



وزارة التعليم العالي و البحث العلمي

جامعة نينوى

كلية الطب

فرع الكيمياء و الكيمياء الحياتية

المنهاج التعليمي

٢٠٢٣-٢٠٢٤

تمت المصادقة على المنهاج واحالته الى عمادة كلية الطب استنادا بما جاء في الامر الصادر من
فرع الكيمياء والكيمياء الحياتيه المرقم ٩ في ٢٠٢٣/٩/١٩

ام د بسام أدوار حنا

رئيس فرع الكيمياء والكيمياء الحياتيه

تأسس الفرع عام ٢٠٠٤ تحت اسم (فرع الكيمياء الحياتية) كإحدى الفروع العلمية لكلية طب نينوى وقد تم استبدال اسم الفرع إلى (فرع الكيمياء والكيمياء الحياتية) عام ٢٠١٨ استناداً إلى الكتاب الصادر من وزارة التعليم العالي والبحث العلمي / دائرة الدراسات والتخطيط والمتابعة / الدراسات والتخطيط ذي العدد ٣ / ٣ / ٢٤٠٨ بتاريخ ٢٠١٨/٣/١٣

إن فرع الكيمياء والكيمياء الحياتية منذ تأسيسه يتعامل مع الطلبة والملاك التدريسي والوظيفي تعاملًا متساويًا بغض النظر عن الجنس والعرق والدين والوضع الاجتماعي والاقتصادي وقد وضعت رئاسة الفرع نصب عينها مراعاة القدرات البدنية للجميع إن تطلب الأمر ذلك.

استعان فرع الكيمياء والكيمياء الحياتية برسالة وأهداف الكلية لتخطيط المناهج الدراسية والتقييم وتعزيز جودة التعليم وضمان الجودة.

منتسبو الفرع

الكادر التدريسي					
ت	الاسم	اللقب العلمي	الاختصاص العام	الاختصاص الدقيق	الملاحظات
١	د. بسام أدوار حنا	أستاذ مساعد	بكالوريوس طب و جراحة عامه	بوردي عراقي (دكتوراه) في علم الأمراض / الكيمياء المرضية	رئيس الفرع
٢	مصعب عسكر طه	مدرس مساعد	بكالوريوس علوم كيمياء	ماجستير كيمياء حيائية	مقرر الفرع
٣	د. محمد عبد الغفور احمد	أستاذ	بكالوريوس علوم صيدلة	دكتوراه كيمياء جزيئية وبايولوجيا الخلايا الجذعية	
٤	د. تماضر عباس حمودي	مدرس	بكالوريوس علوم كيمياء	دكتوراه كيمياء تحليلية	- مسوول شعبة السيطرة على تداول المواد الكيمياوية والباليوجيه الخضره والسامه في رئاسة الجامعه. - مشرف مختبر بحوث الكيمياء - مسوول مخزن المواد الكيمياويه
٥	د. اسامه ميسر محمود	مدرس	بكالوريوس علوم كيمياء	دكتوراه كيمياء حيائية	
٦	مهيمن عبد المنعم عبد الكريم	مدرس مساعد	بكالوريوس علوم كيمياء	ماجستير كيمياء عضويه	
٧	انسام عبد الغفور حسن	مدرس مساعد	بكالوريوس طب و جراحة بيطريه	ماجستير كيمياء حيائية بيطريه	مشرف مختبر الكيمياء و الكيمياء الحياتيه
٨	نغم فارس خليل	رئيس أطباء اختصاص	بكالوريوس طب و جراحة عامه	ماجستير كيمياء حياتيه	منسبه من دائرة صحة نينوى للعمل في الفرع
٩	خالص محمد شحاده	مدرس مساعد	بكالوريوس علوم كيمياء	ماجستير كيمياء فيزياويه	طالب دكتوراه في اختصاص الكيمياء الحياتيه
١٠	منهل جلال صالح	مدرس مساعد	بكالوريوس تربيه كيمياء	ماجستير كيمياء حياتيه	
١١	أسماء حمزه عباس	مدرس مساعد	بكالوريوس تربيه كيمياء	ماجستير علوم كيمياء	طالبة دكتوراه في اختصاص الكيمياء التحليليه

١٢	ساره عبد الاله يونس	مدرس مساعد	بكالوريوس تربيته كيمياء	ماجستير علوم كيمياء	طالبة دكتوراه في اختصاص الكيمياء الحياتية
١٣	سوزان صدقي سليم	مدرس مساعد	بكالوريوس علوم كيمياء	ماجستير كيمياء عضويه	طالبة دكتوراه في اختصاص الكيمياء العضويه

الكادر الفني				
ت	الاسم	العنوان الوظيفي	الاختصاص العام	الملاحظات
١	سفانه يوسف محمد	طبيب مقيم اقدم	بكالوريوس طب و جراحة عامه	طالبة يورد في اختصاص الكيمياء المرضيه
٢	حنيفه محمد صالح	طبيب مقيم دوري	بكالوريوس طب و جراحة عامه	منسبه للعمل في دائرة صحة نينوى
٣	نور قبس سعيد	رئيس كيمياويين	بكالوريوس علوم كيمياء	مسؤول فني لمختبر الكيمياء و الكيمياء الحياتية
٤	رؤى يحيى قاسم	معاون رئيس كيمياويين	بكالوريوس علوم كيمياء	
٥	سدي عبد العزيز عبد الرزاق	كيمياوي اقدم	بكالوريوس علوم كيمياء	منسب للعمل في جامعة الحمدانيه
٦	عمر حازم محمد	رئيس كيمياويين	بكالوريوس تربية كيمياء	
٧	شريف اركان شريف	كيمياوي اقدم	بكالوريوس علوم كيمياء	امين مخزن المواد الكيمياوية

الكادر الوظيفي				
ت	الاسم	العنوان الوظيفي	الشهادة	الملاحظات
١	ندى ادريس ابراهيم الساعاتي	رئيس حرفيين	متوسطة	ملاحظ الفرع

الرؤية

المعاصرة لعلمي الكيمياء الطبية والحياتية

الاهداف العامة لفرع الكيمياء و الكيمياء الحياتية

يقوم فرع الكيمياء و الكيمياء الحياتية بتدريس مادة الكيمياء الطبية للمرحلة الاولى و مادة الكيمياء الحياتية للمرحلة الثانية.

