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10 2 JAN 2023

M.Sc. Part I (Semester I)
Subject: Biochemistry
(CHB4101) Biomolecules
(2019 Pattern)

[Time 3 Hours]

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

[Max. Marks: 50]

Q1)

Answer the Following (Any Five)

Two Marks Each

10 M

- a) Draw the structure of one sulfur containing non-essential amino acid and an aromatic amino acid with indole ring
- b) Write the structure of a homo and hetero disaccharide.
- c) Write the structure of a nucleoside and nucleotide
- d) What are ampholytes? Give example
- e) Define Isoelectric pH and Zwitter ions
- f) Define saponification number and give its significance

Q2)

Answer the following questions (Any Three)

Three Marks Each

9 M

- a) Differentiate between Anomers and epimers with suitable examples
- b) How reducing sugars are different from non - reducing sugars. Explain with examples
- c) Differentiate between essential and nonessential amino acids with suitable example.
- d) Write a note on central dogma of molecular biology

Q3)

Answer the following questions (Any Three)

Three Marks Each

9M

- a) Write a note on the bonds that stabilize tertiary structure of proteins
- b) What is denaturation and proteolysis of proteins?
- c) Write the reactions of glucose with their significance
- d) What is flip -flop movement? Explain

Q4)

Answer the following questions (Any Three)

Three Marks Each

9 M

- a) What are amphipathic lipids? How do they behave in water?
- b) How peptide bond is formed? List out its features
- c) Write the significance of vitamin B12
- d) What are Ionophores? List their types

(Q5)

- Answer the following questions (Any 2)**
Four Marks Each
- a) Elaborate on the steps involved in solid phase synthesis of oligopeptides by Bruce Merrifield
 - b) Write a note on cyclisation of sugars by Fischer and Haworth formula
 - c) Describe the types of membrane transport with suitable example

8 M

(Q6)

- Answer the following questions (Any One)**
Five Marks Each
- a) Describe the structure and functional significance of DNA and type of RNA
 - b) Write a note on water soluble vitamins with structure and functions

5M

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2:30

M.Sc.-II (Semester: III)
Subject: Biochemistry
CHB 5303 Neurochemistry and Endocrinology
2019 Pattern (4 Credits)

[Time: 3 Hours]

[Max. Marks : 50]

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

Q1)

Answer the following questions (Any Five).

Two Marks Each

10 M

- a) What is autocrine and paracrine behavior of a hormone? Give example
- b) Students were show some pictures and asked to write down the sequence of pictures shown. Which part of brain is involved in this activity? State other function of this part
- c) Which hormone is called as 'trust hormone'? Give related physiological role
- d) Which hormone has anti-inflammatory activity and what is its precursor?
- e) Identify the lobes in cerebrum for following functions
 - i. Speech area
 - ii. Collection of Sensory information
 - iii. Comprehension
 - iv. Perception of size, shape and movement of an object
- f) What is role of TSH? State its target cell of action

Q2)

Answer the following questions (Any Three)

Three Marks Each

9M

- a) State the role of important enzymes in BBB.
- b) State properties and physiological role of prolactin
- c) State the correlation between estrogen and amenorrhea
- d) Write a note on LTP?

Q3)

Answer the following questions (Any Three)

Three Marks Each

9M

- a) Explain indirect motor pathway with its important functions
- b) What is Zinc motif? How it is involved in action of hormones?
- c) Why amount of white matter decreases from cervical to sacral region of spinal cord?
- d) The hormone inhibits fear responses in person and promotes prosocial interactions, identify the hormone and state its other important roles

Q4)

Answer the following questions (Any 3)

- a) Explain functions of Hypothalamus
- b) Enlist pharmacological actions of glucocorticoids
- c) Write a note on enteric nervous system
- d) Explain the properties and role of luteinizing hormone

Three Marks Each

9M

Q5)

Answer the following question (Any 2)

- a) What is GABA? Describe its synthesis, action and reuptake
- b) Describe the direct motor pathways
- c) Describe properties, mode of action, physiological role with hyper and hypo conditions of oxytocin

Four Marks Each

8M

Q6)

Answer the following questions (Any One)

- a) Explain the biosynthetic pathway and important biochemical functions for any one steroid hormones
- b) Autonomic motor system controls involuntary actions in body. Explain

Five Marks Each

5M


[0.4 JAN 2023]

M.Sc. I (Semester I)
Subject: Biochemistry
(CHB4102) Biophysical Techniques (2019 pattern)

