.Sc. Biochemistry

Session: 2022-23

Semester: First

Max. Time: 3 Hours

Course Title: Biomolecules and Metabolism

Max. Marks: 70

Course Code: SIAS BC 1102 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) What is glycogenesis?
- b) What are storage polysaccharides? Discuss any one in detail.
- c) What is mutarotation?
- d) What are fatty acid? Write the structure of polyunsaturated fatty acids.
- e) What are uncommon amino acids, cite the examples.
- f) Describe Tautomerism in uracil and write down different structural forms.
- g) Explain Ramachandran plot and its significance

Q 2. (2X7=14)

- a) Differentiate between substrate level and oxidative phosphorylation. Write all the steps of substrate level phosphorylation from EMP pathway and Krebs cycle.
- b) Pentose Phosphate Pathway is an anabolic in nature, explain.
- c) What is pyruvate decarboxylation? Explain the role of enzymes and co-enzymes involved in it.

Q3. (2X7=14)

- a) What is beta oxidation? How many ATP are synthesized on complete oxidation of one molecule of palmitic acid?
- b) What are ketone bodies? Write its biosynthetic pathway.
- c) What are phospholipids? Discuss its biological importance.

Q 4. (2X7=14)

- a) Describe different secondary and super-secondary structure of proteins with examples, also write down various forces that stabilizes protein structure.
- b) Describe different general properties of amino acids. Also, define the titration curve of Alanine and Histidine.

- c) Write a note on general reactions involved in amino acid metabolism. Also, describe urea cycle.

Q 5.

(2X7=14)

- a) Write down different spectroscopic and thermal properties of nucleic acid. Describe structural organization of eukaryotic DNA.
- b) Write down different factors stabilizing DNA double helix. Also comment on presence of thymine base in DNA rather than uracil.
- c) Describe pathways of purine and pyrimidine degradation, also mention its regulation.

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations, March 2023

Programme: Biochemistry

Semester: I

Course work Ph.D.

Course Title: Research Methodology

Max. Time: 3 Hour

Course Code: SIAS BC 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

Term End Examinations March 2023

Programme: M.Sc. Biochemistry

Semester: First

Course Title: Analytical Biochemistry

Course Code: SIAS BC 11 03 C 3104

Session: 2022-23

Max. Time: 3 Hours

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 of the following. (4X3.5=14)**
- Define different types of lens aberrations.
 - How does the power of the lens help in imaging?
 - Spectrophotometric method of DNA quantification
 - Ray diagram of image formation by a Compound Microscope.
 - Relevance of Plate height in Chromatography.
 - Define differential Centrifugation.
 - A protein (pI 6) is unstable and degrade below its pI, how will you purify such protein by ion exchange Chromatography (IEC)?
- Q 2. Attempt any TWO of the following. (2X7=14)**
- Define the term Confocal. How does a Confocal Microscope acquire a 3D image?
 - What is the resolution of an image? Define different factors that affect the resolution.
 - How does a Phase contrast microscope able to produce a contrast image?
- Q3. Attempt any TWO of the following. (2X7=14)**
- Describe SDS-PAGE. Why do we keep different pH of the resolving and stacking gel in SDS-PAGE?
 - What is blotting? Describe Western blotting and its application.
 - Define centrifugation and also elaborate on different types of gradient centrifugation.
- Q 4. Attempt any TWO of the following (2X7=14)**
- Define the term Size Exclusion. Briefly explain the working of Size Exclusion Chromatography (SEC).
 - Write short notes on, Void volume vs Bed Volume, Eluent vs Eluate, Retention factor, and retention time.
 - What does stand for HPLC? How does HPLC help in protein purification?

Q 5. Attempt any TWO of the following.

(2X7=14)

- a) Differentiate between UV-visible, fluorescence, and nuclear magnetic resonance spectroscopy.
- b) Explain the principle, working mechanism, and application of mass spectroscopy.
- c) Define ELISA. Discuss the basic steps involved in ELISA and also differentiate between direct and indirect ELISA.

