

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.

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.

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.

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.

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.)
I. Essay:			
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
II. Short Questions:			
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
III. Reasoning Out:			
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
IV. Very Short Answers :			
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

October 2011

[KZ 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.

I. Essay :

	Pages (Max.)	Time (Max.)	Marks (Max.)
1. Discuss the atomic absorption spectrophotometry and mention its uses.	6	15	10
2. Describe the structure and properties of immunoglobins	6	15	10

II. Short Questions:

1. Buffers.	3	8	5
2. Starch.	3	8	5
3. Amino acids not found in proteins.	3	8	5
4. Osmometry.	3	8	5
5. Lipoproteins.	3	8	5
6. Management of radioactive wastes.	3	8	5
7. ELISA.	3	8	5
8. Isoelectric focusing.	3	8	5

III. Reasoning Out:

1. What is the reason for increased mobility of albumin in protein electrophoresis?	4	10	5
2. What is the significance of ionic strength of buffer electrophoresis?	4	10	5
3. What is the reason for using polymeric packings as an alternative to silica in High performance liquid chromatography?	4	10	5
4. Hydrophobic interaction as a result of association of nonpolar groups is Favoured in polar solutions of protein - why?	4	10	5

IV. Very Short Answers :

1. Define Outlier.	1	4	2
2. Heparin.	1	4	2
3. Principle of flurometry.	1	4	2
4. Uronic acids.	1	4	2
5. Mean.	1	4	2
6. Restriction fragment length polymorphism.	1	4	2
7. Peptide bond.	1	4	2
8. Accuracy.	1	4	2
9. Electroendosmosis.	1	4	2
10. Surface tension.	1	4	2

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. 1. Express the following laboratory values (given in conventional units) in S.I units. | | | |
| Blood Glucose 120 mg/dl | Blood Urea 40 mg /dl | | |
| 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 |

(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.

[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.

(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.

(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 α - 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.

[LG 148]

APRIL 2015

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

Answer ALL questions

I. Essay:

(2 x 10 = 20)

1. Discuss in detail the principle and applications of Atomic Absorption Spectrophotometry.
2. What are the steps in verifying a validated analytical method of a manufacturer before introducing it into your laboratory?

II. Short Questions:

(8 x 5 = 40)

1. What are 'Limit Checks' and their utility as part of quality assurance?
2. SI units of measurement.
3. Immuno Electrophoresis.
4. Factors affecting oxygen binding to hemoglobin.
5. Westgard Multi QC rules and their interpretation.
6. Isotopic and Non Isotopic labels used in Immunoassay techniques.
7. How will you assess the performance characteristics of a spectrophotometer?
8. Management of various categories of biomedical and biohazardous waste in a clinical laboratory.

III. Reasoning Out:

(4 x 5 = 20)

1. Individuals with HbS are protected against infection with Plasmodium – Why?
2. Why is stored blood not a good oxygen transporter and how is it overcome in blood banks?
3. Why is a freshly prepared standard solution of glucose allowed to stand overnight before it can be used as a standard in a clinical chemistry lab?
4. Internal Quality Control is a measure of Random Error whereas external Quality Control is a measure of Systematic error – Justify.

IV. Very Short Answers:

(10 x 2 = 20)

1. ROC Curve and its significance.
2. What are 'domains' in the structure of proteins?
3. Phenylisothiocyanate and its use.
4. Classification of aminoacids based on metabolic fate with examples.
5. What are Human Anti Mouse Antibodies (HAMA) and what is their significance in immunoassay?
6. Analytical Measurement Range.
7. Plasmalogens and their biochemical role.
8. State any 2 functions of Glycosaminoglycans in a cell.
9. Explain Diastereoisomers with an example.
10. Hb M disease.

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

Answer ALL questions

I. Essay:

(2 x 10 = 20)

1. What are glycosaminoglycans? Describe the Chemistry and functions.
2. Explain the principle and practical applications of ELISA. Compare the merits and demerits with Chemiluminescence assay.