Time: 3 Hrs

Max. Marks: 50

Instruction to candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

- Q1) **Answer the following questions (Any Five).** **Two Marks Each** **10M**
- a) Write differences between Nitrocellulose filters, fibre glass filters and polycarbonate filters.
 - b) What are advantages of Lyophilization?
 - c) What is dialysis? What is its importance in biochemistry
 - d) Define : (a) Void volume and (b) Theoretical plate
 - e) What is meant by quenching?
 - f) What is the charge on an analyte at its pI?
- Q2) **Answer the following questions (Any Three).** **Three Marks Each** **9M**
- a) Discuss the factors contributing towards peak broadening in column chromatography?
 - b) Explain partition principle involved in column chromatography with an example
 - c) Write a note on paper chromatography explaining its types.
 - d) Explain the principle of Ion Exchange chromatography
 - e) How you can determine molecular weight of protein by gel chromatography?
- Q3) **Answer the following questions (Any Three)** **Three Marks Each** **9M**
- a) What are differences between Native PAGE and SDS PAGE?
 - b) Which are the commonly used staining methods to detect proteins on gels? Which one is more sensitive and why?
 - c) Write basic principle of electrophoresis? Explain the role of reagents used to prepare vertical gel.
 - d) Describe applications of electrophoresis.
- Q4) **Answer the following questions (Any Three).** **Three Marks Each** **9M**
- a) Give the principle of density gradient centrifugation.
 - b) How UV-Vis spectroscopy can be used to determine purity of a compound?
 - c) What is the principle behind Isoelectric focusing?
 - d) Explain the effects of different macromolecules on viscosity of solutions.

- Q5) Answer the following questions (Any Two) Four Marks Each 8M**
- a) Explain Geiger Muller counter along with its principle of operation
 - b) Write a note on X-Ray Diffraction
 - c) Write a note on Cerenkov counting.
- Q6) Answer the following questions (Any One) Five Marks Each 5M**
- a) Explain instrumentation, working and principle of AAS.
 - b) Describe by an example how enzyme reactions can be monitored with the help of UV-Vis spectroscopy

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05 JAN 2023

M.Sc.-I (Semester: I)
Subject: Biochemistry
Paper Title: Enzymology and Plant Biochemistry
Paper Code: CHB 4104
2019 Pattern (4 Credits)

[Time: 3 Hours]

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

[Max. Marks : 50]

Q1) Answer the following questions (Any Five).

Two Marks Each

10M

- a) What is covalent catalysis?
- b) Identify the equation name and define the terms

$$\frac{1}{v} = \frac{1}{V_m} + \frac{K_m}{V_m} \frac{1}{[S]}$$

- c) What is group specificity of enzymes? Give example
- d) Enlist physiological effects of gibberellins
- e) List out the nutrients that take part in redox reactions in plant
- f) How ammonia is incorporated in biomolecules?

Q2) Answer the following questions (Any Three)

Three Marks Each

9M

- a) Discuss the effect of following on rate of enzymatic reactions
 - i) Orientation and proximity
 - ii) Strain and Distortion
- b) What is immobilization of enzymes and state its types and application
- c) Describe physiological role of auxins in plants
- d) Explain in brief preparation of an explant

Q3) Answer the following questions (Any Three)

Three Marks Each

9M

- a) How rise and decrease in temperature affect rate of enzymatic reaction?
- b) What is allosteric regulation of enzymes? Explain
- c) Describe role of RUBISCO in carbon metabolism of plants
- d) Explain role of phosphorous in plant growth

Q4) Answer the following questions (Any Three)

Three Marks Each

9M

- a) Explain methods of enzyme purification based on polarity
- b) Write a note on ping pong mechanism of enzyme reactions
- c) Discuss biosynthesis, transport and physiological role of abscisic acid in plants
- d) Explain the biochemical role of ethylene in plants

Q.5

Answer the following questions (Any Two)
Four Marks Each

- a) What is subcellular fractionation? Explain with suitable example for enzyme extraction
- b) Describe light reactions of photosynthesis
- c) Describe the role of nitrogen complex in nitrogen fixation.

Q6)

Answer the following questions (Any Two)
Five Marks Each

- a) Describe methods used for enzyme purification on the basis of their size.
- b) Explain Carbon metabolism with respect to C3 and C4 plants

5M

8M

Fergusson College (Autonomous), Pune-4**M.Sc. (Semester I)
Subject: Biochemistry
(CHB4102) Genetics and Cell biology (2019 pattern)****Time: 3 Hrs****Max. Marks: 50****Instruction to candidates:**

