

BIOCHEMISTRY

GUIDE BOOK

**ACADEMIC
YEAR: 2022-23**



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VISION

To set local and global standards for quality patient outcomes – creating a culture of excellence to promote a transformative experience for the 21st century clinicians, educators and researchers to benefit all humanity

MISSION

To develop well-rounded academicians, thinkers, clinicians and researchers by strengthening a global view, broadening intellectual foundations and teach effective communication. It is our aspiration to cultivate creative and critical thinking skills for problem solving, sensitive to cultural and ethical values and responsibilities. Our graduates will be role models and society leaders.

VALUES

- Equity
- Quality
- Compassionate behaviour
- Social accountability
- Social justice
- Humanistic approach
- Leadership
- Innovation
- Integrity
- Collaboration

LEARNING OUTCOMES

Our dental graduate shall be able to:

- Demonstrate an understanding of fundamental biochemical principles, including the structure/function of biomolecules, metabolic pathways, and regulation of biological/biochemical processes
- Demonstrate proficiency in basic laboratory techniques
- Apply the scientific method to processes of experimentation and hypothesis testing

Biochemistry lab



Biochemistry - COURSE CODE - 1.3

Introduction

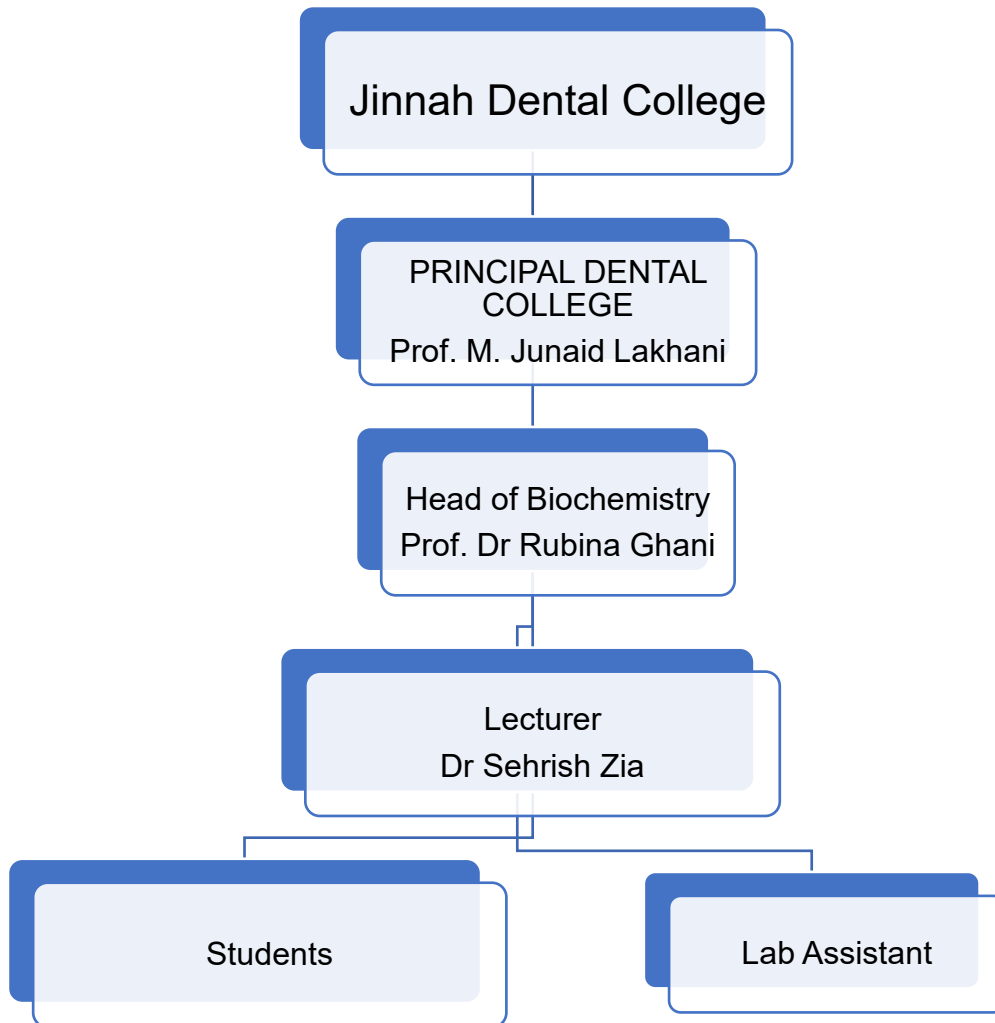
Biochemistry occupies a central place in life sciences and research, focusing on understanding the chemical processes occurred in the living organism. The Department pursues the research aims through up-to-date equipment and state-of-the-art technologies. Biochemistry indispensable to understanding how life works in a fundamental way. A wide range of teaching and learning methods are used. It will be covered in a year time. The course has been planned to study the normal structure and functions of cell in context of clinical problems. This will benefit the students to understand the basic biomedical information in relation to clinical sciences.