II. Short Questions:

(8 x 5 = 40)

1. Secondary structure of Proteins.
2. Standard Deviation.
3. Essential fatty acids.
4. Spectrophotometry.
5. Internal Quality Control
6. Adsorption Chromatography.
7. Phospho Lipids.
8. Biologically important peptides.

III. Reasoning Out:

(4 x 5 = 20)

1. Proline not compatible with alpha helix.
2. Acidosis precipitates a crisis in sickle cell.
3. A deficiency of alpha 1 – antitrypsin result in emphysema – Explain.
4. Glycine cannot be seen in $\text{NH}_2\text{-CH}_2\text{-COOH}$ form.

IV. Very Short Answers:

(10 x 2 = 20)

1. Student 't' test.
2. Synthetic Nucleotides.
3. Principle of flame photometry.
4. Role of Prostaglandins.
5. Levey – Jennings chart.
6. Osmosis.
7. Forces stabilizing higher structures of Proteins.
8. Functions and types of immunoglobins.
9. Uronic Acids and their significance.
10. Accuracy.

(LI 148)

APRIL 2016

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 the principle, components and applications of Spectrophotometer.
2. Describe the structure and functions of phospholipids.

II. Short Questions:

(8 x 5 = 40)

1. Precision.
2. Structure of collagen.
3. Hybridization techniques.
4. Reference interval.
5. Ion exchange chromatography.
6. Pre analytical variables.
7. Polyacrylamide Gel Electrophoresis.
8. Ion selective electrodes.

III. Reasoning Out:

(4 x 5 = 20)

1. Sigmoidal oxygen dissociation curve of Haemoglobin.
2. Pulmonary surfactant brings down the work done for ventilation.
3. Atomic absorption methods are more sensitive than flame emission methods.
4. pI of protein gives some clue about the aminoacid content of the protein.

IV. Very Short Answers:

(10 x 2 = 20)

1. Principle of ELISA.
2. Isoelectric pH.
3. Regression analysis.
4. Turn around time.
5. Principle and applications of potentiometry.
6. Haldane effect.
7. Significance of Polyunsaturated fatty acids.
8. Liposomes and its therapeutic applications.
9. Keratan Sulphate.
10. Stabilising forces in molecules.

**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. Write a note on the principle and applications of Tandem Mass Spectrometry.
2. Describe the principle, components and applications of thin Layer chromatography.

II. Short Questions:**(8 x 5 = 40)**

1. Properties of biomembranes.
2. Structure of Cholesterol and Vitamin D.
3. Structure of insulin.
4. Iso electric focusing.
5. Ultracentrifugation.
6. Reagent grade water.
7. Electrochemiluminescence.
8. "Delta check" and its application in Quality assurance.

III. Reasoning Out:**(4 x 5 = 20)**

1. In SDS PAGE the movement of protein does not depend on the charge of protein.
2. Why replacing ribose by deoxy ribose in DNA increase the stability of information storage?
3. Vegetable oils are usually preserved with addition of antioxidants.
4. Venom of viper snakes leads to hemolysis.

IV. Very Short Answers:**(10 x 2 = 20)**

1. Westgard rules.
2. Immunoglobulin G.
3. Lecithin : Sphingomyelin ratio.
4. ELISA.
5. Principle of flame photometry.
6. Beer Lambert's law.
7. End point analysis.
8. Receiver operating curve.
9. Control material.
10. Heparin.

**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. What is chromatography, types, technique of partition chromatography?
2. Describe in detail the strategies for establishing reference intervals with respect to selection of reference individuals, specimen collection, Quality control procedures and statistical treatment of values.

II. Short Questions:**(8 x 5 = 40)**

1. Structure and types of collagen and disorders due to defects in collagen synthesis.
2. Molecular basis of sickling in Sickel cell anemia.
3. What are the criteria for choosing an internal quality control material and how will you interpret and monitor IQC values in your clinical chemistry lab?
4. Delayed Enhanced Lanthanum Fluoride Immunoassay - Principle and applications.
5. Bar coding in specimen identification.
6. Glycolipids – classification, structure and biological significance.
7. Handling and prevention of needle stick injuries in a clinical laboratory.
8. What are the causes of Hemolysis of a blood sample in a laboratory and what steps would you take to prevent hemolysis as part of quality assurance?

