

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1053 **D**

Unique Paper Code : 2492011103

Name of the Paper : Biochemical Techniques

Name of the Course : **B.Sc. (Hons.) Biochemistry**

Semester : I

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **six** questions
3. Attempt **any four** questions.
4. **All questions** carry equal marks.
5. **Question No. 1** is compulsory.

P.T.O.

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1. (a) Answer / Explain the following:

- (i) Agarose gel is preferred over polyacrylamide for electrophoresis of DNA.
- (ii) Two methods used to check the purity of DNA sample.
- (iii) Sedimentation rate depends on the shape and density of a molecule.
- (iv) TLC is advantageous over paper chromatography.

(b) Give an example of

- (i) A substance used for density gradient chromatography.
- (ii) A stationary phase used in TLC.
- (iii) An extrinsic fluor. (12,3)

2. (a) Write the role of the following:

- (i) Vacuum pump in ultracentrifuge.
- (ii) Monochromator in a spectrophotometer.
- (iii) TEMED in electrophoresis.

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(b) Define the following:

- (i) Sedimentation coefficient
- (ii) Bathochromic shift
- (iii) Partition coefficient
- (iv) Exclusion limit
- (v) Electrophoretic mobility
- (vi) Stokes shift (9,6)

3. (a) Discuss the principle of affinity chromatography. What is the ligand used for purification of the following:

- (i) Immunoglobulin G
- (ii) Glycoprotein
- (iii) mRNA

(b) Explain the process of fluorescence and give two applications.

(b) What are the features of an ideal chromatographic gel matrix? (6,5,4)

P.T.O.

4. (a) Discuss the working of a spectrofluorimeter with the help of a diagram.
- (b) Explain the principle of gel filtration chromatography and give two applications.
- (c) Explain the technique of density gradient centrifugation. (5,5,5)
5. (a) Differentiate between the following:
- (i) Cation and anion exchanger
 - (ii) SDS-PAGE and native gel electrophoresis
 - (iii) Extrinsic and intrinsic fluor
- (b) A solution of UTP of concentration 29.3 mg/litre has an absorbance of 0.25 at 260nm. If the light path is 1.0cm and the molecular weight of UTP is 586, calculate the molar absorbance coefficient of UTP. (12, 3)
6. Write short notes on the following:
- (a) Different types of rotors
 - (b) Isoelectric focussing
 - (c) Lamberts-Beer Law (5, 5, 5)
- (200)

Dec-2022

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1015

D

Unique Paper Code : 2492011101

Name of the Paper : Biomolecules (DSC-I)

Name of the Course : B.Sc. (Hons.) Biochemistry

Semester : I

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are six questions
3. Attempt any four questions.
4. All questions carry equal marks.
5. Question No. 1 is compulsory.

P.T.O.

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1. (a) Explain the following:

- (i) Sucrose is referred to as a non-reducing sugar.
- (ii) DNA absorbs more at 260nm with increase in temperature.
- (iii) Population that primarily consumes corn rich diet often suffers from pellagra.
- (iv) Oleic acid has a lower melting point than Elaidic acid.
- (v) Lactose exists in two anomeric forms but no anomeric forms of sucrose have been reported. (2x5=10)

(b) Write the reaction involved for the following:

- (i) RNA is treated with an alkali
- (ii) Phosphatidyl choline is treated with phospholipase A₂ (2.5x2=5)

2. Differentiate between the following:

- (a) Thromboxanes and Leukotrienes
- (b) Essential and non-essential amino acids

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(c) Homopolysaccharides and Heteropolysaccharides

(d) Chitin and Cellulose

(e) Glycoproteins and Proteoglycans

(f) tRNA and mRNA (2, 2, 2.5, 2.5, 3, 3)

3. (a) An investigator isolated two DNA samples (A and B) of same genome size but found that the melting point was different. The melting point of B was determined to be higher than A. Can you explain the reason behind it?

(b) Explain the different ionic forms of Histidine using a titration curve.

(c) Discuss any three types of membrane lipids. (4, 5, 6)

4. (a) Identify the vitamin deficient in the following conditions and mention the symptoms:

(i) Impaired blood clotting

(ii) Bleeding gums

(iii) Night blindness

(iv) Anemia

P.T.O.