ان منهاج تدريس مادتي الكيمياء الطبية و الكيمياء الحياتية يهدف الى بناء قاعدة اساسية للطلبة بهدف تهيئهم لدراسة المواد الدراسية السريرية في السنوات اللاحقة عبر تدريسهم العديد من المواضيع النظرية والعملية التي لها علاقة بالمواضيع السريرية كمواضيع الدهون، الكاربوهيدرات، البروتين، الفيتامينات و الهرمونات اضافة الى حيازة جميع الطلبة عند التخرج من كليتنا بغض النظر عن العرق او الجنس او القومية او اللغة او الدين الكفايات و المهارات الاساسية و المعرفة التي تجعله متهيئاً للإداء الجيد في دوره كطبيب و للبحث العلمي في مجال الطب لخدمة المجتمع ووضع حلول ناجعه لمشاكله الصحية الشائعة اضافة الى تهيئة الطالب وتشجيعه على التعلم مدى الحياة من خلال الاستمرار في تنمية المهارات واستخدام

التكنولوجيا بالشكل الأمثل وتشجيعهم على المزيد من القراءة و نيل شهادة الاختصاص في مجال الكيمياء السريرية او المرضية .
ان تدريسي الفرع حريصون على تطوير المنهاج نظريا وعمليا بما يتوافق مع التطور العلمي المعرفي والتكنولوجي على سبيل المثال تم مؤخرا إضافة تدريس موضوعي الكيمياء الخضراء و السلامة الكيميائية في المرحلة الأولى وموضوعي السمنة ومتلازمة الايض و تفاعل البلمرة المتسلسل في المرحلة الثانية.

مخرجات التعليم

- ان تدريس مادة الكيمياء الحياتية للمرحلة الثانية يعتبر مكملا لمادة الكيمياء الطبية للمرحلة الأولى لذلك فان مخرجات التعليم المطلوبة بالخريج واحدة لكلتا المادتين وكما يلي:
- 1- تقديم النصائح الصحية في مجال الفحوص المختبرية.
 - 2- الاستعداد لإكمال الدراسات العليا في مجال الكيمياء السريرية او المرضية.
 - 3- مطالعا بشكل واسع على علوم الكيمياء بشكل عام و والمواضيع التي لها علاقة بدراسة الطب بشكل خاص.
 - 4- متمكنا من اجراء الفحوص المختبرية الشائعة والتجارب في مجال الكيمياء والكيمياء السريرية والتعامل بشكل علمي مع نتائج تلك الفحوص.
 - 5- المعرفة الكاملة بالأسلوب الامثل لتهيئة المريض للفحوص المختبرية المختلفة في مجال الكيمياء السريرية.
 - 6- يحترم المريض ويحافظ على اسراره وعدم تقديم الجانب المادي على الجانب الإنساني.

المراحل المستهدفة

أولا: المرحلة الأولى / مادة الكيمياء الطبية

- عدد الطلبة المتوقع: ٣٦٠ طالب وطالبة
 - عدد التدريسيين الكلي: ٦
 - نسبة عدد التدريسيين الكلي إلى الطلبة: ١:٦٠
- ثانيا: المرحلة الثانية/ مادة الكيمياء الحياتية

- عدد الطلبة المتوقع: ٣٦٠ طالب وطالبة
- عدد التدريسيين الكلي: ٦
- نسبة عدد التدريسيين الكلي إلى الطلبة: ١:٦٠

نموذج التعليم

يعتمد التعليم في الفرع على نموذج التخصصات في المواضيع العلمية المدرجة في المنهاج مع الاستعانة بأسلوب حل المشكلات قدر الامكان.

طرائق التعليم

تشمل طرائق التعليم النظري والعملي كما مدرج ادناه مع ملاحظة ان الاعداد الكبيرة جدا من الطلبة مقارنة بأعداد التدريسيين وسعة القاعات الدراسية والمختبرات التعليمية تعيق نسيبا تطبيق تلك الطرائق بالشكل الأمثل. الذي نطمح اليه.

طريقة التعليم النظري

تلقى المحاضرات النظرية في القاعات الدراسية ويدير المحاضرة الأستاذ او الطالب مع الالتزام بما يلي:-

- التشجيع على التعليم المعتمد على الطالب.
- يقدم المحاضر في بداية المحاضرة الاهداف من تلك المحاضرة.
- اعتماد مناهج التعامل الصفي اللغوي الصوتي واللغوي الكتابي والرسوم بما يعين الطالب على الفهم.
- إشراك الطالب باعتماد أسلوب المناقشة التي يرأسها المحاضر و أسلوب الاستنتاج الجماعي وتحفيز الطالب على التفكير والنقاش والابتعاد عن الأسلوب الإملائي الحفظي
- دعم المحاضرة بالتقنيات التعليمية عبر الحاسب الآلي و خاصة برنامج عرض الشرائح والفيديو والاستعانة بالشبكة العنكبوتية.
- اعتماد التقويم التكويني من خلال اغناء المحاضرة بالمناقشات الصفية و الاختبارات الشفهية و القصيرة مع ملاحظة اداء الطلبة اضافة الى الواجبات اليومية.
- تشجيع الطلبة على تقديم السمونات والمحاضرات المنهجية بما يقوي شخصيتهم و يساهم من خلال المناقشات التي تحصل على فهم المادة بشكل اوسع.
- تشجيع الطلبة على تقديم التقارير العلمية في مادة الكيمياء و علاقتها بالطب مما يساعدهم على قراءة المصادر العلمية وادراك المادة الدراسية بصورة اوسع.
- اعتماد مبداء النقد و التثمين.
- تحفيز التفكير التحليلي لدى الطالب.
- تشجيع التفاعل الطلابي النشط من خلال الاستبيانات و المقابلات.
- تكييف مفردات المنهاج بما يتلائم مع ما يدرسه الطالب في مرحلته و ما سيدرسه في المراحل اللاحقة.
- توضيح المبادئ الأساسية للبحث العلمي في المادة الدراسية و تشجيع الطلبة معنويا على اجراء البحوث.
- التواصل المستمر مع الطلبة من خلال المواقع الإلكترونية وخاصة من خلال صف كوكل عبر الحساب الرسمي للكلية وإغناؤه بالمعلومات والمصادر التي تساعد الطالب في عملية التعلم.

طريقة التعليم العملي

ان طريقة التدريس العملي المذكورة ادناه يتم اعتمادها في جميع المواضيع العملية المدرجة في المنهاج و المعطاة للطلاب خلال السنة الدراسية وكما يلي:

- التشجيع على التعليم المعتمد على الطالب.

