

## Department of Biochemistry

### Description of Biochemistry Department Courses

	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 200	General Laboratory Safety	1	0	1	-

▪ **Course Objectives:**

▪ **Course Description:**

Danger and safety in laboratories- sources of dangers- physical hazards- fire- pressure- chemical hazard- corrosive and irritant substances- Toxic compounds- flammable compounds- explosives compounds- radiation- Ionizing radiation- alpha particle- beta particle- gamma radiation- neutrons- non, ionizing radiation- visible radiation- ultra violet R- other- biological hazard- micro organisms- animals- body fluids- genetic eng.- recombinant DNA- spillage and waste disposal- chemical- radiation topes- infected materials- waste disposal- chemical waste- radioactive waste- infected materials- general safety measure- laboratory safety equipment- safety signs- personal protection- gloves- clothing- face masks-first aid- immediate assistance- burns- eye injuries- bleeding-minor cuts-gassing- poisoning- reagent handling- miscellaneous- lab. Report-experimental procedures- result data and calculations- controls and planks- general rules for nomenclature- tables graphs- preparation and storage of solution and reagents-analytical balances- storage- making dilutions- standard solutions- ref.

**Main text books:**

1. CRC Handbook of Laboratory Safety. Fifth Edition.

Editor. A. Keith Furr

2. الأسس الأولية لإجراء التجارب الحيوية المعملية. الطبعة الأولى. أ.د. طه بن عبدالله

قمصاني

1	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 201	General Biochemistry	3	3	4	-

## Objectives of the course

Study the structure, properties and functions of biomolecules.

## Course Description:

Introduction to acids, bases and buffers-Amino acids and proteins: classification and characteristics - Carbohydrates: classification, derivatives and reactions - Lipids: classification and properties-Introduction to biological membranes and lipoproteins-Nucleic acids: chemical structures of nitrogenous bases, nucleosides and nucleotides-Chemical and 3-D structures of DNA-Introduction to enzymes, hormones and vitamins.

## Main text books:

- Principle of Biochemistry by D. Voet and J. Voet (2005), 3<sup>rd</sup> edition, J. Wiley (USA).
- Principles of Biochemistry by A. El-Aasar, Academic Bookshop (1996). Cairo, Egypt.

## Subsidiary books:

- Biochemistry by L. Stryer (2006), 6<sup>th</sup> edition. Freeman (USA).
- Principles of Biochemistry by G. Zubay and others (1995) WCB. (USA).

2	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 211	General Metabolism (1)	3	3	4	Bioc 201

## Objectives of the course:

Study of carbohydrates and lipids metabolism.

## Course Description:

Carbohydrates and lipids digestion-Different pathways for synthesis and degradation of carbohydrates (metabolism of glucose, fructose, galactose, disaccharides, starch, glycogen) - Synthesis and degradation of neutral

lipids and fatty acids - Biosynthesis of cholesterol - Biosynthesis and functions of leukotrienes and prostaglandins - Phospholipids and their functions - Lipoproteins: classes, functions and clinical disorders - Bile acids and pigments - Porphyrins - Diseases associated with carbohydrates and lipids metabolism disorders.

**Main text books:**

- Biochemistry by D. Voet and J. Voet (2005), 3<sup>rd</sup> edition, J. Wiley (USA).
- Biochemistry by L. Stryer (2006), 6<sup>th</sup> edition, Freeman (USA).

**Subsidiary books:**

- Metabolism at a glance by J. Salway (1995), Blackwell Science (UK).

3	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 231	Enzymes	2	3	3	Bioc 201

**Objectives of the course:**

Study of enzymes and their role in the biochemical reactions.

**Course Description:**

Definition and assays of enzymes - Properties of enzymes - Enzyme classification and nomenclature - Isolation and purification of enzymes from different sources - Characteristics and structures of enzymes - Mechanism of enzyme action - Coenzymes - Isozymes - Enzyme kinetics - Inhibitors and activators of enzymes.

**Main text books:**

- Understanding enzymes by T. Palmer (1991). 3<sup>rd</sup> edition, Ellis Harwood (UK).

**Subsidiary books:**

- Fundamentals of enzymology by Price and Stevens (1999), 3<sup>rd</sup> edition, Oxford U.P. (UK).
- Biochemistry by L. Stryer (2006), 6<sup>th</sup> edition, W.H. Freeman (USA).