III. Reasoning Out:**(4 x 5 = 20)**

1. Why HbF is not a good transporter of oxygen to tissues?
2. Internal standards should be used in liquid scintillation counters. Why?
3. Osmometer is based on freezing point depression. Why?
4. Potentiometry excludes Electrolyte exclusion effect. Explain.

IV. Very Short Answers:**(10 x 2 = 20)**

1. Use of cyanogen bromide.
2. Role of Heterophile antibodies in ELISA and how is it overcome?
3. What is the significance of myelin basic protein?
4. Prion diseases.
5. Youden Plot.
6. What is correlation coefficient? What is its significance?
7. What preservative is used for collecting urine for 24-hour urinary uric acid estimation? Justify.
8. Spectral bandwidth.
9. Mutarotation of glucose and its significance
10. What are semi essential aminoacids and why are they called so?

**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. Explain the principle and components of Fluorometer. Write a note on its limitations.
2. Explain the modes of operation of Capillary Electrophoresis System.

II. Short Questions:**(8 x 5 = 40)**

1. Secondary structure of Proteins.
2. Calibration.
3. Six sigma principles.
4. Radio active decay.
5. Biological Hazards in the Clinical Laboratory.
6. Nephelometer.
7. Slab gel electrophoresis.
8. Chemistry and Functions of Retinol Binding Protein.

III. Reasoning Out:**(4 x 5 = 20)**

1. Ion Exchange Chromatography is the reference method in diagnosis of Tyrosinemia.
2. Positive Guthrie's test for increased methionine should be interpreted with care.
3. Breast tumour is defined as Estrogen Receptor Negative, but the patient responds to endocrine therapy.
4. Water is a unique solvent.

IV. Very Short Answers:**(10 x 2 = 20)**

1. Significance of Handerson – Hasselbalch equation.
2. Hydrogen bonds in Water molecule.
3. Super secondary structure of Proteins.
4. Molecular chaperones.
5. Significance of Hyaluronic Acid.
6. Clinical importance of Cerebrosides.
7. Oxidised LDL.
8. Stereo specificity of Enzymes.
9. β 2 Microglobulin –clinical importance.
10. Proteins in Saliva.

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 15 = 30)

1. Discuss in detail the principle, Components and applications of Atomic Absorption Spectrophotometer. Add a note on its interferences.
2. Write in detail the controllable pre analytical variables and its control Measures in clinical biochemistry laboratory.

II. Short notes:

(10 x 5 = 50)

1. Reagent grade water and testing for water purity.
2. Immunoradiometric Assay.
3. Synthetic Nucleotide.
4. Turbidimetry and its applications.
5. Structure and functions of immunoglobulin.
6. Reference Materials.
7. Immunofixation electrophoresis.
8. Microarray Techniques.
9. Proficiency testing and laboratory Accreditation.
10. Gibbs Donnan equilibrium.

III. Reasoning Out:

(4 x 5 = 20)

1. Mass spectrometry has emerged as a method of choice for protein identification.
2. Acid Citrate Dextrose is preferred anti-coagulant in molecular diagnostic techniques.
3. Buffer plays an important role in conventional electrophoresis of serum protein.
4. Allosteric properties of Hemoglobin results from its quaternary structure.

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 15 = 30)

1. Define Potentiometry. Discuss in detail the Principle, applications, advantage and limitations of Ion Selective Electrodes.
2. Explain in detail the principle, components, application and advantage of Tandem mass spectrometer.

II. Short notes:

(10 x 5 = 50)

1. Elucidation of primary structure of protein.
2. Chemiluminescence.
3. Management of biological and radioactive wastes.
4. Performance verification of Spectrophotometer.
5. Analytical sensitivity and specificity.
6. Affinity chromatography and its clinical applications.
7. Clinical uses of radioisotopes.
8. DNA Sequencing.
9. Quality control charts.
10. Receiver operating characteristic curve and its applications.

