Kingdom of Saudi Arabia
Ministry of Higher Education
Northern Border University (NBU)
College of Medicine
Department of Biochemistry

المملكة العربية السعودية
وزارة التعليم
جامعة الحدود الشمالية
كلية الطب
قسم الكيمياء الحيوية

STUDY GUIDE

Biochemistry-2

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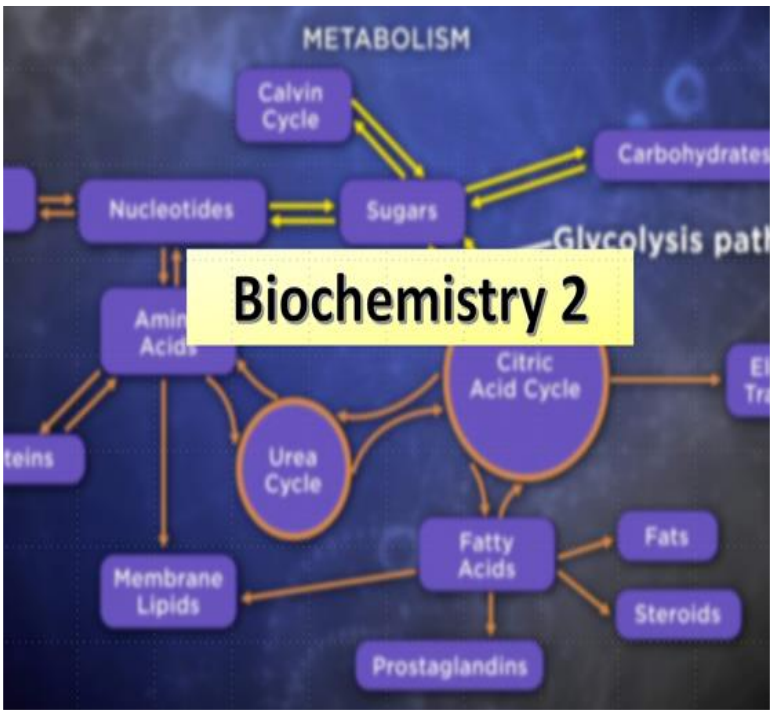
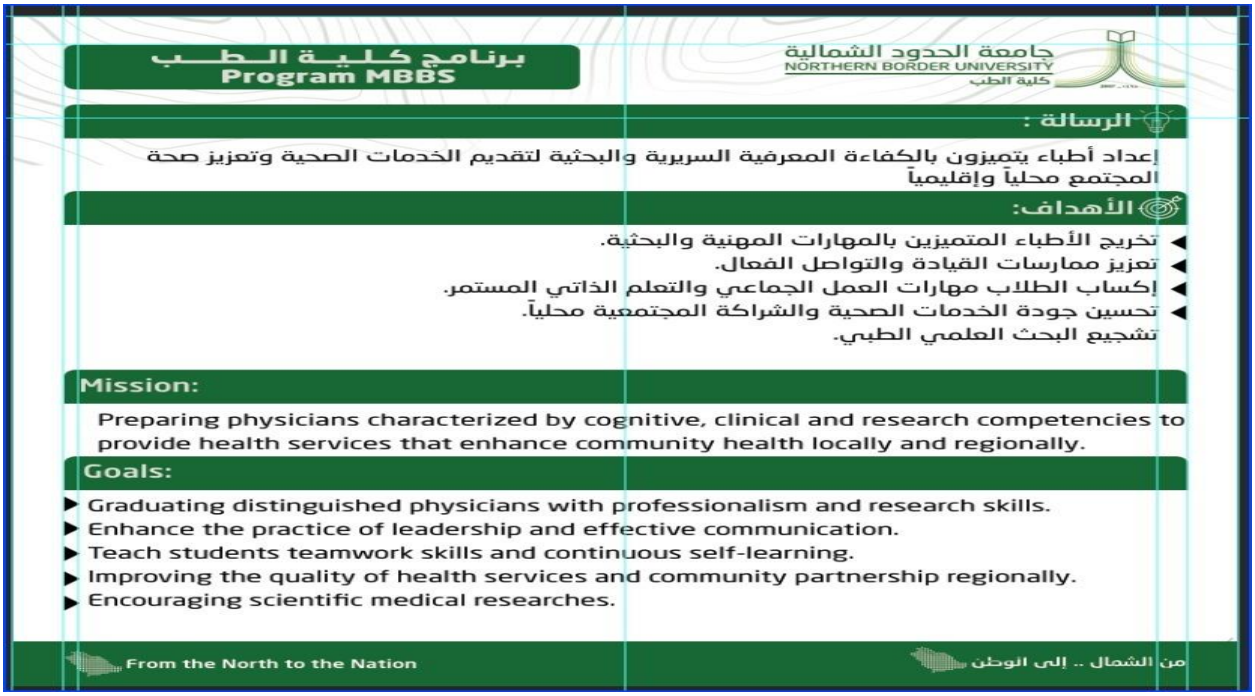


