

March 2009

[KU 148]

Sub. Code: 2043

**M.D. DEGREE EXAMINATION**

**Branch XIII – BIOCHEMISTRY**  
(Common to all Candidates)

**Paper I – PHYSICAL AND ORGANIC ASPECTS OF  
BIOCHEMISTRY, INSTRUMENTATION BIOCHEMICAL  
TECHNIQUES, BIOSTATISTICS**

*Q.P. Code : 202043*

**Time : Three hours**

**Maximum : 100 marks**

**Draw suitable diagram wherever necessary**

**Answer ALL questions**

**I. Essay questions : (2 x 20 = 40)**

1. Describe in detail the structure, classification and functions of immunoglobulins.
2. Name the plasma/RBC buffers and urine buffers. Describe the role of respiratory system and the role of kidney in the maintenance of acid base balance.

**II. Write short notes on : (10 x 6 = 60)**

1. Tonometry.
2. Chemiluminescence.
3. Reference materials.
4. Uronic acids and sugar alcohols.
5. Ion exchange chromatography.
6. Evaluation of diagnostic test.
7. ELISA.
8. Membrane proteins.
9. Sterols.
10. Measurement of radioactivity.

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September 2009

[KV 148]

Sub. Code: 2043

**M.D. DEGREE EXAMINATION**

**Branch XIII – BIOCHEMISTRY**  
(Common to all Candidates)

**Paper I – PHYSICAL AND ORGANIC ASPECTS OF  
BIOCHEMISTRY, INSTRUMENTATION BIOCHEMICAL  
TECHNIQUES, BIOSTATISTICS**

*Q.P. Code : 202043*

**Time : Three hours**

**Maximum : 100 marks**

**Draw suitable diagram wherever necessary**

**Answer ALL questions**

**I. Essay questions :** (2 x 20 = 40)

1. Describe the structure and types of Collagen. Add a note on the relationship of function to the three dimensional structure.
2. Describe the chemical composition, classification of Lipoproteins and their separation techniques.

**II. Write short notes on :** (10 x 6 = 60)

1. Ion selective electrodes.
2. Blotting techniques.
3. Sphingolipids.
4. Biological role of Dextrin and Cellulose.
5. Gel filtration Chromatography.
6. Computer applications in Clinical chemistry.
7. Correlation coefficient and coefficient of variation.
8. Tandem mass Spectrometer.
9. Synthetic Nucleotides.
10. Flame emission photometry.

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March 2010

[KW 148]

Sub. Code: 2043

**M.D. DEGREE EXAMINATION**

**Branch XIII – BIOCHEMISTRY**  
(Common to all Candidates)

**Paper I – PHYSICAL AND ORGANIC ASPECTS OF  
BIOCHEMISTRY, INSTRUMENTATION BIOCHEMICAL  
TECHNIQUES, BIOSTATISTICS**

*Q.P. Code : 202043*

**Time : Three hours**

**Maximum : 100 marks**

**Draw suitable diagram wherever necessary**

**Answer ALL questions**

**I. Essay questions :**

**(2 x 20 = 40)**

1. Describe the structural organization of adult hemoglobin. Explain the changes occurring at the molecular level during oxygenation.
2. Describe the principles, types and applications of radio immuno assay. How does this technique compare with ELISA techniques?

**II. Write short notes on :**

**(10 x 6 = 60)**

1. Arachidonic acid derivatives and their functions.
2. Glucose biosensors.
3. Working principle of atomic absorption spectrophotometry.
4. Liposomes.
5. SDS – polyacrylamide gel eletrophoresis.
6. Dietary fibre.
7. Dry chemistry methods.
8. Evaluation of a method of estimation.
9. Scintillation detectors.
10. Determination of primary structure of protein.

