Cairo University
Faculty of Medicine
Department of Medical Biochemistry and molecular biology

Course Specifications
Course title: Medical Biochemistry and Clinical Chemistry-II
Course Code: BIO-204

Second year of M.B. B.Ch. program
Department offering the course Medical Biochemistry Department
Second academic year of M.B.B.Ch. program
Date of Approval: 2016

A) Basic Information:
Allocated marks: 150 marks
Course duration: 30 weeks of teaching (including revision sessions) with end course exams, midterm exam and final end of year examination.
Total teaching hours: 135 hours
- Theoretical 75 hours
- Practical and tutorials 60 hours

B) Professional Information:

I- Aim of the Course:
- To enable the student to be oriented with the biochemical importance of macro- and micronutrients.
To enable the student to illustrate and/or describe the metabolic pathways of macronutrients, nucleotides, and important trace elements.

To enable the students to point-out hereditary and acquired metabolic disturbances and their biochemical laboratory and clinical outcomes.

To enable the student to explain the bioenergetics of the concerned metabolic pathways under different physiological circumstances and their integrator regulations with other working metabolic pathways.

To enable the student to describe the metabolism of erythrocytes and the related metabolic disorders.

To enable the student to list non-protein nitrogenous compounds (NPN) and their normal range in blood.

To enable the student to list some non functional plasma enzymes and their clinical implications.

To enable the student to interpret medical laboratory reports.

2- INTENDED LEARNING OUTCOMES:

2- a) KNOWLEDGE AND UNDERSTANDING:

By the end of the course, students should be able to:

1. Define the metabolic pathways of carbohydrates, lipids, proteins, nucleotides and their micro-molecules and determine the site of each. (a1,2)

2. Explain the bioenergetics of the concerned metabolic pathways under different physiological circumstances

3. Illustrate the steps and regulatory mechanisms of these pathways. (a1,2)

4. Point out the related metabolic disorders and their clinical prints on biochemical and molecular basis.(a5,6)

5. Describe micronutrients, their biochemical, clinical and laboratory importance and deficiency manifestations of each.(a1,9)

6. Describe the metabolism of erythrocytes and the related metabolic disorders.

7. List NPN and their levels in blood as well as some important plasma enzymes and their clinical implications.

2-b) Practical Skills:

By the end of the course, students should be able to:
1. Identify the physical and chemical characters of normal urine under different physiological conditions. (b1)
2. Perform chemical tests to detect abnormal constituents of urine. (b1)
3. Estimate serum levels of glucose, total proteins, albumin, cholesterol, creatinine and uric acid by colorimetric methods. (b1)
4. Assess glucose tolerance by glucose tolerance test. (b1)

2.c) Professional Attitude and Behavioral Skills.

- Respect and follow the institutional code of conduct. (c6)

2.d) Communication Skills:

*By the end of the course, students should be able to:*

1. Work effectively in a group in lab. (d2, d6)
2. Respect the role of staff and co-staff members regardless of degree or occupation. (d2, d6)

2.e) Intellectual Skills

*By the end of the course, students should be able to:*

1. Interpret symptoms, signs and biochemical laboratory findings of some metabolic disorders. (e1, 2, 3)
2. Interpret urine report outcome. (e1, 2, 3)
3. Point out the significance of determination of serum levels of glucose, total proteins, albumin, cholesterol, creatinine and uric acid. (e1, 2, 3)
4. Diagnose the type of abnormality of pathological glucose tolerance curve. (e1, 2, 3)
5. Diagnose a metabolic disturbance etiology on basis of case-study reports. (e1, 2, 3)

2.f) General and Transferable Skills

*By the end of the course, students should be able to:*

1. Use efficiently sources of biomedical information to remain current with advances in knowledge and practice. (f1, 2, 4)
2. Present information clearly in written, electronic and verbal forms during preparation of seminars. (f3, 5)
3. Communicate ideas and arguments effectively. (f3, 4, 5)
4. Manage time and resources effectively and set priorities. (f6)
3. COURSE CONTENTS:

<table>
<thead>
<tr>
<th>Subject</th>
<th>Lectures</th>
<th>Practical/small groups</th>
<th>Total</th>
<th>% Total hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioenergetics, TCA cycle</td>
<td>7</td>
<td>4</td>
<td>11</td>
<td>8.2</td>
</tr>
<tr>
<td>Carbohydrate Metabolism</td>
<td>16</td>
<td>8</td>
<td>24</td>
<td>17.8</td>
</tr>
<tr>
<td>Lipid Metabolism</td>
<td>18</td>
<td>8</td>
<td>26</td>
<td>19.3</td>
</tr>
<tr>
<td>Insulin, Diabetes Mellitus</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>8.9</td>
</tr>
<tr>
<td>General Protein Metabolism</td>
<td>4</td>
<td>6</td>
<td>10</td>
<td>7.4</td>
</tr>
<tr>
<td>Amino acid Metabolism</td>
<td>8</td>
<td>6</td>
<td>14</td>
<td>10.5</td>
</tr>
<tr>
<td>Heme Metabolism</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>5.5</td>
</tr>
<tr>
<td>Purine &amp; Pyrimidine Metabolism</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>6.0</td>
</tr>
<tr>
<td>Metabolic Integration</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2.9</td>
</tr>
<tr>
<td>Reactive Oxygen Species</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>2.3</td>
</tr>
<tr>
<td>Vitamins</td>
<td>6</td>
<td>6</td>
<td>12</td>
<td>8.9</td>
</tr>
<tr>
<td>Blood</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2.3</td>
</tr>
<tr>
<td>Total</td>
<td>75</td>
<td>60</td>
<td>135</td>
<td>100</td>
</tr>
</tbody>
</table>

3-A) TOPICS:

1. Bioenergetics and tricarboxylic acid cycle: steps, regulation, and importance.

2. Metabolism of carbohydrates: Dietary carbohydrates, digestion and absorption, pathways of glucose oxidation, glycogen metabolism, gluconeogenesis, special metabolism of fructose, and galactose, pathological aspects of carbohydrate metabolism and their clinical implications with special emphasis on diabetes mellitus and biochemistry of insulin and other disorders of carbohydrate metabolism and their clinical importance.


4. Metabolism of proteins: Dietary proteins, digestion and absorption, general aspect of protein metabolism, metabolism of ammonia, metabolism of individual
amino acids with related errors of metabolism, pathological aspects of protein and amino acid metabolism and their clinical implications.

5. Metabolism of Heme: Synthesis of porphyrins and heme, catabolism, hyperbilirubinemia and porphyrias.

6. Metabolism of purines and pyrimidines: Digestion and absorption of nucleic acids, biosynthesis and catabolism of purines and pyrimidines with the related errors of metabolism (including gout), and synthetic base analogues and their clinical use.

7. Metabolic integration: Metabolic changes, adaptation and regulation during starve-feed cycle, aerobic and anaerobic exercises. Special metabolism of ethyl alcohol and its pathological effects.

8. Vitamins: Types, structure, functions, deficiency manifestations and recommended daily allowance.

9. Reactive oxygen species; generation, combating, and biological and pathological effects.


3-B) TUTORIAL CLASSES:
   a- Preparation of assignments
   b- Presentation
   c- Case scenarios, reports and problem solving.

3-C) PRACTICAL CLASSES:

1. Urine report.
2. Colorimetric measurement of plasma glucose, total proteins, albumin, cholesterol, creatinine and uric acid.
3. Variations in glucose tolerance curve under different clinical conditions.
4. Case report studies applying the outcomes of previous parameters.

4. TEACHING AND LEARNING METHODS:

4-A) METHODS USED:

1. Lectures (general and small group lectures).
2. Practical classes (small group teaching, practice of laboratory skills, AV aids)

2.1 Urine report.
2.2 Colorimetric methods in clinical chemistry.
2.3 Biochemical laboratory report comments.

Lectures:

4 lectures per week; one hour each between 8.00 a.m and 2.00 p.m according to the current time table in general lecture halls.

Practical classes and tutorials:

The students are divided into 6 groups. Each group has three hours-practical class once per week. Students of each group are divided into 2 subgroups. Both subgroups will rotate between tutorial classes (the related subjects of the theoretical lectures with AV aids and animations) and practical class.

