

Maulana Abul Kalam Azad University of Technology, WB
(Formerly known as West Bengal University of Technology)
Syllabus of B.Sc. (Medical Lab Technology)
Effective from academic session 2023-24
Semester 3
Detailed Syllabus

Course: Clinical Haematology Clinical Haematology Lab		
Course Code: BMLC301+BMLC391	Semester: III	
Maximum Marks: 100+100		
Teaching Scheme	Examination Scheme	
Lecture: 3	End semester Exam: 70	
Tutorial: 0	Attendance: 5	
Practical: 2	Continuous Assessment: 25	
Credit: 3+2	Practical/Seasonal internal continuous evaluation: 40	
	Practical/Seasonal external examination: 60	
SL No.	Course Objective	
1	Students will learn the differential diagnosis and appropriate diagnostic valuation of common hematologic abnormalities.	
2	Students will be able to acquire knowledge on the clinical features of various examinations conducted in a laboratory	
3	Students will be able to equip themselves with the tools and techniques engaged in cytochemistry based diagnosis.	
4	Students will gather a sum of knowledge on the qualitative and quantitative analysis of different disorders.	
	Course Outcomes	
	Mapped module/Unit	
CO 1	Demonstrate knowledge about the structure of haemoglobin and other blood cells and functions.	U1
CO 2	Explain the morphology of RBC and their abnormalities.	U2
CO 3	Relate the knowledge about leucopoiesis and the ESR.	U2, U4
CO 4	Explain the definition, types and lab investigations of anaemia.	U2,U3
CO 5	Illustrate the knowledge about haemostatic mechanism and coagulation.	U5
CO 6	Make use of the skill to perform the test for different haematological investigations.	U1,U2,U3,U4,U5

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Learning Outcome/Skills:

The students will be able to learn, acquire and apply the fundamentals of the components of blood, disorders and their respective tests in the laboratory. They get to know a more thorough and detailed knowledge on the clinical haematology and its corresponding application for a complete look.

Unit	Total Hours	% of Questions	Bloom's Taxonomy	Remarks, if any
THEORY				
U1	5	10	1,2	N/A
U2	12	30	2	N/A
U3	8	15	1,2,3	N/A
U4	8	15	1,2	N/A
U5	12	30	1,2,3	N/A
	45	100		

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Course Code:	BMLC301	
Course:	Clinical Haematology	Credits: 3.0
Contents		
Chapter	Name of the Topic	Hours
Unit-I	General blood picture estimation of iron, TIBC, Transferrin, Ferritin, Plasma haemoglobin, Vit.B12, Folic acid, Heinz bodies, Platelet count, Platelet aggregation test, PT, INR, APTT, Thrombin time. Role of coagulation factors.	5
Unit-II	Aplastic anaemia, Anaemia of chronic disorders, Sideroblastic anaemia: aetiology, pathogenesis, clinical features, laboratory investigations. Bone marrow examination, composition & functions, aspiration techniques, processing and staining.	12
Unit-III	Sickle cell anaemia, sickle cell trait, aetiology, pathogenesis, clinical features, and laboratory investigations, Sickling test, Thalassemia, classification, aetiology, pathogenesis, clinical features, laboratory Investigations.	8
Unit-IV	Leukaemia and its classification, WHO and FAB classification, AML, ALL, CML, CLL, its aetiology, clinical features, laboratory investigations. Cytochemistry involved in diagnosis of various types of leukaemia.	8
Unit-V	Qualitative and quantitative disorders of platelets, disorders of secondary haemostasis, haemophilia and its lab diagnosis, Von- Willebrand disease, Disseminated intravascular coagulation, thrombosis, Disorder of fibrinogen, test for bleeding & coagulation disorders, correction studies for factor deficiency, quantitative factor assay, LCells, its demonstration and significance.	12
Total:		45

