

Course Guide: Cell-Molecule Biochemistry (120)

Course Instructor: Dr. Rahmati **Contact Information: rahmatibio@gmail.com**

Prerequisite or Corequisite: None

Credits: 2.32 Type of Credits: Theoretical (1.88) - Practical (0.44)

Semester Offered: First and Second Semester

Level: Professional Doctorate

Number of Sessions: 23 Sessions (47 Hours)

Start and End Dates of Sessions: According to the Academic Calendar

Weekly Session Schedule: Sunday-Thursday (8 AM - 12 PM)

Venue for In-Person Sessions: Theory (Classroom 2-1, Medical Faculty) - Practical (Medical Faculty - Department of Biochemistry and Clinical Laboratories - Biochemistry Laboratory)

First Name	Last name	Department	Rank	E-mail	Quick contact information
Fatemeh	Khaki Khatibi	Biochemistry and Clinical Laboratories	Associate Professor	fatemehkhakikhatibi@yahoo.com	0413364666
Nadereh	Rashtchi Zadeh	Biochemistry and Clinical Laboratories	Professor	rashtchin@tbzmed.ac.ir	0413364666
Nosratollah	Zarghami	Biochemistry and Clinical Laboratories	Professor	zarghami@tbzmed.ac.ir	0413364666
Akbar	Hasani	Biochemistry and Clinical	Associate Professor	dr.hasania@hotmail.com	0413364666

		Laboratories			
Ali	Motta	Biochemistry and Clinical Laboratories	Associate Professor	mota.biomed@gmail.com	0413364666
Nazila	Fathi Maroufi	Biochemistry and Clinical Laboratories	Assistant Professor	n.fathi6788@gmail.com	0413364666

Overall Course Objectives:

1. Familiarity with the clinical importance, structure, classification, properties, and function of biological molecules.
2. Familiarity with water and buffers, amino acids, carbohydrates, lipids, proteins, enzymes, vitamins, and nucleotides.
3. Familiarity with the process of gene replication using nucleic acids

Specific Course Objectives:

It is expected that learners, after completing this course, will be able to explain the following objectives:

1. **Water and Buffers:** Structure of water - Hydrogen bonds - Henderson-Hasselbalch equation - Acid and base - Definition of buffer - Important body buffers - Definition of acidosis and alkalosis and their clinical importance.
2. **Amino Acids and Proteins:** Structure of amino acids - Physicochemical properties - Classification of amino acids - Essential and non-essential amino acids - Titration of amino acids - Primary, secondary, tertiary, and quaternary structure of proteins - Protein folding and denaturation - Structure and function of myoglobin - Structure and function of hemoglobin - Structure and function of collagen and their clinical importance.
3. **Carbohydrates:** Definition - Structure of carbohydrates - Physicochemical properties - Monosaccharide derivatives - Disaccharides - Homopolysaccharides - Heteropolysaccharides - Glycoproteins and their clinical importance.
4. **Lipids and Lipoproteins:** Structure, types, and physicochemical properties of fatty acids - Types of lipids (Triacylglycerol, esterified and free cholesterol, phospholipids, sphingolipids) - Liposome, micelle, and emulsion - Specific proteins (Apolipoproteins) - Types of lipoproteins and their clinical importance.
5. **Enzymes:** Definition - Classification - Structure - Nomenclature - Active site - Mechanism of enzyme action - Determination of enzyme activity - Factors affecting enzyme function - Michaelis-Menten equation - Types of enzyme inhibitors - Isoenzymes - Types of regulated and unregulated enzymatic reactions - Regulation of enzyme action and their clinical importance.
6. **Vitamins:** Definition - Classification - Structure of vitamins - Coenzymatic role - Water-soluble vitamins - Fat-soluble vitamins - Disorders resulting from vitamin deficiencies and their clinical importance.

7. **Nucleic Acids:** Components of nucleic acids (DNA, RNA) - Nucleosides - Nucleotides - Structure of DNA and its types - Structure of RNA and its types.
8. **Replication:** Process of replication in prokaryotes, eukaryotes, repair, and its clinical importance

Practical: It is expected that students will become familiar with or perform the following:

1. Familiarity with laboratory equipment - Laboratory safety - Laboratory waste disposal methods - How to use a pipette.
2. Qualitative tests for sugars (Benedict's test - Seliwanoff's test - Barfoed's test - Bial's test - Polysaccharides).
3. Qualitative tests for amino acids and proteins (Xanthoproteic test - Millon's test - Hopkins-Cole test - Biuret test).
4. Familiarity with chromatography (serum sugars and proteins) - Electrophoresis (serum sugars and proteins).
5. Familiarity with enzyme kinetics (temperature - pH - inhibitor concentration).
6. Familiarity with spectrophotometer (Beer-Lambert law) - Flame photometer (measurement of sodium, potassium).

