

[This question paper contains 6 printed pages.]

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Your Roll No. 2023

Sr. No. of Question Paper : 4537

E

Unique Paper Code : 32491201

Name of the Paper : Proteins

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

Semester : II

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 **eight** questions.
3. Attempt any **five** questions.
4. **All** questions carry equal marks.
5. Question No. 1 is compulsory.



1. (a) State whether true or false with justification:

(i) Proline is rarely present in an alpha-helix.

P.T.O.

- (ii) Fibroin, the silk protein is rich in Ala and Gly residues.
- (iii) Persons living at high altitudes have higher levels of BPG in blood.
- (iv) Myoglobin is abundant in the muscle of diving mammals such as seals and whales.
- (v) French press is used for homogenizing fibrous proteins.
- (vi) Dialysis is used for desalting of protein preparations.

(b) Give one example of each of the following proteins/peptide :

- (i) Glycoprotein
- (ii) Hormone
- (iii) Metallo-protein
- (iv) Storage protein
- (v) Transport protein
- (vi) Antibiotic

(12,3)

2. (a) Two peptides are to be separated by ion exchange chromatography. At the pH of the mobile phase to be used on the column, peptide A has a net charge of -3 and peptide B has a net charge of $+1$. Which peptide would elute first from the cation-exchange resin and anion-exchange resin? Explain why?
- (b) Describe Anfinsen's experiment, concerning the denaturation and renaturation in ribonuclease A.
- (c) Comment on the following :
- (i) Woolen clothes shrink when washed in hot water but silk items do not.
 - (ii) 2D gel electrophoresis is used for the resolution of complex mixture of proteins.
 - (iii) Ammonium sulfate is the preferred salt for salt fractionation of proteins.
 - (iv) Glycine in proteins does not have restricted psi and phi dihedral angles. (3,4,8)
- 3 (a) Differentiate between the following :
- (i) Integral and peripheral membrane proteins

- (ii) Salting in and salting out
- (iii) Globular and fibrous proteins
- (iv) HPLC and FPLC
- (v) Concerted and sequential model (15)

4. (a) Describe the solid phase peptide synthesis method given by Merrifield. Also give its advantages.
- (b) Explain the principle of affinity chromatography. Discuss its advantages over other column chromatographic methods of protein purification.
- (c) Write down the functions of the following reagents in Protein chemistry :
- (i) Performic acid
 - (ii) Phenyl isothiocyanate
 - (iii) 1-fluoro-2,4-dinitrobenzene
 - (iv) Urea (6,5,4)
5. (a) Explain how hydropathy plots predict transmembrane domains of proteins.

- (b) Explain the molecular basis of the Bohr effect.
- (c) Discuss the molecular basis and disease manifestation of the following diseases :
- (i) Sickle cell anemia
 - (ii) Prion disease (3,4,8)
6. (a) Give the various steps involved in the Edman degradation method of determining the sequence of a given protein.
- (b) Discuss the various bonds which lead to the stability of a protein.
- (c) Carbon monoxide binds to free heme molecules more than 20,000 times better than O_2 but it binds only about 200 times better when the heme is bound in myoglobin. Explain why?
- (d) Define the following :
- (i) Sedimentation coefficient
 - (ii) Exclusion limit
 - (iii) Isopycnic centrifugation (5,4,3,3)

7. (a) What are protein databases? Name any one and explain its uses.
- (b) Compare and contrast the O_2 binding curves of Myoglobin and Hemoglobin.
- (c) Differentiate between α helix and β pleated structure. (4,6,5)
8. Write short notes on the following :
- (a) Ramachandran map
- (b) Lyophilization
- (c) Fetal hemoglobin
- (d) Molecular chaperones
- (e) Antibody structure (15)

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Your Roll No. 2023

No. of Question Paper : 4657

E

que Paper Code : 32491202

e of the Paper : Enzymes

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

ester : II

ation : 3 Hours

Maximum Marks : 75

Instructions for Candidates

Write your Roll No. on the top immediately on receipt of this question paper.

There are 8 questions.

Attempt any 5 questions.

All questions carry equal marks.

Question No. 1 is compulsory.



(a) Explain the following :

- (i) At very high substrate concentrations the enzyme activity becomes constant.

P.T.O.