III. Reasoning Out:

(4 x 5 = 20)

1. P_{50} expresses the relative affinities of different hemoglobins for oxygen.
2. Patient preparation and manner of specimen collection can significantly affect the result of Serum Calcium measurement.
3. Agarose gel electrophoresis of CSF protein is preferred in the diagnosis of Multiple Sclerosis.
4. Glucose is not stored in its monomeric form.

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 15 = 30)

1. What are homogenous and heterogeneous immunoassays? Write the principle, technique and applications of labeled immunoassays.
2. What is ISO 9000? What are internal and external quality control methods in a biochemical lab? Compare their merits and demerits.

II. Short notes:

(10 x 5 = 50)

1. Electro endosmosis.
2. Blood collection for Biochemical analysis in Paediatric age .
3. Biogenic amines.
4. Procedures used to process solutions in a biochemical lab.
5. Non Controllable Pre analytical variables in a clinical lab.
6. Reflectance Photometry.
7. Levey Jenning chart.
8. Measurement of Thiamine and its deficiency status.
9. Point of care testing.
10. Functions of Vitamin C.

III. Reasoning Out:

(4 x 5 = 20)

1. Polyethylene Glycol (PEG 6000) is particularly useful in Immunochemical methods.
2. When collecting Blood sample uniform draw of blood must be established.
3. Affinity Chromatography is used for separation of large quantities of Protein and antibodies.
4. Glucose administration decreases symptoms of porphyrias, explain.

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 15 = 30)

1. What are the different hazards in a clinical lab? How to avoid or prevent them?
2. What are the basic types of Chromatography? Explain different types of chromatography based on the separation mechanism.

II. Short notes:

(10 x 5 = 50)

1. Sign test.
2. Blotting techniques.
3. Systematic error.
4. Laboratory information system.
5. Isoenzymes analysis of lactate dehydrogenase.
6. Blood group antigens.
7. Derivatives of Purine Nucleotides.
8. Quaternary structure of Protein.
9. Cholesterol structure and function.
10. Detection and measurement of Radioactivity.

III. Reasoning Out:

(4 x 5 = 20)

1. Capillary electrophoresis is also termed as Micellar Electrokinetic Chromatography.
2. DNA sequencing alone cannot be used to study the primary structure of protein.
3. Liposomes are more useful in Transdermal delivery of drugs and cosmetics.
4. Decreased Cardiolipin as a cause for Cardio skeletal Myopathy.

**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 15 = 30)

1. Discuss in detail the principle and applications of Tandem Mass Spectrophotometry.
2. Explain the principle types and clinical application of Electrophoresis

II. Short notes:

(10 x 5 = 50)

1. Urine preservatives and urinary collection
2. Use of radio isotopes in diagnostic tests and its disposal
3. Functions of glycosaminoglycans
4. Briefly describe the structure and types of collagen and add a note on disorders due to defects in collagen synthesis
5. Requirements for implementation of internal quality control programme in a laboratory . How to monitor and interpret the IQC values ?
6. Explain the biochemical and molecular basis of sickle cell anaemia.
7. Mucopolysaccharides and their biological significance
8. Principle and application of Competitive ELISA
9. Biochemical basis of antibody heterogeneity
10. Functions of hemoglobin.

III. Reasoning Out:

(4 x 5 = 20)

1. Freshly prepared glucose standard is not preferred in a clinical chemistry lab.
2. Acidosis can precipitate a crisis in sickle cell.
3. Proline is not compatible in alpha helix
4. Direct ISE method is preferred for the measurement of serum sodium in the presence of hyperproteinemia and hyperlipoproteinemia?

