



Biochemistry And Nutrition



Block BAN-104

STUDENT STUDY GUIDE

2024-2025



Revised by

**Medical Biochemistry
Department**

**Faculty of Medicine
Sohag University**



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Basic Information of the block

Program on which the course is given Bachelor of Medicine and Surgery (M.B., B.Ch.).

Elements (Major or Minor) of the program: Undergraduate

Departments offering the course: Medical Biochemistry Departments.

Academic year/level: 1st year, 1st semester.

Date of specification approval: 2024-2025

Title: Biochemistry and Nutrition

Code: BAN-104

Credit points: 6

Weeks: 4 weeks

Lecture: 34 hours

Practical: 24 hours

Student learning activities: 60 hours {self -directed learning (SDL) . 12 hrs. formative assessment}

Case- based group discussion: 20hrs.

Total: 150 hours

Biochemistry And Nutrition

Names and Contact Information of Staff Responsible for The Block:

Block coordinator

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Assistant Prof. Amira Moura Foad Hamdy , Medical Biochemistry Department

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Head of Departments Sharing in The Block:

Prof. . Nagwa Sayed Ahmed, Head of Medical Biochemistry Department

All Staff Members Involved in Teaching of The Block:

Medical Biochemistry

Prof. Nagwa Sayed Ahmed

Prof. Mohamed Ahmed Abd Elmoety

Prof. Aida Abdeen

Dr. Reda Salah Yousef

Drr. Amera Murad

Dr. Marwa Shaaban Hashim

Dr. El Shima Hafez Abd Elal

Dr. Amira Ahmed Genedy

Dr. Alia Khiry

Dr. Samer Mostafa Kamel



Professional information

I- Block Aims

Overall aim of the block:

Understand the energy production and storage, basal metabolic rate, carbohydrate, protein and fat metabolism, maintain body temperature and maintain and transmitting its genetic information.

By the end of this block, the students are expected to:

- 1) Describe basic function of human cell. Know homeostasis and explore how the body maintained its internal environment constant.
- 2) Describe mode of energy production and storage through cell membrane.
- 3) Recognize major structural biomolecules of human body, and components of food stuff.
- 4) Understand basics of biochemical reactions and its clinical applications
- 5) Describe pathways and mechanisms of generation, usage and storage of energy pool of the cell.
- 6) Understand synthesis and generation of key cellular biomolecules
- 7) Understand the outcome of disturbances in biochemical pathways for energy production, storage and synthesis of cellular biomolecules
- 8) Outline the structure human genome
- 9) Understand central dogma of molecular biology
- 10) Describe DNA mutation and their impact on human health



NARS competencies covered by the block

NARS areas covered by the block

The competency areas of the NARS- Medicine competency framework are

- 1- The graduate as a health care provider.
- 2- The graduate as a health promoter.
- 3- The graduate as a professional.
- 4- The graduate as a scholar and scientist.
- 5- The graduate as a member of the health team and a part of the health care system.
- 6- The graduate as a lifelong learner and researcher.

Sub competencies

- 1.1 Take and record a structured, patient centered history.
- 1.2 Adopt an empathic and holistic approach to the patients and their problems.
- 1.3 Assess the mental state of the patient.
- 1.4 Perform appropriately-timed full physical examination of patients, appropriate to the age, gender, and clinical presentation of the patient while being culturally sensitive.
- 1.5 Prioritize issues to be addressed in a patient encounter.
- 1.6 Select the appropriate investigations and interpret their results taking into consideration cost/ effectiveness factors.
- 1.7 Recognize and respond to the complexity, uncertainty, and ambiguity inherent in medical practice.
- 1.8 Apply knowledge of the clinical and biomedical sciences relevant to the clinical problem at hand.
- 1.9 Retrieve, analyze, and evaluate relevant and current data from literature, using information technologies and library resources, in order to help solve a clinical problem based on evidence (EBM).
- 1.10 Integrate the results of history, physical examination and laboratory test findings into a meaningful diagnostic formulation.
- 2.1 Identify the basic determinants of health and principles of health improvement.
- 2.2 Recognize the economic, psychological, social, and cultural factors that interfere with wellbeing.