- (ii) A purified enzyme has maximum specific activity.
- (iii) Penicillin is an enzyme inhibitor.
- (iv) Enzymes can be regulated by irreversible covalent modifications.
- (v) Streptokinase is used in enzyme therapy.

(b) Define the following terms :

- (i) Turnover Number
- (ii) Activation energy
- (iii) Initial velocity
- (iv) Specific activity
- (v) Isozyme

(10,5)

2. (a) What are the features of enzymes that make them remarkable biological catalysts?
- (b) Pyridoxal phosphate is a versatile coenzyme. Explain with the help of three examples.

(c) Explain why ser-195 in chymotrypsin has a lower pK_a than other serine residues. (4,6,5)

3. (a) Explain why ATCase is an important regulatory enzyme. Describe how this enzyme is regulated by allosteric modulation.

(b) Using lineweaver-Burk plots explain the following types of enzyme inhibitions:

(i) Competitive

(ii) Non-competitive

(c) How do you express activity of an enzyme? Explain why enzyme activities are measured under saturating substrate concentration. (6,6,3)

4. (a) Discuss the catalytic mechanism of lysozyme.

(b) How are enzymes classified? Explain giving an example of each class.

(c) What is the ratio of the $[S]$ to K_M when the velocity of an enzyme catalyzed reaction is 80% of its V_{max} ? (6,6,3)

5. (a) Specific activity of an enzyme is an important parameter in following the progress of enzyme purification. Comment.
- (b) Name the cofactor and give the structure of the following enzymes :
- (i) Transaminase
 - (ii) Pyruvate carboxylase
- (c) Give an example of the following :
- (i) A metalloenzyme
 - (ii) An allosteric enzyme
 - (iii) An therapeutic enzyme
 - (iv) An enzyme present in tears (6,5,4)
6. (a) Discuss with the help of examples how enzymes can be regulated by reversible covalent modification.

(b) Differentiate between the following :

(i) Holoenzyme and apoenzyme

(ii) Active site and regulatory site

(c) How will you differentiate between single and double displacement reactions kinetically?

(6,5,4)

7. (a) Explain the importance and the regulatory mechanism of the enzyme aspartate transcarbamoylase.

(b) Derive the Michaelis-Menten equation. Show how it can be transformed to LB plot. Compare the LB plot with Eadie-Hofstee plot.

(c) The drug allopurinol is used in the treatment of gout. Explain.

(6,6,3)

8. Write short notes on the following :

(a) Immobilized enzymes

(b) Protease inhibitors

(c) Zymogens

(5,5,5)

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Your Roll No. **JULY 2023**

Sr. No. of Question Paper : 1211

F

Unique Paper Code : 2492011202

Name of the Paper : Metabolism of Carbohydrates

Name of the Course : **B.Sc. (Hons.) Biochemistry**
DSC-4

Semester : II

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.
4. **All** questions carry equal marks.
5. Question no. 1 is compulsory.



1. (a) Give reasons for the following :

(i) Fructose is metabolized more rapidly than glucose.

(ii) Glucose 6-Phosphate Dehydrogenase deficiency results in hemolytic anemia.

- (iii) Gluconeogenesis is an endergonic pathway.
- (iv) In the absence of oxygen, pyruvate is converted into lactate in the muscle.

(b) Give the reaction for the following :

- (i) Oxidative decarboxylation reaction in TCA cycle.
- (ii) Reaction involved in substrate level phosphorylation in Glycolysis.
- (iii) Reaction catalyzed by Enolase.
- (iv) Reaction of TCA cycle which is also a part of Electron transport chain.
- (v) Reaction requiring Biotin as coenzyme.

(2.5×4, 1×5)

2. (a) Differentiate between the following :

- (i) Autotrophs and Heterotrophs
- (ii) Post absorptive state and early fasting state
- (iii) Branching enzyme and debranching enzyme
- (iv) Pasteur effect and Crabtree effect

(3,4,4,4)

3. (a) PFK-1 is the key regulatory enzyme of glycolysis. Explain the mode of regulation.
- (b) Give the pathway of Galactose entry into glycolysis.
- (c) Give the mechanism how Arsenate blocks ATP synthesis in Glycolysis.
- (d) Fluoride in tooth pastes prevent dental caries. Explain. (6,4,3,2)
4. (a) Gluconeogenesis involves two compartments: mitochondria and cytosol for the synthesis of glucose from pyruvate. Explain.
- (b) Elaborate on the Non-oxidative phase of HMP pathway. How does it feed into glycolysis?
- (c) Hexokinase IV (glucokinase) in the liver differs from hexokinase (I) in the muscle in its kinetics and biological role. Explain. (6,6,3)
5. (a) Elaborate how Glycogen phosphorylase is activated by Glucagon.
- (b) Give the role of Glycogenin in initiation of Glycogen synthesis.

