



DISCIPLINE SHEET

1. Programme of study description

1.1.	The "Carol Davila" University of Medicine and Pharmacy Bucharest
1.2.	FACULTY OF MEDICINE/ DEPARTMENT I FUNCTIONAL SCIENCES
1.3.	DISCIPLINE: BIOCHEMISTRY
1.4.	DOMAIN OF STUDY: HEALTHCARE
1.5.	CYCLE OF STUDIES: BACHELOR'S DEGREE
1.6.	STUDY PROGRAMME - MEDICINE

2. Subject description

2.1.	Discipline name: CLINICAL BIOCHEMISTRY						
2.2.	COURSE HOLDER						
2.3.	SEMINARY HOLDER						
2.4. Year of study	II	2.5. Semester	II	2.6. Evaluation type	Exam	2.7. Discipline regime	

3. Total estimated time (hours/semester didactic activity)

3.1. Number of hours/week	2	Out of which : 3.2. Course	1	3.3. Seminary	1
3.4. Total number of hours from the curriculum	28	Out of which: 3.5. Course	14	3.6. Seminary within the course	14
Distribution of allotted time					hours
Study from textbooks, courses, bibliography, student notes					
Supplementary documentation (library, on specialized electronic platforms, on the field)					
Preparing for seminars/laboratories, homeworks, reports, portfolios and essays					
Tutoring					
Examinations					
Other activities					
3.7. Total hours of individual study					
3.9. Total hours per semester					
3.10. Number of credit points		-			3

4. Prerequisites (where applicable)

4.1. of curriculum	Graduated biochemistry exam year I
4.2. of competencies	-

5. Requirements (where applicable)

5.1. course organization	large lecture hall
5.2. seminary/lab organization	large lecture hall

6.Acquired specific skills

Professional skills (expressed through knowledge and abilities)	• The assimilation of some fundamental concepts of medical biochemistry • Knowledge of the main biochemical parameters determined in the hospital laboratory (biological significance, interpretation of abnormal results) • The ability to correlate biochemical and clinical aspects • Useful elements in disease screening and early diagnosis • Notions of preventive nutritional medicine • The ability to select complex cases that need to be sent to a specialist
Transversal competencies (of role, of professional and personal development)	• Development of preclinical and clinical medical thinking • Development of biomedical scientific language • Connections between different areas of the same domain, fast intelligent connections in the front of a clinical case • The patient viewed from the perspective of the connection of various diseases • Easy transition from the preclinical to the clinical field

7. Subject learning objectives (based on the scale of acquired specific competencies)

7.1. General objective	- Familiarize students with the main biochemical indicators used in laboratory diagnosis - Understanding and studying in depth of some essential biochemical aspects in the pathogenesis of different diseases - Interpretation of laboratory tests
7.2. Specific objectives	- Developing students' ability to analyze and to interpret the laboratory tests results - Clinical cases analysis based on biological samples - Deepening of knowledge and understanding, from biochemical point of view, of the mechanisms involved in cardiovascular, digestive, hepatic, renal diseases - The ability to select the best laboratory test according to the purpose (e.g. screening, diagnosis) -Acquiring some notions of micronutrition useful in the prevention and treatment of diseases

8.Contents

8.1.Course followed by interpretations of laboratory tests on worksheets	Teaching methods	Observations

1. Metabolism of the human body - integrative biochemical aspects -metabolic changes in anabolism -metabolic changes in catabolism	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video projection, various Web materials, etc.) Interactive method, discussions Exemplification, problematization	During each lecture discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students
2. Biochemistry of physical effort Energy balance. Lipid, protein and carbohydrate metabolism during physical effort Energy consumption and thermogenesis - particularities in children and the elderly Biochemical aspects of nutrition Daily diet. Metabolic effects of unbalanced diets. Diet in various diseases	Lecture, systematic exposure, examples, Discussions	During each lecture, discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students
3.Antioxidants versus free radicals -formation and effects of free radicals -enzymatic antioxidants -nonenzymatic antioxidants	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video projection, various Web materials, etc.) The interactive method Exemplification, problematization, discussions	During each lecture, discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students
4. Sensitivity and specificity of a laboratory test The precision and accuracy of a laboratory test Test results: variations, errors, interferences Clinical applications Clinical enzymology and biomarkers Clinical applications of transaminases activity, CK, LDH	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video projection, various Web materials, etc.) The interactive method Exemplification, problematization, discussions	During each lecture, discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students
5.Clinical enzymology and biomarkers Clinical applications of serum amylase, serum lipase, alkaline and acid phosphatases, prostate specific antigen, serum pseudocholinesterase activities	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video projection, various Web materials, etc.) The interactive method Exemplification, problematization, discussions	During each lecture, discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students
6.Protein metabolism Protein synthesis and degradation Total proteins dosing, fibrinogen	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video	During each lecture, discussions are held, suggestions are asked for the analysis of