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Course Code: BMLC391	Course: Clinical Haematology Lab
Credit: 2	Practical
1	General blood picture
2	Determination of red cell indices
3	Demonstration of hypochromic microcytic slide.
4	Determination of G-6-PD
5	Differential Leukocyte Count.
6	Absolute leucocyte count
7	Demonstration of toxic granulation of neutrophil
8	To perform PT and Calculate INR
9	To perform APTT
10	To perform sickling test
11	Determination of Plasma Hemoglobin
12	To perform reticulocyte count

List of Books

Sr. No.	Name of Author	Title of the BOOK	Edition/Publication
1	Shadma Siddiqui Chandra Bahadur Singh Dangi	Practical Manual for Clinical and Applied Haematology	
2	Nanda Maheshwari	Clinical Pathology, Haematology and Blood Banking	
3	Santosh Kumar Mondal	Laboratory Manual of Clinical Pathology and Hematology	
4	Edward C. Klatt & Vinay Kumar	Robbins and Cotran Review of Pathology	

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Semester 3
Detailed Syllabus

Course: Clinical Microbiology		
Clinical Microbiology Lab		
Course Code: BMLC302+BMLC392	Semester: III	
Maximum Marks: 100+100		
Teaching Scheme	Examination Scheme	
Lecture: 3	End semester Exam: 70	
Tutorial: 0	Attendance: 5	
Practical: 2	Continuous Assessment: 25	
Credit: 3+2	Practical/Seasonal internal continuous evaluation: 40	
	Practical/Seasonal external examination: 60	
Sl No.	Course Objective	
1	Students will learn the handling of instruments and sterilization techniques.	
2	Students will be able to identify and differentiate bacteria and fungus in biological samples.	
3	Students will acquire a comprehensive knowledge on the clinical studies conducted in a laboratory.	
4	Students will get to know the acts of metabolism of different causative agents.	
	Course Outcomes	Mapped module/Unit
CO 1	Build the basic knowledge of microbiology.	U1
CO 2	Define the different equipments used in microbiology Lab.	U1,U2
CO 3	Understand the mode of infection and safety measures taken in microbiology laboratory.	U2,U3
CO 4	Explain the viral and protozoan diseases.	U4
CO 5	Demonstrate the activities conducted in diagnostic microbiology.	U2,U3, U4
CO 6	Remember the character of different microorganisms.	U1,U2,U3,U4
CO 7	Utilize the knowledge and skill in diagnostic laboratory to perform different tests related to blood and its allied factors.	U5

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Learning Outcome/Skills:

The students will be able to focus on the various aspects of medical microbiology laboratory and learn the tools and techniques of the antibiotic sensitivity tests. Further they will manage to grip the fundamentals of diseases caused by pathogenic micro-organisms.

Unit	Total Hours	% of Questions	Bloom's Taxonomy	Remarks, if any
THEORY				
U1	8	15	1,2	N/A
U2	8	15	1,2,3	N/A
U3	12	35	1,2	N/A
U4	10	25	1,2	N/A
U5	7	10	1,2,3	N/A
	45	100		