- (b) Comment on the importance of waxes.
- (c) Compare and contrast the various forms of DNA.
(6, 3, 6)

5. (a) Draw the structure of the following:

- (i) Histidine
 - (ii) Cellobiose
 - (iii) Plasmalogen
 - (iv) Phosphotyrosine
 - (v) Sphingomyelin
 - (vi) Estradiol
 - (vii) Keratan Sulfate
 - (viii) Selenocysteine
- (1.5×8=12)

(b) What are Lectins? Discuss their biological role.
(3)

6. Write short notes on the following:

- (a) Vitamin A
 - (b) Watson and Crick model of DNA
 - (c) Role of storage lipids
 - (d) Storage polysaccharides
- (3, 4, 4, 4)
(200)

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Your Roll No.....

Sr. No. of Question Paper : 1212 **D**

Unique Paper Code : 2494001001

Name of the Paper : Molecules of Life (GE-1)

Name of the Course : **B.Sc. (Hons.) Biochemistry**

Semester : 1

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are six questions.
3. Attempt **any four** questions.
4. All questions carry equal marks.
5. Question no. 1 is compulsory.

P.T.O.

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1. (a) Define the following terms with suitable examples wherever applicable:

- (i) Zwitterion
- (ii) Buffer
- (iii) Epimers
- (iv) Rancidity
- (v) Mutarotation

(b) Match the biomolecules from List A with List B

List A: Glyceraldehyde, Stearic acid, Phospholipid, Oleic acid, Reducing sugar, Adenine, Cholesterol, Cerebroside, Ribose, Chitin

List B: Pentose, Homopolysaccharide, Glucose, Triose, MUFA, Steroid, Glycolipid, Fatty acid, Nitrogenous base, Phosphatidylcholine (10, 5)

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2. Differentiate between the following:

- (a) Acidic and basic amino acids
- (b) Reducing and Non-reducing Disaccharide
- (c) Essential and non-essential amino acid
- (d) Starch and Glycogen
- (e) Glycerolipids and sphingolipids (3×5)

(a) Draw the structure of the following:

- (i) β -D glucopyranose
- (ii) Serine
- (iii) Phosphatidic acid
- (iv) Phenylalanine
- (v) 2-deoxyribose

P.T.O.

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- (b) Explain the salient features of the structure of B-DNA using a suitable diagram.
- (c) What are non-standard amino acids. Use suitable examples (Any two), draw the structures and mention their significance also. (5x3)
4. (a) Name the amino acids that absorb ultraviolet light. Which one absorbs maximum UV light?
- (b) Explain briefly the effect of unsaturation on the melting point of Fatty acids using suitable example
- (c) Indicate whether the following pairs of sugars are epimers, anomers or enantiomers.
- α -D glucopyranose and β -D glucopyranose
 - D-glucose and D-galactose
 - D-fructose and L-fructose

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- (d) Write an example each for the following:
- Essential fatty acid
 - Imino acid
 - Synthetic analogue of nucleotide
 - A sphingolipid
 - An amino acid that is optically inactive
 - Amino acid with pK value close to biological pH
- (e) Write briefly on the organization of DNA into Chromatin. (3x5)
5. (a) Explain why?
- Amino acids act as buffers.
 - Lactose exists in two anomeric forms while no anomeric form of sucrose has been reported.

P.T.O.

- (c) DNA is more stable than RNA
- (d) DNA rich in GC base pair melts at a higher temperature than the DNA which is rich in AT base pairs.
- (e) A Protein that is abundant in basic amino acids exhibits positive charge (3x5)
6. (a) Elaborate on the function of Carbohydrates in biological systems.
- (b) Why Triglycerides are the preferred choice as storage fuel compared to Glycogen?
- (c) Mention the properties of water that makes it an ideal solvent.
- (d) Explain briefly the functions of RNA. (4,3,3,5)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1056 C

Unique Paper Code : 32491101

Name of the Paper : Molecules of Life

Name of the Course : B.Sc. (Hons.) Biochemistry

Semester : I

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are 8 questions.
3. Attempt any 5 questions.
4. All questions carry equal marks.
5. Question no. 1 is compulsory.

1. State whether True or False with justification

(i) All Amino acids are optically active.

P.T.O.