- يبدأ المحاضر (تدريسي او طالب) التدريس العملي في مختبر الكيمياء والكيمياء الحياتية بشرح نظري مفصل عن الموضوع مع طريقة إجراء التجربة و تتم مناقشة الموضوع مع الطلبة و طرح الاسئلة التي تتركز على حل المشكلات .
- يقسم طلبة المرحلة إلى عدة مجاميع رئيسية، كل مجموعته يخصص لها درس عملي لإجراء التجربة في المختبر.
- يبدأ الطلبة بعد تقسيم المجموعة الرئيسية إلى مجاميع صغيرة بإجراء التجربة بأنفسهم كذلك يقوم الطلبة بمناقشة الموضوع و نتائجها فيما بينهم و من خلال تلك المجاميع الصغيرة و ربطه بالمعلومات النظرية و تحت اشراف الكادر التدريسي.
- بدون الطلبة نتيجة كل تجربة أجريت في المختبر من قبلهم في دفتر خاص حيث يتم ابداء الملاحظات و توقيعه من قبل التدريسي المسؤول عن التجربة و يخصص له درجة ضمن درجة اليوميات الخاصة بمادة العملي.
- التواصل المستمر مع الطلبة من خلال المواقع الإلكترونية وخاصة من خلال صف كوكل عبر الحساب الرسمي للكلية وإغناؤه بالمعلومات و المصادر التي تساعد الطالب في عملية التعلم.

طرق تقييم واختبار الطلبة

يكون تقييم واختبار الطلبة من خلال اجراء الامتحانات النظرية و العملية بالإضافة الى تخصيص درجة خاصة بنشاطات الطلبة متمثلة باليوميات و كما يلي:

- السعي السنوي (٤٠٪)
 - امتحان العملي النهائي (١٠٪)
 - امتحان النظري النهائي (٥٠٪)
- تكون الية احتساب درجة السعي السنوي (٤٠٪) كما يلي:
- الامتحانات اليومية و النشاطات لمادة النظري في الفصل الدراسي الأول: ٢,٥٪
 - الامتحانات اليومية و النشاطات لمادة العملي في الفصل الدراسي الأول: ٢,٥٪
 - امتحان الفصل الدراسي الاول العملي: ٥٪
 - امتحان نصف السنة النظري: ٢٠٪
 - الامتحانات اليومية و النشاطات لمادة النظري في الفصل الدراسي الثاني: ٢,٥٪
 - الامتحانات اليومية و النشاطات لمادة العملي في الفصل الدراسي الثاني: ٢,٥٪
 - امتحان الفصل الدراسي الثاني العملي: ٥٪

على الطالب الحصول على ما لا يقل عن (٥٠٪) من الدرجة النهائية لغرض النجاح

ان أسلوب الاختبارات يعتمد على ما يلي:

- ١- تعتمد اليوميات على نشاطات الطلبة الذهنية و التي يتم اختبارها بعدة طرق منها اسلوب حل المشكلات و اختبارات تعتمد على العصف الذهني
- ٢- تعتمد الامتحانات النظرية على انواع مختلفة من الاسئلة من ضمنها الاختيارات المتعددة، الاجابات القصيرة و الاسئلة المقالية حيث يتم صياغتها بشكل يعتمد على اختبار مدى فهم الطالب للمادة و ليس حفظها اخذين بنظر الاعتبار ان تكون ضمن الأهداف التعليمية المحددة و تتوزع على جميع مفردات المنهاج عبر استخدام نظام blueprint اخذين بنظر الاعتبار أهمية الموضوع.
- ٣- تعتمد الامتحانات العملية على اختبارات اجراء التجربة و كذلك قياس مدى فهم الطالب لمادة النظري بالعملي بطرق مختلفة كإجراء الامتحانات الشفوية او OSPE او اسلوب

حل المشكلات اخذين بنظر الاعتبار ان تكون ضمن الأهداف التعليمية المحددة وتشمل جميع مفردات المنهاج.
 ٤- يتم اعداد الاسئلة من قبل تدريسيي المادة و يتم مراجعتها من قبل السيد رئيس الفرع.

Curriculum for Teaching Medicinal Chemistry / First Class

Duration and Units

Teaching is at both theoretical and practical levels

Theoretical teaching: number of hours per week:

- 2 hours/week in the first semester. (total 30 hours)
- 2 hours/week in the second semester. (total 30 hours)
- Total: 60 hours per academic year.
- Number of units: 4 units

Practical Teaching: number of hours per week:

- 2 hours/week in the first semester. (total 30 hours)
- 2 hours/week in the second semester. (total 30 hours)
- Total: 60 hours per academic year.
- Number of units: 2 units

Total number of units: 6 units

Syllabus and Instructional Objectives of Theoretical Teaching

1st Semester

Chapter: Lab Safety and Green Chemistry

Week	Lectures Title	Hours	Instructional Objectives
1 st and 2 nd	Introduction	1	At the end of the study, the students are supposed to be able to define the lab safety and green chemistry.
	Chemical Laboratory Safety and security.	2	At the end of the study, the students are supposed to be able to identify the general rules in lab safety and security.
	Green chemistry	1	At the end of the study, the students are supposed to be able to identify the green chemistry and its importance.

Chapter: Analytic Chemistry

Week	Lectures Title	Hours	Instructional Objectives
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3rd-11 th	Introduction.	1	At the end of the study, the students are supposed to be able to have a general idea about analytic chemistry and its relationship with medical study.
	Radioactivity and medical uses of radioactive isotopes.	2	At the end of the study, the students are supposed to be able to: 1- Identify the principle of radioactivity. 2- Explain the basic medical uses of radioactive substances in diagnosis and treatment of diseases.
	Acids, bases, and salts of medical interests.	2	At the end of the study, the students are supposed to be able to: 1- Identify the main acids, bases, and salts present in human. 2- Relate the subject with diseases affecting human.
	International system of units.	1	At the end of the study, the students are supposed to be able to: 1- Demonstrate the international system of units in medicine. 2- Apply the interconversion between traditional and international units.
	pH concept, acid-base balance.	2	At the end of the study, the students are supposed to be able to: 1- Understand the concept of pH and acid base balance. 2- Describe how the body can keep them in balance. 3- Define and classify acidosis and alkalosis.
	Solutions and methods of expressing concentration.	2	At the end of the study, the students are supposed to be able to: 1- Classify solutions. 2- Describe the different methods for expressing the concentration of solutions.
	Buffers and buffer systems of physiological importance.	2	At the end of the study, the students are supposed to be able to: 1- Define buffer. 2- Classify buffer system inside the body. 3- Explain the presence of constant pH in human blood.
	Colloidal chemistry and biological systems, dialysis and living system.	1	At the end of the study, the students are supposed to be able to: 1- Define colloidal chemistry. 2- Describe the biological system inside the body. 3- Correlate the concept of colloidal chemistry with its medical uses.
	Chelation and possible applications in medicine.	2	At the end of the study, the students are supposed to be able to: 1- Define chelation. 2- Correlate the concept of chelation with its medical uses.