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- 2.3 Discuss the role of nutrition and physical activity in health.
- 2.4 Identify the major health risks in his/her community, including demographic, occupational and environmental risks; endemic diseases, and prevalent chronic diseases.
- 2.5 Describe the principles of disease prevention, and empower communities, specific groups or individuals by raising their awareness and building their capacity.
- 3.1 Exhibit appropriate professional behaviors and relationships in all aspects of practice, demonstrating honesty, integrity, commitment, compassion, and respect.
- 3.2 Adhere to the professional standards and laws governing the practice, and abide by the national code of ethics issued by the Egyptian Medical Syndicate.
- 3.3 Respect the different cultural beliefs and values in the community they serve.
- 3.4 Treat all patients equally, and avoid stigmatizing any category regardless of their social, cultural or ethnic backgrounds, or their disabilities.
- 3.5 Ensure confidentiality and privacy of patients' information.
- 3.6 Recognize basics of medico-legal aspects of practice, malpractice and avoid common medical errors.
- 3.7 Recognize and manage conflicts of interest.
- 3.8 Refer patients to the appropriate health facility at the appropriate stage.
- 3.9 Identify and report any unprofessional and unethical behaviors or physical or mental conditions related to himself, colleagues or any other person that might jeopardize patients' safety
- 4.1 Describe the normal structure of the body and its major organ systems and explain their functions.
- 4.2 Explain the molecular, biochemical, and cellular mechanisms that are important in maintaining the body's homeostasis.
- 4.3 Recognize and describe main developmental changes in humans and the effect of growth, development and aging on the individual and his family.



Intended Learning Outcomes of the BAN Block

A- Knowledge and understanding:

Upon completion of the course students should be able to:

A1- List the structure and functions of the different classes of dietary components and body biomolecules and their derivatives.

A2- Identify basics of biochemical reactions.

A3- Describe the central pathways that provide living organisms with energy.

A4- List the terms of reactive oxygen species, xenobiotics and their harm to the human body.

A5- Express detailed information regarding the flow of genetic information in human body.

A6- Define cell cycle events, terms of apoptosis, oncogene, tumor markers, monogenic and complex genetic disorders.

B- Intellectual skills

B1- Correlate the outcome of deficiency of dietary components, and abnormal biomolecules structure/formation.

B2- Discuss how enzyme activity is regulated.

B3- Explain regulation and integration of the major metabolic pathways.

B4- Illustrate examples where defects in biochemical processes result in diseases, and predict potential outcomes of biochemical defects.

B5- Explain mechanisms that regulate expression of genetic information.

B6- Distinguish consequences of DNA mutation.



C- Psychomotor skills

C1- Display safe laboratory practice.

C2- Participate in laboratory tutorials, exercises, and biochemical case scenarios.

C3- Handle techniques and procedures commonly utilized in the field of medical biochemistry and understand its principles.

C4- Perform the assay of commonly used diagnostic biochemical tests.

C5- Interpret laboratory reports.

D- General and transferable skills

The skills of a general nature, which can be applied in any subject area, including: written and oral communication, the use of new technological tools, ICT, group working, problem solving, management ...etc.

D1- Practice the value of teamwork by acting in small groups,

D2- Practice effectively using a written health record, electronic medical record, or other digital technology

D3- Organize time and resources effectively and set priorities;

D4- Present information clearly in written, electronic and oral forms, and communicates ideas and arguments effectively;

D5- Discuss their work and that of others, using constructive feed-back.

D6- Integrate in inter-professional activities and collaborative learning to continuously improve personal practice and contribute to collective improvements in practice.



Total hours and credit points						
	Lectures	Practical	Case-based group discussions	SDL	Formative assessment	Total
Hours	34	24	80		12	150
Credit points						6

Teaching and learning methods:

- 1- Lectures for knowledge and intellectual skill outcomes.
- 2- Practical sessions to gain psychomotor skills and using practical book.
- 3- Self-directed learning (SDL) and case-based group discussion for the topics studied in lectures or related topics; including libraries, E-learning (photographs, reading cases and solving of questions - available online) as well as consulting professors for gathering of information.

Student Assessment:

1. Formative:

This is used to monitor student's learning to provide ongoing feedback that can be used by instructors to improve their teaching and by students to improve their learning.

It's given at least once in the form of quizzes that is made available for the students at the E-learning site at the end of the block.

Answers are presented instantly after the attempts and discussed on the students groups or in person with the teaching staff

Questions should be consistent with the level of the final exam. The student's attendance is a condition for entering the summative exams. The electronic or paper achievement file must be used to follow up on the students' evaluation, and its completion is a condition for entering the final exams

2. Summative

It is used to evaluate student's achievements at the end of the block. The grades tell whether the student achieved the learning goal or not.

