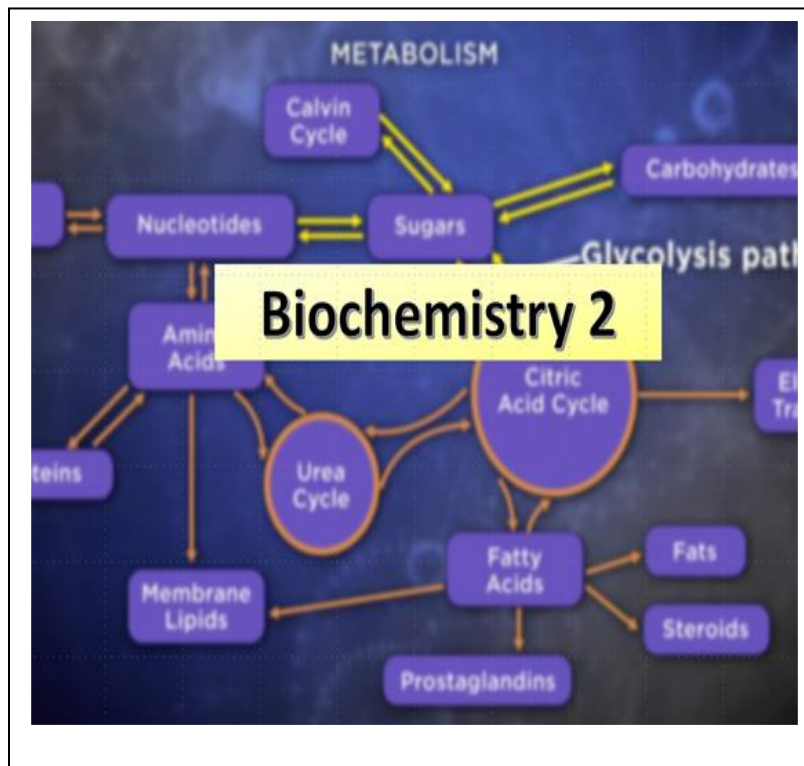


# STUDY GUIDE

## Biochemistry-2

1211212



### Course coordination

Female section

Prof. Manal S Fawzy ([manal.darwish@nbu.edu.sa](mailto:manal.darwish@nbu.edu.sa))

Male section

Dr. Abdelnaser Badway ([abdelnaser.ali@nbu.edu.sa](mailto:abdelnaser.ali@nbu.edu.sa))

برنامج كلية الطب  
Program MBBS

جامعة الحدود الشمالية  
NORTHERN BORDER UNIVERSITY  
كلية الطب

**الرسالة :**  
إعداد أطباء يتميزون بالكفاءة المعرفية السريرية والبحثية لتقديم الخدمات الصحية وتعزيز صحة المجتمع محلياً وإقليمياً

**الأهداف:**

- ▶ تخريج الأطباء المتميزين بالمهارات المهنية والبحثية.
- ▶ تعزيز ممارسات القيادة والتواصل الفعال.
- ▶ إكساب الطلاب مهارات العمل الجماعي والتعلم الذاتي المستمر.
- ▶ تحسين جودة الخدمات الصحية والشراكة المجتمعية محلياً.
- ▶ تشجيع البحث العلمي الطبي.

**Mission:**  
Preparing physicians characterized by cognitive, clinical and research competencies to provide health services that enhance community health locally and regionally.

**Goals:**

- ▶ Graduating distinguished physicians with professionalism and research skills.
- ▶ Enhance the practice of leadership and effective communication.
- ▶ Teach students teamwork skills and continuous self-learning.
- ▶ Improving the quality of health services and community partnership regionally.
- ▶ Encouraging scientific medical researches.

From the North to the Nation

من الشمال .. إلى الوطن

### 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
- 2- Dr. Naglaa Mokhtar
- 3- Prof. Manal Said Fawzy

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

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

### 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

- Recognize the biochemical principles of metabolic pathways (energy generating and biosynthetic pathways).
- Identify the metabolic pathways of different macronutrients, their regulations, and integrations in different conditions.
- Summarize the metabolism of carbohydrates, proteins, lipids, and nucleic acids and their associated disorders.
- Evaluate the energy released from different biochemical reactions inside the body.
- 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	<b>Knowledge:</b>	
1.1	<b>Describe the digestion/absorption and recognize the different metabolic pathways of carbohydrates, lipids, amino acids, proteins, and nucleotides in</b>	<b>K1</b>

CLOs		Aligned PLOs
	<b>health and diseases.</b>	
<b>1.2</b>	<b>Recognize the principles of spectrophotometric and colorimeter assays, protein electrophoresis, and the different laboratory blood investigations.</b>	<b>K1</b>
<b>2</b>	<b>Skills:</b>	
<b>2.1</b>	<b>Analyze blood levels of biochemical molecules and explain and interpret the normal and abnormal features in laboratory results.</b>	<b>S2</b>
<b>2.2</b>	<b>Evaluate the photographs of protein electrophoresis.</b>	<b>S2</b>
<b>2.3</b>	<b>Apply the core-writing skills to express his knowledge and ideas</b>	<b>S6</b>
<b>3</b>	<b>Values:</b>	
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	<b>Introductory lecture</b> - 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, Monosaccharides, 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
<b>Total</b>		<b>48</b>

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

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge</b>		
<b>1.1</b>	Recognize the principles of the spectrophotometric and colorimeter assays, protein electrophoresis, and the different laboratory blood investigations	Direct instructional (Lectures)	Written exams (MCQs & SAQs)
<b>1.2</b>	Label the different laboratory blood tests and their roles in diseases diagnosis	Direct instructional (Lectures)	Written exams (MCQs & SAQs)
<b>2.0</b>	<b>Skills</b>		
<b>2.1</b>	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
<b>2.2</b>	-Evaluate the photographs of protein electrophoresis.	Laboratory-based strategy (demonstration, direct instruction, cooperative)	OSPE
<b>3.1</b>	Employ the skill of self-learning through updated medical information from different approved sources	Laboratory-based strategy (demonstration, direct instruction, cooperative)	OSPE
<b>3.0</b>	<b>Values:</b>		
<b>3.1</b>	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	6 <sup>th</sup>	25%
2	Assignment	10 <sup>th</sup>	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)

<b>Required Textbooks</b>	<b>Lippincott's Illustrated Reviews of Biochemistry, 7<sup>th</sup> edition (2017): Richard A. Harvey, &amp; Denise R. Ferrier. Lippincott's Williams &amp; Wilkins.</b>
<b>Essential References Materials</b>	<ol style="list-style-type: none"> <li><b>Harpers Illustrated Biochemistry: 31<sup>st</sup> Edition (2018): Victor W. Rodwell, David Bender. The McGraw Hill Education.</b></li> <li><b>Textbook-of-Biochemistry-For-Medical-Students-6th-Edition (2011). DM-Vasudevan, Sreekumari S, Kannan Vaidyanathan</b></li> </ol>
<b>Electronic Materials</b>	<p><a href="https://www.acb.org.uk/our-resources/biochemistry.html">https://www.acb.org.uk/our-resources/biochemistry.html</a>  <a href="https://www.asbmb.org/education/online-teaching/online-lab-work">https://www.asbmb.org/education/online-teaching/online-lab-work</a>  <a href="https://biochem.oregonstate.edu/content/biochemistry-free-and-easy">https://biochem.oregonstate.edu/content/biochemistry-free-and-easy</a>                      - other websites updated each year</p>
<b>Other Learning Materials</b>	- 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>