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Course Code:	BMLC302	
Course:	Clinical Microbiology	Credits: 3.0
Contents		
Chapter	Name of the Topic	Hours
Unit-I	Lab organization, management, recording of results and quality control in Medical Microbiology Lab. Safety measures in Microbiology Laboratory, Occurrence of lab infections, route of infections in laboratory, safety measures precaution in use of pathogens in teaching. Host pathogen interaction: Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, and Toxigenicity, Carriers and their types, Opportunistic infections, Nosocomial infections. Transmission of infection.	8
Unit-II	Specimen collection from patients, Culture medium used in microbiology, Preparation and standardization of inoculums, Antibiotic susceptibility testing in bacteriology, choice of antibiotics MIC and MBC: Concepts and methods for determination various methods of Antibiotic susceptibility testing with special reference to Stokes and Kirby-Bauer method.	8
Unit-III	Description, morphology, cultural characteristics, pathogenicity, clinical features and lab diagnosis of Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Mycobacterium, Clostridia, Escherichia coli, Salmonella, Shigella, Proteus, Vibrio, Pseudomonas, Spirochetes, Yersinia. Introduction of Mycology: Definition, general properties and classification cutaneous mycoses, Systemic mycoses, Opportunistic mycoses. Culture and laboratory test for fungus.	12
Unit-IV	Viral diseases List of diseases of various organ systems and their causative agents. The following diseases in detail with Symptoms, mode of transmission, prophylaxis and control, Rabies, Dengue, AIDS. Protozoan diseases List of diseases of various organ systems and their causative agents. The following diseases in detail with Symptoms, mode of transmission, prophylaxis and control. Malaria, Amoebiasis.	10
Unit-V	Antimicrobial agents: Source, General characteristics and mode of action Antibacterial agents: Five modes of action with one example each: Inhibitor of nucleic acid synthesis; Inhibitor of cell wall synthesis; Inhibitor of cell membrane function; Inhibitor of protein synthesis; Inhibitor of metabolism. (Briefly discussion) Antifungal agents: Mechanism of action of Amphotericin B, Griseofulvin Antiviral agents: Mechanism of action of Amantadine, Acyclovir. General idea of Antibiotic resistance (MDR, MRSA)	7
Total:		45

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Course Code: BMLC392	Course: Clinical Microbiology Lab
Credit: 2	List of practical
1	Study of bacterial flora of skin by swab method
2	Perform antibacterial sensitivity by Kirby-Bauer method
3	Determination of minimal inhibitory concentration(MIC) of an antibiotic
4	Study using permanent mounts: stages of malarial parasite in RBCs
5	To perform HIV Tridot test.
6	To perform radial immune-diffusion test.
7	To perform immune-precipitation method.
8	To perform HBsAg rapid test.
9	To perform ASO test
10	Introduction of Allergy panel
11	Manteaux test

List of Books

Sl. No.	Name of Author	Title of the Book	Edition & Publisher
1	Ananthanarayan R. and Paniker C.K.J.	(2009) Textbook of Microbiology	8th edition, University Press Publication
2	Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A.		
3		Adelberg's Medical Microbiology. 26th edition.	McGraw Hill Publication
4	Goering R., Dockrell H., Zuckerman M. and Wakelin D.	(2007) Mims' Medical Microbiology. 4th edition. Elsevier.	9th edition. McGraw Hill Higher Education
5	Willey JM, Sherwood LM, and Woolverton CJ.	(2013) Prescott, Harley and Klein's Microbiology	9th edition. McGraw Hill Higher Education.

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Semester IV
Detailed Syllabus

Course: Immunology and Serology Immunology and Serology Lab		
Course Code: BMLC401 + BMLC491		Semester: IV
Maximum Marks: 100+100		
Teaching Scheme		Examination Scheme
Lecture: 3		End semester Exam: 70
Tutorial: 0		Attendance: 5
Practical: 2		Continuous Assessment: 25
Credit: 3+2		Practical/Seasonal internal continuous evaluation: 40
		Practical/Seasonal external examination: 60
Sl. No.	Course Objective	
1.	Prepare the students with the basic knowledge of immune system, its functions and its related diseases.	
2	Students will be able to carry out differential diagnosis of immune diseases with the help of upgraded techniques.	
3.	Students will be able to gain knowledge on the features of antigen , antibody reactions and serological aspects.	
4.	Students will hopefully acquire a sum of knowledge on hypersensitivity, vaccines and the laws governing it.	
	Course Outcomes	Mapped module/Unit
CO 1	Illustrate the basic concept of immune cells, immune organs, antigens, haptens and immunogens.	U1
CO 2	Demonstrate different types of antibody and its structures and immune response.	U2
CO 3	Explain about the histocompatibility complex and its role in transplantation immunology.	U2,U3
CO 4	Acquire knowledge on immunological disorder and its related diseases.	U4
CO 5	Understand about the immunization and its functions to protect from immune disease.	U5
CO 6	Apply the knowledge and skill in diagnostic laboratory to perform serological tests.	U4,U5