4	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 301	Inorganic Biochemistry	2	-	2	Bioc 231

**Objectives of the course:**

To apply core inorganic concepts to understanding of the role of inorganic elements in biological systems.

**Course Description:**

Occurrence and availability of inorganic elements in organisms – Biological function of inorganic elements – Properties and Functions of some important metallic enzymes – Absorption and transport of the essential, inorganic elements- Toxic elements – Chemotherapy using compounds of inorganic elements

**Main text books :**

- Inorganic Biochemistry, An Introduction, J.A. Cowan 1997, Wiley-VCH.

**Subsidiary texts :**

1. Bioinorganic chemistry, Bertini, Gray, Lippard and Valentine 1994, University science books.
2. Principle of Bioinorganic chemistry, S.J. Lippard, and J.M. Berg, 1994, University Science books.

5	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 312	General Metabolism (2)	2	3	3	Bioc 211

**Objectives of the course:**

Study of Amino acids and nucleotides metabolism.

**Course Description:**

Proteins and Nucleic acid digestion - Metabolism of amino acids (anabolism and catabolism of individual amino acids) - Urea cycle - Physiologically active amines (serotonin and histamine) - Nucleotide metabolism (synthesis and degradation of purines and pyrimidines) -

Diseases associated with their metabolism disorders.

**Main text books:**

- Biochemistry by D. Voet and J. Voet (2005), 3<sup>rd</sup> edition, J. Wiley (USA).
- Biochemistry by L. Stryer (2006), 6<sup>th</sup> edition, Freeman (USA).

**Subsidiary books:**

- Metabolism at a glance by J. Salway (1999), Balckwell Science (UK).

6	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 313	Hormones	2	-	2	Bioc 231

**Objectives of the course:**

Study of hormones and their functions.

**Course Description:**

Hormones classification, their effects on the molecular and cellular levels  
- Endocrine hormones (thyroid, parathyroid, pituitary, hypothalamus, pancreas, renal and gonads) - Diseases related to hormonal disturbances.

**Main text books:**

- Essential Endocrinology Charles G. D. Brook and Nicholas J. Marshall (2001).

**Subsidiary books:**

- Endocrinology by S.A. Binkley (1995). Harper Collins (UK).

7	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 314	Biochemistry of Nutrition	2	3	3	Bioc 231

**Objectives of the course:**

Study of the nutrients.

**Course Description:**

Digestion, absorption, transport and transformation of carbohydrates, proteins, lipids, vitamins, water and minerals - Nutrition in relation to health - Energy balance and weight control - Nutrition of man throughout life - Physical fitness - Nutritional deficiency diseases in man - Problems of world food shortage and suggested solutions - Food safety and food technology (food additives and food analyses).

**Main text books:**

- Nutrition by E. Hamilton, E. Whitney and F. Sizer (2001), 2<sup>nd</sup> edition West Publishing Company (USA).

**Subsidiary books:**

- Perspectives in Nutrition by G. Wardlaw, and P. Insel (2001), 4<sup>th</sup> edition, Mosby (USA).

8	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 315	Metabolic Regulation	2	-	2	Bioc 312

**Objectives of the course:**

Study the various mechanisms of metabolic regulation in living organisms.

**Course Description:**

Introduction to metabolic regulation - Allosteric enzymes (allosteric behaviour, identification of rate limiting enzymes, crossover point, cooperative binding and its different models) - Regulation of carbohydrate metabolism in muscle, liver and intestine - Regulation of glycogen metabolism - Regulation of metabolism in adipose tissue - Role of starvation, diabetes, hypothyroidism in metabolic regulation.

**Main text books:**

- Metabolic Regulation by K. Frayn (2003), Portland Press (UK).
- Regulation in Metabolism by E. Newsholme and C. Start (1973), J. Wiley (UK).

**Subsidiary books:**

- Hormones and Metabolic Control by White and Baxter (1995), Arnold (UK).

9	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 331	Bioenergetics	2	-	2	Bioc 231

**Objectives of the course:**

The study of mechanisms of energy transduction in biological systems.

**Course Description:**

Types of energy, its conversion and transfer in biosystems. Energy transducers and transduction mechanisms by specific biomolecules. Laws governing energy transfer and utilization. Anatomy of the mitochondrion and chloroplast. Location of enzymes, redox carriers and the oxidative phosphorylation machinery. Inhibitors and uncouplers of energy-linked functions. Utilization of the proton gradient to drive the formation of high energy bonds. The molecular structure of F1 ATP-ase synthase. Mitochondrial dysfunction and disease.