Time plan:

<table>
<thead>
<tr>
<th>Item</th>
<th>Time schedule</th>
<th>Teaching hours</th>
<th>Total hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>4times/week; one hour each</td>
<td>4x18 wks and</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>between 8.00 a.m and 2.00 p.m</td>
<td>1x3 revision</td>
<td></td>
</tr>
<tr>
<td>Practical</td>
<td>3 hours every other week</td>
<td>3x10 w</td>
<td>30</td>
</tr>
<tr>
<td>Tutorial</td>
<td>3 hours every other week</td>
<td>3x10 w</td>
<td>30</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>135</td>
</tr>
</tbody>
</table>
**Extra contact hours:**

**Lectures:**
- One week for orientation, introduction
- Two weeks; revision first half
- Two weeks; revision second half

**Practical:**
- Two weeks; revision first half
- Two weeks; revision second half
- Two weeks exam

**Exams**
- One week: end course exam
- One week: midyear exam
- One week: spring exam
- One week: final exam

**4-D) TEACHING AND LEARNING FACILITIES:**

Facilities used for teaching this course include:
- Lecture halls: provided by the Faculty.
- Small group classes: in the Department.
- Information technology / AV aids: available in computer-assisted classes in the Department.
- Laboratory: laboratory facilities to perform the required experiments are available in the department.

**5. STUDENT ASSESSMENT:**

**5-A. ATTENDANCE CRITERIA:**

The minimum acceptable practical (and tutorial) attendance is 75%; students who fail to attend that percentage of activities will not attend the practical exam.

**5-B. Assessment TOOLS:**
### Tool Purpose

<table>
<thead>
<tr>
<th>Tool</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formative exams (quizzes)</td>
<td>Assessment of knowledge and understanding with feedback for detection of lagging students</td>
</tr>
<tr>
<td>Written examination</td>
<td>Assessment of knowledge and understanding</td>
</tr>
<tr>
<td>Oral examination</td>
<td>Assessment of knowledge and understanding</td>
</tr>
<tr>
<td>Practical examination</td>
<td>Assessment of practical, intellectual and general skills. (check list)</td>
</tr>
<tr>
<td>Assignment ,and presentations</td>
<td>Assessment of knowledge and understanding, communication and general and transferable skills</td>
</tr>
</tbody>
</table>

- Midyear examinations: one in *January* for all students and the other in *April*. The students who don't attend the examination(s) for acceptable reason; their marks will be raised as a proportion from the final written examination score.
- Final examination: at the end of the academic year, in *May*, for all students. The exam will be re-held in *September* for those who fail to pass the final exam or postpone it.

### 5-D) GRADING SYSTEM:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Marks allocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm examinations</td>
<td>10</td>
</tr>
<tr>
<td>Midyear examinations: (January)</td>
<td>20</td>
</tr>
<tr>
<td>Final examination:</td>
<td></td>
</tr>
<tr>
<td>Written</td>
<td>75</td>
</tr>
<tr>
<td>OSPE</td>
<td>45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>150</strong></td>
</tr>
</tbody>
</table>

- Student knows his marks after the Formative exams.
- The minimum passing score is 90 marks provided at least 30 marks are obtained in the final written examination.
- Passing grades are: **EXCELLENT** $\geq 85\%$, **VERY GOOD** 75-<85\%, **GOOD** 65-<75\% and **FAIR** 60-<65\%. 
5-E) Examination description:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mid-year</td>
<td>A one--hour written paper composed of short essay type questions</td>
<td>20 marks</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>A one-hour case study and/or MCQ</td>
<td>10</td>
</tr>
<tr>
<td>Final</td>
<td>A 3-hour written paper composed of short essay type questions (65 marks) and MCQ (10 marks)</td>
<td>75 marks</td>
</tr>
<tr>
<td>OSPE</td>
<td>Giving report on provided urine samples Measurement of provided samples (glucose, urea, uric acid) using spectophotometer, clinical interpretation + practical sheet (case study and/or MCQ)</td>
<td>45 marks</td>
</tr>
</tbody>
</table>

6 - LEARNING AND REFERENCE MATERIALS:

6-A) BASIC MATERIALS:
- Department Book: available for students to purchase from different bookshops at the faculty.
- Overhead projections and computer presentations used during teaching in tutorial classes.
- Notes on the laboratory practical work.

6-B) SUGGESTED MATERIALS:
- Harper's Biochemistry.
- Lippincott's Illustrated Biochemistry.
- The Department's web site. http://www.biomed.eg.net

Course coordinator: Prof. Dr. Samar Marzouk
Head of Department: Professor Dr. Yasser Nassar

Date: 25 / 12 / 2016