Electrophoresis of serum proteins - normal values and modified values, in pathology	projection, various Web materials, etc.) The interactive method Exemplification, problematization, discussions	some plasma and serum values and at the end, feedback is requested from the students
7. Biochemical indicators in liver diseases (I) Liver functions Laboratory tests that investigate liver functions: indicators of necrosis indicators of cholestasis excretion indicators severity indicators immunological indicators	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video projection, various Web materials, etc.) The interactive method Exemplification, problematization, discussions	During each lecture, discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students
8. Biochemical indicators in liver diseases (II) Autoimmune hepatitis Drug-induced hepatitis Storage liver diseases Hemochromatosis Wilson's disease Metabolic changes in chronic alcoholism Metabolic changes in non-alcoholic fatty liver (NAFLD), in non-alcoholic fatty pancreas (NAPFLD)		
9. Biochemical indicators in cardiovascular diseases Metabolic changes in the ischemic heart Blood markers used for the detection and quantification of acute coronary syndrome - Troponins - Myoglobin - Creatine kinase Future biomarkers for the detection of ischemia and for stratification risk of acute coronary syndrome - Inflammation markers with predictive value for coronary events - The main risk factors for cardiovascular diseases; - Other risk factors for cardiovascular diseases Primary and secondary dyslipidemias, lipid profile variations, predictive value of plasma lipids	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video projection, various Web materials, etc.) The interactive method Exemplification, problematization, discussions	During each lecture, discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students
10. Biochemical indicators in renal diseases Kidney functions Laboratory tests for renal functions investigation Glomerular function investigation tests: - Creatinine clearance - Serum urea/serum creatinine ratio - Mean urea and creatinine clearances - Predictive formulas (estimation formulas) of glomerular filtration rate Tubular function investigation tests	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video projection, various Web materials, etc.) The interactive method Exemplification, problematization, discussions	During each lecture, discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students

Global renal function indicators - Urinalysis - Proteinuria Azotemia versus uremia Nephritic syndrome versus nephrotic syndrome Chronic renal failure-laboratory tests Acute renal failure-laboratory tests		
11. Metabolic diseases Metabolic syndrome criteria, metabolic changes in prediabetes Metabolic features of visceral fat Gout Mitochondrial diseases		
12. Metabolic changes in diabetes The unifying mechanism by which hyperglycemia induces cellular damage: polyol pathway, intracellular formation of AGE precursors, PKC pathway, increased hexosamines activity	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video projection, various Web materials, etc.) The interactive method Exemplification, problematization, discussions	During each lecture, discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students
13. Biochemistry of cancer General considerations Mechanisms of oncogenic viruses Normal cell cycle and oncogenic control mechanisms Tumor suppressor genes Tumor markers Biochemical aspects in cell apoptosis	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video projection, various Web materials, etc.) The interactive method Exemplification, problematization, discussions	During each lecture, discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students
14. Mineral metabolism Metabolism of macrominerals: sodium, potassium, calcium, magnesium, phosphates Metabolism of microminerals: iron, copper, zinc, selenium Laboratory tests for mineral imbalances investigation in the human body Iron metabolism Laboratory diagnosis of occult bleeding: guaiac test, immunochemical test, heme-porphyrin test	Lecture, systematic exposure The use of electronic presentation materials (PowerPoint, video projection, various Web materials, etc.)	During each lecture, discussions are held, suggestions are asked for the analysis of some plasma and serum values and at the end, feedback is requested from the students
8.2. Seminary / laboratory	Teaching methods	Observations
Biochemical aspects of nutrition Balanced daily diet. Daily caloric requirement. Enteral and parenteral nutrition (advantages, disadvantages, calculation of caloric requirements)	-Systematic exposure, Power Point presentations, conversation, interactive method, working with textbooks, presentation of didactic films, problematization,	During the laboratory practice: - mathematical and/or statistical processing of the obtained data - grid type exercises, calculation problems
Basal metabolic rate calculation. Daily caloric requirement. Energy consumption and physical effort. Food supplements and functional foods		