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

- Q1) **Answer the following questions (Any Five).** **Two Marks Each** **10M**
- a) Explain Law of purity of gametes
 - b) Define i) Auxotrophs ii) Multiple alleles
 - c) Give examples of Autosomal Trisomy
 - d) Define i) Monoploidy ii) Polyploidy
 - e) Enlist 7 characters taken by Mendel while studying the features of pea plant
 - f) Define test cross and why it is used?
- Q2) **Answer the following questions (Any Three).** **Three Marks Each** **9M**
- a) What happens when F⁺ is crossed with F⁻?
 - b) What is Incomplete Dominance? Explain it with suitable example
 - c) Elaborate the mechanism of Transformation
 - d) Explain inheritance due to Mitochondrial DNA with suitable example
 - e) Define Epistasis and briefly explain dominant Epistasis and recessive Epistasis
- Q3) **Answer the following questions (Any Three)** **Three Marks Each** **9M**
- a) Give an account on Collaborative gene interaction
 - b) Write a note on Supplementary gene interaction
 - c) What happens when Hfr × F⁻ cell?
 - d) How the organism goes from lysogenic cycle to lytic cycle.
- Q4) **Answer the following questions (Any Three).** **Three Marks Each** **9M**
- a) Draw a well labelled diagram of prokaryotic and eukaryotic cells
 - b) Write a note on plasma membrane and its functions
 - c) Add a note on Fungi mentioning its classification and biological importance
 - d) What is the difference between the nuclear envelop and the cell membrane in terms of structure and function?
- Q5) **Answer the following questions (Any Two)** **Four Marks Each** **8M**

- a) What is fertilization? Write in brief about spermatogenesis and oogenesis with an illustration
- b) Distinguish between gap junction and tight junction
- c) Differentiate between passive and active transport

Answer the following questions (Any One)

Five Marks Each

5M

- a) Which cells undergo meiosis and mitosis? Illustrate different phases of mitosis.
- b) Explain the process of gametogenesis and oogenesis.

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M.Sc. Part II (Semester III)
Subject: Biochemistry
(CHB5301) Genetic Engineering & Animal Cell Culture (2019 pattern)

Time: 3 Hrs

Max. Marks: 50

Instruction to candidates:

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

Q1)	Answer the following questions (Any Five).	Two Marks Each	10 M
	a) Tell the names of enzymes that convert blunt end DNA to sticky end DNA and sticky end to blunt end.		
	b) What are the important modules needed in cloning vectors.		
	c) Differentiate between adaptors and linkers		
	d) Enlist selectable markers in bacteria and yeast vectors.		
	e) What is the difference between primary and secondary cell culture?		
	f) List the various types of vectors with respect to size of foreign they can carry.		
Q2)	Answer the following questions (Any Three)	Three Marks Each	9 M
	a) Describe the steps involved in creating a recombinant plasmid.		
	b) Differentiate between pBR322 and pUC vector.		
	c) Explain the technique of Pyrosequencing.		
	d) What is CRISP-Cas9 system? What role Protospacer Adjacent Motif (PAMs) plays in CRISPR Cas9 system?		
Q3)	Answer the following questions (Any Three)	Three Marks Each	9 M
	a) You have cloned a cDNA encoding a human hormone, and you hope to produce the hormone in bacteria in order to treat a severe genetic disorder. Unfortunately, when you insert this DNA into a plasmid and transform it into the bacteria, you get no hormone production. Give valid reason for your failure, and suggest a possible solution.		
	b) Give an account of the Blue-White Method of selection of recombinants.		
	c) A researcher sets an experiment involving animal cell culture and kept cell lines in the CO ₂ incubator. What will happen if CO ₂ supply gets interrupted immediately after setting up the experiment?		
	d) Explain different steps involved in Sanger's method of DNA sequencing.		

Q4)	Answer the following questions (Any Three)	Three Marks Each	9M
	a) Differentiate cDNA and Genomic library. What precautions one should take while preparing cDNA library?		
	b) Compare real-time PCR and end-point PCR method.		
	c) Explain importance of animal cell culture technology and compare various cell culture techniques.		
	d) Draw neat diagrams of cloning vector and expression vector with proper label.		
Q5)	Answer the following questions (Any Two)	Four Marks Each	8 M
	a) If you add ligase to alkaline phosphates treated vector does the ligation takes place? Justify your answer		
	b) Recommend the properties for choosing a good vector and host.		
	c) Review Agrobacterium-mediated gene transfer method.		
Q6)	Answer the following questions (Any One)	Five Marks Each	5 M
	a) Explain the advantages and disadvantages of using prokaryotic and eukaryotic system for production of recombinant proteins.		
	b) What is in-vitro mutagenesis? Discuss in detail any one method of introducing mutation.		

Fergusson College (Autonomous), Pune-4**M.Sc. (Semester III)
Subject: Biochemistry
(CHB5302) Immunology and Toxicology (2019 pattern)****Time: 3 Hrs****Max. Marks: 50****Instruction to candidates:**

- 1) All questions are compulsory.
- 2) Neat diagrams must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.