Assessment task	Proportion of Total Assessment	Marks
Portfolio assessment	10%	9
Midterm examination (MCQs,)	20%	18
OSPE exam for practical	30%	27

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Final written Exams (50%MCQ+ 50% short answer questions and MEQs)	40%	36
Total	100	90



List of topics

Biochemistry And Nutrition BAN 104 Lectures				
NO	Title of lectures	ILOs	Week number	Contact hours
1	Overview of Vitamins and minerals I, II	A1, B1	1 st week	2
2	Biochemistry of enzymes and clinical enzymology	A1, B1	1 st week	2
3	Biochemistry of dietary, functional and structural carbohydrates I, II	A2, B2	1 st week	2
4 & 5	Glycolysis, and pyruvate oxidation I, II	A1, B1	1 st week	2
6	Tricarboxylic acid cycle, TCA I, II	A3, B3	1 st week	2
7	Oxidative phosphorylation and respiratory chain	A3, B3	1 st week	1
8	Storage of glucose: glycogen synthesis and degradation I & II	A3, B3	1 st week	2
9	Gluconeogenesis	A4, B4	1 st week	1
10	Biochemistry of dietary, functional and structural lipids I, II	A3, B3	2 nd week	2
11	Assimilation of dietary fat (lipolysis & B-oxidation of fatty acids) I, II	A3, B1, B4	2 nd week	2
12	Ketogenesis & ketolysis	A1, B1	2 nd week	1
14	Synthesis of Fatty Acids and triacylglycerol (Lipogenesis)	A3, B3	2 nd week	1
15	Biochemistry of amino acids and proteins structure function I & II	A3, B1, B3, B4	2 nd week	1
16	Removal and fate of amino acid nitrogen, Urea cycle	A3, B1, B3, B4	2 nd week	2
17	Synthesis degradation & biomolecules derived from amino acids I, II	A3, B3, B4	2 nd week	2
18	Synthesis degradation & biomolecules derived from amino acids III	A3, B3, B4	2 nd week	1
19	Oxygen Toxicity and free radical	A3, B3, B4	2 nd week	1

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BAN-104 I. Lectures				
NO	Title of lectures	ILOs	Week number	Contact hours
20	Integration, Regulation, Perturbations of Energy Metabolism	A3, B3, B4	3 rd week	1
21	DNA structure and organization	A45 B4	3 rd week	1
22	Purine and Pyrimidine Metabolism	A5,B5	3 rd week	1
23	DNA replication	A5,B5	3 rd week	1
24	RNA structure and Function and transcription I & II	A9,B9	3 rd week	1
25	Protein synthesis (translation)	A5,B5	3 rd week	1
26	DNA Mutation & Repair I & II	A5,B6	3 rd week	1
	Revision and Exam		4 th week	NA
Total				34



II. BAN-Practical Sessions				
		BIO		
NO	Title of practical session	ILOs	Week	Hours
1	Basic Laboratory Principles & Safety Measures	C1-2	1 st	2
2	Plasma protein I	C1-4	1 st	2
3	Plasma protein II	C1-4	1 st	2
4	Clinical enzymology	C1-4	1 st	2
5	Urine report I	C1-4	2 nd	2
6	Urine report II	C1-4	2 nd	2
7	Urine report III	C1-4	2 nd	2
8	Non protein nitrogenous compound I	C1-4	2 nd	2
9	Non protein nitrogenous compound II	C1-4	3 rd	2
10	DNA Extraction / Gel Electrophoresis, RFLP	C1-4	3 rd	2
11	Polymerase-chain reaction (PCR)	C1-4	3 rd	2
12	Revision	C1-4	4 th	2
EXAM			4 th	
Total			24	



III. BAN-Case based group discussion		BIO		
NO	Title of case session	ILOs	Week	Hours
1	Case Vegetarian diet	A1, B1, D1-6	1 st	2
2	Old Male with Slowly Progressive Memory Impairment (protein precipitation in Alzheimer disease)	A1, B1, D1-6	1 st	2
3	Case of megaloblastic anaemia	A1, B1, D1-6	1 st	2
4	Scurvy	A1, B1, D1-6	2 nd	2
5	Case Anaerobic metabolism	A1, B1, D1-6	2 nd	2
6	Lactose intolerance	A1, B1, D1-6	2 nd	2
7	4.1 Case of Ornithine Carbamoyl Transferase Deficiency	A2, 3, B3, 4, D1-6	2 nd	2
8	Case of phenylketonuria	A2,3, B3, 4 D1-6	3 rd	2
9	Gout	A1, 5, B5, 6 D1-6	3 rd	2
10	Case Sick cell anaemia	A1, 5, B5, 6 D1-6	3 rd	2
Total				20



VI. BAN-SDL		BIO		
NO	Title of SDL session	ILOs	Week	Hours
1	Biochemistry of vitamins and minerals	A1, B1, D1-6	1 st	2
2	Isoenzymes and clinical enzymology	A3, B3, D1-6	1 st	2
3	Biochemistry of carbohydrates, polysaccharides	A1, D1-6	2 nd	2
4	Gluconeogenesis and regulation of blood glucose level	A3, B2, B4, D1-6	2 nd	2
5	Integration, regulation and regulation of metabolism Oxygen toxicity and free radical metabolism Purine & pyrimidine Metabolism	A5,6,B5,B6 D1-6	3 th	2
6	Regulation of gene expression, DNA mutation and repair, Biochemical Basis of Carcinogenesis	A5,6,B5,B6 D1-6	3 th	2
Total				12



List of References (Recommended books)

A- Lectures notes:

Hand out of the lectures will be available as PDF on the web of the collage and each student can access by his/ her ID code. MCQ and cases study book of the department.