**Main text Books:**

- Nicholls, G. David and Ferguson, J. Stuart (2002). Bioenergetics 3.

10	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 341	Physical Biochemistry	2	3	3	Bioc 231

**Objectives of the course**

Study of physical phenomena in the biological systems.

**Course Description:**

Thermodynamics (equilibrium, electrochemical potential, membrane equilibrium) - Intermolecular forces - Chemical kinetics of some biological reactions - Pharmacokinetics - Diffusion and transport across biological membranes.

**Main text books:**

- Physical Chemistry: Principles and Application in Biological Sciences by I. Tinoco and others (1995), 3<sup>rd</sup> edition, Prentice Hall (USA).

**Subsidiary books:**

- Principles of Physical Biochemistry by K.E. van Holde and others (1998), Prentice Hall (USA).

11	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 342	Natural Products	3	3	4	Bioc 312

**Objectives of the course**

Study of photosynthesis and the different aspect of natural products.

**Course Description:**

Photosynthesis - Biosynthesis of carbohydrates from CO<sub>2</sub> in C<sub>3</sub> and C<sub>4</sub> plants – Secondary metabolites (natural products) in plants – Methods of separation and identification of natural products – Biosynthesis of natural products (Alkaloids, Phenolic, Terpenoids) in plants. The commercial and medical important of natural products.

**Main text books:**

1. Photosynthesis by Lawlor (2000), 2<sup>nd</sup> edition.
2. Natural products by S. Mann, R.S. Davidson, J.B. Hobbs (1994).

**Subsidiary books:**

1. Introduction to Plant Biochemistry by Goodwin and Mercer (1983), 2<sup>nd</sup> edition, Pergamon Press (UK).
2. Plant Biochemistry, Vol. 13 (1993), Conn. Ed.

12	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 343	Analytical Biochemistry	3	3	4	Bioc 231

**Objectives of the course**



The use of chemical and physical methods in separation, determination and identification of various biomolecules.

**Course Description:**

Preparative and analytical methods - Chromatography (adsorption and partition) and its biochemical applications (ion-exchange, affinity and gel filtration) - Separation by salts, organic solvents and centrifugation - Electrophoresis - Dialysis - Micro filtration - Photometry and its application in biochemistry (UV, VIS, IR, fluorescence, atomic emission and absorption ,NMR) - Isotopes - Immunological separation methods - Genetic engineering.

**Main text books:**

- Modern Experimental Biochemistry by R. Boyer (2000), 3<sup>rd</sup> edition, Benjamin - Cummings (USA).

**Subsidiary books:**

- Analytical Biochemistry by D.J. Holme and H. Peck (1998). 3<sup>rd</sup> edition, Longman (UK).

13	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 370	Biochemistry for medical engineering	3	3	4	-

**Objectives of the course:**

Study of the qualitative and quantitative structure of living matter and their transformation on the molecular level.

**Course Description:**

Structure and functions of biomelecules: carbohydrates, lipids, amino acids, proteins and nucleic acids-Enzymes and coenzymes-Metabolism and energy – Respiration – body fluid – Role of biochemistry in some medical areas.

**Main text Books:**

1. Living chemistry by Ucko, David, Academic press (1986). N.Y (USA).

2. Experiments in living chemistry by Ucko, David, Academic press (1986). N.Y (USA).

**Subsidiary books:**

- Biochemistry by G. Zubay and others (1995). WCB (USA).

14	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 371	Biochemistry for non-Biochemist	3	3	4	-

**Objective of the Course:**

Study the structure, properties and function of biomolecules and their transformation in the cells.

**Course Description:**

Structure, properties and function of carbohydrates, lipids, amino, acids, proteins, nucleotides and nucleic acids in cells – Enzymes and their roles in catalyzing biochemical reactions – coenzymes – Generation and transduction of energy in the cell. Biosynthesis of some biomolecules.

**Main text books :**

أسس الكيمياء الحيوية . د. عبدالمنعم الأعسر , المكتبة الأكاديمية (1996), القاهرة .

**Subsidiary books:**

- Biochemistry by D. Veot and J. Voet (2005). 3<sup>rd</sup> edition, J. Wiley (USA).

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15	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 390	Summer Training (1)	-	6	2	Department Approval

**Objectives of the course:**

To provide the student with practical training in biochemistry related

areas such as hospitals, factories, research centers, and quality control centers.

