

Course Specifications

University	Beni-Suef
Faculty	Pharmacy
Dept.	Biochemistry

1-Course Info.	Course Name: Biochemistry 2
Code No.	Academic year/ Level: 3 year, level 5
Credit hours: Lecture	(2) hour + Practical (2) hour

2-Overall Aim of the Course

A continuation of Biochemistry 1, Biochemistry II covers energy metabolism, metabolic pathways of small molecules. Hopefully, you will develop and appreciate a broad and thorough understanding at the molecular level of the metabolic and regulatory events that control the functioning of normal cells, tissues and organs and understand how these processes are altered by disease.

ATP is the energy currency of all cells and understanding how it is formed is a crucial topic in biochemistry. we will study several crucial metabolic pathways that are vital for life by examining catabolic pathways by which cells degrade and oxidize the macromolecules carbohydrates, fatty acids and proteins to release energy by the core catabolic pathways (e.g. glycolysis, fatty acid oxidation, citric acid cycle, etc.) in addition to the anabolic pathways that are involved in energy storage (e.g. glycogenesis and lipogenesis, etc) and individual amino acid metabolism, urea cycle, steroids, liver biotransformations. The enzymatic regulatory mechanisms of the different metabolic pathways are also considered.

3-Intended Learning Outcomes of the course (ILOs)

a. Knowledge and understanding

Upon successful completion of this course, the student will be able to:

1. Understand the concept of catabolism and anabolism
2. Know the mechanism of cell signal transduction especially in the metabolism of macromolecules. This includes the adenyl cyclase, the second messenger; cyclic AMP and protein kinase
3. Understand the role of glycolysis in carbohydrate metabolism and the meaning of substrate-level phosphorylation, NAD^+ regeneration, 2,3-BPG cycle and the aerobic and anaerobic conditions .
4. Know the hormonal control on the enzymatic regulation of glycolysis
5. Understand the role of citric acid cycle in energy yield and its regulatory key enzymes.
6. Know the gluconeogenesis and its metabolic regulation.
7. Discuss the process of glycogenesis and glycogenolysis and their metabolic control by insulin and glucagon hormones.
8. Explain the alternative pathways for glucose oxidation including its metabolic regulation through HMP (PPP) and uronic acid pathway.
9. Note the metabolism of galactose and fructose and their metabolic disorders
10. Understand the blood glucose level and its regulatory factors as well as the consequences of its disturbances (glucosuria, diabetes mellitus & hyperglycemia)
11. Describe the structure, sources, absorption, biosynthesis and hormonal regulation of the key enzyme of cholesterol as well as its catabolism and excretion
12. Discuss the lipoproteins (chylomicrons, HDL, LDL, VLDL) structure, function and metabolism and note the LDL receptors
13. Interpret the relation between disorders of lipoproteins and the CAD and atherosclerosis
14. Explain the energy production and its metabolic regulation throughout β -oxidation of fatty acids in addition to the minor α and ω oxidation

	<ol style="list-style-type: none"> 15. Discuss biosynthesis, elongation and desaturation of fatty acids and its metabolic regulation 16. Know the essential fatty acids function and role in PG, TXA₂, and LT 17. Explain the synthesis of TAG and metabolism of adipose tissue and its relation to DM and obesity 18. Interpret the role of the liver in fat metabolism (fatty liver, lipotropic factors) 19. Describe the metabolism of ketone bodies (ketogenesis, ketolysis and regulation), 20. Note the metabolites that serve as sources of acetyl CoA and its fates. 21. Know the function, biosynthesis and catabolism of phospholipids 22. Explain the general aspects of protein metabolism (+ve and -ve nitrogen balance and its hormonal regulation) 23. Be able to identify the different pathways of NH₂ group removal (transamination, oxidative and non-oxidative deamination) the Metabolism of amino acids 24. Be able to distinguish between the role of NH₃ in acid-base regulation by kidney and its toxic effect in the brain 25. Explain urea cycle and its regulation as well as to compare between the carbamoyl phosphate synthetase I and II 26. Describe NH₃ intoxication throughout causes, types, mechanisms, symptoms and treatment 27. Interpret the interrelation of urea cycle and TCA cycle 28. Illustrate the biosynthesis of creatinine, and its excretion and also know the meaning of creatinine coefficient and creatinuria (physiological & pathological) 29. Discuss the metabolism of individual amino acids which includes a) synthesis of non essential amino acids b) the glucogenic or ketogenic pathway c) function and important derivatives d) metabolic inborn or disorders.
<p>b. Intellectual Skills</p>	<p>Upon successful completion of this course students will be able to understand the molecular principles that underlie biochemical</p>