Oxidative stress diseases-biochemical aspects Biochemical markers in oxidative stress diseases	debate.	related to the subject of the practical work Within each practical lecture there are discussions, suggestions are asked for the analysis of some plasma values
The activities of CK, LDH, ALT and AST in various conditions		
The activities of serum amylase, serum lipase, alkaline phosphatase, prostate specific antigen in various conditions		
Serum protein electrophoresis in various pathologies		
Laboratory tests investigating liver dysfunction I- clinical examples		
Laboratory tests investigating liver dysfunction II- clinical examples		
Laboratory tests that investigate the cardiovascular system dysfunction - clinical examples		
Laboratory tests investigating kidney dysfunction - clinical examples		
Modified laboratory tests in prediabetes –examples of clinical cases		
Modified laboratory tests in diabetes –examples of clinical cases		
Modified laboratory tests in cancer		
Modified laboratory tests in mineral imbalances - examples of clinical cases		
Bibliography 1. Atanasiu V, Mohora M (coordonatori), Dogaru B, Duță C, Gaman G, Gîlcă M, Lixandru D, Muscurel C, Pîslaru L, Stoian I, Vîrgolici B: „Biochimie medicală – ghid pentru lucrări practice”, Ed. Niculescu, București, (ISBN 978-973-748-822-0) 2013; (ISBN 978-973-748-655-4) 2012; (ISBN:978-973-748-XXX-X) 2011 2. Stoian I (coordinator), autori: Gaman L, Gîlcă M, Hillebrand A, Panait E, Vîrgolici B: Practical Guide of Biochemistry-revised edition (ISBN:978-973-708-570-2), Carol Davila, University Press, Bucharest, 2011 3. Tietz <i>Textbook of Clinical Chemistry and Molecular Diagnostics</i> , 5th Edition, Saunders USA, 2012		
Bibliography Biochemistry textbooks year I Bogdana Vîrgolici, Marilena Gîlcă, “Aspects of Clinical Biochemistry”, ”Carol Davila”University Press, Bucharest, 2011, ISBN:978-973-708-536-8		

Bogdana Vîrgolici, Marilena Gilcă, “Elemente de biochimie de laborator” (2010), Editura Universitară „Carol Davila”, București, ISBN:978-973-708-478-1

Bogdana Vîrgolici, Marilena Gilcă, “Elemente de biochimie de laborator”+editie revizuita(2015), Editura Universitară „Carol Davila”, București, ISBN

Goljan E.F., *Pathology review, Saunders text and review series*, by W.B. Saunders Company, USA, 1998

Chiva A., *Investigația electroforetică în diagnosticul de laborator (ghid de interpretare)*, Ed. Universitară Carol Davila, București, 2008

Medscape, online, updated practical guidelines, updated algorithms and protocols of internationally recognized medical federations and associations

9. Corroborating the contents of the discipline with the expectations of the epistemic community representatives, professional associations and representative employers in the field related to the program

The clinical biochemistry course supports students in their future physician activity, helping them face the multiple challenges they will encounter after graduation, both in terms of direct work with patients and health care labor market. The course contains theoretical milestones, paraclinical investigation algorithms, which can be useful to students in the transition from school to active life, facilitating their professional and indirectly social insertion. The content of the discipline is constantly updated, in accordance with similar university programs in the country and abroad, with the real requirements and priorities of the current medical practice, with the new discoveries in the field. In order to better adapt to the requirements of the labor market of the content of the discipline, active representative persons at different levels in the field of medical and laboratory biochemistry are periodically consulted in order to obtain feedback regarding the subjects taught and ways of their continuous improvement.

10. Evaluation

Activity type	10.1. Evaluation criteria	10.2. Evaluation methods	10.3. Weigh of the final grade
10.4. Course and seminary/laboratory	- It will be noted: accuracy and completeness of knowledge; logical coherence; degree of assimilation of specialized terms; the ability to work with concepts taught at the course and seminary/laboratory - Students can take the exam only if they have a maximum of 3 absences from course and seminary/laboratory - The written exam consists in solving a test consisting of 50 questions - The exam is considered to be promoted if the student has accumulated at least 5 points (the equivalent of grade 5)	Simple and grouped complement grid tests Minimum grading scale of each chapter	Questions are 50% from the course and 50% from the seminary/laboratory
Minimum performance standard			

- For grade 5 (out of 10) in the practical exam, the student must: know the meaning of a certain biochemical dosed parameter, be able to solve simple clinical cases.
- For grade 5 (out of 10) in the theoretical exam, the student must be able to interpret the abnormal values of the main biochemical parameters discussed in the course.

Date of filing

Signature of the course tenured coordinator

Date of approval in the
Council of the Department

Signature of the Head of the Department