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- (ii) Histidine acts as biological buffer at physiological pH.
 - (iii) Cellulose is not digested by humans.
 - (iv) Trehalose is non-reducing disaccharide.
 - (v) Oleic acid has higher melting point than stearic acid.
 - (vi) DNA does not show increase in absorbance on heating.
 - (vii) Chitin is an example of storage homopolysaccharides.
 - (viii) At pH more than pI amino acids exists in negatively charged form.
 - (ix) Vit K is responsible for its antioxidant action.
 - (x) Glycosaminoglycans has slippery consistency. (1.5×10=15)
2. Differentiate between the following :
- (i) B-DNA and A-DNA
 - (ii) Conformation and Configuration

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- (iii) Glycerophospholipid and Sphingophospholipid
 - (iv) Anomer and Epimer
 - (v) Water soluble and fat-soluble vitamins (3×5=15)
3. (a) Why is tryptophan poorly soluble but arginine is readily soluble in water?
- (b) The pKa value of carboxylic group in amino acids is lower than in that in acetic acid. Why?
- (c) Sucrose is non-reducing sugar, but lactose is reducing sugar. Why?
- (d) Why can human body not synthesize Vitamin-C, while some mammals like rats can synthesize Vitamin-C?
- (e) Why do animals store glycogen but not glucose for their energy need? Explain in brief. (3×5=15)
4. (a) Write down Henderson-Hasselbalch equation. What is its significance? Calculate the pH of a dilute solution that contains a molar ratio 2:1 of potassium acetate to acetic acid (pKa = 4.76).

P.T.O.

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- (b) Discuss the titration curve of glycine, indicating pka, pl and buffering zone.
- (c) Why DNA is a better molecule for storing genetic information than RNA. (8,5,2)
5. (a) What are glycosaminoglycans? Explain their role with help of examples.
- (b) What do you mean by biological buffers? Explain with the help of suitable examples.
- (c) List out various roles of nucleotides. (6,6,3)
6. Write short note on :
- (a) Salient features of Watson and Crick DNA double helix model
- (b) Lipid as signaling molecule
- (c) Water as reactant (5×3=15)
7. (a) What is the active form of vitamin-D and name the site where active form is synthesized?

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- (b) Name the vitamin deficiency identifying symptoms in the following conditions :
- (i) Scurvy
- (ii) Pellagra
- (iii) Rickets
- (iv) Megaloblastic anaemia
- (c) Name any two vitamins with antioxidant properties.
- (d) Name any three enzyme cofactors derived from vitamins. (2,8,2,3)
8. (a) Draw the structure of following :
- (i) A sulphur containing amino acid
- (ii) An hydroxyl group containing amino acid
- (iii) 7-methyl guanosine
- (iv) Phosphatidylethanolamine
- (v) β -D galactosamine

P.T.O.

(vi) Palmitic acid

(vii) Maltose

(b) Give reaction for the following :

(i) Action of alkali on RNA

(ii) Reaction of monosaccharides with cupric ions

(iii) Action of phospholipase A on lecithin

(iv) Action of enzyme sucrase on sucrose in presence of HCl (7,8)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1034 **D**
Unique Paper Code : 2492011102
Name of the Paper : Proteins (DSC-2)
Name of the Course : B.Sc. (Hons.) Biochemistry
Semester : 1
Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are 6 questions.
3. Attempt any 4 questions. All questions carry equal marks.
4. Question no. 1 is compulsory.

1. A. Choose the best choice :

- (a) Which of the following pairs of bonds within a peptide backbone show free rotation around both bonds?

P.T.O.

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- (i) $C\alpha-C$ and $N-C\alpha$
 - (ii) $C=O$ and $N-C\alpha$
 - (iii) $C=O$ and $N-C$
 - (iv) $N-C$ and $C-C\alpha$
 - (v) $N-C\alpha$ and $N-C$
- (b) A bond generally absent in cytosolic proteins but present in extracellular proteins is known as -
- (i) Hydrogen bond
 - (ii) Disulfide bond
 - (iii) Ionic bond
 - (iv) Hydrophilic bond
 - (v) Van der Waal interactions
- (c) An integral membrane protein can be solubilized by extraction with :
- (i) A buffer of alkaline or acid pH.

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- (ii) A solution of high ionic strength.
 - (iii) A chelating agent that removes divalent cations.
 - (iv) A detergent solution
 - (v) An organic solvent
- (d) A repeating structural unit in a multimeric protein is known as a(n) :
- (i) Domain
 - (ii) Motif
 - (iii) Oligomer
 - (iv) Protomer
 - (v) Subunit

B. Write an example and one function of the following:

- (a) Tripeptide
- (b) Glycoproteins
- (c) Metalloprotein

P.T.O.