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Learning Outcome/Skills:

The primary spot will be on the immune organs, antigens, haptens, antibodies and histocompatibility complex and transplantation. This knowledge will help the students to conduct the causes of different disorders related to various serological tests

Unit	Total Hours	% of Questions	Bloom's Taxonomy	Remarks, if any
THEORY				
U1	7	10	1,2	N/A
U2	6	10	1,2	N/A
U3	8	10	1,2	N/A
U4	12	35	1,2,3	N/A
U5	12	35	1,2,3	N/A
	45	100		

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Course Code:	BMLC401	
Course:	Immunology and Serology	Credits: 3.0
Chapter	Name of the Topic	Hours
Unit-I	Historical background, general concepts of the immune system, innate and adaptive immunity, Cell and organs of immune system, Phagocytosis. Antigens, Immunogen, haptens: Properties, foreignness, molecular size, heterogeneity, B and T cell epitopes, T dependent and T independent antigens. Immune Response- Humoral immunity & cell mediated immunity.	7
Unit-II	Antigen - Definition, classes, properties. Antibodies/Immunoglobulin - Definition, Properties, Sub types of Immunoglobulins	6
Unit-III	Antigen/Ab Reaction/Serological Refractions – Features of antigen/antibody Reaction- - Precipitation - Agglutination - Complement fixation test - Neutralization - Opsonization - Immune adherence - Immuno fluorescence - Immuno electron microscopic test Introduction of Major Histocompatibility Complex, organization of MHC and inheritance in humans; Antigen presenting cells, antigen processing and presentation. Mechanism of humoral and cell mediated immune response. Introduction of transplant immunology, graft rejection, tissue typing for transplant, Laboratory test for transplant.	8
Unit-IV	Hypersensitivity and its types Introduction to Allergy and its laboratory test. Autoimmune disorders, pathogenesis, organ specific and systemic autoimmune disorders and its markers such parietal cell antibody, anti-sperm antibody, lupus anticoagulants, HLA-B27, anti CCP Immunological disorders: primary and secondary immunodeficiency, SCID, AIDS, Tumour, types of tumours, Various Tumour Markers, their significance and method of estimation	12
Unit-V	ELISA , Vaccination - Schedule & Vaccines, classification and applications, Active and passive immunization, Immunoprophylaxis schedule in neonates, children and in pregnancy. Biomedical Waste & Management and Law governing it	12
	Total:	45

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Course Code: BMLC491	Course: Immunology and Serology Lab
Credit: 2	List of practical
1	To demonstrate agglutination reaction.
2	To perform RA test.
3	To perform WIDAL test.
4	To perform CRP test.
5	To perform HIV Tridot test.
6	To perform HBsAg rapid test.
7	To perform ASO test.
8	To perform blood grouping test.
9	To perform RPR test

List of Books

Sr. No.	Name of Author	Title of the BOOK	Publication
1	Abbas AK, Lichtman AH, Pillai S.	Cellular and Molecular Immunology	6th edition Saunders Publication, Philadelphia.
2	Delves P, Martin S, Burton D, Roitt IM. (2006)	Roitt's Essential Immunology	11th edition Wiley-Blackwell Scientific Publication, Oxford.
3	Goldsby RA, Kindt TJ, Osborne BA. (2007)	Kuby's Immunology	6th edition W.H. Freeman and Company, New York.
4	Murphy K, Travers P, Walport M. (2008)	Janeway's Immunobiology	7th edition Garland Science Publishers, New York.
5	Peakman M, and Vergani D. (2009)	Basic and Clinical Immunology	2nd edition Churchill Livingstone Publishers, Edinberg.
6	Richard C and Geiffrey S. (2009)	Immunology	6th edition. Wiley Blackwell Publication