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations March 2023

Programme: M.Sc. Biochemistry

Session: 2022-23

Semester: First

Max. Time: 3 Hours

Course Title: Fundamentals of Biochemistry

Max. Marks: 70

Course Code: SIAS BC 11 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) Explain the statement "A strong chemical connection to Biology" exists in the Universe' with atleast one example
- b) Show the linear and ring form of a hexose and fructose sugars. Show structural differences between (i) α -glucose and β -glucose (ii) glucose and galactose
- c) Illustrate how triglycerides are generated? Show the type of bond formed during triglycerides biosynthesis. Show the structure of a lipid bilayer.
- d) What are GAGs and Cardioglycosides? Provide their structure and importance.
- e) On a food container, following details were found: 20:0 and 20:4 (^{5,8,11,14}).What do they indicate?
- f) Provide the structure of a nucleotide present in DNA and RNA. What are the major differences in DNA and RNA?
- g) What are the biomolecules that constitute the cell? Plasma membrane plays a crucial role in formation of primitive cell. Justify.

Q 2. (2X7=14)

- a) CARBON makes the basis of all life-Justify and explain
- b) What is common between Plant cell and bacteria and explain how bacterial cell wall is useful for their classification and function?
- c) What are Polysaccharides and how are they classified? Provide the structural details of Plant polysaccharides and describe their differences.

Q3. (2X7=14)

- a) What are the components of lipids? Provide the broad classification of storage and structural lipids. How are they differentiated based on their features?
- b) Sphingolipids play a major role in cell membrane. Explain in detail. Give an account on the inherited human diseases resulting from abnormal accumulation of membrane lipids.
- c) Lipids function as signaling molecules, cofactors, hormones and pigments. Explain in detail.

Q 4.

(2X7=14)

- a) What are the four different types of protein structures? Explain the role of the primary structure of the protein in determining the protein function.
- b) Explain the structural features of α -helix and β -pleated sheets of proteins. Explain their significance.
- c) Give an account of the proteins: myoglobin and hemoglobin. Discuss how their structural features play an important role in biological activities.

Q 5.

(2X7=14)

- a. What are the three types of DNA structure? Explain the Watson-Crick double helical structure of DNA.
- b. What are the factors that can break the DNA structure? Why is it important to protect the DNA structure?
- c. Describe various methods available for qualitative and quantitative analysis of DNA.

CENTRAL UNIVERSITY OF HARYANA

Term End Examinations March 2023

Programme: M.Sc. Biochemistry

Session: 2022-23

Semester: First

Max. Time: 3 Hours

Course Title: Cell and Molecular Biology

Max. Marks: 70

Course Code: SIAS BC 11 02 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 questions

(4X3.5=14)

- a) Define shine dalgarno sequence. Write its significance in protein synthesis
- b) Difference between different types of DNA polymerases involved in DNA replication
- c) Define codons. Also write their characteristic features
- d) Wobble hypothesis
- e) Membrane proteins
- f) Transcription termination
- g) Endocytosis

Q 2. Explain following:

(2X7=14)

- a) Explain structural arrangement of various components of plasma membrane by describing most accepted model for it.
- b) What is membrane transport system? Explain various approaches of membrane transport by highlighting their significance.
- c) What is membrane trafficking? Discuss various approaches of secretion of biomolecules.

Q3. Give a detailed account on following

(2X7=14)

- a) Discuss the various components of cytoskeleton by explaining their significance
- b) What is Extracellular matrix? Explain various components of ECM. Why ECM is significant for a cell?
- c) Differentiate between plant and animal cell by drawing a well labeled diagram.

Q 4. Describe following

(2X7=14)

- a) Define replication. Explain the mechanism of semi-conservative mode of replication with well labeled diagram

- b) Define mutation. Discuss various types of mutations
- c) Mechanism of direct DNA repair, base and nucleotide excision repair

Q 5. Explain following (2X7=14)

- a) Define promoters. Differentiate between various types of eukaryotic RNA polymerases. Explain the mechanism of transcription by highlighting the impact of various inhibitors
- b) Describe translation mechanism in prokaryotes. How it is differ from the eukaryotic translation?
- c) How one amino acid is encoded by more than one genetic codon? Also explain the role of specific types of RNA in protein synthesis.

CENTRAL UNIVERSITY OF HARYANA

End Semester Examinations -March 2023

Programme: M.Sc Biochemistry

Session: 2022-24

Semester: First

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 lipid 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) Explain the physicochemical properties of the intracellular environment in detail.

Q3.

(2X7=14)

- a) Explain in detail about the secondary structure of proteins.
- b) What are the structural features of fibroin and myoglobin with respect to secondary and tertiary structure?

- c) What are the forces and interactions responsible for the tertiary and quaternary structure of proteins, and their role in maintaining the 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 N-terminal Protein sequencing in detail. What is the significance in protein biochemistry?
- b) How does Mass spectrometry work and explain the methods of ionization?
- c) Write about different methods of protein engineering with examples.