	Ions in living system and their importance.	2	At the end of the study, the students are supposed to be able to: 1-Define ions. 2-Classify ions. 3-Correlate the ions present in the body with their importance in human.
	Pollutions Prevention and cure of pollution.	1	At the end of the study, the students are supposed to be able to: 1-Define pollution. 2-Know the types of pollution. 3-Describe the ways of protection from pollution and how to deal with the poisoned person.

2nd Semester

Chapter: Organic Chemistry

Week	Lectures Title	Hours	Instructional Objectives
1 st -7 th	Hydrocarbons	3	At the end of the study, the students are supposed to be able to: 1- Define hydrocarbons. 2-Classify hydrocarbons. 3-Describe the nomenclature, physical and chemical properties and the chemical reactions of alkanes, alkenes alkynes, benzene and aromatic hydrocarbons.
	Alcohols and phenols	2	At the end of the study, the students are supposed to be able to name alcohols and phenols, describe their physical and chemical properties and their chemical reactions.
	Carbonyl compounds (aldehydes and ketones)	2	At the end of the study, the students are supposed to be able to name different carbonyl compounds, describe their physical and chemical properties and their chemical reactions.
	Carboxylic acids and some of their derivatives	2	At the end of the study, the students are supposed to be able to name of carboxylic acids and some of their derivatives, describe their physical and chemical properties and their chemical reactions.
	Esters	2	At the end of the study, the students are supposed to be able to name esters, describe their physical and chemical properties and their chemical reactions.
	Amines.	2	At the end of the study, the students are supposed to be able to:

			1- Define amines. 2- Classify amines. 3- Name amines, describe their physical and chemical properties and their chemical reactions.
	Heterocyclic compounds	1	At the end of the study, the students are supposed to be able to: 1- Define heterocyclic compounds. 2- Classify heterocyclic compounds. 3- Name heterocyclic compounds, describe their physical and chemical properties and their chemical reactions.

Chapter: Biochemistry

Week	Lectures Title	Hours	Instructional Objectives
8 th -15 th	Introduction to carbohydrates.	1	At the end of the study, the students are supposed to be able to: 1- Learn, what are the carbohydrates ? 2- List the importance of carbohydrates. 3- Classify carbohydrates.
	The Stereochemistry of carbohydrates.	1	At the end of the study, the students are supposed to be able to demonstrate the three dimensional and cyclic structures of carbohydrates.
	Physical and chemical properties of monosaccharides.	1	At the end of the study, the students are supposed to be able to relate the physical and chemical properties of monosaccharides with medicine.
	Disaccharides. Oligosaccharides. Polysaccharides.	1	At the end of the study, the students are supposed to be able to describe the importance and structures of disaccharides, oligosaccharides and polysaccharides in our life.
	Introduction to lipids.	1	At the end of the study, the students are supposed to be able to: 1- Define lipids. 2- Describe the importance of lipids. 2- Classify lipids. 3- Compare between saturated and unsaturated fatty acids.
	Nomenclature and importance of fatty acids.	1	At the end of the study, the students are supposed to be able to name fatty acids by different ways of nomenclature and know their importance.
	Chemical properties of fats and oils.	1	At the end of the study, the students are supposed to be able to draw the products of hydrolysis, saponification, and hydrogenation reactions of triglycerides.
	Structures of phosphoglycerides , membrane structure	1	At the end of the study, the students are supposed to be able to: 1- Describe the basic structures of other lipids, including

	and steroids.		waxes, phosphoglycerides, lecithin, cephalins, sphingolipids, and glycolipids. 2-Identify the importance of lipids in cell membrane structure. 3- Identify steroids specially cholesterol.
	Introduction to proteins.	1	At the end of the study, the students are supposed to be able to define and classify proteins and amino acids.
	Reaction of amino acids.	1	At the end of the study, the students are supposed to be able to identify the reactions of amino acids.
	The structure and functions of protein	1	At the end of the study, the students are supposed to be able to: 1- Describe the primary, secondary, tertiary, and quaternary structure of proteins. 2- Correlate between the function of protein and human health.
	Introduction to nucleic acids.	1	At the end of the study, the students are supposed to be able to know the components of nucleic acids and nucleotides.
	General nucleotide structure.	1	At the end of the study, the students are supposed to be able to describe the primary structure of DNA and the 3D double-helix structure.
	DNA replication.	1	At the end of the study, the students are supposed to be able to identify DNA replication.
	Ribonucleic acid (RNA).	1	At the end of the study, the students are supposed to be able to: 1- Identify the structure of RNA. 2-Describe the transcription of DNA to RNA.
	The Genetic code.	1	At the end of the study, the students are supposed to be able to define genetic code, translation, protein synthesis and mutations.

Syllabus and Instructional Objectives of Practical Teaching

1st Semester		
Week	Subject	Instructional Objectives
1st	Introduction	At the end, the students should know the rules of the work in the medical chemistry lab in following practical lessons.

2 nd	Scientific lab. Equipment.	At the end, the students should be able to name the related equipment in lab and acquire a practical skill for their uses in the lab .
3 rd	Lab. safety	At the end, the students should be able to use the available lab safety equipment in emergency.
4 th	pH meter	At the end, the students should be able to use pH meter and interpret its results.
5 th	Chemical analysis.	At the end, the students should be able to know the theoretical and practical skills in chemical analysis.
6 th	Titration (Acid base)	At the end, the students should be able to do acid base titration and interpret the results.
7 th	Titration (Redox)	At the end, the students should be able to do redox titration and interpret the results.
8 th	Organic chemistry	At the end, the students should have theoretical and practical skills for analysis and interpretation of organic chemistry parameter results.
9 th	Identification of unknown (Formative assessment)	At the end, the students should have theoretical and practical skills in identifying the unknown chemical substances according to what they have learned in 1 st semester.
10 th	Revision	To remind students the skills learned previously in the first semester.
11 th	Practical examination	To assess the students about the skills they acquired in their practical lessons in the first semester.
12 th	Theoretical examination	To assess the students about the theoretical information and the skills of analyzing the results that they acquired in their practical lessons in the first semester.
2nd Semester		
1st	Carbohydrates (1)	At the end, the students should be