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September 2010

[KX 148]

Sub. Code: 2043

**M.D. DEGREE EXAMINATION**

**Branch XIII – BIOCHEMISTRY**

**Paper I – PHYSICAL AND ORGANIC ASPECTS OF BIOCHEMISTRY,  
INSTRUMENTATION BIOCHEMICAL TECHNIQUES, BIostatISTICS**

**(Common to all Candidates)**

*Q.P. Code : 202043*

**Time : Three hours**

**Maximum : 100 marks**

**Draw suitable diagram wherever necessary.**

**Answer ALL questions.**

**I. Essay questions :**

**(2 X 20 = 40)**

1. Explain the principles and steps of Polymerase Chain Reaction (PCR). Indicate the diagnostic applications of PCR.
2. Explain the different structural organization of proteins. Discuss the determination of primary structure of proteins.

**II. Write short notes on :**

**(10 X 6 = 60)**

1. Haemoglobin electrophoresis.
2. Write briefly on sub cellular fractionation and marker enzymes.
3. Henderson Hasselbalch equation.
4. Osmolarity and Osmolality.
5. Blood gas analysis.
6. Auto radiography.
7. Mucopolysaccharides.
8. Phospholipids and their functions.
9. Flame photometer.
10. Heparin.

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MAY 2011

[KY 148]

Sub. Code: 2043

M.D. DEGREE EXAMINATION

BRANCH XIII – BIOCHEMISTRY

PHYSICAL AND ORGANIC ASPECTS OF BIOCHEMISTRY,

INSTRUMENTATION BIOCHEMICAL TECHNIQUES, BIostatISTICS

Q.P. Code : 202043

Time : 3 hours  
(180 Min)

Maximum : 100 marks

Answer ALL questions in the same order.

	Pages (Max.)	Time (Max.)	Marks (Max.)
<b>I. Essay:</b>			
1. Write in detail the various types of labeled immunochemical assays. Add a note on homogenous immunoassays.	6	15	10
2. Define Potentiometry. Explain in detail the principles, applications and advantages of ion selective electrodes.	6	15	10
<b>II. Short Questions:</b>			
1. Establishment of reference intervals.	3	8	5
2. Linearity and recovery.	3	8	5
3. Mechanism of antibody diversity.	3	8	5
4. Acute phase reactants.	3	8	5
5. Apolipoproteins and their functions.	3	8	5
6. Gibbs Donnan Equilibrium.	3	8	5
7. Name the glycosaminoglycans. Add a note on their structure and function.	3	8	5
8. Principles of fluorimetry.	3	8	5
<b>III. Reasoning Out:</b>			
1. Laboratory results for glucose shows a standard deviation of 12, mean of 101 mg/dL, whereas for creatinine the observed standard deviation is 0.5 and mean is 1.2 mg/dL. The quality manager judges analytical performance for glucose to be better than that of creatinine. Justify.	4	10	5
2. PAGE for protein separation requires stacking gel. Explain.	4	10	5
3. 2, 3 DPG decreases the affinity of hemoglobin for oxygen. Explain.	4	10	5
4. Reverse sequencing of proteins need to be supplemented by mass spectrometry. Explain.	4	10	5
<b>IV. Very Short Answers :</b>			
1. Significance of Inosine.	1	4	2
2. Receiver Operating Characteristics Curve.	1	4	2
3. Omega 3 fatty acids.	1	4	2
4. How will you check the photometric accuracy of a spectrophotometer?	1	4	2
5. Urine preservatives.	1	4	2
6. Stains used in protein electrophoresis.	1	4	2
7. Coagulation of protein.	1	4	2
8. Limiting aminoacids.	1	4	2
9. Ceramide.	1	4	2
10. Structure of starch.	1	4	2

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**M.D. DEGREE EXAMINATION**  
**BRANCH XIII – BIOCHEMISTRY**  
**PAPER I – PHYSICAL AND ORGANIC ASPECTS OF BIOCHEMISTRY,**  
**INSTRUMENTATION BIOCHEMICAL TECHNIQUES, BIostatISTICS**  
*Q.P. Code : 202043*