Teaching Methodology:

According to the schedule announced at the beginning of the course.

1. Educational classes based on lectures by the professor using teaching tools such as educational slides, along with asking questions aligned with the specific objectives of each session, and summarizing and answering student questions.
2. Assigning coursework aligned with educational objective

Student Assessment Method:

1. MCQ and written exam worth 20 points.

Minimum Passing Grade for this Course: 10 points.

Permissible Absence Hours for this Course:

Permissible Justified Absence Hours (with instructor approval) for this Course: (According to approved educational regulations, the maximum hours of **justified absence** for a theoretical course is 4/17.

Educational Resources:

- Harper's Biochemistry (Latest Edition)
- Dolin's Biochemistry (Latest Edition)
- Use of Lippincott's and Lehninger's biochemistry reference books is suggested.

Learning Opportunities:

Introduction of related videos, animations, and podcasts available on educational websites.

Contact Information:

Course Instructors: Dr. Mohammad Rahmati - Dr. Akbar Hasani - Dr. Nazila Fathi Maroufi
- Dr. Nosratollah Zarghami - Dr. Fatemeh Khaki Khatibi - Dr. Ali Mota

Educational Deputy of the Department: Dr. Nazila Fathi Maroufi

Educational Expert: Mr. Maghsoud Shaker (Medical Faculty, 3rd Floor, Department of Biochemistry and Clinical Laboratories) Phone Number: 33646666

In the Name of God

Course Guide Biochemistry Discipline (121)

Instructor in Charge: Dr. Ghorbani Haghjoo - Dr. Motta

Student Contact/Access:

mota.biomed@gmail.com

ghorbani@tbzmed.ac.ir

Prerequisite or Corequisite: Molecular-Cell Biochemistry

Number of Credits: 1.73 **Type of Credit:** Theoretical (1.29) - Practical (0.44)

Semesters Offered: First and Second Semesters

Level: Professional Doctorate

Number of Sessions: 19 sessions (37 hours)

Start and End Dates of Sessions: According to the academic calendar

Weekly Session Schedule: Wednesdays, 8:00 AM - 12:00 PM

Location of In-Person Sessions: Classroom 13-9, Faculty of Medicine

First Name	Last name	Department	Rank	E.mail	Quick contact information
Amir	Ghorbani Haghjoo	Biochemistry and Clinical Laboratories	Professor	ghorbani@tbzmed.ac.ir	0413364666
Fatemeh	Khaki Khatibi	Biochemistry and Clinical Laboratories	Associate Professor	fatemehkhakikhatibi@yahoo.com	0413364666
Nadereh	Rashtchi Zadeh	Biochemistry and Clinical Laboratories	Professor	rashtchin@tbzmed.ac.ir	0413364666

Nosratollah	Zarghami	Biochemistry and Clinical Laboratories	Professor	zarghami@tbzmed.ac.ir	0413364666
Akbar	Hasani	Biochemistry and Clinical Laboratories	Associate Professor	dr.hasania@hotmail.com	0413364666
Ali	Motta	Biochemistry and Clinical Laboratories	Associate Professor	mota.biomed@gmail.com	0413364666
Nazila	Fathi Maroufi	Biochemistry and Clinical Laboratories	Assistant Professor	n.fathi6788@gmail.com	0413364666

Overall Course Objectives:

1. Familiarity with the importance of oxidative phosphorylation, metabolic pathways of carbohydrates, lipids, amino acids, non-protein nitrogenous compounds, and clinical blood enzymes.
2. Familiarity with quantitative and qualitative changes of molecules and metabolites in the clinical manifestations of various diseases related to each metabolic pathway.
3. Familiarity with the clinical importance of measuring blood enzymes and some other body fluids, including blood.
4. Familiarity with the importance of the integration of the metabolism of the three major nutrients under physiological conditions.

Specific Course Objectives:

It is expected that learners, after completing this course, will be able to explain the following objectives:

1. **Oxidative Phosphorylation:** Thermodynamics laws, free energy changes, reduction potential, electron transport chain, chemiosmotic theory, inhibitors of the electron transport chain.
2. **Carbohydrate Metabolism:** Digestion and absorption, glycolysis pathway, pyruvate oxidation, Krebs cycle, gluconeogenesis, glycogenesis, glycogenolysis, fructose metabolism, galactose metabolism.
3. **Amino Acid Metabolism:** Digestion and absorption, general reactions of amino acid catabolism, urea cycle, specific reactions of amino acid catabolism (aromatic, branched-chain, and sulfur-containing amino acids), biosynthesis of non-essential amino acids, biosynthesis of compounds derived from amino acids.