It aims to provide importance of biochemistry and its role in clinical for the students so that they are able to apply it when they come across more advanced topics. The study of biochemistry will help you to learn about the biochemical processes, signal transduction and genetic information in the cell. This knowledge of basic sciences amicably integrated longitudinally with Ethics and Professionalism,

Rationale

Before moving on to complex clinical issues, it becomes imperative for the students to achieve clear concepts of the basic organization of human body and organ systems. This module is designed to cover the general structure, function and biochemical reactions of the human body. It demonstrates an understanding of fundamental biochemical principles, including the structure/function of biomolecules, metabolic pathways, and regulation of biological/biochemical processes and also demonstrate proficiency in basic laboratory techniques

HIERARCHY OF THE DEPARTMENT



TEACHING AND LEARNING STRATEGIES

Lectures (large group teaching)

First year BDS students are taught basics of Biochemistry (pre-clinical) in the lectures. Complemented. it is a once-a-week lecture of 50 minutes duration for 2 days per week with / tutorial and practical for 75 minutes per week.

E-Learning

In the challenging times of pandemic COVID-19, distance learning has been incorporated in the strategies of learning and teaching. An easy access has been provided to the students through the institution's E-portal. Each student has the access to the portal through their individual Ids, on which they can go through the recorded lectures and material, whenever they want.

During the pandemic, and now as a routine, students can access their recorded lectures of Biochemistry on Zoom well. It is also utilized to deliver the lectures in real time during the lockdown.

ASSESSMENT TOOLS AND STRATEGIES:

In-Class Assessment:

- a. Participation/ interaction
- b. BCQ.
- c. Tutorials interaction with Socrative quiz
- d. OSPE.

Mid Term examinations:

These are conducted in the mid of the academic year. It has the following

Component	Marks
BCQs	50
OSPE	50
TOTAL	100

Pre-Professional examinations:

These are conducted at the end of the academic year before the final professional examination.

The break-up is as follows:

Component	Marks
BCQs	50
OSPE	45
Internal evaluation	05
TOTAL	100

INTERNAL EVALUATION/ CONTINUOUS ASSESSMENT POLICY:

Continuous Assessment

Continuous Assessment policy		
1.	Assignment/ class test/ ward test etc.	25%
2.	Mid-term exam	35%
3.	Pre-prof. exam	35%
4.	Extra effort	5%

Details of Assignments/ Test/Mid-term/ Pre-professional examinations.		
1.	Present and fail	25%
2.	Pass	Actual percentage
	ABSENT	ZERO

Professional Annual Examinations:

Professional annual examinations are conducted by the University (JSMU) and comprise theory examinations and OSPE/OSCE.

Eligibility criteria for sitting in the Professional Annual Examinations is as follows:

1. Minimum of **40% aggregate** marks in all continuous assessment examinations (Mid-Term Examinations, Pre-Professional Examinations, Assignments and Tests)
2. Students less than **75% overall attendance** will not be allowed to sit in the Annual/Professional Examinations.
3. Clinical attendance will be maintained separately. Attendance in any clinical rotation which falls below **75%** must be made up by students.

To be considered successful in annual professional examination the students must pass individual components of the professional examination.

This is to say, that the students must pass theory and OSPE/ OSCE examinations independent of each other. Failing one component will result in failing that component of the subject only. The student will then have to appear for supplementary examination in that component of the subject.