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C. Give reasons for the following :

- (a) The peptide bond is a semi-rigid bond
- (b) CO is a silent killer.
- (c) Alzheimer's disease is a proteopathy.
- (d) Collagen possess very high tensile strength (4,3,8)

2. (a) Differentiate between the following :

- (i) Fibrous and Globular proteins
- (ii) Motifs and domains
- (iii) Parallel and Anti-parallel β strand
- (iv) Tertiary and Quaternary structure (4,4,4,3)

3. (a) Calculate the length of a linear peptide in nm having 200 amino acids, out of which 60% of residues are in α -helix and rest are in β -pleated sheets.
- (b) Describe Edman degradation method of protein sequencing in detail. What are its advantages over Sanger's method?

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(c) Give an account of α -Keratin structure and what makes them mechanically durable? (4,6,5)

4. (a) Explain the Bohr Effect and give its physiological relevance?

(b) The following steps were performed on a peptide using enzyme cleavage. Determine the amino acid sequence of the peptide.

(i) Step 1. Treatment with trypsin yields three fragments with the following sequences WGA, AGTK, YLDR.

(ii) Step 2. Treatment with chymotrypsin gave the following three peptide fragments: GA, LDRW, AGTKY.

(c) Give the basis of the following statements :

(i) Fetal hemoglobin has higher affinity for oxygen

(ii) Hemoglobin S homozygous individuals are anemic

(iii) Hemoglobin Hill plots give variable Hills coefficient (5,2,5,7,5)

P.T.O.

5. (a) Write the mechanism for the denaturation of proteins by each of the following reagents or conditions.

(i) Urea

(ii) High temperature

(iii) Detergent

(iv) Low pH

(b) Explain the energy – entropy diagram for protein folding. Explain how chaperones assist in protein folding. (8,7)

6. Write short notes on the following :

(a) Ramachandran plot

(b) Prion diseases

(c) Protein structure prediction tools (5,5,5)

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Your Roll No.....

Sr. No. of Question Paper : 1272

C

Unique Paper Code : 32493301

Name of the Paper : Biochemical Techniques

Name of the Course : B.Sc. (Hons.) Biochemistry

Semester : III (CBCS-LOCF)

Duration : 2 Hours

Maximum Marks : 50

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are **six** questions.
3. Attempt any **four** questions only.
4. **All** questions carry equal marks.
5. Question no. **1** is compulsory.

1. (a) Answer briefly (any four) :

- (i) Swing out rotors are rotor of choice for density gradient centrifugation.

P.T.O.

- (ii) Photomultiplier tubes are more sensitive than photocells.
- (iii) Protein separation by gel filtration chromatography depends on the size and shape of a molecule.
- (iv) Molecular weight of a protein can be determined by SDS-PAGE.
- (v) Dialysis is important for protein de-salting.

(b) Define the following :

- (i) Partition coefficient
- (ii) Exclusion limit of a gel
- (iii) Sedimentation coefficient (8,4,5)

2. (a) Discuss the principle and give two applications of the following techniques :

- (i) SDS-PAGE
- (ii) Affinity chromatography
- (iii) Fluorescence spectroscopy
- (iv) Density gradient centrifugation

- (b) One tryptophan and one tyrosine are present in a protein sequence. What would be the molar concentration of that protein? (Molar extinction coefficient at 280 nm for tryptophan = $3000 \text{ M}^{-1} \text{ cm}^{-1}$ and tyrosine = $1500 \text{ M}^{-1} \text{ cm}^{-1}$, respectively, absorption at 280 nm is 0.90 and pathlength 1 cm.). (10,2,5)

3. (a) Differentiate between the following :

- (i) Absorbance and fluorescence
- (ii) Isopycnic and rate zonal centrifugation
- (iii) Cation and anion exchangers
- (iv) Native and denatured gel electrophoresis

(b) Explain the Beer-Lambert's law and discuss its limitations. (8,4,5)

- 4. (i) Write down the principle and two applications of gel filtration chromatography.
- (ii) With a schematic diagram describe the working of a spectrophotometer.
- (iii) Describe the 3 types of rotors which are used in centrifuge. (5,4,3,5)

P.T.O.

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5. (a) Discuss the principle and the applications of analytical ultracentrifuge.

(b) What are the various elution strategies used in ion exchange chromatography?