4. **Clinical Enzymology:** Causes of increase and decrease in serum activity of intracellular enzymes, necessary criteria for the clinical application of enzymes, clinical importance of enzymes (Alkaline Phosphatase, Acid Phosphatase, 5' Nucleotidase, Gamma-Glutamyl Transferase, Aminotransferases, Lactate Dehydrogenase, Creatine Phosphokinase, Cholinesterase, Aldolase, Amylase, Lipase).
5. **Lipid and Lipoprotein Metabolism:** Digestion and absorption of fats, chylomicron metabolism, VLDL metabolism, LDL metabolism, HDL metabolism, diseases of lipoprotein metabolic pathways, fatty acid biosynthesis pathway, beta-oxidation of fatty acids, cholesterol biosynthesis, ketone body biosynthesis.
6. **Nucleotide Metabolism:** *De novo* biosynthesis pathway of purines, *Salvage* biosynthesis pathway of purines, regulation of purine biosynthesis pathway, purine catabolism, diseases of purine metabolic pathway, *De novo* biosynthesis pathway of pyrimidines, *Salvage* biosynthesis pathway of pyrimidines, regulation of pyrimidine biosynthesis pathway, pyrimidine catabolism, diseases of pyrimidine metabolic pathway.
7. **Metabolism of Non-Protein Nitrogenous Compounds:** Heme biosynthesis, diseases related to heme biosynthesis, porphyria, heme catabolism, diseases of heme catabolism.
8. **Integration of Metabolic Pathways:** Importance of key and regulatory sites in metabolic pathways, importance of different tissues in metabolic pathways, metabolic pathways in the liver, metabolic pathways in adipose tissue, metabolic pathways in muscle tissue, metabolic pathways after meals, metabolic pathways in the fasting state, metabolic pathways after prolonged starvation.

Practical: It is expected that students will become familiar with or perform the following:

1. Measurement of serum calcium and/or phosphorus.
2. Measurement of serum glucose (Glycemia - Diabetes).
3. Measurement of serum urea (Uremia - Diacetyl monoxime) and/or serum creatinine test.
4. Hormone measurement by ELISA method.
5. Measurement of serum triglycerides and/or cholesterol.
6. Complete Urinalysis (Physical-Chemical and Urine Dipstick) - Complete Urinalysis (Microscopic Examination).
7. Measurement of serum uric acid.

Teaching Methodology:

According to the schedule announced at the beginning of the course.

3. Educational classes based on lectures by the professor using teaching tools such as educational slides, along with asking questions aligned with the specific objectives of each session, and summarizing and answering student questions.
4. Assigning coursework aligned with educational objective

Student Assessment Method:

2. MCQ and written exam worth 20 points.

Minimum Passing Grade for this Course: 10 points.

Permissible Absence Hours for this Course:

Permissible Justified Absence Hours (with instructor approval) for this Course: (According to approved educational regulations, the maximum hours of **justified absence** for a theoretical course is 4/17.

Educational Resources:

- Harper's Biochemistry (Latest Edition)
- Dolin's Biochemistry (Latest Edition)
- Use of Lippincott's and Lehninger's biochemistry reference books is suggested.

Learning Opportunities:

Introduction of related videos, animations, and podcasts available on educational websites.

Contact Information:

- **Course Instructors:** Dr. Amir Ghorbani Haghjoo, Dr. Fatemeh Khaki Khatibi, Dr. Nazila Fathi Maroufi, Dr. Nadereh Rashtchi Zadeh, Dr. Nosratollah Zarghami, Dr. Akbar Hasani, Dr. Ali Motta.
- **Educational Deputy of the Department:** Dr. Nazila Fathi Maroufi
- **Educational Expert:** Mr. Maghsoud Shaker (Faculty of Medicine, 3rd Floor, Department of Biochemistry and Clinical Laboratories)
- **Phone Number:** 33646666

In the Name of God

**Course Guide Course Guide for Hormone
Biochemistry (122)**

Instructor in Charge: Dr. Rahmati

Student Contact/Access: rahmatibio@gmail.com

Prerequisite or Corequisite: Molecular-Cell Biochemistry - Biochemistry Discipline

Number of Credits: 0.7 **Type of Credit:** Theoretical

Semesters Offered: First and Second Semesters

Level: Professional Doctorate

Number of Sessions: 6 sessions (12 hours)