CURRICULUM OF BIOCHEMISTRY

1.3.1 BIOCHEMISTRY OF CELL

S.NO.	TOPICS	LEARNING OBJECTIVES By the end of first year BDS, the student should be able to	MODE OF TEACHING	ASSESSMENT TOOLS The students will be assessed during class tests, mid-rotation and end-of rotation tests; mid-term and final examination through:
1	Introduction to Biochemistry	1. Define Biochemistry 2. Discuss the importance of in Dentistry	1. Lectures	1. BCQS
2.	Cell- Biochemical Composition & Cell Organelles.	1. Describe: Important micro and macro molecules found in the cell and the major functions of Organelles.	1. Lectures 2. Tutorial	1. BCQS
3.	Cell Membrane	1. Describe: Biochemical structure 2. Functions of cell membrane/ Active and Passive transport	1. Lectures 2. Tutorial 3. Practical	1. BCQS
4.	Water	1. Describe: <ul style="list-style-type: none"> • Biochemical structure • Properties of water 	1. Lectures 2. Tutorial	1. BCQS
5.	pH & Buffers	1. Describe: <ul style="list-style-type: none"> • Buffers, Acidosis & Alkalosis • Types of Buffers, Acidosis & Alkalosis Mechanism of action of Buffers, Acidosis & Alkalosis	1. Lecture 2. Tutorial	1. BCQS 2. OSPE

1.3.2 CARBOHYDRATE CHEMISTRY

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Introduction of Carbohydrates	1. Define carbohydrates. 2. Classify carbohydrates. 3. List source of carbohydrates. 4. Discuss the biomedical importance of carbohydrates	1. Lectures	1. BCQ
2.	Monosaccharides + Disaccharides and Oligo saccharides	1. Define monosaccharides, Disaccharides, Oligosaccharides, isomerism. 2. Classify monosaccharides, Disaccharides, Oligosaccharides, isomerism. 3. Discuss the biomedical importance of monosaccharides, Disaccharides, Oligosaccharides.	1. Lecture 2. Tutorial	1. BCQs
3.	Polysaccharides	1. Define Polysaccharides. 2. Classify Polysaccharides. 3. Explain the functions of Polysaccharides.	1. Lecture 2. Tutorial 3. Practical	1. BCQs

1.3.3 LIPID CHEMISTRY

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Introduction of Lipids + Lipid Peroxidation	<ol style="list-style-type: none"> 1. Define lipids. 2. Classify lipids. 3. Discuss the functions of lipids. 4. Discuss the biomedical importance of lipids. 5. Explain the complications of lipid peroxidation. 	1. Lecture	1. BCQs
2.	Fatty Acids + Eicosanoids & Derived Lipids	<ol style="list-style-type: none"> 1. Define fatty acids 2. Classify fatty acids 3. Explain their properties, functions & nutritional importance 4. Define derived lipids & Eicosanoids 5. Classify derived lipids & Eicosanoids 6. Discuss the biomedical importance of derived lipids & Eicosanoids 	<ol style="list-style-type: none"> 1. Lecture 2. Lecture 3. Tutorial 	1. BCQ
3.	Compound Lipids + Cholesterol	<ol style="list-style-type: none"> 1. Discuss compound lipids 2. Classify compound lipids with functions 3. Discuss the biomedical importance of each (PL, LP, GL, Sphingo lipid) 4. Explain the structure, properties, functions, sources, transport & biomedical importance of cholesterol, LP 	<ol style="list-style-type: none"> 1. Lecture 2. Lecture 3. Tutorial 4. Practical 	<ol style="list-style-type: none"> 1. BCQ 2. OSPE

1.3.4 PROTEIN AMINO ACID CHEMISTRY

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Amino Acids + Introduction of Protein	<ol style="list-style-type: none"> 1. Describe the properties, functions and chemical reactions shown by amino acids, 2. Classify amino acid 3. Define of protein 4. Explain structure of protein 5. Classify protein 	<ol style="list-style-type: none"> 1. Lecture 2. Lecture 3. Tutorial 	1. BCQ
2.	Protein structure + Collagen & Elastin	<ol style="list-style-type: none"> 1. Describe the structure & physical properties of the protein molecule 2. Explain the structure, function 3. Discuss biomedical importance of Collagen & Elastin 	1. Lecture	1. BCQ
3.	Plasma Proteins & Immunoglobulins	<ol style="list-style-type: none"> 1. Define Plasma proteins 2. Classify Plasma proteins 3. Discuss biomedical importance of simple proteins (plasma protein) 	<ol style="list-style-type: none"> 1. Lecture 2. Tutorial 3. Practical 	1. BCQ