**Time : 3 hours**  
**(180 Min)**

**Maximum : 100 marks**

**Answer ALL questions in the same order.**

**Pages Time Marks**  
**(Max.) (Max.) (Max.)**

**I. Essay:**

- |  |   |    |    |
|--|---|----|----|
| 1. Explain in detail the principle of Mass Spectrometry and its application in Clinical Biochemistry.                | 9 | 15 | 10 |
| 2. What is Turn-Around –Time? Explain the ways of improving Turn-around –Time in the laboratory of a large hospital. | 9 | 15 | 10 |

**II. Short Questions:**

- |  |   |   |   |
|--|---|---|---|
| 1. Amyloidosis and its clinical importance.          | 3 | 8 | 5 |
| 2. Types and functions of Collagen.                  | 3 | 8 | 5 |
| 3. Clinical aspects of nutritional anaemias.         | 3 | 8 | 5 |
| 4. Biochemical basis of including fibre in the diet. | 3 | 8 | 5 |
| 5. Function of Protein Kinases.                      | 3 | 8 | 5 |
| 6. Fatty acyl CoA dehydrogenases.                    | 3 | 8 | 5 |
| 7. Liquid Chromatography and its applications.       | 3 | 8 | 5 |
| 8. Synthesis of Triacylglycerols.                    | 3 | 8 | 5 |

**III. Reasoning Out:**

- |  |   |    |   |
|--|---|----|---|
| 1. Fetal blood has a higher affinity for oxygen than does adult blood.   | 5 | 10 | 5 |
| 2. Individuals with malabsorption disorders are advised to include short and medium chain fatty acids in the diet – explain. | 5 | 10 | 5 |
| 3. Explain the mechanism of action of PABA analogs.  | 5 | 10 | 5 |
| 4. Deficiency of the urea cycle enzyme Ornithine Transcarbamoylase can cause excretion of pyrimidine precursors- explain     | 5 | 10 | 5 |

**IV. Very Short Answers :**

- |  |   |   |   |
|--|---|---|---|
| 1. Express the following laboratory values (given in conventional units) in S.I units.<br>Blood Glucose 120 mg/dl                      Blood Urea 40 mg /dl<br>Serum Creatinine 2.0 mg/dl                      Serum Total Protein 6.8g/dl | 1 | 4 | 2 |
| 2. Define Bioluminescence  | 1 | 4 | 2 |
| 3. Write the principle of Flurometry.  | 1 | 4 | 2 |
| 4. What is Type I reagent grade water?   | 1 | 4 | 2 |
| 5. What is meant by Standard Reference Material? Give an example.  | 1 | 4 | 2 |
| 6. What are salvage reactions of Pyrimidine bioynthesis?   | 1 | 4 | 2 |
| 7. What is Xanthine lithiasis ?  | 1 | 4 | 2 |
| 8. Give examples of modifications of amino acid that are already present in peptides.  | 1 | 4 | 2 |
| 9. Define Edman Reaction.  | 1 | 4 | 2 |
| 10. Write the principle of Iso-electric focusing.  | 1 | 4 | 2 |

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(LC 148)

APRIL 2013

Sub. Code: 2043

**M.D. DEGREE EXAMINATION  
BRANCH XIII - BIOCHEMISTRY**

**PAPER I – PHYSICAL AND ORGANIC ASPECTS OF BIOCHEMISTRY,  
INSTRUMENTATION BIOCHEMICAL TECHNIQUES, BIOSTATISTICS**

*Q.P. Code: 202043*

**Time: Three Hours**

**Maximum: 100 marks**

**I. Essay: (2x10=20)**

1. Write a note on the principles, performance and application of high performance liquid chromatography.
2. What are mucopolysaccharides? Mention their function and clinical importance.

**II. Short Questions: (8x5=40)**

1. Clinical significance of Transferrin.
2. Functions and related disorders of Sphingophospholipids.
3. Physiologically important monosaccharides/derivatives.
4. What is Gibbs – Donnan effect?
5. Brief on Peritoneal dialysis.
6. What is Fluorescence microscopy?
7. Significance of Polycrylamide.
8. Applications of Radiomunoassay.