Start and End Dates of Sessions: 8/7/1404 - 13/8/1404

Weekly Session Schedule: Tuesdays, 8:00 AM - 12:00 PM

Location of In-Person Sessions: Classroom 8-9, Faculty of Medicine

First Name	Last name	Department	Rank	E.mail	Quick contact information
Nazila	Fathi Maroufi	Biochemistry and Clinical Laboratories	Assistant Professor	n.fathi6788@gmail.com	0413364666
Fatemeh	Khaki Khatibi	Biochemistry and Clinical Laboratories	Associate Professor	fatemehkhakikhatibi@yahoo.com	0413364666
Mohammad	Rahmati	Biochemistry and Clinical Laboratories	Professor	rahmatibio@gmail.com	0413364666

Overall Course Objectives:

1. Familiarity with the importance of hypothalamus hormones, posterior and anterior pituitary hormones.
2. Familiarity with pancreatic hormones and thyroid hormones.
3. Familiarity with hormones of the adrenal cortex and medulla.
4. Familiarity with calcium-regulating hormones.
5. Familiarity with sex hormones.
6. Understanding the importance of the integrated endocrine system as a coordinating tool for maintaining homeostasis and its role in controlling the body's exchanges and needs.

Specific Course Objectives:

It is expected that learners, after completing this course, will be able to explain the following objectives:

1. **Introduction to Hormones (Overview):** Types of hormone classifications, chemical structure of hormones.
2. **Hypothalamus and Posterior/Anterior Pituitary Hormones:** Chemical structure of hormones secreted by the anterior pituitary, role of anterior pituitary hormones on protein, lipid, and carbohydrate metabolism, chemical structure of hormones secreted by the posterior pituitary, role of posterior pituitary hormones, diseases related to anterior pituitary hormones, synthesis of growth hormone.
3. **Pancreatic Hormones:** Endocrine hormones of the pancreatic islets of Langerhans with emphasis on insulin and glucagon, chemical structure of insulin, role of insulin on protein, lipid, and carbohydrate metabolism, function of somatostatin.
4. **Thyroid Hormones:** Stages of production and secretion of thyroid hormones, structure of thyroid hormones, mechanism of thyroid hormone synthesis, importance of conversion of thyroxine to triiodothyronine, actions of thyroid hormone with emphasis on cellular metabolic activity, and on carbohydrate, lipid, and protein metabolism, factors regulating thyroid hormone secretion, feedback effects of thyroid hormone on the pituitary and hypothalamus, antithyroid substances and their mechanism of action, hyperthyroidism and hypothyroidism.
5. **Adrenal Cortex and Medulla Hormones:** Types of mineralocorticoids and glucocorticoids of the adrenal cortex with emphasis on aldosterone and cortisol, chemical structure of adrenal cortex hormones, disorders related to adrenal cortex hormones with emphasis on adrenal cortex hypofunction (Addison's) and hyperfunction (Cushing's).
6. **Adrenal Medulla Hormones:** Chemical structure of adrenal medulla hormones, mechanism of action of adrenal medulla hormones, factors regulating secretion of adrenal medulla hormones, function of adrenal medulla hormones, effect of cortisol on protein, lipid, and carbohydrate metabolism, regulation of adrenal medulla hormone secretion.
7. **Calcium-Regulating Hormones:** Importance of calcium in the body and its levels, overview of calcium homeostasis, chemical structure of calcium-regulating hormones (Parathyroid

hormone, Calcitonin, and 1,25-Dihydroxycholecalciferol), disorders related to calcium-regulating hormones (Parathyroid hormone, Calcitonin, and 1,25-Dihydroxycholecalciferol).

8. **Sex Hormones:** Androgens as hormones secreted by the testes, chemical structure of androgens, biosynthesis and secretion of androgens, regulation of androgen synthesis and secretion, Estrogens as hormones secreted by the ovaries, chemical structure of estrogens, biosynthesis and secretion of estrogens, function of estrogens, Progestins as hormones secreted by the ovaries, chemical structure of progestins, biosynthesis and secretion of progestins, diseases related to sex hormones.

Teaching Methodology:

According to the schedule announced at the beginning of the course.

5. Educational classes based on lectures by the professor using teaching tools such as educational slides, along with asking questions aligned with the specific objectives of each session, and summarizing and answering student questions.
6. Assigning coursework aligned with educational objective

Student Assessment Method:

MCQ and written exam worth 20 points.

Minimum Passing Grade for this Course: 10 points.