16	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 391	Biochemical terminology & literature	3	-	3	Bioc 201

**Objectives of the course:**

To provide information's about the important sources of literature concerning with the biochemical publication. Discussion on some publication models. Study of the roots of biochemical terminology.

**Main Text Books:**

Most widespread periodicals such as : Science, Nature, scientific America, Biochemistry J., J. Biol. Chem., Methods in Enzymology.

**Subsidiary Books:**

- Abo-Khatwo's English-Arabic Encyclopedia of Biology and Biochemistry (1992). Dar Al-Qebla, Jeddah, Saudi Arabia.

17	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 392	Computer applications in Biochemistry	2	3	3	Bioc 312, 231

**Objectives of the course :**

To use of computer for simulation and solving biochemical problems such as enzyme kinetics, nucleotide and peptide sequences.

**Main Text Books:**

- Computational Biochemistry and Biophysics, Beeker, Oren M. (2002).

**Subsidiary Books:**

- Analysis of Biochemical systems: A practical Guid for Biochemists and Molecular Biologists, Eberhard, Voit, O. (2000).

18	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 401	Special Topics in Biochemistry	1	-	1	-

**Objectives of the course :**

Selected up to date different topics in the field of biochemistry will be presented every semester.

19	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 416	Clinical Biochemistry	3	3	4	Bioc 315

**Objectives of the course:**

To provide some informations about clinical biochemistry.

**Course Description:**

Biochemical tests in clinical medicine - Water, Sodium and Potassium - Hydrogen ion homoeostasis and blood gases - Diabetes mellitus - Clinical analyses (blood, urine, stool, amniotic fluid, cerebrospinal fluid and synovial fluid) - Clinical enzymology - Hyperuricaemia and gout - Clinical nutrition - Liver diseases and gall stones - Inherited metabolic diseases - Plasma proteins - Kidney function.

**Main text books:**

- Clinical Chemistry by W. Marshall (1995), Mosby (USA).

**Subsidiary books:**

- Clinical Biochemistry for Medical Students by M.F. Laker (1996), Saunders (UK).

20	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 417	Biochemistry of Diseases	2	-	2	Bioc 315

**Objectives of the course:**

Study of the Biochemical basis of some Human Diseases.

**Course Description:**

Introduction to human anatomy and physiology with emphasising on cellular and chemical aspects of physiology. A brief in various organ systems including digestive, cardiovascular, and respiratory systems and some of their diseases – introduction to cancer cells and some type of cancers – Sexual transmitted diseases.

**Main text books:**

- Applied Biochemistry of Clinical Disorders, Allan, G. Gornall, Harper of Row publisher, 1980, USA.

**Subsidiary books:**

- Harper's Biochemistry, R.K. Murray, D.K. Granner, P.A. Mayes and V.W. Rodwell, twenty five edition, 1998, Printic Hall, USA.

21	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 418	The Biochemistry of Cancer Cells	2	-	2	Bioc 231,312

**Objectives of the course:**

Study of types and treatment of cancer.

**Course Description:**

Cancer an overview – Tumor growth and spread – Cancer causing radiation – Cancer and viruses – Cancer causing chemicals – Mechanism of carcinogenesis – Experimental cancer research – Cancer and heredity – Cancer and hormones – Unmasking the cancer – Treatment of cancer - Coping with cancer – Progress in cancer research – Prevention of cancer.

22	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 422	Microbial Toxins	2	-	2	Bioc 231

**Objectives of the course:**

Study of a group of microbial toxins and their actions.

**Course Description:**

Exotoxins: Cytotoxins (diphtheria toxin) – enterotoxins (cholera toxin) – neurotoxins (tetanus toxin) – Pertussis toxin – Anthrax toxin – structure and their mode of action. Endotoxins: Structure – Synthesis and mode of action. Algaltoxins: Red tide and paralytic shellfish poisoning. Fungal toxins: Aflatoxins – Ergot alkaloids – mushroom toxins. Application of microbial toxins: Food poisoning – Biological control.

**Main text books:**

1. ADP – Ribosylating toxin by Aktories, Ed (1992). Springer – Verlag (Germany).
2. Principles of Microbiology by R.M. Atlas (1997), 2<sup>nd</sup> edition, McGraw-Hill (USA).

**Subsidiary texts:**

- Microbiology by L. Prescott and other (1996). 3<sup>rd</sup> edition, WCB (USA).