B- Essential books:

Medical Biochemistry Books:

Lectures

1. Elsevier integrated reviews biochemistry second edition
2. Lippincott's Illustrated Reviews Biochemistry, 6 edition
3. Kaplan USMLE™. Step 1 Biochemistry and Medical Genetics Lecture Notes 2013
4. First aid for USML Step 1 2019 student to student guide
5. First aid for USML Step 1 2018 basic sciences

Practical and case study

1. Department practical book

Medical Biochemistry Journals

1. Critical Reviews in Biochemistry and Molecular Biology
2. Annual Review of Biochemistry
3. Nature Methods



Topic Outlines

BIO		BAN - Week 1			
NO	Title	ILOs	Week	Hours	
Lectures (1-9)					
Lecture 1	Overview of Vitamins and minerals-I & II Define vitamins, classify them according to their solubility Describe the role of water-soluble vitamins in metabolism Discuss sources and manifestation of water soluble vitamin deficiency	A1, B1	1 st	1	
Lecture 2	Biochemistry and clinical enzymology-I, II Define enzymes & describe structural components of the enzyme system. Discuss mechanism of enzyme action Explain types of enzyme specificity Enumerate factors affecting enzyme activity Describe kinetics of enzyme reaction List different types of enzyme Inhibition Explain with examples mechanisms of enzyme inhibition Enumerate different modes of regulation of enzyme activity Define isoenzymes & explain its clinical applic	A1, B1	1 st	2	
Lecture 3	ation	A2, B2	1 st	1	

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Lecture 4-5	Biochemistry of dietary, functional and structural carbohydrates I-II Identify different classes of carbohydrates, and list their biological importance. List functions of monosaccharides, and oligosaccharides and their derivatives Define and classify polysaccharides. Discuss structure and function medically important homo and hetero-polysaccharides.	A1, B1	1 st	2
Lecture 6	ATP production & Biological Oxidation Describe ATP and Enumerate its functions Describe components of electron transport chain and explain its major steps Discuss regulation, inhibition & uncouplers of oxidative phosphorylation	A3, B3	1 st	2
Lecture 7	Glycolysis I-II Define glycolysis, Describe reaction steps of glycolysis Calculate energetics of glycolysis Discuss function of glycolysis with emphasis of RBCs Describe regulation of glycolysis Discuss disease related to glycolysis	A3, B3	1 st	2
Lecture 8	Tricarboxylic acid cycle I-II Describe the conversion of pyruvate into acetyl-CoA and its regulation Define TCA cycle, its location & biological importance Describe steps of TCA, Calculate its energetics of TCA Mention co-factors Explain regulation of TCA cycle.	A3, B3	1 st	1
Lecture 9	Storage of glucose: glycogen synthesis and degradation I & II Describe the steps for glycogen synthesis Explain regulation of glycogen synthesis Illustrate the differences between function of glycogen in skeletal muscle and liver	A4, B4	1 st	1

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Lecture 10	Gluconeogenesis Mention definition, site and biological importance of gluconeogenesis Discuss the gluconeogenic precursors, Describe pathways of gluconeogenesis Discuss regulation of gluconeogenesis	A3, B3	2 nd	2
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BIO		BAN- Week 2			
NO		Title	ILOs	Week	Hours
Lecutres					
Lecture 11& 12	Biochemistry of dietary, functional and structural lipids I-II Classification & Biological importance of fat Discuss structure and function of fatty acids, fattyalcohols, and their derivatives Discuss Structure and function of phospholipids,glycolipids with special emphasis on cell membrane Discuss Structure and function of lipoproteins		A3, B3	2 nd	2
Lecture 13	Assimilation of dietary fat (lipolysis & Boxidation of fatty acids) I-II Define lipolysis and describe its steps & regulation Enumerate sources of fatty acids for oxidationDescribe activation & transport and of fatty acids into mitochondria Describe the steps of B-oxidation of fatty acids Calculate the bioenergetics of FA oxidation Explain regulation of Fatty Acid Oxidation		A1,B1	2 nd	1
Lecture 14	Ketogenesis & ketolysis Describe synthesis and degradation of ketone bodies. Calculate the bioenergetics of ketolysis Discuss regulation of ketogenesis & ketolysis		A3, B3	2nd	2
Lecture 15	Synthesis of Fatty Acids and triacylglycerol (Lipogenesis) List Sources of NADPH for Fatty Acid SynthesisList sources of and transport of acetyl CoA into mitochondria Describe the pathways of FA synthesis List steps of synthesis of TAG (Lipogenesis) Describeregulation of synthesis of TAG (Lipogenesis)		A3,B1, B3, B4	2nd	1