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Detailed Syllabus

Course: HISTOTECHNIQUES		
Course Code: BMLC402	Semester: IV	
Maximum Marks: 100		
Teaching Scheme	Examination Scheme	
Lecture: 3	End semester Exam: 70	
Tutorial: 1	Attendance: 5	
Practical: 0	Continuous Assessment: 25	
Credit: 4	Practical/Seasonal internal continuous evaluation: 0	
	Practical/Seasonal external examination: 0	
Sl. No.	Course Objective	
1.	Students will be able to carry out tissue processing and general staining.	
2.	Students will be able to learn about the equipments and instruments of cytology.	
3	Students will be able to learn on tissues, types and relevance.	
4.	Students will gain a pen paper knowledge on liquid based preparation and automated service.	
	Course Outcomes	Mapped module/Unit
CO 1	Understand the basic knowledge of histotechnique.	U1,U2
CO 2	Demonstrate the tissue processing and microtome and its use.	U3,U4
CO 3	Able to explain the process of frozen tissue section in emergency and routine tissue staining.	U5,U6

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Learning Outcome/Skills:

The students will have the chance to go thorough the concepts of cytology and histo pathology. Their knowledge can be channelized in various related domains.

Unit	Total Hours	% of Questions	Bloom's Taxonomy	Remarks, if any
THEORY				
U1	10	10	1,2	N/A
U2	10	20	1,2	N/A
U3	10	20	1,2,3	N/A
U4	10	20	1,2,3	N/A
U5	10	20	1,2,3	N/A
U6	10	10	1,2,3	N/A
	60	100		

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Course Code:	BMLC402	
Course:	HISTOTECHNIQUES	Credits:3L+1T
Chapter	Name of the Topic	Hours
Unit-I	Cell: basic structure and function, cell organelles, cell cycle, Benign and Malignant tumours, Instruments used in cytology, preparation of buffers, stains, Microscopy: Light, compound, phase contrast, fluorescence	10
Unit-II	Introduction of histopathology, cytology & histotechniques, laboratory organization, care & maintenance of equipments used in histotechnology lab, Safety measures in histotechnology lab Reception, Recording, Labelling and transportation of tissue specimens, Basic concepts of fixation and various types of fixative used in histopathology and cytopathology	10
Unit-III	Tissue and its types, Location and function, Grossing of tissues, whole mount, sections, smears, tissue processing and its steps, manual and automated method, components & principle of automatic tissue processor. Decalcification, decalcification methods, types of decalcifying fluid, Processing of bones and teeth, Embedding media, its type and properties	10
Unit-IV	Instruments and equipment's used in cytology Fixation and Fixatives used in cytology, Adhesive and mounting media, Cell block and cytopspin technique, Staining such as PAP, Diff-quick, MGG, H&E, Shirr staining, significance of PAP-HPV, Destaining and restaining of slides, Cover slipping	10
Unit-V	Aspiration and exfoliative cytology, Patient preparation, Sample collection, Fixation, Processing and Staining FNAC, collection, processing of sample and staining, on site quick staining procedure Unit-VI Pap staining, Progressive & Regressive, Hormonal cytology in different age groups, Collection and processing of sputum, BAL, CSF, Pleural, peritoneal and pericardial fluid, Gynaecologic sample	10
Unit-VI	Sex chromatin demonstration, Introduction of Immunocytochemistry, different markers and its applications, Automation in cytology, Liquid based preparation & automated screening device	10
	Total:	60

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List of Books

Sr. No.	Name of Author	Title of the BOOK	Publication
1		Bancroft's Theory and Practice of Histological Techniques	7th Edition, Elsevier Publications
2	Harshmohan (2017)	Textbook of Pathology	7th edition, Jaypee Publications
3	Godkar.B. Praful,(2016)	Textbook of MLT	3rd edition, Bhalani Publications
4	C F A Culling,(1974)	Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques	3rd edition, Butterworths Publishers