1.3.5 ENZYMES

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Introduction of Enzymes Mechanism of Action of Enzymes	1. Define Enzymes. 2. Explain structure and classification of enzymes. mechanism of action enzymes & MM equation	1. Lecture 2. Tutorial	1. BCQ
2.	Factors & Inhibitors	1. Discuss the factors affecting enzyme activity & regulation of enzyme activity	1. Lecture 2. Practical	1. BCQ
3.	Clinical Enzymology	1. Discuss the clinical importance of enzymes in diagnosis	1. Lecture 2. Tutorial	1. BCQ

1.3.6 NUCLEOPROTEINS

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Nucleotides	1. Define nucleoproteins 2. Explain the chemical structure & significance of nucleoproteins	1. Lecture 2. Tutorial	1. BCQ
2.	DNA & RNA	1. Describe the chemical structure, properties and functions of DNA & RNA	1. Lecture	1. BCQ
3.	Central Dogma of Molecular Biology	1. Discuss the central dogma of molecular biology	1. Lecture 2. Tutorial 3. Practical	1. BCQ 2. OSPE

1.3.7 HEMOGLOBIN CHEMISTRY

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Heme-Structure	1. Discuss, structure, functions, & types of hemoglobin	1. Lecture 2. Tutorial	1. BCQ
2.	Heme-Synthesis & Porphyrins	1. Explain heme synthesis & its disorders	Lecture	1. BCQ
3.	Hemoglobinopathies	1. Discuss the types, biochemical defects & clinical manifestation of hemolytic anemia (Thalassemia, Sickle cell Anemia etc.)	1. Lecture 2. Tutorial 3. Practical	1. BCQ
3.	Heme- Degradation & Jaundice	1. Discuss Bilirubin synthesis, types and fate. 2. Classify Jaundice & LFTs	1. Lecture	1. BCQ

1.3.8 VITAMIN

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Vitamin A+ Vitamin E & K	1. Discuss the structure, functions RDA, sources & clinical abnormalities of vitamin A , E & K	1. Lecture 2. Lecture 3. Tutorial	1. BCQ
2.	Vitamin D	1. Discuss the structure, functions RDA, sources & clinical abnormalities of vitamin D	1. Lecture	1. BCQ
3.	Vitamin C	1. Discuss the structure, functions RDA, sources & clinical abnormalities of vitamin C	1. Lecture 2. Tutorial	1. BCQ
4.	Vitamin B12 & Folic Acids	1. Discuss the structure, functions RDA, sources & clinical abnormalities of vitamin B12 & Folic acids	1. Lecture 2. Tutorial	1. BCQ
5.	Vitamin B1+ Vitamin B2, B3 & B6	1. Discuss the structure, functions RDA, sources & clinical abnormalities of vitamin B1, B2, B3 & B6	1. Lecture 2. Lecture 3. Practical	1. BCQ

1.3.9 MINERALS

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Iron	1. Discuss the functions RDA, sources, transport, storage & clinical importance of iron	1. Lecture 2. Tutorial	1. BCQ
2.	Calcium, Phosphorus	1. Discuss the functions RDA, sources, transport, storage & clinical importance of calcium & phosphorus	1. Lecture	1. BCQ
3.	Fluoride & Other Minerals	1. Discuss the functions, RDA, sources & biochemical role of fluoride & other important Minerals.	1. Lecture 2. Lecture 3. Tutorial 2. Practical	1. BCQ