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Lecture 16	Biochemistry of amino acids and proteins structurefunction relation-I & II Define amino acid and its structure Classify amino acids Describe structural organization of proteins. Describe with examples disorders of protein folding (Misfolding) Classify proteins Discuss examples of medically and structurally important proteins, Plasma proteins, collagen, and keratin	A3,B1, B3, B4	2 nd	1
Lecture 17	Removal and fate of amino acid nitrogen (Transamination & Urea cycle) Describe reactions of Transamination and oxidative deamination, Discuss metabolic and diagnostic importance of Transamination Discuss sources, fate & mechanism of ammonia intoxication List and discuss steps of Urea Cycle Discuss regulation of urea cycle Explain urea cycle defects	A3, B3, B4	2 nd	2
Lecture 18-19	Synthesis degradation & biomolecules derived from amino acids I Describe Synthesis of glycine amino acid Enumerate biomolecules derived from glycine amino acid Discuss biosynthesis and biochemical role of Glutathione, Creatine, choline Synthesis, degradation & biomolecules derived from amino acids II Describe Synthesis of tyrosine amino acid. Discuss biosynthesis and biochemical role of, adrenaline, melanin, and thyroxine, Discuss inborn errors of phenyl alanine and tyrosine amino acids. Synthesis, degradation & biomolecules derived from amino acids III Discuss products formed by amino acid decarboxylation(GABA, histamine) Discuss metabolism of S- adenosylmethionine Enumerate biomolecules derived from amino acids, their function.	A3, B3, B4	2 nd	2
		A7, B7, B8	5 th	1
Lecture 20	DNA Structure and chromatin organization Define DNA structure, forms, types and cellular distribution Define nucleosome, describe its structure List the different levels of chromatin condensation till chromosome	A3, B3	3 th	1



BIO		BAN 3 rdWeek		
Number	Title	ILOs	Week	Hours
Lectures (21-28)				
Lecture 21	Integration, regulation and perturbation of metabolism Describe tissue & cellular metabolic response to feeding, fasting and starvation Describe cellular metabolic response to exercise	A5, B4	3 th	1
Lecture 22	DNA Structure and chromatin organization Define DNA structure, forms, types and cellular distribution Define nucleosome, describe its structure List the different levels of chromatin condensation till chromosome	A5, B5	3 th	1
Lecture 23	Purine & pyrimidine Metabolism Enumerate Purine and pyrimidine bases, nucleosides and nucleotides Explain Catabolism of purines and pyrimidine nucleotides: Discuss disorders of purine and pyrimidine nucleotide metabolism	A5, B5	3th	1
Lecture 24	DNA replication Define DNA replication, List its requirements Describe its main steps	A5, B5	3 th	1
LECTURE 24	RNA structure and Function and transcription List posttranscriptional modification of RNA Explain steps of posttranscriptional modification	A5, B5	3 rd	1
Lecture 25	Protein synthesis (translation) Define genetic code List its characters Outline the steps of protein synthesis (translation). List the main posttranslational modifications of protein	A5, B5	3 rd	1

Lecture 26	DNA Damage & Repair I & II Define mutations List the main causative agents of DNA damage. Describe different types of mutation, its outcome	A6, B6	3 rd	1
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N O	Practical	ILOs	Week	Hours
BAN Practical 1	Basic Laboratory Principles and Safety Measures Practice proper safety measures in clinical lab Identify and handle lab glassware and perform micro pipetting Describe the centrifuge and its function. Identify molarity and normality, and measuring units in clinical chemistry	C1, C2	1st	2
BAN Practical 2	Plasma protein I Describe the differences between/and in obtaining plasma & serum Enumerate causes of high and low plasma proteins & discuss albumin globulin ratio Discuss principles of colorimetry Estimate Serum total protein	C2, C3	1 st	2
Practical 3	Plasma protein II Define electrophoresis & list analytes separated by electrophoresis Discuss principle, and procedures of protein electrophoresis List of normal and abnormal plasma protein & Analyse patients' reports Estimate Serum total protein by colorimetry	C1-4	1st	2
Practical 4	Clinical enzymology Identify tissue specificity of each enzyme Assay of GOT, GPT, LDH, Alkaline phosphatase, aspart of clinical enzymology Perform the procedures Analyse patient data, and interpret them	C5-8	1 st	2
Case based group discussion and SDL				
BAN- CASE 1& 2 & 3	1 Case Vegetarian diet Identify the importance of essential amino acids. Identify problems with inadequate essential amino acid intake Identify other metabolite deficiencies associated with vegetarian diet	A1, B1 D1-6	1 st	1
	2 82-Year-Old Male with Slowly Progressive Memory Impairment Discuss protein folding. Identify the role of protein misfolding in neurodegenerative diseases (the neurotoxic plaques in Alzheimer's disease)	A1, B1 D1,2,3,4	1 st	1
	3. Case of megaloblastic anaemia Describe the role of cobalamin in red blood cell formation. Describe the role of cobalamin in metabolism. List other causes of megaloblastic anaemia	A1, B1 D1-6	1st	1