		able to differentiate practically between different types of monosaccharides and interpret the results.
2 nd	Carbohydrates (2)	At the end, the students should be able to test the presence of carbohydrates in a specimen and interpret the results.
3 rd	Carbohydrates (3)	At the end, the students should be able to differentiate practically between different types of disaccharides, interpret the results and hydrolyze the disaccharides.
4 th	Carbohydrates (4)	At the end, the students should be able to differentiate practically between different types of polysaccharides, interpret the results and hydrolyze the polysaccharides.
5 th	Identification of unknown (Formative assessment)	At the end, the students should have theoretical and practical skills in identifying the unknown carbohydrate substances according to what they have learned.
6 th	Proteins (1)	At the end, the students should be able to differentiate practically between different amino acids.
7 th	Proteins (2)	At the end, the students should be able to precipitate the protein and use the general color reactions of amino acids and proteins to distinguish between them.
8 th	Identification of unknown (Formative assessment)	At the end, the students should have theoretical and practical skills in identifying the unknown amino acids or protein substances according to what they have learned.
9 th	Enzyme	At the end, the students should be able to analyze the enzymes and compare the effect of different factors on enzyme activity.
10 th	Revision	To remind students of what they have learned previously in the second semester.

11 th	Revision	To remind students the skills learned previously in the second semester.
12 th	Practical examination	To assess the students about the skills they acquired in their practical lessons in the second semester.
13 th	Theoretical Examination	To assess the students about the theoretical information and the skills of analyzing the results that they acquired in their practical lessons in the second semester.
14 th	Final practical examination	To assess the students about the skills they acquired in their practical lessons in the first and second semesters.
15 th	Final theoretical examination	To assess the students about the theoretical information and the skills of analyzing the results that they acquired in their practical lessons in the first and second semesters.

References

I- Textbooks

1- Harper's illustrated biochemistry

Authors:

Rodwell VW
Bender DA
Botham KM
Kennelly PJ
Weil PA

Edition Number: 31st

Year of publication: 2018

Publishing Company: Mc Graw Hill Education / New York

Number of Pages: 2023

- It was chosen for students because it is a systematic course and includes the main topics that students need , in addition to containing images that help the student to understand the material.

2- The Chemical Basis of Life

Author:

George H. Schmid

Edition Number: 1st

Year of publication: 1982

Publishing Company: Little Brown and Company

Number of Pages: 941

II- Assistant Books

Title	Authors	Edition Number
Lippincott's Illustrated Reviews Biochemistry.	- Ferrier DR	6 th edition

III- Assistant Links

<https://classroom.google.com/u/0/c/NjlyNDg1NTM3Njgy>

<https://classroom.google.com/u/0/c/NjMzNDc0MjgzMzkz>

Curriculum for Teaching Biochemistry / Second Class

Duration and Units

Teaching is at both theoretical and practical levels.

Theoretical teaching: number of hours per week:

- 3 hours/week in the first semester. (total 45 hours)
- 3 hours/week in the second semester. (total 45 hours)
- Total: 90 hours per academic year.
- Number of units: 6 units

Practical Teaching: number of hours per week:

- 2 hours/week in the first semester. (total 30 hours)
- 2 hours/week in the second semester. (total 30 hours)
- Total: 60 hours per academic year.
- Number of units: 2 units

Total number of units: 8 units

Syllabus and Instructional Objectives of Theoretical Teaching

1st Semester			
Chapter: Enzymes			
Week	Lecture Titles	Hours	Instructional objectives
1 st 17-21/9/23	Introduction	1	At the end of the study, the students are supposed to be able to: 1-Define enzymes. 2-Differentiate between coenzymes and cofactors. 3- Classify enzymes.
	Structures of enzymes.	1	At the end of the study, the students are supposed to be able to: 1- Describe the chemical structure of enzymes. 2-Describe isoenzymes.
	Functions of enzymes.	1	At the end of the study, the students are supposed to be able to: 1-Discuss the catalytic function of enzymes. 2-Explain the role of enzymes in lowering activation energy.
2 nd 24-28/9/23	Enzymes kinetics.	1	At the end of the study, the students are supposed to be able to: 1-Define enzyme kinetics. 2-Explain the theories of enzyme kinetics.
	Mechanism of action.	1	At the end of the study, the students are supposed to be able to:

			<p>1-Describe the mechanism of the action of enzymes.</p> <p>2-Demonstrate the factors affecting the activity of enzymes.</p> <p>3- Correlate the subject with related clinical sciences.</p>
	Bioenergetics	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Define the bioenergetics.</p> <p>2-Define and classify the inhibitors of enzymes.</p> <p>3- Correlate the subject with related clinical sciences.</p>

Chapter: Biologic Oxidation

Week	Lecture Titles	Hours	Instructional objectives
3 rd 1-5/10/23	Introduction	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Define biologic oxidation.</p> <p>2-Classify oxidoreductases.</p> <p>3- Interpret the importance of biologic oxidation.</p>
	Oxidases and Dehydrogenases.	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Describe the mechanism of action.</p> <p>2-List the factors affecting the activity.</p> <p>3-Memorize examples for each enzyme.</p> <p>4-Correlate the subject with clinical sciences.</p>
	Oxygenases , peroxidases and superoxide dismutase.	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Describe the mechanism of action.</p> <p>2-List the factors affecting the activity.</p> <p>3-Memorize examples for each enzyme.</p> <p>4-Correlate the subject with clinical sciences.</p>

Chapter: Oxidative Phosphorylation

Week	Lecture Titles	Hours	Instructional objectives
4 th 8-12/10/23	Structure of mitochondria.	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Describe the structure of mitochondria.</p> <p>2- Locate the respiratory chain.</p> <p>3-Demonstrate the energy liberated in mitochondria.</p>
	Components of respiratory chain.	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Identify the component of the four complexes of respiratory chain.</p> <p>2-Demonstrate the sources of reducing equivalent.</p>
	Mechanism of action.	1	<p>At the end of the study, the students are supposed</p>

			to be able to: 1-Explain the chemiosmotic theory. 2-Describe the correlation between oxidation and phosphorylation. 3-List the sources of ATP inside the body. 4-Demonstrate the ATP/ADP cycle.
5 th 15-19/10/23	ATP synthase	1	At the end of the study, the students are supposed to be able to: 1-Describe the structure of ATP synthase. 2-Implement ATP synthase in oxidative phosphorylation.
	Inhibition of respiratory chain.	1	At the end of the study, the students are supposed to be able to: 1- Classify the inhibitors of respiratory chain. 2-Demonstrate the effect of inhibitors on health. 3-Correlate the subject with clinical sciences.
	Substrate shuttle .	1	At the end of the study, the students are supposed to be able to: 1-List the substrate shuttle. 2-Describe the mechanism of action. 3-Explain the different number of ATP produced in each shuttle system.