(c) Why is agarose preferred over polyacrylamide gel for DNA electrophoresis? (5,4,5,3)

6. (a) What is adsorption chromatography? Explain the principle of thin layer chromatography. How TLC is more advantageous over paper chromatography?

(b) Explain the isoelectric focusing techniques.

(c) Write the role of following :

(i) Ninhydrin

(ii) TEMED

(6,4,5,2)

(500)

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[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1416 C

Unique Paper Code : 32491303

Name of the Paper : Hormone: Biochemistry and Function

Name of the Course : B.Sc. (Hons.) Biochemistry

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are 8 questions.
3. Attempt any 5 questions.
4. All questions carry equal marks.
5. Question no. 1 is compulsory.

1. (a) Explain the following statements :
 - (i) Signal transduction pathways result in amplification of signal.

P.T.O.

- (ii) Steroid hormones regulate gene expression by binding to intracellular receptors.
 - (iii) TSH levels are high in Hashimoto's disease.
 - (iv) Ghrelin is often known as hunger hormone.
 - (v) Corpus luteum is a transitory endocrine gland.
- (b) Explain the following terms :
- (i) Paracrine hormone
 - (ii) Goitrogens
 - (iii) Inhibin
 - (iv) POMC peptide
 - (v) Menarche (10,5)
2. (a) NO (nitric oxide) does not have a specific cellular receptor. How, then, does it act as a signaling molecule?
- (b) How do DAG and IP3 originate? Give the mechanism of one action that each of them mediate.

- (c) Cholera toxin and Forskolin cause increased production of cAMP. Give the mechanism of action of each. (4,5,6)
- (a) Schematically give the signal transduction events that follow when Insulin binds to its receptor.
- (b) Give mechanism of short term and long term regulation of hormone receptors.
- (c) Diagrammatically explain the biosynthesis steps involved in Thyroid hormone synthesis. (5,5,5)
- (a) Taking an example each explain the positive and negative feedback regulation mechanism of hormones.
- (b) The hypothalamus communicates differently with the anterior pituitary and the posterior pituitary. Explain with the help of a diagram.
- (c) Elaborate on the direct and indirect actions of Growth hormone. Name the diseases associated with GH excess. (5,5,5)

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5. Give the role of the following :
- (a) Renin-Angiotensin system in maintaining electrolyte balance
 - (b) Insulin in glucose homeostasis.
 - (c) Vitamin D in Ca^{2+} homeostasis. (5,5,5)
6. (a) What are fight-or-flight responses? How are they triggered?
- (b) Summarize the role of Gastrin, Cholecystokinin and Secretin following a meal.
- (c) What are oral contraceptives? Discuss their mechanism of action? (5,6,4)
7. (a) What changes happen in males during puberty?
- (b) Every month, the uterus prepares itself to receive a fertilized egg. Give the role of estrogen and progesterone in bringing about changes in the uterine lining to nourish the embryo. Also give details of the menstruation process if the egg is not fertilized.

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- (c) Show how interplay of hormones bring about development of lactating mammary gland. (4,6,5)
8. (a) Patients suffering from Hypothyroidism often suffer from cold intolerance. Explain Why?
- (b) Thirty year old man underwent surgery for cystic pituitary adenoma. Three weeks post operation he developed increasing thirst and was drinking 4-5 L of fluid in 24 h. He was waking up four to five times at night to pass urine. What further tests would you recommend to confirm diagnosis of Diabetes Insipidus?
- (c) Common signs and symptoms of Cushing syndrome include weight gain and fatty tissue deposits, particularly around the midsection and in the face. What causes Cushing syndrome and give the basis of the symptoms observed. Also state the biochemical parameters observed in Cushing syndrome.

P.T.O.

(d) What stimulates the release of PDGF? Discuss its biological role. (3,4,5,3)

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Your Roll No.....

Sr. No. of Question Paper : 1387

C

Unique Paper Code : 32491302

Name of the Paper : Membrane Biology and Bioenergetics

Name of the Course : B.Sc. (H) Biochemistry

Semester : III

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are 8 questions.
3. Attempt any 5 questions.
4. All questions carry equal marks.
5. Question no. 1 is compulsory.

1. (a) Give explanation for the following (any 6)

- (i) Integral membrane proteins require detergents for their solubilisation.

P.T.O.