BAN-SDL 1	Biochemistry of Vitamins and minerals-I Define vitamins, classify them according to their solubility Describe the role of water-soluble vitamins in metabolism Discuss sources and manifestation of water-soluble vitamin deficiency Enumerate fat soluble vitamins Describe the role of fat-soluble vitamins Describe manifestations of fat-soluble vitamin deficiency	A1, B1	1st	1
SDL 2	Iso-enzymes, clinical enzymology & regulation of enzyme activity Enumerate factors affecting enzyme activity Describe kinetics of enzyme reaction List different types of enzyme Inhibition Explain with examples mechanisms of enzyme Inhibition Enumerate different modes of regulation of enzyme Activity Define isoenzymes and its applications Use of enzyme as diagnostic and prognostic tools	A2, B2, D1-6	1st	2
	Formative assessment 1			





BIO		BAN- Week 2		
Practical				
Practical 5	Urine report I Define glycosuria & glucosuria & Discuss causes of glucosuria. List types of ketone bodies & Discuss its causes Define albuminuria, proteinuria & enumerate itscauses Benedict, Heat coagulation, and Rothera test	C1-4	2 nd	2
Practical 6	Urine report II Define glycosuria & glucosuria & Discuss causes of glucosuria. List types of ketone bodies & Discuss its causes Define albuminuria, proteinuria & enumerate itscauses Benedict, Heat coagulation, Rothera test & Perform Dipstick Analyse true patient data, and interpret them	C1-4	2 nd	2
Practical 7	Urine report III Define glycosuria & glucosuria & Discuss causes of glucosuria. List types of ketone bodies & Discuss its causes Define albuminuria, proteinuria & enumerateits causes Perform Dipstick, Benedict, Heat coagulation, and Rothera test Analyse true patient data, and interpret them	C1-4	2 nd	2
Practical 8	Estimation of non- protein nitrogenous compounds I List NPNC in urine and blood Discuss diagnostic importance of blood urea and serum creatinine levels Perform lab test for blood urea estimation & serum creatinine Analyse the data, and interpret them	C1-4	2 nd	2
Case based group discussion and SDL				



CASE 4 & 5 & 6&7	4 Scurvy List functions of vitamin C Describe the biochemical action of vitamin C List causes of vitamin C deficiency List manifestation of vitamin C deficiency	A1, B1 D1-6	2 nd	1
	5 A case of anaerobic metabolism Enumerate causes of lactic acidosis Illustrate the differences in energy production in aerobic and anaerobic conditions in different organs Discuss the tricarboxylic acid (TCA) cycle in different tissues.	A3, B3.4 D1-6	2 nd	2
	Acase of lactose intolerance	A3, B3.4 D1-6	2 nd	2
	8.1 Case of Ornithine Carbamoyl Transferase Deficiency Enumerate sources and fate of ammonia Discuss ammonia intoxication Describe urea cycle and its defects Mention protocol of diagnosis	A3, B3,4 D1-6	3 rd	1
SDL 3 & 4	Biochemistry of medically important carbohydrates, & polysaccharides Define polysaccharides, describes its classification Discuss structure and function of Homopolysaccharides Discuss structure and function of Heteropolysaccharides Discuss structure and function of proteoglycans	A1, D1-6	2 nd	2
	Gluconeogenesis Mention definition, site and biological importance of gluconeogenesis Discuss the gluconeogenic precursors, pathways gluconeogenesis & regulation	A3, B3D1-6	2 nd	2
	Formative assessment 2			

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Practical				
Practical 9	Estimation of non-protein nitrogenous compounds II List causes of hyperuricemia and hypouricemia Discuss the management of hyperuricemia Perform lab test for uric acid estimation & serum creatinine Analyse the data, and interpret them	C1-4	3 rd	2
Practical 10	Perform DNA Extraction / Gel Electrophoresis Describe methods of DNA extraction Perform DNA extraction and know its further application Discuss restriction endonucleases, RFLP and its applications	C1-2	3 rd	2
Practical 11	PCR Explain the principles of PCR & Identify its types Explain the diagnostic importance PCR Discuss post PCR application, with special reference to DNA sequencing. Perform PCR reaction & analyse results	C5-6	3 rd	2
Case based group discussion and SDL				