**III. Reasoning Out: (4x5=20)**

1. How can parenteral administration of vitamin k differentiate obstructive jaundice from severe liver parenchymal disease?
2. Patients on lithium should be monitored strictly. Why?
3. Why is there an increase in colour intensity of the violet ring in Rothera's test, when the patient with diabetic keto-acidosis is improving and then ketonemia resolving?
4. How does prolonged anticonvulsant therapy with barbiturates and phenytoin present with hypocalcemia and osteomalacia?

**IV. Very Short Answers: (10x2=20)**

1. What is immuno PCR?
2. Statistical significance of Standard deviation.
3. What is PRECISION?
4. Importance of ANOVA.
5. Define: Molality of a solution.
6. Occurrence and functions of Heparan sulfate.
7. 3 basic components of spectrophotometry.
8. What is Y protein?
9. Physiological applications of Surface tension.
10. Define Photodiodes.

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[LD 148]

OCTOBER 2013

Sub. Code: 2043

**M.D. DEGREE EXAMINATION**

**BRANCH XIII – BIOCHEMISTRY**

**PAPER I – PHYSICAL AND ORGANIC ASPECTS OF BIOCHEMISTRY,  
INSTRUMENTATION BIOCHEMICAL TECHNIQUES, BIostatISTICS**

*Q.P. Code: 202043*

**Time: Three Hours**

**Maximum: 100 marks**

**I. Essay:**

**(2 x 10 = 20)**

1. Classify centrifugation based on their principles. Discuss the applications of ultracentrifugation.
2. Compare and contrast the concepts of quality control, quality assurance and quality management with context to a clinical laboratory. Discuss proficiency testing in clinical laboratories.

**II. Short Questions:**

**(8 x 5 = 40)**

1. Uses of Henderson-Hasselbach equation.
2. Inhibitors of glycoprotein synthesis.
3. Beta alanine formation and its role in the body.
4. Principle of capillary electrophoresis and its uses.
5. Causes and rationale of unfolded protein response.
6. Leukotrienes formation and their postulated role in the body.
7. Modified polynucleotides and their role.
8. Statistical measures of impression.

**III. Reasoning Out:**

**(4 x 5 = 20)**

1. What is lactulose? Reason out the rationale of using lactulose in treatment of hepatic encephalopathy.
2. A protein was found to give a single band of molecular weight 'M' on a native polyacrylamide gel electrophoresis. On subsequent treatment of the sample with beta mercaptoethanol, the protein forms 2 bands each of a lower molecular weight than the initial weight 'M'. Reason out the phenomenon observed with examples.
3. A potentially infectious sample needs to be transported to a referral clinical laboratory for analysis. Discuss the key considerations for the transportation of such a sample.
4. Inuit Eskimos have a low incidence of cardiovascular disease when compared to other populations in the rest of the world. Reason out the probable causes with emphasis on their diet.

**IV. Very Short Answers:**

**(10 x 2 = 20)**

1. Open and closed systems with regard to chemical reactions.
2. Role of water as a reactant.
3. Rationale of using dextran for therapy.
4. Role and significance of dolichols in the body.
5. Various secondary structure of proteins with examples.
6. Role and function of immunoglobulin M in the body.
7. Explain nucleotide second messengers with examples.
8. Reagent grade water production.
9. Principle of radioimmunoassay.
10. Timed urine collection and its used in the clinical laboratory.

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(LE 148)

APRIL 2014

Sub. Code:2043

**M.D. DEGREE EXAMINATION  
BRANCH XIII - BIOCHEMISTRY**

**PAPER – I – PHYSICAL AND ORGANIC ASPECTS OF BIOCHEMISTRY,  
INSTRUMENTATION BIOCHEMICAL TECHNIQUES, BIOSTATISTICS**

*Q.P.Code: 202043*

**Time: Three Hours**

**Maximum: 100 marks**

**I. Essay Questions:**

**(2X10=20)**

1. Discuss in detail the principle, components, types and applications of electrophoresis.
2. Describe the various levels of organization of protein structure. Explain the principle of **nephelometry**.