- (ii) Many thermodynamically favorable reactions do not occur at room temperature.
 - (iii) Phosphatidylserine is found predominantly on the cytosolic side of the membrane.
 - (iv) PEP has high standard free energy change of hydrolysis.
 - (v) Cholesterol plays a dual role in maintaining membrane fluidity.
 - (vi) Oxygen is not evolved in cyclic photophosphorylation.
 - (vii) MDR pumps are referred as molecular vacuum cleaners.
 - (viii) Digitoxin is used in the treatment of congestive heart failure.
- (b) Explain the role of the following :
- (i) Bacteriorhodopsin in *Halobacterium halobium*
 - (ii) Brown fat in newborn mammals
 - (iii) Tight junctions in membrane (9,6)

- (a) Explain the key developments leading to the elucidation of the structure of biomembranes.
 - (b) What is the role of CFTR? How does CFTR differ from ABC transporters?
 - (c) Give the structural composition of F_0F_1 ATP synthase. Explain the mechanism of ATP synthesis by rotational catalysis. (6,4,5)
- (a) Explain Peter Mitchell's chemiosmotic theory. Give two experimental evidences in support of the chemiosmotic theory.
- (b) Explain the use of Liposomes as drug delivery system.
- (c) Define CMC. Explain different parameters that can be used to measure CMC. (6,4,5)
- (a) What type of transporter is GLUT1? Elaborate upon the membrane topology and function of GLUT 1.
- (b) Explain the structure and function of water channels?

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(c) Give the mode of action of the following :

(i) Amytal

(ii) DNP

(iii) Oligomycin

(iv) Azide

(5,4,6)

5. (a) What are membrane rafts. Why are they called detergent resistant domains? Give the physiological significance of these rafts.

(b) What do you understand by Homeoviscous adaptation.

(c) What is the significance of cyclic photophosphorylation in plants. (6,4,5)

6. (a) Elaborate upon different types of membrane proteins. Give examples of membrane proteins with alpha helix and beta barrel structures.

(b) Differentiate between P-Type and V-Type ATPases.

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5

(c) What are reactive oxygen species? Enumerate the ROS scavenging mechanisms in mitochondria.

(6,4,5)

7. (a) Give a diagrammatic representation of RBC membrane skeleton. Label the major RBC membrane proteins.

(b) How do you determine the topology of a membrane protein? Give two methods.

(c) Depict the Z-scheme of photosynthesis in plants with the help of diagram. (5,6,4)

8. (a) Calculate the actual free energy change of ATP hydrolysis in the human erythrocytes in which the ATP, ADP and Pi concentrations are 2.25, 0.25 and 1.65mM respectively.

Assume that pH is 7.0 and the temperature is 37 degree Celsius.

(R = 8.315 J/mol. K; Standard free energy change of ATP hydrolysis = -30.5KJ/mol)

(b) Elaborate upon photophosphorylation in purple bacteria and green sulphur bacteria.

P.T.O.

(c) Explain the role of following in the study of membrane dynamics:

(i) FRAP

(ii) TNBS

(iii) SPT

(4,5,6)

(500)

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Your Roll No.....

Sr. No. of Question Paper : 1370

C

Unique Paper Code : 32491301

Name of the Paper : Metabolism of Carbohydrates & Lipids

Name of the Course : B.Sc. (H) Biochemistry

Semester : III

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are 8 questions.
3. Attempt any 5 questions.
4. All questions carry equal marks.
5. Question no. 1 is compulsory.

1. (a) Comment on the following :

- (i) Sugar nucleotides are required for synthesis of glycogen.

P.T.O.

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- (ii) High NADPH/NADP ratio decreases the rate of hexose monophosphate shunt
- (iii) Fatty acids cannot cross mitochondrial membrane to carry out beta oxidation in mitochondrial matrix
- (iv) Fructose 2,6-bisphosphate is a potent activator of glycolysis
- (v) Water soluble vitamins play a crucial role in the citric acid cycle.
- (vi) Bile helps in digestion and absorption.