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Detailed Syllabus

Course: CLINICAL BIOCHEMISTRY		
Course Code: BMLC403	Semester: IV	
Maximum Marks: 100		
Teaching Scheme	Examination Scheme	
Lecture: 3	End semester Exam: 70	
Tutorial: 1	Attendance: 5	
Practical: 0	Continuous Assessment: 25	
Credit: 4	Practical/Seasonal internal continuous evaluation: 0	
	Practical/Seasonal external examination: 0	
Sl. No.	Course Objective	
1.	The students are introduced to the the basic knowledge and functions different enzymes .	
2.	Students will know and understand the basics of reagent preparations.	
3.	Students will understand and apply the acquired knowledge on instrument handling to perform common analytical test.	
4	Students will be able to understand the basic concepts of automation, principle, structure and function.	
	Course Outcomes	Mapped module/Unit
CO 1	Demonstrate about clinical biochemistry and lab with safety measures and maintenance.	U1
CO 2	Illustrate the structure, properties and significance enzymes.	U2
CO 3	Explain the enzyme kinetics and inhibition with its functions.	U3
CO 4	Understand about the isozymes and diseases present in human body.	U4
CO 5	Demonstrate the basic concepts of automation and laboratory management.	U5
CO 6	Apply the knowledge and skill in diagnostic laboratory to perform biochemical test.	U4,U5

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Learning Outcome/Skills:

In Clinical Biochemistry , the students will be entitled to the detailed knowledge of different enzymes and their subsequent significance. Further, the students will acquire the basics of automation, analyzers and various hospital laboratory management and urine examination.

Unit	Total Hours	% of Questions	Bloom's Taxonomy	Remarks, if any
THEORY				
U1	10	10	1,2	N/A
U2	15	30	1,2,3	N/A
U3	10	15	1,2	N/A
U4	10	15	1,2	N/A
U5	15	30	1,2,3	N/A
	60	100		

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Course Code:	BMLC403	
Course:	CLINICAL BIOCHEMISTRY	Credits:3L+1T
Chapter	Name of the Topic	Hours
Unit-I	Introduction to Clinical Biochemistry and role of Medical Lab Technologist, ethics, responsibility, safety measure and hazards in clinical biochemistry lab and first aid in laboratory accidents. Glassware's & plastic ware's used in lab, calibration of volumetric apparatus, cleaning& care and maintenance	10
Unit-II	Introduction to enzymes, Classification of Enzymes, Isoenzymes, Concept of lock and key and induced fit theory, concept of activation energy and binding energy. Factors affecting enzyme activity, Coenzyme: Classification, various types and function, structure of NAD ⁺ , NADP ⁺ , FAD and FMN, PPP. Units for measuring enzyme activity, factors affecting enzyme level in serum/plasma. Clinical assay& its type, kinetic assay and end point assay for the enzymes.	15
Unit-III	Enzyme kinetics, the Michaelis-Menten equation and its physiological significances, Enzyme Inhibition, types of inhibitors of enzyme	10
Unit-IV	Isoenzymes, their tissue distribution and clinical significance: ALT, AST,ALP,GGT,CPK,CKMB, LDH,Troponin, Myoglobin, Amylase, Lipase,ACP	10
Unit-V	Basic Concepts of Automation, principle, working and maintenance of various clinical chemistry analysers, point of care testing, Hospital Laboratory Management. Physical, chemical and microscopic examination of urine, Bence Jones Proteinuria and its clinical significance, qualitative test of urine for reducing sugars, protein, ketone bodies, bile Salt, bile pigments, urobilinogen, occult blood, uric acid, urea and Creatinine, quantitative estimation of 24 hrs. urine for protein and their clinical significance.	15
	Total:	60

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List of Books

Sr. No.	Name of Author	Title of the BOOK	Publication
1	M Adhya & B Singha, (2018)	Biochemistry (General and Ocular).	
2	D M Vasudevan, (2011),	Textbook of Medical Biochemistry	6th edition Jaypee Publishers
3	M N Chatterjea & Rana Shinde	Practical text Book of Biochemistry for medical Students	Second edition, Jaypee Brothers Medical Publishers (P) Ltd