**II. Short Questions:**

**(8X5=40)**

1. Principle and applications of osmosis.
2. Reference Materials.
3. Isoelectric point and its application.
4. Material Safety Data Sheet
5. Fluid Mosaic Model of Membrane.
6. Principle and applications of High Performance Liquid Chromatography.
7. Laboratory Information System.
8. Timed Urine Collection and Urine preservatives.

**III. Reasoning Out:**

**(4X5=20)**

1. Why vegetable oils have a long shelf life when compared to animal oil?
2. The molecular weight determined from SDS-PAGE is sometimes very different from the molecular weight determined from amino acid sequencing. Explain.
3. Two control vendors are trying to sell a general chemistry control product. List the reasons you should consider before making a decision about which product to buy.
4. A patient with HIV & hepatitis co-infection had pseudohyponatremia as measured by indirect ion selective electrode. Explain.

**IV. Very Short Answers:**

**(10X2=20)**

1. Electro endosmosis
2. Coefficient of Variation
3. Heterophile Antibodies
4. Name 2 Westgard rules that detect random error.
5. Why glycogen is more branched than starch?
6. Measures of correlation.
7. Ionic strength of buffers.
8. Mention 4 modified amino acids with their uses.
9. Name 4 synthetic nucleotide analogues.
10. Name the phospholipid which is antigenic in nature and its location.

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(LF 148)

OCTOBER 2014

Sub. Code:2043

**M.D. DEGREE EXAMINATION  
BRANCH XIII - BIOCHEMISTRY**

**PAPER I – PHYSICAL AND ORGANIC ASPECTS OF BIOCHEMISTRY,  
INSTRUMENTATION, BIOCHEMICAL TECHNIQUES, BIOSTATISTICS**

*Q.P.Code: 202043*

**Time: Three Hours**

**Maximum: 100 marks**

**I. Essay Questions:**

**(2 x 10 = 20)**

1. Discuss in detail the various pre analytical variables that can affect the quality of a test result in a clinical chemistry laboratory.
2. Describe the principles of different immunoassay techniques used in a laboratory, the advantages and disadvantages of each one of them.

**II. Short Questions:**

**(8 x 5 = 40)**

1. High density lipoproteins
2. Gibbs - Donnan Equilibrium and its importance in a cell.
3. Types of laboratory water- the application of each one them & their characteristics.
4. Steps in & methods of elucidating the primary structure of a protein.
5. What is 'Delta Check' and its utility as part of quality assurance?
6. Blotting techniques.
7. Elements of laboratory accreditation.
8. Liposomes and their application in clinical medicine.

**III. Reasoning Out:**

**(4 x 5 = 20)**

1. It is better to express imprecision of an analytical method in terms of coefficient of variation rather than standard deviation. Justify with an example.
2. Why the human body is unable to synthesise  $\alpha$ - linolenic acid?
3. Why glucose is stored as glycogen and not as glucose itself?
4. Why is it better to measure serum sodium by Direct ISE methods in the presence of hyperproteinemia and hyperlipoproteinemia?

**IV. Very Short Answers:**

**(10 x 2 = 20)**

1. Students' t-test.
2. Classification of amino acids based on their side chains.
3. What are Ramachandran's angles and their importance in protein structure?
4. Structure of cardiolipin and its role in a cell.
5. What is 'High Dose Hook effect' and how can it be overcome?
6. 'Molar absorptivity' of a substance and its significance.
7. Advantages of capillary electrophoresis over slab gel electrophoresis.
8. State any 2 functions of GAGs in a cell.
9. Explain Diastereoisomers with an example.
10. Ruhemann's purple.

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