(b) Identify the defective enzyme in following :

- (i) Niemann pick disease
- (ii) Mc Ardles syndrome
- (iii) Lactose Intolerance (12,3)

2. Differentiate between :

- (a) Substrate level phosphorylation and oxidative phosphorylation
- (b) Fatty acid synthesis and breakdown
- (c) Malate Aspartate shuttle and Glycerol 3 phosphate shuttle (5,5,5)

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3. Give the following conversions with enzymes involved in :

- (a) Acetyl CoA to Mevalonate
- (b) Galactose to glucose-6- phosphate
- (c) Glucose to ribose 5 phosphate
- (d) Glycerol-3-phosphate to phosphatidic acid (4,4,4,3)

4. Answer the following :

- (a) Animals cannot convert fatty acid into glucose but plants can. Explain by giving suitable reactions.
- (b) C3 plants are different from C4 plants.
- (c) Arsenate does not affect glycolysis but effects ATP synthesis.
- (d) Glucose-6-phosphate is not given intravenously.
- (e) HDL is a scavenger of cholesterol. (4,4,3,2,2)

5. Explain the following :

- (a) Reciprocal regulation of gluconeogenesis and glycolysis with specific reference to Glucokinase, PFK I and PFK II.
- (b) Oxidation of odd chain fatty acids leads to net synthesis of oxaloacetate.

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- (c) Carnitine plays important role in fatty acid oxidation.
- (d) Liver glycogen contribute to blood glucose but not muscle glycogen. (6,3,3,3)
6. (a) Give the total number of ATP produced in the following :
- (i) Complete oxidation of Palmitic acid.
 - (ii) Alpha ketoglutarate to malate.
- (b) Give synthesis of triacylglycerol from glycerol. (7,5,3)
7. (a) Explain digestion and absorption of triacylglycerol.
- (b) Describe the regulation of fatty acid oxidation by malonyl CoA.
- (c) Give action of the following :
- (i) Aspirin
 - (ii) Statins
- (d) Give the regulation of Rubisco enzyme. (4,4,4,3)
8. Write short notes on :
- (a) Amphibolic nature of TCA Cycle
 - (b) Starve Feed Cycle
 - (c) Omega oxidation
 - (d) Ketone bodies (4,4,4,3)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1874

C

Unique Paper Code : 32495902

Name of the Paper : GE-Proteins and Enzymes

Name of the Course : B.Sc. (Hons.) Biochemistry

Semester : III

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are 8 questions.
3. Attempt any 5 questions.
4. All questions carry equal marks.
5. Question no. 1 is compulsory.

1. (a) State whether the following statements are true or false with justification :

(i) Disulphide bridges are formed during protein folding.

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- (ii) Enzyme active site contains polar or charged molecules.
- (iii) Lactate dehydrogenase is an example of isozyme.
- (iv) Proline is found at the turns in the helix.
- (v) K_m is directly proportional to the affinity of the substrate.
- (vi) Ribosome is an example of the ribozyme. (2×6)

(b) Give an example of the following :

- (i) Suicide inhibitor
- (ii) Protein misfolding disorder
- (iii) Metalloprotein (3×1)

2. Write short note on the following : Any 3

- (a) Thalassemia
- (b) Functional diversity of proteins
- (c) Oxygen binding curves of hemoglobin and myoglobin

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- (d) Immobilization of enzymes (3×5)

3. Differentiate between the following :

- (i) Prosthetic group and coenzyme
- (ii) Diagnostic enzymes and therapeutic enzymes
- (iii) HPLC and FPLC
- (iv) Differential and density gradient centrifugation
- (v) Lock and key model and induced fit model (5×3)

4. (a) Write the characteristic features of α -helix.

(b) Give the principle of ammonium sulphate precipitation for isolation of protein.

(c) Distinguish between stacking and resolving gels in SDS PAGE. A protein has a molecular mass of 400 kDa when measured by gel filtration. When subjected to gel electrophoresis in the presence of sodium dodecyl sulfate (SDS), the protein gives three bands with molecular masses of 180, 160, and 60 kDa. When electrophoresis was carried

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out in the presence of SDS and dithiothreitol, three bands are again formed, this time with molecular masses of 160, 90, and 60kDa. Determine the subunit composition of the protein. (5,5,5)

5. (a) Write the principle of molecular sieve chromatography.
- (b) Write the Lineweaver-Burke equation and draw LB plots for competitive and uncompetitive inhibition.
- (c) Determine the sequence of a peptide based on the following information :
 - (i) Complete hydrolysis revealed that small peptide contains the following amino acids: Ala, Lys, 2 Met, Gly, Leu, Asp.
 - (ii) Reaction with dansyl chloride gave dansyl-Ala.
 - (iii) CNBr treatment released:
 - (a) Tetrapeptide having Ala, Met, Lys and Asp.