23	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 432	Molecular Biochemistry	2	3	3	Bioc 312

**Objectives of the course:**

Study of the macromolecules involved in genetics.

**Course Description:**

The relationship between chemical structures and functions of proteins - Relationship between chemical structure and function of nucleic acids in relation to storage, coding and transfer of information across subsequent generations - Various techniques used to study this experimental discipline (x-ray diffraction, centrifugation, electron microscopy, isotopes, amino acid and nucleotide sequencing) - Genetic engineering and its applications in medicine, agriculture and industry.

**Main text books:**

1. Genetics a Molecular Approach by T. A. Brown (1990).
2. Genetics Biochemistry: From Gene to Proteins by J. Etienne-Decart (1988). Ellis Horwood Ltd. (USA).

**Subsidiary books:**

- Gene V by B. Lewin (1996). Oxford U.P. (UK).

24	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 444	Drug Metabolism	2	-	2	Bioc 312

**Objectives of the course:**

Biotransformations reactions and fate of drugs in the body.

**Course Description:**

Pharmacokinetics of drugs; absorption, distribution, metabolism, storage and excretion. Phase I and phase II reactions. The role of mixed function oxidase (MFO) and cytochrome P 450 (CYP) in drug metabolism. Induction, inhibition and regulation of CYP's. Xenobiotic chemical pollutants, polymorphism and other factors affecting drug metabolism.

**Main text books:**

- Pharmacokinetics and Metabolism in Drug Design. Smith, D.A. et al., (2000).

**Subsidiary books:**

- Principles of Drug Action by W. Praett and P. Taylor (1990). 3<sup>rd</sup> edition, Churchill and Livingstone (USA).

25	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 445	Applied Biochemistry	3	3	4	Bioc 231

**Objectives of the course:**

Study of the different application fields which biochemistry can share in industry.

**Course Description:**

Some aspects of microbial biochemistry-Aerobic and anaerobic fermentation-Biotechnology – Genetic engineering and biotechnology – Biotechnology and the production of chemicals, antibiotics, Vaccines, inter Ferons and enzymes –Application of enzymes in food industry and medicin – Biomass and the production of biological fuels – single cell proteins – Bioremediation.

**Main text books:**

- Biotechnology by J. Smith (1996). 3<sup>rd</sup> edition, Cambridge U.P. (UK).

**Subsidiary books:**

- Biotechnology by Crueger and Crueger (1990). 2nd edition, Sinauer Associates (USA).

26	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 446	Immunochemistry	2	3	3	-

**Objectives of the course:**

Study of the molecular immune system.

**Course Description:**

Organs, cells and molecules of the immune system - Natural and acquired



immunity - Humoral and cellular immunity - Antigens, antibodies and their interactions - Interferons and other cytokines - Failures of the immune system - Natural and acquired immuno deficiency diseases - Allergic reactions, autoimmune diseases and rejection of organ transplant.

**Main text books:**

- Immunology by J. Kuby (1994), Freeman (USA).

**Subsidiary books:**

- Laboratory Immunology and Serology by N.J. Bryant (1986), W.B. Saunders, (USA).

27	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 490	Summer Training (2)	-	6	2	Department Approval

**Objectives of the course:**

To provide the student with practical training in biochemistry related areas such as hospital, factories, research centers, and quality control centres.

28	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 491	Research Projects in Biochemistry	-	9	3	-

**Objectives of the course:**

The course tends to train the student in conducting research work and provide him an opportunity for the acquisition of skills by practical work.

**Course Description :**

Original experimental research in one of the fields of biochemistry carried out under the supervision of a department member. A type written report and an oral presentation is required

29	Course No.	Course Title	No. of Units			Pre-requisites
			Th.	Pr.	Credit	
	Bioc 492	Career skills & technical writing	2	-	2	-

### Objectives of the course:

To develop skills on how to write technical reports.

### Course Description :

Hands-on writing scientific reports in biochemistry. How to retrieve information, resources and sites. How to quote and cite information from paper and electronic resources. How to write references and maintain a high standard of ethics. Skills for effective presentation.

### Main Text Books:

1. mroF :gnitirw cifitneicS fo trA ehT .(1987) .F ,snaH mlebE dna yrtsimehC ni snoitacilbuP lanoisseforP ot stropeR tnedutS .sdleiF detaleR
2. شلبي أحمد ( 1968 ) , كيف تكتب بحثاً أو رسالة – مكتبة النهضة المصرية – القاهرة .