CASE 8& 9&10	Case of phenylketonuria Describe the biochemical conversion of phenylalanine to tyrosine. Describe the biochemical events of PKU Discuss the management of PKU	A1, 5, B5,6 D1-8	3 rd	2
	Gout Enumerate Purine and pyrimidine bases, nucleosides and nucleotides Explain Catabolism of purines and pyrimidine nucleotides: Discuss disorders of purine and pyrimidine nucleotide metabolism Sickle cell anaemia Describe the structure of haemoglobin and its role in oxygen binding and dissociation. Describe the mechanism that amino acid substitution results in sickle cell haemoglobin Enumerate methods of diagnosis	A1,5, B5,6 D1-8	3 rd	2

SDL

NO	Title	ILOs	Week	Hours
SDL 5&6	Integration, regulation and perturbation of metabolism Oxygen toxicity and free radical metabolism Purine & pyrimidine Metabolism Describe tissue & cellular metabolic response to feeding, fasting and starvation Describe cellular metabolic response to exercise Define oxidative stress Describe the effect of ROS on different body biomolecules List diseases associated with ROS Describe body defence mechanism against ROS Discuss disorders of purine and pyrimidine	A3-5, B3-5, B6 D1-6	5 th	2



	Regulation of gene expression, DNA mutation and repair, Biochemical Basis of Carcinogenesis	A1,5, B5,6 D1- 8	3 rd	2
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Formative assessment 3

Questions should be consistent with the level of the final exam. The student's attendance is a condition for entering the summative exams. The electronic or paper achievement file must be used to follow up on the students' evaluation, and its completion is a condition for entering the final exams.



Biochemistry and Nutrition BLOCK BAN-104 Lecture – Blueprint								
N O	Title of lectures	ILOs	Contact hours	Weight	Total mark s	End of the block	Final exam	Portfolio
1	Overview of Vitamins and minerals I,	A1, B1	2	2%	2	2		
2	Biochemistry of enzymes and clinical enzymology	A1, B1	2	2%	3	1	2	
3	Biochemistry of dietary, functional and structural carbohydrates I, II	A2, B2	2	2%	3	1	2	2
4 & 5	Oxidative phosphorylation and respiratory chain	A1, B1	2	2%	2	1	1	
6	Glycolysis, and pyruvate oxidation I, II	A3, B3	2	2%	3	1	2	
7	Tricarboxylic acid cycle, TCA I, II	A3, B3	2	2%	3	1	2	
8	Storage of glucose: glycogen synthesis and degradation I, II	A3, B3	1	2%	2	1	1	
9	Gluconeogenesis	A4, B4	1	1%	2	1	1	2
10	Biochemistry of dietary, functional and structural lipids I, II	A3, B3	2	1%	2	1	1	
11	Assimilation of dietary fat (lipolysis & β -oxidation of fatty acids) I, II	1	1	2%	2	1	2	
12	Ketogenesis & ketolysis	A3, B3	1	2%	2	1	2	2
14	Synthesis of Fatty Acids and triacylglycerol (Lipogenesis)	A3, B1, B3, B4	2	2%	3	1	2	
15	II Biochemistry of amino acids and proteins structure function I, & II	A3, B1, B3, B4	1	1%	3	1	2	
16	) Removal and fate of amino acid nitrogen, Urea cycle	A3, B3, B4	1	1%	2	1	1	
17	Synthesis degradation & biomolecules derived from amino acids I, II	A3, B3, B4	2	2%	3	1	2	
18	Synthesis degradation & biomolecules derived from amino acids III	A3, B3, B4	2	2%	2	1	1	2

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19	Oxygen Toxicity and Free Radical Injury	A1, B1	1	1%	3	1	1	
20	Integration, Regulation, Perturbations of Energy Metabolism	A3, B3, B4	1	1%			1	
21	DNA structure and organization	A4, B4	1	1%	2		2	
22	Purine and Pyrimidine Metabolism	A5, B5	1	1%	1		1	
23	DNA replication	A5, B5	1	1%	2		2	
24	RNA structure and Function and transcription	A9, B9	1	1%	1		1	1
25	Protein synthesis (translation)	A5, B5	1	1%	2		2	
26	DNA Mutation & Repair I & II	A5, B5	1	1%			2	
	Total		34			18	36	9



BIO					
NO	Title of practical session	ILOs	Hours	Weight 30%	Marks in practical exam
1	Basic Laboratory Principles & Safety Measures	C1-2	2	0	0
2	Plasma protein I	C1-4	2	2.2	2
3	Plasma protein II	C1-4	2	3.3	3
4	Clinical enzymology	C1-4	2	3.3	3
5	Urine report I	C1-4	2	3.3	3
6	Urine report II	C1-4	2	2.2	2
7	Urine report III	C1-4	2	3.3	3
8	Non protein nitrogenous compound I	C1-4	2	3.3	3
9	Non protein nitrogenous compound II	C1-4	2	3.3	3
10	DNA Extraction / Gel Electrophoresis, RFLP	C1-4	2	2.2	2
11	Polymerase-chain reaction (PCR)	C1-4	2	3.3	3
12	Revision		2	0	0