- (b) Dipeptide having Gly and Met.
- (c) Free amino acid was released as Leu.
- (iv) Trypsin treatment released :
 - (a) Tripeptide containing Ala, Lys and Asp.
 - (b) Tetrapeptide containing Gly, Leu, 2 Met. (5,6,4)
6. (a) ATCase is an example of both allosteric and feedback regulation, explain.
- (b) Explain the significance of Ramachandran plot in determining the secondary structure of proteins.
- (c) What are ampholytes? How they are useful in the separation of proteins? (5,5,5)
7. (a) Write enzyme classification with one example of each class.
- (b) Explain the Merrifield's solid phase peptide synthesis.
- (c) What is the role of Horseradish peroxidase in ELISA? (6,7,2)

8. (a) What is the significance of Multienzyme complexes?
Explain citing one example.
- (b) Proteolytic enzymes are expressed in the proprotein form, explain.
- (c) Explain the concerted and sequential model for allosteric proteins. (6,4,5)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1038 **C**

Unique Paper Code : 32491502

Name of the Paper : Gene Expression and Regulation

Name of the Course : B.Sc. (Hons.) Biochemistry

Semester : V

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. There are 8 questions.
3. Attempt any 5 questions.
4. All questions carry equal marks.
5. Question no. 1 is compulsory.

1. (a) Explain the following :

- (i) Oligonucleotides containing the Shine-Dalgarno sequence inhibit translations in prokaryotes but not in eukaryotes.

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- (ii) Cells carrying suppressor tRNA genes are less viable than wild-type cells.
- (iii) The RNA polymerase core enzyme is catalytically active but non-specific
- (iv) The ribosome is a ribozyme
- (v) Role of the C terminal domain of RNA polymerase is crucial for transcription in eukaryotes

(b) What do you understand by the following terms?

- (i) Enhancers
 - (ii) Insulators
 - (iii) Inducer
 - (iv) Promoter escape
 - (v) Guide RNA
- (10,5)

2. (a) Differentiate between the following: (any three)

- (i) Group I and Group II introns

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- (i) Rho dependent and independent transcription termination
 - (iii) RNA Pol I and RNA Pol II
 - (iv) Class I and Class II Aminoacyl tRNA synthetase
 - (v) Negative and Positive Regulation
- (b) The following mRNA nucleotide sequence is provided to you:

5'AGUUCUAACGCUACAGUCUACCAGCUCGGA3'

Write the sequence of the coding and non-coding strand of the corresponding DNA. Also indicate the sense, antisense, plus and minus DNA strand.
(9,6)

3. (a) What are the core promoter elements in prokaryotes and eukaryotes? What do you understand by a consensus sequence?
- (b) Discuss the importance of GTP in the translation process. Explain how and why tRNA synthetases play the most crucial roles in determining the fidelity of translation?

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- (c) Why is Sigma factor called the specificity factor? Describe the structure and function of Sigma factor. (5,4,6)
4. (a) Diagrammatically explain how one eukaryotic gene can give rise to two functional proteins.
- (b) Discuss the biochemical and genetic experiments to prove that the genetic code is triplicate.
- (c) Describe a technique that can be used to demonstrate the promoter binding activity of any transcription factor. (4,6,5)
5. (a) Discuss the experiment that showed that the direction of protein synthesis is from N to C terminal.
- (b) Describe the regulation of Lac operon in bacteria. Contrast it with the regulation of the galactose operon in yeast cells.
- (c) Explain the significance of Cap and Poly-A tail in eukaryotic mRNA. (3.5,7.5,4)

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6. (a) In Eukaryotes, a transcript can be broken explicitly into pieces for reducing its expression. Describe the mechanism by which this phenomenon takes place and write the possible applications associated with it.
- (b) Explain how cooperative binding facilitates regulation?
- (c) With the help of a diagram, explain how pre-rRNA transcripts are processed in bacteria? (7,4,4)
7. (a) Explain the regulation of gene expression by Chromatin remodelling.
- (b) Write the mechanism of action of the following :
- (i) Chloramphenicol
 - (ii) Tetracycline
 - (iii) Rifampicin
 - (iv) Fusidic acid
 - (v) Actinomycin D (7.5,7.5)

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8. Write short notes on (any three)

(a) Riboswitches

(b) RNA Editing

(c) DNA binding domains

(d) Attenuation

(e) Salient features of genetic code (15)

(500)