Course coordination

Female section **Prof. Manal S Fawzy** (manal.darwish@nbu.edu.sa)

Male section **Dr. Abdelnaser Badway** (abdelnaser.ali@nbu.edu.sa)



Course Identification

1. Credit hours	3
2. Level/year at which this course is offered	2nd year - 6th semester
3. Pre-requisites for this course	-

Course Contributors

1- Dr. Abdelnaser Badway
3- Prof. Manal Said Fawzy
2- Dr. Naglaa Mokhtar

Actual Learning Hours (Copy and paste the table from courses specification)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	42
2	Laboratory/Studio	6
3	Tutorial	-
4	Others (specify)	-
	Total	48

Course Objectives (Copy and paste the table from courses specification)

1. Course Description

The course focuses on the different metabolic pathways of carbohydrates, proteins, lipids, and nucleotides. The course discusses the regulation of these metabolic pathways, either the anabolic or the catabolic one, and their integration in different conditions. The course illustrates the related energetics (i.e. calculations of energy gain or loss) to these metabolic pathways. Finally, the course relates the derangement of these metabolic pathways of the different macronutrients to several acquired or genetic disorders.

2. Course Main Objectives

a) Recognize the biochemical principles of metabolic pathways (energy generating and biosynthetic pathways).
b) Identify the metabolic pathways of different macronutrients, their regulations, and integrations in different conditions.
c) Summarize the metabolism of carbohydrates, proteins, lipids, and nucleic acids and their associated disorders.
d) Evaluate the energy released from different biochemical reactions inside the body.
e) Apply knowledge and skill in the correlation of cellular metabolism to biological functions in different conditions and diseases.

Course Learning Outcomes (Copy and paste the table from courses specification)

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Describe the digestion/absorption and recognize the different metabolic pathways of carbohydrates, lipids, amino acids, proteins, and nucleotides in	K1

	health and diseases.	
1.2	**Recognize the principles of spectrophotometric and colorimeter assays, protein electrophoresis, and the different laboratory blood investigations.**	**K1**
2	**Skills:**	
2.1	**Analyze blood levels of biochemical molecules and explain and interpret the normal and abnormal features in laboratory results.**	**S2**
2.2	**Evaluate the photographs of protein electrophoresis.**	**S2**
2.3	**Apply the core-writing skills to express his knowledge and ideas**	**S6**
3	**Values:**	
3.1	Employ the skill of self-learning through updated medical information from different approved sources	V1

Course Content (Copy and paste the table from courses specification)

No	List of Topics	Contact Hours
1	Introduction to metabolism, signal transduction, digestion and absorption, and glucose transporters	2
2	Glycolysis	2
3	Citric acid cycle	2
4	Gluconeogenesis	2
5	Glycogen metabolism	2
6	Pentose phosphate pathway, Monosaccharaides, and uronic acid metabolism	2
7	Regulation of blood glucose & Diabetes mellitus	2
8	Practical: Spectrophotometer principle and Estimation of blood glucose	1
9	Practical: GTT and HbA1C Estimation	1
10	Digestion and absorption	2
11	Lipoprotein metabolism	2
12	FA synthesis and lipogenesis	2
13	Lipolysis, Fatty acid oxidation	2
14	Ketogenesis, and phospholipid's metabolism	2
15	Cholesterol synthesis, regulation, and Bile acids	2
16	Plasma lipoproteins and Fatty liver & Eicosanoid metabolism	2

17	Practical: Cholesterol & TG estimation	1
18	Digestion and absorption &-Protein turnover, nitrogen balance	2
19	Transamination, deamination, and Urea cycle	2
20	Glycine, Alanine, Serine and Threonine (biosynthesis and Degradation)	2
21	Aromatic amino acids and Tryptophan	2
22	Cysteine, Methionine, branched chain, basic, and acidic amino acids	2
23	Practical: Plasma total protein and albumin estimation	1
24	Metabolism of purine nucleotides	2
25	Metabolism of pyrimidine nucleotides	2
26	Practical: Serum urea, creatinine, and uric acid estimation	1
27	Practical: Protein Electrophoresis	1
Total		48

Teaching strategies and Assessment Methods for Students (Copy and paste the table from courses specification)