دور تائي

Exam	Final (60%)	Practical (40%)	Total
Medical Biochemistry Departments.	54	36	90
Total	54	36	90



DAY/ TIME	8-9	9-10	10-12	12-2	
Saturday 14December	Overview of Vitamins and minerals I, II د مروة مدرج أ		Practical 1 (precautions and plasma protein) Group I اكاديمي 2	Practical 1 Group II اكاديمي 2	
Sunday 15December	Biochemistry of enzymes and clinical Enzymology د رضا مدرج أ		Practical 1 Group III اكاديمي 2	Practical 1 Group IV اكاديمي 2	
Monday 16December	Biochemistry of dietary, functional and structural carbohydrates I, II د نجوي مدرج أ		Practical 2 (colorimetry and enzymology) Group II اكاديمي 2	Practical 2 Group I اكاديمي 2	
Tuesday 17 December	Glycolysis, and pyruvate oxidation I, II د اميرة احمد مدرج أ		Practical 2 Group IV اكاديمي 2	Practical 2 Group III اكاديمي 2	
Wednesday 18December	Tricarboxylic acid cycle, TCA I, II د الشيماء مدرج أ		Practical 3 (physical examination of urine) Group I اكاديمي 2	Practical 3 (physical examination of urine) Group II اكاديمي 2	
Thursday 19December	Behavior (pps) مدرج أ		Ethics (pps) مدرج أ		



Day/time	8-9	9-10	10-12	12-2
Saturday 21 December	Oxidative phosphorylation and respiratory chain د اميره مدرج أ	Gluconeogenesis د رضا مدرج أ	Practical 3 (physical examination of urine) Group III اكاديمي 2	Practical 3 (physical examination of urine) Group IV اكاديمي 2
Sunday 22 December	Storage of glucose: glycogen synthesis and degradation I & II د رضا مدرج أ		Practical 4 (chemical examination of urine) Group II اكاديمي 2	Practical 4 (chemical examination of urine) Group I اكاديمي 2
Monday 23 December	Ketogenesis & ketolysis دمحمد مدرج أ	Biochemistry of dietary, functional and structural lipids I, II د الشيماء مدرج أ	Practical 4 (chemical examination of urine) Group IV اكاديمي 2	Practical 4 (chemical examination of urine) Group III معامل دور 3 و 4



Tuesday 24 December	Assimilation of dietary fat (lipolysis & B-oxidation of fatty acids) I, II د نجوي I, II مدرج أ		Practical 5 (GOUT & PCR) Group I اكاديمي 2	Practical 5 (GOUT & PCR) Group II معامل دور 4و3
Wednesday 25 December	Synthesis of Fatty Acids and triacylglycerol (Lipogenesis) د مروء مدرج أ		Practical 5 (GOUT & PCR) Group III اكاديمي 2	Practical 5 (GOUT & PCR) Group IV معامل دور 4و3
Thursday 26 december				

Day/time	8-9	9-10	10-12	12-2
Saturday 28 December	Removal and fate of amino acid nitrogen, Urea cycle د عايدہ مدرج أ		Practical 6 (REVISION) GROUP II الفصول التفاعلية	Practical 6 (REVISION) GROUP I الفصول التفاعلية
Sunday 29 December	Synthesis degradation & biomolecules derived from amino acids I, II د عايدہ مدرج أ		Practical 6 (REVISION) GROUP IV الفصول التفاعلية	Practical 6 (REVISION) GROUP III الفصول التفاعلية
Monday 30 December	Biochemistry of amino acids and proteins structure function I & II د محمد عبد المعطي مدرج أ	Synthesis degradation & biomolecules derived from amino acids III د عايدہ مدرج أ		
Tuesday 31 December	Integration, Regulation, Perturbations of Energy Metabolism د مروہ شعبان مدرج أ	Oxygen Toxicity and Free Radical Injury د اميرہ مراد مدرج أ		
Wednesday 1 jan	Purine& pyrimidine metabolism د عليہ خيرى مدرج أ	DNA structure and function د الشيماء حافظ مدرج أ		
Thursday 2jan				

Day/time	8-9	9-10	10-12	12-2		
Saturday 4 jan	DNA replication د مروه شعبان مدرج أ	RNA transcription د اميره جنيدى مدرج أ				
Sunday 5 jan	Protein synthesis د عليه مدرج أ	DNA mutations and repair د عليه خيرى مدرج أ				
Monday 15 jan						
Tuesday 16 jan						
Wensday 17 jan						
Thrusday 18 jan						