- (c) Give the steps involved in the addition of new glycosyl units to the non-reducing end of glycogen starting with Glucose-6-phosphate. Also state the type of bond formed. (6,3,6)
6. (a) Krebs cycle is an Amphibolic pathway. Explain.
- (b) Describe the Cori cycle. What is its physiological function?
- (c) Explain the process of alcohol fermentation. (6,5,4)
7. (a) Give the cause and Biochemical and physiological manifestation of the following diseases.
- (i) Galactosemia
 - (ii) Von Gierke disease
 - (iii) McArdle Disease
- (b) Give the mechanism of inhibition of the following TCA cycle inhibitors :
- (i) Fluoroacetate
 - (ii) Malonate
- (3×3, 2×3)

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Your Roll No. JULY 2023

Sr. No. of Question Paper : 1230

F

Unique Paper Code : 2492011203

Name of the Paper : Basic Concepts of Cell Biology

Name of the Course : **B.Sc. (Hons.) Biochemistry – DSC-5**

Semester : II

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.
4. All questions carry equal marks.
5. Question no. 1 is compulsory.



1. (a) Fill in the Blanks :

- (i) _____ enzyme is defective in autosomal recessive disorder I cell disease.
- (ii) _____ cytoskeletal element is found in flagella of Euglena.
- (iii) _____ microscope is best suited for visualizing a live cell without using any stain.

(c) Give the steps involved in the addition of new
1230 **2**

- (iv) _____ is primary structural component of basal lamina.
- (v) In animal cells, lipids like steroidal hormones are synthesized in _____.

(b) State True or False and Justify (**any 5**) :

- (i) Lysosomes are formed by process of packaging in the endoplasmic reticulum.
- (ii) Glycosylation completes in Endoplasmic reticulum
- (iii) Gap Junctions are present in neurons and cardiac cells.
- (iv) Vesicles are moved by Cytoplasm.
- (v) Proline and Glycine are two amino acid that forms triple-stranded helix of Elastin.
- (vi) Deficiency of vitamin C causes weakened connective tissue. (5,10)

2. Differentiate between the following :-

- (i) Pinocytosis and Phagocytosis
- (ii) Upright and Inverted Microscope
- (iii) SER and RER

(iv) Dyes and Fixatives

(v) Tight junctions and Adheren Junctions

(5×3=15)

3. (a) Comment on the following statements :

(i) Vincristine is a common chemotherapeutic agent used to treat cancer.

(ii) In a couple, if father suffers from LHON and mother does not, son will not be affected with this disease.

(iii) Polarity of epithelial cells is maintained by tight junctions.

(iv) Liver cells contain abundant amount of Peroxisomes.

(v) Golgi bodies are dynamic in nature.

(b) Define the following :

(i) Magnification

(ii) Pinocytosis

(iii) Plasmodesmata

(iv) MTOC

(v) Cell adhesion molecules

(10,5)

4. (a) Describe the process of Receptor mediated endocytosis with the help of suitable example.
- (b) What is the role of GTP in the assembly of microtubules? Explain the term Dynamic instability and what role does it play in cellular activity?
- (c) Explain two activities of Lysosomes. Draw the structure of axoneme of cilia and flagella.
(5,5,5)
5. (a) How does Endoplasmic reticulum perform the Quality check of the newly synthesized Glycoproteins?
- (b) Compare Mitochondrial Genome with Chloroplast Genome.
- (c) Describe the mechanism of proteins import inside the nucleus.
(5,5,5)
6. Write short notes on the following (**any 3**) :
- (i) Lysosomal storage diseases
 - (ii) Glycosaminoglycans
 - (iii) Endosymbiotic theory
 - (iv) Meiosis
- (5,5,5)