1.3.10 CARBOHYDRATE METABOLISM

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Digestion & Absorption of Carbohydrates	1. Describe the mechanism by which complex dietary carbohydrates are broken down to simple sugars & their absorption from GIT into portal blood	1. Lecture 2. Tutorial	1. BCQ
2.	Glycolysis	1. Define glycolysis 2. Explain the reactions involved in glycolytic pathway along with the fate of pyruvate formed from glucose	1. Lecture	1. BCQ
3.	TCA	1. Explain the reactions of citric acid cycle & its regulation.	1. Lecture 2. Tutorial 3. Practical	1. BCQ
4.	Gluconeogenesis	1. Define gluconeogenesis 2. Explain the reactions and its regulations	1. Lecture 2. Tutorial	1. BCQ
5.	Glycogen Metabolism	1. Describe the formation and breakdown of glycogen & its regulation	1. Lecture	1. BCQ
6.	HMP	1. Describe the purpose importance & reactions of Hexose Monophosphate Pathway.	1. Lecture	1. BCQ
7.	Regulation Of Blood Glucose & Diabetes Mellitus	1. Discuss the normal blood glucose level, clinical significance of its variations & metabolic derangements that occur in Diabetes Mellitus	1. Lecture 2. Tutorial	1. BCQ 3. OSPE

1.3.11 LIPID METABOLISM

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Digestion & Absorption of Lipids	1. Describe the mechanism by which complex dietary lipids are broken down to simpler forms and their absorption from GIT.	1. Lecture 2. Tutorial	1. BCQ
2.	Lipid Transport (Lipoproteins)	1. Discuss the chemistry, metabolism and associated clinical disorders of lipoproteins.	1. Lecture	1. BCQ
3.	β Oxidation	1. Explain the oxidation of fatty acid in the body to give energy	1. Lecture 2. Tutorial 3. Practical	1. BCQ

4.	Ketone Bodies & Bile salts	<ol style="list-style-type: none"> 1. Explain the synthesis & utilization of Ketone Bodies in the body. 2. Explain the biosynthesis of bile salts. 	<ol style="list-style-type: none"> 1. Lecture 2. Tutorial 	1.BCQ
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1.3.12 ETC

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Electron Transport Chain	1. Discuss the structure & functions of Electron Transport Chain & synthesis of ATP.	<ol style="list-style-type: none"> 1. Lecture 2. Tutorial 	1.BCQ

1.3.13 PROTEIN METABOLISM

S.NO.	TOPICS	OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Digestion & Absorption of Proteins	1. Describe the mechanism by which dietary proteins are broken down into simpler forms & their absorption from GIT.	<ol style="list-style-type: none"> 1. Lecture 2. Tutorial 	1.BCQ
2	Reactions of Amino acids + Urea Cycle and NH ₃ Toxicity	<ol style="list-style-type: none"> 1. Explain the reactions of amino acids & Ammonia Metabolism. 2. Explain the reactions of urea cycle & its disorders 	<ol style="list-style-type: none"> 1. Lecture 2. Lecture 	1. BCQ
3.	Phenylalanine + Tyrosine + Tryptophan Metabolism	1. Discuss the metabolism of specific amino acids & its inborn errors (Phenylalanine Tyrosine & Tryptophan)	<ol style="list-style-type: none"> 1. Lecture 2. Lecture 3. Tutorial 4. Practical 	1.BCQ

1.3.14 NUTRITION

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Introduction of Nutrition	1. Discuss the biomedical importance of nutrition	<ol style="list-style-type: none"> 1. Lecture 2. Tutorial 	1.BCQ
2	Balanced diet, Malnutrition & Obesity	<ol style="list-style-type: none"> 1. Explain the importance of balanced diet 2. Discuss the clinical abnormalities of Malnutrition & Obesity 	<ol style="list-style-type: none"> 1. Lecture 	1. BCQ

1.3.15 ENDOCRINOLOGY

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Introduction of Hormones	1. Define hormones 2. Classify Hormones 3. Discuss the general characteristic & mechanism of action of hormones	1. Lecture 2. Tutorial	1.BCQ
2	Classification	1. Describe the various hypothalamic releasing factors that control the secretion, anterior pituitary hormones & posterior pituitary hormones	1. Lecture 2. Lecture	1. BCQ
3.	Adrenal Hormones	1. Explain the chemistry, biosynthesis, mechanism of action & metabolic role of adrenal hormones	1. Lecture 2. Lecture 3. Tutorial 4. Practical	1.BCQ