Chapter: Obesity and Metabolic Syndrome

Week	Lecture Titles	Hours	Instructional objectives
6 th 22-26/10/23	Introduction	1	At the end of the study, the students are supposed to be able to know the importance of the subject.
	Obesity	1	At the end of the study, the students are supposed to be able to: 1-Define obesity. 2-Classify obesity. 3- Understand the role of biochemistry in both the causes and outcome of obesity.
	Metabolic syndrome	1	At the end of the study, the students are supposed to be able to: 1-Define metabolic syndrome. 2-Classify metabolic syndrome. 3- Understand the role of biochemistry in both the causes and outcome of metabolic syndrome.

Chapter: Micronutrients

Week	Lecture Titles	Hours	Instructional objectives
7 th 29/10/23 – 2/11/23	Trace elements	1	At the end of the study, the students are supposed to be able to: 1-List the trace elements in human. 2-Discuss the biochemical and clinical role of trace elements in health and diseases.
	Introduction to	1	At the end of the study, the students are supposed

	vitamins		to be able to: 1-Define the vitamins. 2-Classify the vitamins. 3-Differentiate between water and lipid soluble vitamins.
	Folic acid and Vitamin B12	1	At the end of the study, the students are supposed to be able to: 1-Identify the chemical structure. 2-Memorize the sources. 3-Describe the function. 4-Describe the causes of its deficiency. 5-Relate the deficiency with clinical effect.
8 th 5-9/11/23	Vitamins B ₁ ,B ₂ and B ₆	1	At the end of the study, the students are supposed to be able to: 1-Identify the chemical structure. 2-Memorize the sources. 3-Describe the function. 4-Describe the causes of its deficiency. 5-Relate the deficiency with clinical effect.
	Vitamins A and D	1	At the end of the study, the students are supposed to be able to: 1-Identify the chemical structure. 2-Memorize the sources. 3-Describe the function. 4-Describe the causes of its deficiency. 5-Relate the deficiency and excess with clinical effect.
	Vitamins C, E and K	1	At the end of the study, the students are supposed to be able to: 1-Identify the chemical structure. 2-Memorize the sources. 3-Describe the function. 4-Describe the causes of its deficiency. 5-Relate the deficiency with clinical effect.
Chapter: Carbohydrate Metabolism			
Week	Lecture Titles	Hours	Instructional objectives
9 th 12-16/11/23	Introduction	1	At the end of the study, the students are supposed to be able to: 1-Define carbohydrates. 2-Describe the chemical structures. 3-Classify carbohydrates. 4-Know the sources of carbohydrates. 5-Name the pathways of glucose metabolism.
	Glycolysis	2	At the end of the study, the students are supposed to be able to: 1-Discuss its biochemical pathway.

			<p>2-Explain the energy produced.</p> <p>3- Memorize the clinical defects in the pathway.</p> <p>4-Describe the regulation of the pathway.</p>
10 th 19-23/11/23	Krebs cycle	2	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Discuss the biochemical pathway.</p> <p>2- Explain the energy produced.</p> <p>3- Memorize the clinical defects in the pathway.</p> <p>4-Describe the regulation of the pathway.</p>
	Pentose phosphate pathway	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Discuss the biochemical pathway.</p> <p>2-Identify the importance of pentose phosphate pathway.</p> <p>3- Memorize the clinical defects in the pathway.</p> <p>4-Describe the regulation of the pathway.</p>
11 th 26-30/11/23	Glycogen metabolism	2	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Describe the biochemical pathway of glycogenesis and glycogenolysis.</p> <p>2-Identify the importance of glycogen metabolism.</p> <p>3- Define glycogenesis.</p> <p>4-Describe the regulation of the pathway.</p>
	Gluconeogenesis	1	<p>At the end of the study, the students are supposed to be able to describe the synthesis of glucose from non-carbohydrate compounds.</p>
Chapter: Lipid Metabolism			
Week	Lecture Titles	Hours	Instructional objectives
12 th 3-7/12/23	Introduction	2	<p>At the end of the study, the students are supposed to be able to:</p> <p>1- Describe the properties of lipid.</p> <p>2-Classify lipids.</p> <p>3-Classify the types of fatty acids.</p> <p>4-Use the different types of nomenclature of fatty acids.</p> <p>5- Describe the importance of omega 3.</p> <p>6-Describe the isomerism of fatty acids.</p> <p>7-Memorize the chemical structures of phospholipid and triacylglycerol.</p>
	Fatty acids synthesis.	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Describe the biochemical pathway.</p> <p>2-Describe the regulation of the pathway.</p> <p>3- Explain the presence of essential fatty acids.</p> <p>4-Discuss the importance of essential fatty acids.</p>

13 th 10-14/12/23	Fatty acid oxidation	1	At the end of the study, the students are supposed to be able to: 1-Describe the biochemical pathway. 2-Explain the penetration of long chain acyl CoA into inner mitochondrial membrane. 3- Discuss the energy produced. 4-Describe the regulation of the pathway. 5-Identify the clinical aspect of fatty acid oxidation defect.
	Ketone bodies	1	At the end of the study, the students are supposed to be able to: 1- Define ketone bodies and classify its types. 2- Explain the formation of ketone bodies. 3-Describe the biochemical synthesis of ketone bodies. 4-Discuss the causes of ketonemia and ketoacidosis. 5-Relate the keto diet with weight reduction.
	Metabolism of triglycerides and phospholipids.	1	At the end of the study, the students are supposed to be able to: 1- Understand the synthesis and catabolism of triglycerides and phospholipids. 2- Relate the metabolism with clinical aspect.
14 th 17-21/12/23	Types of adipose tissues.	1	At the end of the study, the students are supposed to be able to: 1- Classify adipose tissues. 2-Compare between white and brown adipose tissues.
	Transport of lipid in human	2	At the end of the study, the students are supposed to be able to: 1-Explain the transport of lipids in body fluid. 2-Describe the structure and types of lipoproteins. 3-Identify the importance of lipoproteins and apoproteins. 4-Identify the sources of different lipoproteins. 5-Describe the pathways of endogenous and exogenous triacylglycerol. 6-Describe the metabolism of chylomicron, VLDL and HDL. 7-Explain antiatherogenic effect of HDL. 8-Describe the pathway of HDL metabolism. 9- Correlate the subject with related clinical sciences .
2nd Semester			
1 st	Bile acid and	1	At the end of the study, the students are supposed

28/1/24- 1/2/24	cholesterol synthesis.		to be able to: 1-Describe the pathway of bile acids and cholesterol synthesis. 2- Explain the cholesterol balance inside the body. 3- Explain the role of LDL in atherogenesis.
	Factors affecting serum lipid level and atherosclerosis	1	At the end of the study, the students are supposed to be able to: 1- List the factors affecting serum lipid level and atherosclerosis. 2-Describe their biochemical mechanism in development of atherosclerosis.
	Dyslipidemia	1	At the end of the study, the students are supposed to be able to: 1- List the causes of both hypolipidemia and hyperlipidemia. 2- Explain the lipid defects occur in these diseases. 3-Identify Fredriksson classification.