[LS 148]

**NOVEMBER 2020
(OCTOBER 2020 SESSION)
M.D. DEGREE EXAMINATION**

Sub. Code: 2043

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 15 = 30)

1. Discuss in detail the principle and applications of high Performance Liquid chromatography
2. Explain the steps in validating an analytical method of a manufacturer before introducing it into your laboratory?

II. Short notes:

(10 x 5 = 50)

1. Turn around time in laboratory
2. Biomedical waste generated in clinical laboratory and its disposal
3. Functions and biomedical applications of Plasmalogens
4. Explain the term 'Limit Checks'. How is it useful in quality assurance programme?
5. Westgard Multi QC rules and their interpretation.
6. Classify and explain briefly the structure and biological significance of Glycolipids.
7. Classify Heteropolysaccharides and write a note on their biologic significance.
8. Principle and application of Sandwich ELISA
9. Protein polymorphisms and its effect on function.
10. Biochemical and structural changes of haemoglobin chronic hypoxic conditions

III. Reasoning Out:

(4 x 5 = 20)

1. Why Glucose is stored in polymer form in the body?
2. Alkalosis can precipitate tetany
3. Why the human body is unable to synthesise α -linolenic acid?
4. Prolonged anticonvulsant therapy with barbiturates and phenytoin present with hypocalcemia and osteomalacia

[MD 0721]

**JULY 2021
(MAY 2021 SESSION)**

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 15 = 30)

1. Explain the principle, components and uses of mass spectrometer. Write a note on tandem mass spectrometry.
2. Write in detail about total laboratory automation. Write a note on modular integrated automation.

II. Short notes:

(10 x 5 = 50)

1. Vander waals forces.
2. Secondary structure of proteins.
3. Peptide sequencing.
4. Liquid scintillation detector.
5. Vapour pressure osmometer.
6. Counter immuno electro phoresis.
7. Measures of variation.
8. Lecithins.
9. Non competitive inhibition of enzymes.
10. Functions of glycos aminoglycans.

III. Reasoning Out:

(4 x 5 = 20)

1. Photo multiplier tubes of spectro photo meter should be shielded from stray light.
2. Ion selective membrane is the “Heart” of an ion selective electrode.
3. Enzymes as labels in immuno assays do have limitations.
4. A receiver operating characteristic curve must inevitably pass through the upper right corner.

THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY

[MD 1121]

**NOVEMBER 2021
(OCTOBER 2021 SESSION)
M.D. DEGREE EXAMINATION**

Sub. Code: 2043

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 15 = 30)

1. Explain the Principle and Components of Atomic absorption Spectrometer.
Write a note on Interferences in Atomic absorption Spectrometer.
2. Write in detail about Principle, Components and Limitations of Fluorometry.

II. Short notes:

(10 x 5 = 50)

1. Surface tension and its clinical applications.
2. Primary Structure of Proteins.
3. Peptide Synthesis.
4. Crystal Scintillation Detector.
5. Colloid Osmotic Pressure Osmometer.
6. Crossed Immuno Electrophoresis.
7. Confidence Intervals.
8. Phosphatidyl Inositol.
9. Competitive inhibition of Enzymes.
10. Bio synthesis of Glycosaminoglycans.

III. Reasoning Out:

(4 x 5 = 20)

1. An Receiver Operating Characteristic curve must inevitably pass through the lower left corner.
2. α emitters are very dangerous.
3. Home applications of Point of Care Testing are not immune from interference.
4. Cellulose Acetate has largely been replaced by Agarose Gel in most clinical applications.

THE TAMIL NADU DR.M.G.R. MEDICAL UNIVERSITY

[MD 0521]

MAY 2022

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 15 = 30)

1. Describe in detail the process of automation in clinical laboratory.
2. Principle, instrumentation, application and limitation of flurometry.

II. Short notes:

(10 x 5 = 50)

1. Anticoagulants and preservatives for blood.
2. Calibration.
3. Total quality management in a laboratory.
4. Isotopes switching.
5. Eicosanoids.
6. Assessment of outliers.
7. Structure of collagen.
8. Sig sigma principle.
9. Ion selective electrodes.
10. Structure and functions of Immunoglobulins.