1.3.16 NEUROTRANSMITTERS

S.NO.	TOPICS	LEARNING OBJECTIVES	MODE OF TEACHING	ASSESSMENT TOOLS
1.	Neurotransmitters	1. Explain the chemistry, biosynthesis, mechanism of action & metabolic role of neurotransmitters	1. Lecture 2. Tutorial	1.BCQ 3.OSPE

JINNAH MEDICAL & DENTAL COLLEGE
BDS YEAR 1 CURRICUUM
BIOCHEMISTRY PRACTICAL

S.NO.	TOPICS	OBJECTIVES By the end of the session the first year BDS student should be able to demonstrate the following	TEACHING AND PRACTICAL METHODOLOGY	ASSESSMENT TOOLS The students will be assessed mid-rotation and end-of rotation tests; mid-term and final examination through:
1.	Lab Hazards & Solutions	Safety procedures during practical and how to make hypotonic, hypertonic, isotonic solution	Demo and preparing slides and Preparing Solution, writing in journals	OSPE/ VIVA
2	Carbohydrates	Polysaccharides Mono& Disaccharides	Demo, performs and identify all the reducing sugars. Writing in journals	OSPE/ VIVA
3.	Amino Acid	Detection of individual amino acid	Demo, performs, writing in journals.	OSPE/ VIVA
5.	Protein	Scheme , detection of individual proteins	Demo, performs and identify all protein & Writing in journals	OSPE/ VIVA
6.	Lipids	Properties of lipids	Demo, performs and identify all lipid & Writing in journals	OSPE/ VIVA
8.	Spectrophotometry	Laws, its mechanism, its uses	Demo and presentation	-
9.	Estimations	Cholesterol by kit Method importance	Demo, Calculations	OSPE/ VIVA
10.	Estimations with kit	Protein, Albumin and A?G ration by kit Method importance	Demo, Calculations	OSPE/ VIVA
11	Liver Function Test (LFT) enzymes	Importance, types of jaundice and interpretations	Demo, presentation	OSPE/ VIVA
12	Bilirubin estimation with Kit	Importance and interpretations	Demo, presentation	OSPE/ VIVA
14	Estimation with Kit /glucometer	Estimation of glucose with kit, glucometer and oral glucose tolerance test and its interpretation	Demo and presentation	OSPE/ VIVA
15.	Hb electrophoresis, chromatography,	Its application and importance	Presentation	OSPE/ VIVA
16.	Urine analysis	Normal and Abnormal contents	Demo, performs and identify all Normal and abnormal & Writing in journals	OSPE/ VIVA

RECOMMENDED BOOKS (Latest editions): TEXT BOOKS

1. Lippincott's Illustrated reviews of Biochemistry
2. Biochemistry by Devlin
3. Biochemistry by Hashimi
4. Medical Biochemistry by MN Chatterjea
5. Biochemistry by DM Vasudevan
6. Biochemistry by U .Satyanurayana

DRESS CODE POLICY FOR STUDENTS WORKING IN LAB

The dress code policy has been developed to maintain and promote high standards of personal appearance, hygiene, professionalism, and safety in the work place. The professional image of JMDC will be upheld by all the students through their dress and attire, which should be consonant with the national cultural sensitivities. It is important to ensure that the institute's image is projected favourably. It is the responsibility of all students to adhere to the institution policy (as well as departmental laboratory policy) and comply with the following defined rules of conduct.

1. All students are required to be clean, well-groomed and dressed appropriately for the class at all times.
2. Female students are required to dress in well-tailored and subtly colored clothing which portrays an image of modesty, respectability, decorum and efficiency.
3. All students must wear (MANDATORY) clean, white, neat lab-coats while in the lab.
4. Female long hair must be tied at the back, neatly into a bun or braid.
5. All students must be neat and clean whenever they report to work. As an example, male students should keep shirts buttoned and tucked neatly into pants.
6. Casual sportswear such as blue jeans, shorts, sweat suits, warm-up suits, t-shirts (with or without writing on them), and sundress - should NOT be worn in the class/lab• Foot wear should be clean, safe and appropriate for the lab