Chapter: Hormones

Week	Lecture Titles	Hours	Instructional objectives
2 nd 4-8/2/24	Introduction	1	At the end of the study, the students are supposed to be able to: 1-Define hormones. 2-Classify hormones. 3-Differentiate between group I and II hormones. 4-Describe target cells. 5-Describe hormone receptors.
	Adrenocortical hormones	2	At the end of the study, the students are supposed to be able to: 1-Identify the control of secretion. 2- Describe the biochemical synthesis. 3- Discuss their function. 4-Describe transport of hormones. 5- Demonstrate their metabolism.
3 rd 11-15/2/24	Testicular hormones	1	At the end of the study, the students are supposed to be able to: 1-Identify the control of secretion. 2- Describe the biochemical synthesis. 3- Discuss their function. 4-Describe transport of hormones. 5- Demonstrate their metabolism.
	Ovarian hormones	1	At the end of the study, the students are supposed to be able to: 1-Uderstand the control of secretion. 2- Describe the biochemical synthesis.

			<p>3- Discuss their function.</p> <p>4-Describe transport of hormones.</p> <p>5- Demonstrate their metabolism.</p> <p>6-Identify the peripheral aromatization.</p>
	Catecholamines	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Identify the control of secretion.</p> <p>2- Describe the biochemical synthesis.</p> <p>3- Identify the function.</p> <p>4-Describe transport of hormones.</p> <p>5- Describe the metabolism.</p> <p>6-Compare between catecholamines produced by adrenal medulla and extramedullary tissues.</p>
4 th 18-22/2/24	Thyroid hormones	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>2-Identify the control of secretion.</p> <p>2- Describe the biochemical synthesis.</p> <p>3- Discuss their function.</p> <p>4-Describe transport of hormones.</p> <p>5- Demonstrate their metabolism.</p> <p>6-Explain the peripheral conversion of T4.</p>
	Hypothalamic and pituitary hormones	2	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Identify these hormones. and their classification.</p> <p>2-Identify the control of secretion.</p> <p>3- Identify the function of these hormones.</p>
5 th 25-29/2/24	Pancreatic hormones	2	<p>At the end of the study, the students are supposed to be able to:</p> <p>1-Describe the chemical structure of these hormones.</p> <p>2-Uderstand the control of secretion.</p> <p>3- Describe the biochemical synthesis.</p> <p>4- Identify the function.</p> <p>5-Describe transport of hormones.</p> <p>6- Demonstrate their metabolism.</p>
	Parathyroid hormones	1	<p>At the end of the study, the students are supposed to be able to:</p> <p>1- Describe the chemical structure of parathyroid hormone.</p> <p>2-Describe the control of secretion of parathyroid hormone.</p> <p>3-Describe the biochemical synthesis of parathyroid hormones.</p> <p>4-Identify the function of parathyroid hormones.</p> <p>5-Describe the metabolism of parathyroid hormones.</p>

Chapter: Protein Metabolism

Week	Lecture Titles	Hours	Instructional objectives
6 th 3-7/3/24	Introduction.	1	At the end of the study, the students are supposed to be able to: 1-Define proteins. 2-Define amino acids. 3- Identify the chemical structure of amino acids 4- Classify amino acids. 5- Describe the function of proteins.
	In vivo synthesis of nutritionally nonessential amino acids	1	At the end of the study, the students are supposed to be able to: 1-Describe the biochemical pathways. 2- Explain the presence of essential amino acids. 3-Relate the subject with clinical problems.
	Formation of peptides	1	At the end of the study, the students are supposed to be able to: 1-Describe the order of protein classification. 2-Memorize the pathology of altered protein conformation. 3-Enumerate the biological function of protein. 4-Describe digestion and absorption of protein.
7 th 10-14/3/24	Catabolism of amino acid nitrogen	2	At the end of the study, the students are supposed to be able to: 1-Describe the biochemical stages of urea biosynthesis. 2-Explain the formation of urea. 3-Identify the metabolic disorders of urea cycle.
	Catabolism of carbon skeleton of amino acids	1	At the end of the study, the students are supposed to be able to: 1-Enumerate the types of catabolism of carbon skeleton. 2-Demonstrate the inborn error of metabolism. 3-Compare the different types of aminoaciduria.
8 th 17-21/3/24	Amino acids form pyruvate or intermediates of krebs cycle	1	At the end of the study, the students are supposed to be able to: 1- Describe the chemical pathways of the subject. 2-Relate the subject with the inborn error of metabolism.
	Amino acids form acetyl-CoA	1	At the end of the study, the students are supposed to be able to: 1- Describe the chemical pathways of the subject. 2-Relate the subject with the inborn error of metabolism.

	Conversion of amino acids to specialized products	1	At the end of the study, the students are supposed to be able to describe the pathway and the importance of conversion of amino acids to specialized products.
Chapter: Hemoprotein.			
Week	Lecture Titles	Hours	Instructional objectives
9 th 24-28/3/24	Biochemistry of hemoglobin and myoglobin.	2	At the end of the study, the students are supposed to be able to compare the structure and function between hemoglobin and myoglobin.
	Hemoglobinopathy	1	At the end of the study, the students are supposed to be able to relate the biochemical defects of hemoglobin with clinical diseases.
Chapter: Porphyrin			
Week	Lecture Titles	Hours	Instructional objectives
10 th 31/3/24 – 4/4/24	Heme biosynthesis	1	At the end of the study, the students are supposed to be able to illustrate the heme biosynthesis pathway.
	Porphyria	1	At the end of the study, the students are supposed to be able to: 1-Define porphyria. 2-Classify porphyria. 3-Identify clinical features, diagnosis, and treatment of porphyria. 4-Relate the biochemical aspect of porphyria with its clinical aspect.
	Heme catabolism	1	At the end of the study, the students are supposed to be able to: 1-Identify the transport and metabolism of bilirubin. 2-Define hyperbilirubinemia. 3- Classify hyperbilirubinemia.
Chapter: Tumor Markers			
Week	Lecture Titles	Hours	Instructional objectives
11 th 7-11/4/24	Introduction	1	At the end of the study, the students are supposed to be able to: 1-Define tumor markers. 2-Identify the types of tumor markers.
	Role of tumor markers in medicine.	2	At the end of the study, the students are supposed to be able to 1-Explain the role of tumor markers in health and disease. 2-Identify the characteristics of ideal tumor markers. 3-Identify the ideal ways to measure tumor markers.