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge		
1.1	Recognize the principles of the spectrophotometric and colorimeter assays, protein electrophoresis, and the different laboratory blood investigations	Direct instructional (Lectures)	Written exams (MCQs & SAQs)
1.2	Label the different laboratory blood tests and their roles in diseases diagnosis	Direct instructional (Lectures)	Written exams (MCQs & SAQs)
2.0	Skills		
2.1	Analyze blood levels of biochemical molecules like glucose, cholesterol, triacylglycerol, total protein, albumin, urea, creatinine, and uric acid.	Laboratory-based strategy (demonstration, direct instruction, cooperative)	OSPE
2.2	-Evaluate the photographs of protein electrophoresis.	Laboratory-based strategy (demonstration, direct instruction, cooperative)	OSPE
3.1	Employ the skill of self-learning through updated medical information from different approved sources	Laboratory-based strategy (demonstration, direct instruction, cooperative)	OSPE
3.0	Values:		
3.1	Employ the skill of self-learning through updated medical information from different approved sources	Homework-assignment	Assignment rubric

Assessment Tasks for Students (Copy and paste the table from courses specification)

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm	6th	25%
2	Assignment	10th	15%
3	Final exam	End of semester	40%
4	OSPE	End of semester	20%

Course blueprint (% of total summative marks in blueprint is to be given in the range)

Topics	Teaching strategies	Assessment methods	Knowledge & Understanding			Skill			Values			% of total contact hours	% of total summative marks
			K1	K2	…	S1	S2	S6	V1	V2	…		
Introduction to metabolism, signal transduction, digestion/absorption, and glucose transporters	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Glycolysis	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Citric acid cycle	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Gluconeogenesis	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Glycogen metabolism	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Pentose phosphate pathway, monosaccharides, and uronic acid metabolism	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Regulation of blood glucose and diabetes mellitus	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Practical: Spectrophotometer principle and Estimation of blood glucose	Laboratory-based strategy)	OSPE	K1				S2					1	3.5

Topics	Teaching strategies	Assessment methods	Knowledge & Understanding			Skill			Values			% of total contact hours	% of total summative marks
			K1	K2	…	S1	S2	S6	V1	V2	…		
Practical: GTT and HbA1c Estimation	Laboratory-based strategy	OSPE					S2					1	3.5
Digestion and absorption of lipids	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Lipoprotein metabolism	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
FA synthesis and lipogenesis	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Lipolysis and Fatty acid oxidation	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Ketogenesis and Phospholipid's metabolism	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Cholesterol synthesis, regulation, and Bile acids	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Plasma lipoproteins, Fatty liver, and Eicosanoid metabolism	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Practical: Cholesterol and TG estimation	Laboratory-based strategy	OSPE					S2					1	3
Digestion and absorption of proteins, protein turnover, and nitrogen balance	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Transamination, deamination, and Urea cycle	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Glycine, Alanine, Serine, and Threonine (biosynthesis and degradation)	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4

Topics	Teaching strategies	Assessment methods	Knowledge & Understanding			Skill			Values			% of total contact hours	% of total summative marks
			K1	K2	…	S1	S2	S6	V1	V2	…		
Aromatic amino acids and tryptophan	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Cysteine, Methionine, branched-chain, basic, and acidic amino acids	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	4
Practical: Plasma total protein and albumin estimation	Laboratory-based strategy	OSPE					S2					1	3.5
Metabolism of purine nucleotides	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	2
Metabolism of pyrimidine nucleotides	Direct instructional (Lectures)	Written exams (MCQs & SAQs)	K1					S6	V1			2	2
Practical: Serum urea, creatinine, and uric acid estimation	Laboratory-based strategy	OSPE					S2					1	3.5
Practical: Protein electrophoresis	Laboratory-based strategy	OSPE					S2					1	3

Learning Resources (Copy and paste the table from courses specification)		
Required Textbooks	**Lippincott's Illustrated Reviews of Biochemistry, 7th edition (2017): Richard A. Harvey, & Denise R. Ferrier. Lippincott's Williams & Wilkins.**	
Essential References Materials	**1. Harpers Illustrated Biochemistry: 31st Edition (2018): Victor W. Rodwell, David Bender. The McGraw Hill Education.** **2. Textbook-of-Biochemistry-For-Medical-Students-6th-Edition (2011). DM-Vasudevan, Sreekumari S, Kannan Vaidyanathan**	
Electronic Materials	**https://www.acb.org.uk/our-resources/biochemistry.html** **https://www.asbmb.org/education/online-teaching/online-lab-work** **https://biochem.oregonstate.edu/content/biochemistry-free-and-easy** **- other websites updated each year**	
Other Learning Materials	**- Department lectures power points.**	

Related check lists

PBL

Assignment

Clinical skills checklist

Presentation checklist √

Project checklist

Workshop checklist

(Checklist must be aligned with the learning outcomes)

Course quality evaluation

After the end of the course, please give your **FEEDBACK** through the following link:

https://docs.google.com/forms/d/1IKf4va0FSQSr-7MCXVpdaTsni9W7WYZ6WPVzVO-Z65A/edit