Permissible Absence Hours for this Course:

Permissible Justified Absence Hours (with instructor approval) for this Course: (According to approved educational regulations, the maximum hours of **justified absence** for a theoretical course is 4/17.

Educational Resources:

- Harper's Biochemistry (Latest Edition)
- Dolin's Biochemistry (Latest Edition)
- Use of Lippincott's and Lehninger's biochemistry reference books is suggested.

Learning Opportunities:

Introduction of related videos, animations, and podcasts available on educational websites.

Contact Information:

- **Course Instructors:** Dr. Mohammad Rahmati, Dr. Fatemeh Khaki Khatibi, Dr. Nazila Fathi Maroufi
- **Educational Deputy of the Department:** Dr. Nazila Fathi Maroufi
- **Educational Expert:** Mr. Maghsoud Shaker (Faculty of Medicine, 3rd Floor, Department of Biochemistry and Clinical Laboratories)
- **Phone Number:** 33646666

Course Guide for Kidney Biochemistry (123)

Instructor in Charge: Dr. Fathi

Student Contact/Access: n.fathi6788@gmail.com

Prerequisite: Molecular-Cell Biochemistry - Biochemistry Discipline

Number of Credits: 2/0 **Type of Credit:** Theoretical

Semesters Offered: First and Second Semesters

Level: Professional Doctorate

Number of Sessions: 2 sessions (4 hours)

Start and End Dates of Sessions: 18/8/1404 - 25/8/1404

Weekly Session Schedule: Sundays, 8:00 AM - 12:00 PM

Location of In-Person Sessions: Classroom 13-6, Faculty of Medicine

First Name	Last name	Department	Rank	E.mail	Quick contact information
Nazila	Fathi Maroufi	Biochemistry and Clinical Laboratories	Assistant Professor	n.fathi6788@gmail.com	0413364666

Overall Course Objectives:

1. Familiarity with the clinical importance of maintaining water balance, blood pH balance, and major and trace elements.

2. Familiarity with disorders arising from water and sodium imbalance and calculating the degree of water or sodium deficit in patients.
3. Familiarity with various types of acid-base disorders and how to diagnose these disorders using laboratory reports and ABG data.
4. Familiarity with calculating osmolality and anion gap and using them in determining acid-base disorders.
5. Familiarity with the importance and function of approximately 25 elements, along with disorders and diseases caused by their deficiency or toxicity.

Specific Course Objectives:

It is expected that learners, after completing this course, will be able to explain the following objectives:

1. **Water Metabolism:** Introduction and classification of major and trace elements, definition of electrolytes, the role of elements in determining plasma water and total body water, calculation of blood osmolality, how water balance in the body and plasma is regulated and maintained, water balance disorders, sodium balance disorders.
2. **Blood pH Regulation:** Types of buffers, sites of activity of various buffers, the role of different buffers in regulating blood pH, types of acid-base disorders, discussion of compensation.
3. **ABGs:** Arterial Blood Gases (ABG), diagnosing acid-base disorders in patients using ABG results through various examples, identifying the primary disorder and determining the presence or absence of compensation and whether compensation is adequate, calculating anion gap and delta gap, using anion gap and delta gap in diagnosing the cause and type of acid-base disorder, calculating the delta ratio, Davenport diagrams and their benefits in interpreting ABG results.
4. **Other Elements and Minerals:** Review of the periodic table and major/trace elements, noting that deficiency or excess of any element can lead to disease, interactions between elements in the body environment, potassium and factors involved in maintaining its balance, covering approximately 22 other elements briefly, stating diseases caused by deficiency and toxicity

Teaching Methodology:

According to the schedule announced at the beginning of the course.

7. Educational classes based on lectures by the professor using teaching tools such as educational slides, along with asking questions aligned with the specific objectives of each session, and summarizing and answering student questions.
8. Assigning coursework aligned with educational objective.

Student Assessment Method:

MCQ and written exam worth 20 points.

Minimum Passing Grade for this Course: 10 points.

Permissible Absence Hours for this Course:

Permissible Justified Absence Hours (with instructor approval) for this Course: (According to approved educational regulations, the maximum hours of **justified absence** for a theoretical course is 4/17.

Educational Resources:

- Harper's Biochemistry (Latest Edition)
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Learning Opportunities:

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Contact Information:

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- **Educational Deputy of the Department:** Dr. Nazila Fathi Maroufi
- **Educational Expert:** Mr. Maghsoud Shaker (Faculty of Medicine, 3rd Floor, Department of Biochemistry and Clinical Laboratories)
- **Phone Number:** 33646666