Chapter: Cardiac Markers			
Week	Lecture Titles	Hours	Instructional objectives
12 th 14-18/4/24	Introduction	1	At the end of the study, the students are supposed to be able to: 1-Define cardiac markers. 2-Identify the types and biochemistry of cardiac markers.
	Role of cardiac markers in medicine.	2	At the end of the study, the students are supposed to be able to: 1-Explain the roles of cardiac markers in diagnosis and follow-up of ischemic heart disease. 2-Choose the ideal cardiac markers according to duration of ischemic attacks.
Chapter: Miscellaneous			
Week	Lecture Titles	Hours	Instructional objectives
13 th 21-25/4/24	Metabolic response to trauma	1	At the end of the study, the students are supposed to be able to demonstrate the hemodynamic and neuroendocrine changes that occur during trauma.
	Free radicals and antioxidants	2	At the end of the study, the students are supposed to be able to: 1- Define free radicals and antioxidants. 2- Explain the damaging effect of free radicals. 3-Identify the types and the biochemical function of antioxidant. 4-Compare between different sources of antioxidants.

Syllabus and Instructional Objectives of Practical Teaching

1st Semester		
Week	Subject	Instructional Objectives
1 st 17-21/9/23	Introduction SI Units	At the end, the students should be able to: 1- know the rules of the work in the biochemistry lab in following practical lessons. 2- Memorize the SI Units which studied in the 1 st class.
2 nd 24-28/9/23	Types of specimens	At the end, the students should be able to describe the types of specimens and organize the ideal ways for the collection of

		specimens.
3 rd 1-5/10/23	Urine Examination (1)	At the end, the students should be able to examine and describe the normal urine sample.
4 th 8-12/10/23	Urine Examination (2)	At the end, the students should be able to examine and describe the abnormal urine sample and relate the result with diseases.
5 th 15-19/10/23	Spectrophotometer	At the end, the students should be able to use and describe the content and the principle of spectrophotometer.
6 th 22-26/10/23	Calibration Curve	At the end, the students should be able to do and use the calibration curve.
7 th 29/10/23 – 2/11/23	Serum Albumin	At the end, the students should be able to measure serum albumin concentration and interpret the results.
8 th 5-9/11/23	Blood Glucose	At the end, the students should be able to measure blood glucose concentration and interpret the results.
9 th 12-16/11/23	Serum Calcium	At the end, the students should be able to measure serum calcium concentration and interpret the results.
10 th 19-23/11/23	Serum Phosphorus	At the end, the students should be able to measure serum phosphorous concentration and interpret the results.
11 th 26-30/11/23	Serum Uric acid	At the end, the students should be able to measure serum uric acid concentration and interpret the results.
12 th 3-7/12/23	Revision	To remind students the skills learned previously in the first semester.
13 th 10-14/12/23	Practical examination	To assess the students about the skills they acquired in their practical lessons in the first semester.
14 th 17-21/12/23	Theoretical examination	To assess the students about the theoretical information and the skills of analyzing the results that they acquired in their practical

		lessons in the first semester.
2nd Semester		
1 st 28/1/24- 1/2/24	Serum Protein Electrophoresis	At the end, the students should be able to perform and interpret serum protein electrophoresis results.
2 nd 4-8/2/24	Lipid Profile (1)	At the end, the students should be able to measure serum cholesterol and triglycerides concentration and interpret the results.
3 rd 11-15/2/24	Lipid Profile (2)	At the end, the students should be able to: 1-Measure serum HDLC-concentration and interpret the results. 2-Design lipid profile report and interpret the results of all parameters.
4 th 18-22/2/24	P.C.R.	At the end, the students should be able to perform and interpret P.C.R. results.
5 th 25-29/2/24	Serum Urea	At the end, the students should be able to measure serum urea concentration and interpret the results.
6 th 3-7/3/24	Serum Creatinine	At the end, the students should be able to measure serum creatinine concentration and interpret the results.
7 th 10-14/3/24	Serum Transaminases	At the end, the students should be able to measure serum ALT activity and interpret the results.
8 th 17-21/3/24	Serum Alkaline Phosphatase	At the end, the students should be able to measure serum ALP activity and interpret the results.
9 th 24-28/3/24	Serum Bilirubin	At the end, the students should be able to measure serum bilirubin profile and interpret the results.
10 th 31/3/24 – 4/4/24	Revision	To remind students the skills learned previously in the second semester.
11 th 7-11/4/24	Practical examination	To assess the students about the skills they acquired in their practical lessons in the second semester.
12 th 14-18/4/24	Theoretical Examination	To assess the students about the theoretical information and the

		skills of analyzing the results that they acquired in their practical lessons in the second semester.
13 th 21-25/4/24	Final practical examination	To assess the students about the skills they acquired in their practical lessons in the first and second semesters.
14 th 28/4/24-2/5/24	Final theoretical examination	To assess the students about the theoretical information and the skills of analyzing the results that they acquired in their practical lessons in the first and second semesters.

References

I- Textbooks

Harper's illustrated biochemistry

Authors:

Rodwell VW

Bender DA

Botham KM

Kennelly PJ

Weil PA

Edition Number: 31st

Year of publication: 2018

Publishing Company: Mc Graw Hill Education / New York

Number of Pages: 2023

- It was chosen for students because it is a systematic course and includes the main topics that students need , in addition to containing images that help the student to understand the material.

II- Assistant Books

Title	Authors	Edition Number
Lippincott's Illustrated Reviews Biochemistry	- Ferrier DR	6 th edition

Tietz Textbook of Clinical Chemistry and Molecular Diagnostics	-Rifai N - Horvath AR - Wittwer C	6 th edition
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III -Assistant Links:

<https://www.news-medical.net/health/The-Urea-Cycle-Step-by-Step.asp>

<https://en.wikipedia.org/wiki/Hormone>

<https://www.verywellhealth.com/lynne-eldridge-md-2248383>

<https://classroom.google.com/u/0/c/NjlyNDU4MDk3ODEz>

<https://classroom.google.com/u/0/c/NjMzNDcyNTI3NDQx>