- Q1) **Answer the following questions (Any Five).** **Two Marks Each** **10 M**
- a) Explain with example communicable and non-communicable diseases.
 - b) What is super-antigen?
 - c) Write a note on phagocytosis.
 - d) Give the function of MHC I and II molecule.
 - e) Role of bone marrow and thymus in development of immunity.
 - f) Enlist the cells involved in cell mediated immunity
- Q2) **Answer the following questions (Any Three).** **Three Marks Each** **9 M**
- a) Give the advantages of ELISA over RIA.
 - b) Explain why immunoelectrophoresis is more preferred test than immunodiffusion.
 - c) State the principle of Immunofluorescence and give its application.
 - d) What is the difference between precipitation and agglutination reaction.
 - e) Give the principle of Chemiluminiscence immune assay
- Q3) **Answer the following questions (Any Three)** **Three Marks Each** **9 M**
- a) Explain alternate complement pathway.
 - b) Why cross matching is essential during blood transfusion? Explain
 - c) Write a note on Chediak-Higashi syndrome.
 - d) Define vaccination and add a note on different types of vaccines
- Q4) **Answer the following questions (Any Three).** **Three Marks Each** **9 M**
- a) Classify toxic agents.
 - b) Explain Ames tesr.
 - c) What do you understand from the terms safety and risk? Under which circumstances the risk is taken?
 - d) Define biotransformation, detoxication and toxication.
- Q5) **Answer the following questions (Any Two)** **Four Marks Each** **8 M**
- a) How gene mutation affect reproduction?

- b) What is difference between acute, sub-acute , sub-chronic and chronic toxicity.
- c) Distinguish between
 - 1.Immediate and delayed toxicity
 - 2.Reversible and irreversible toxicity

Q6)

Answer the following questions (Any One)

Five Marks Each

5 M

- a) Give the mechanism of phase I and phase II reaction.
- b) Explain the mechanism of biotransformation for conversion of toxicant to non-toxicant.

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Fergusson College (Autonomous), Pune-4

M.Sc. (Semester III)
Subject: Biochemistry
(CHB5304) Biostatistics, Bioinformatics and Advance Biophysical Techniques
(2019 pattern)

Time: 3 Hrs

Max. Marks: 50

Instruction to candidates:

- 1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) Answer the following questions (Any Five).

Two Marks Each

10M

- a) How will you prepare
i) 2M 275 ml HCL
ii) 4M 20 ml acetic acid solution
b) Define mean and median with suitable example.
c) From the standard normal variant Z=1.98, find the proportion (area) occupied by it as measured from zero. Represent in normal distribution curve.
d) What is meant by the hardware system?
e) Obtain mode of the following data graphically.

Table with 8 columns: Class, 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70. Row 1: Class, 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70. Row 2: Frequency, 2, 5, 10, 16, 9, 4, 1.

f) Compute standard deviation of the following data:

Table with 10 columns: 12, 10, 7, 6, 11, 5, 7, 6, 8, 10.

Q2) Answer the following questions (Any Three).

Three Marks Each

9M

- a) The following data represents the number of productive tillers per plant of a wheat variety. Calculate the mean number of tillers per plant.

Number of productive tillers = 17, 18, 16, 15, 13, 12, 11, 6, 9, 3.

- b) Find out the arithmetic mean and median from the following data:

Table with 8 columns: Number of seeds, 55, 2, 18, 16, 5, 11, 12. Row 1: Number of seeds, 55, 2, 18, 16, 5, 11, 12. Row 2: Number of plants, 60, 53, 50, 44, 60, 30, 41.

- c) Height and weight of 10 students are recorded. The results are given below. Calculate the regression coefficient and test the level of significance.

Height (inches)	65	62	73	76	55	66
Weight (kgs)	60	53	50	44	60	41

- d) Compute median of the following data :
3,6,4,2,6,7,8,9,1,3,5,8,4,2,6,2.

Q3) Answer the following questions (Any Three) Three Marks Each 9M

- a) Enlist tools which compute:
- I. Pairwise sequence alignment
 - II. Multiple sequence alignment
 - III. Ramchandran Plot
- b) What is Ramchandran Plot? Draw allowed regions with respect to each quadrant. Why it is itimportant to assess modelled proteins?
- c) Which database(s) can be used to find manually curated protein sequences? How to identify manually curated entries from the database(s)?
- d) What are different methods used for computing molecular phylogeny. Write one advantage and one disadvantage of each method

Q4) Answer the following questions (Any Three). Three Marks Each 9M

- a) Give the difference between NMR and ESR.
- b) Explain the special uses of LCMS in biology and biochemistry.
- c) Discuss the instruments used in CD.
- d) Give the application of fluorescence spectroscopy.

Q5) Answer the following questions (Any Two) Four Marks Each 8 M

- a) Give the classification of biosensors.
- b) How biosensors are more applicable in biochemistry field.
- c) With the use of biosensors how you can monitor blood glucose level?

Q6) Answer the following questions (Any One) Five Marks Each 5 M

- a) Differentiate between SEM and TEM.
- b) Explain the principle and instrument of SEM.