III. Reasoning Out:

(4 x 5 = 20)

1. Smoking causes emphysema. what is the rationale behind it?
2. Ingestion of Grape juice is a preanalytical variable (assay of drugs) Explain.
3. KCl is the commonly used inner electrolyte in Ion Selective Electrode. Why?
4. Chromatography is for both qualitative and also quantitative for ananlyte.

THE TAMIL NADU DR.M.G.R. MEDICAL UNIVERSITY

[MD 1022]

OCTOBER 2022

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 15 = 30)

1. Explain the steps in validating an Analytical method of a manufacturer before introducing it into your laboratory.
2. Discuss in detail the principle and applications of High Performance Liquid chromatography.

II. Short notes:

(10 x 5 = 50)

1. Westgard Multi QC rules and their interpretation.
2. Timed Urine Collection and Urine preservatives.
3. Reagent Grade water.
4. Electro endosmosis.
5. Turnaround time in laboratory.
6. Chemiluminescence.
7. Disposal of Biomedical waste in a Laboratory.
8. Gibbs Donnan Equilibrium.
9. Delayed Enhanced Lanthanum Fluoride Immunoassay – Principle and Applications.
10. Laboratory Information System.

III. Reasoning Out:

(4 x 5 = 20)

1. Patient preparation and manner of specimen collection can significantly affect the result of Serum Calcium measurement.
2. Water is a unique solvent.
3. Internal standards should be used in liquid scintillation counters. Why?
4. In SDS PAGE the movement of protein does not depend on the charge of protein.

THE TAMIL NADU DR.M.G.R. MEDICAL UNIVERSITY

[MD 0723]

JULY 2023

Sub. Code: 2043

(MAY 2023 EXAM SESSION)

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 15 = 30)

1. Discuss in detail the principle and applications of Capillary Electrophoresis. Write a note on Microchip Electrophoresis.
2. What are internal and external quality control methods in a Clinical diagnostic lab? Compare their Merits and Demerits.

II. Short notes: (10 x 5 = 50)

1. Physiologically important nucleotides.
2. Measures of Dispersion.
3. Definition and advantages of Time-of-Flight Mass Spectrometers.
4. Digital Immunoassay.
5. Diseases caused by misfolding of proteins.
6. Controllable preanalytical Variables.
7. Anticoagulants and Preservatives for Blood.
8. Dixon Plot.
9. Setting up a clinical laboratory and a 24-hours emergency laboratory service.
10. Types and uses of Biobanks.

III. Reasoning Out: (4 x 5 = 20)

1. Chronic Kidney disease affects Calcium Homeostasis.
2. 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 of Creatinine. Justify.
3. The Endoplasmic Reticulum functions as the quality control compartment of the cell.
4. Individual with malabsorption disorders are advised to include short and medium chain fatty acids in the diet.

THE TAMIL NADU DR.M.G.R. MEDICAL UNIVERSITY

[MD 1223]

**DECEMBER 2023
(OCTOBER 2023 EXAM SESSION)**

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 15 = 30)

1. Write an essay on principle, instrumentation technique, application and interferences of Chemiluminescence Immunoassay.
2. Essay on structure, types, biochemical functions, assay and role in diagnosis of Immunoglobins.

II. Short notes: (10 x 5 = 50)

1. Regression analysis.
2. Non controllable variables.
3. Urine as a Biochemical specimen.
4. Elements of Quality Assurance Program.
5. Balances in Biochemical Laboratory.
6. Nephelometry.
7. Support media in Electrophoresis.
8. Glucometers.
9. Acute phase response.
10. Apolipoproteins.

III. Reasoning Out: (4 x 5 = 20)

1. Heparin is not used in collecting Blood samples for PCR.
2. Fecal α 1 Antitrypsin assay may not be reliable for assessing Gastrointestinal Loss of Protein.
3. Arteriolated capillary blood in Blood Gas Analysis.
4. Specimen for assay of Aminolevulinic acid to be refrigerated.