	reactions and can interpret their disorders in relation to its metabolic cause.
c. Professional and Practical Skills	Upon successful completion of this course students will be able to: c.1. Handle the instruments used in the laboratory. c.2. Determine blood glucose level via enzymatic and non-enzymatic methods c.3. Estimate blood total cholesterol via enzymatic colorimetric methods c.4. Determine of serum TAG and HDL c.5. Evaluate of liver enzyme GPT and GOT c.6. Estimate serum urea and creatinine
d. General and Transferable Skills	Upon successful completion of this course students will be able to: d.1. Understand the biochemical scientific terms. d.2. Effectively engage in oral and written communication in a confident and professional manner. d.3. Work as a part of a team. d.4. Perfectly use available IT facilities.
4-Course Contents	<ul style="list-style-type: none"> • Introduction in Carbohydrate chemistry and metabolism • Aerobic and anaerobic Glycolysis and their regulation • PDH and citric acid cycle and regulation • Glycogen metabolism and gluconeogenesis and their regulation • Alternative pathways of glucose oxidation (HMP & uronic acid pathway) and metabolism of galactose and fructose • blood glucose level regulation and the action of the different hormones on its regulation (insulin, epinephrine and glucagon) • Cholesterol metabolism and its regulation • Lipid transport in the blood • β-oxidation of fatty acids and α & ω oxidation • De novo synthesis, elongation and de-saturation of fatty acids • Synthesis & metabolism of TAG and fatty

	<p>liver</p> <ul style="list-style-type: none"> • Metabolism of ketone bodies and phospholipids • General aspects of protein metabolism, removal of amino group and Urea cycle • Metabolism of individual amino acids (synthesis and degradation) • Synthesis of specialized amino acids products
5- Teaching and learning Strategies	<ol style="list-style-type: none"> 1. Lectures 2. Practical laboratory work 3. Tutorial classes 4. Research in library and web
6- Teaching and learning Methods for Special Needs Students.	
7- Student Assessment Methods	
a-Methods	<ol style="list-style-type: none"> 4. Semester work 5. Practical exam 6. Written final term exam 7. Final oral exam
b- Assessment Schedule	<ul style="list-style-type: none"> • Assessment 1: Semester work.....Week 1-14 • Assessment 2: Practical exam.....Week 12-13 • Assessment 3: Final written exam..... Week 14 - 16* • Assessment 4: Final oral exam.....Week 14 - 16* <p>* According to exam schedule.</p>

c- Weighting of Assessment Marks		Type of Assessment	Marks	Weight (%)
		Semester work	10	10%
		Practical exam	25	25%
		Final term Written exam	50	50%
		Final Oral exam	15	15%
		Total	100	100%
8-List of References				
a.Notes		Course Notes, prepared by staff members of the teaching department		
b.Mandatory Books				
c.Suggested Books		<ul style="list-style-type: none">• Harper's Biochemistry, 2003. By Robert K. Murray, Daryl K. Granner, Peter A. Mayes and victor W. Radwell. Publisher: Appelton & Lange.• Lippincott's illustrated review in Biochemistry		
d.Journals		<ol style="list-style-type: none">1. Metabolism clinical and expermental2. Journal of Clinical Endocrinology and Metabolism		

Course Coordinators: Dr. Ibrahim Taha Ibrahim

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