

**Department of: food technology , field crop, foresters**

**College of: AGRICULTURE**

**University of: SALAHADDIN-ERBIL**

**Subject: BIOCHEMISTRY**

**Course Book: 2nd *YEAR STUDENT***

**Lecturer's name: Dr Sazan Mumtaz Haidary**

**Academic Year: 2021/2022**

 **Course Book**/ **1st semester: 2nd Stage**

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| **1. Course name** | **Biochemistry** |
| **2. Lecturer in charge** | **Dr. Sazan Mumtaz haidary** |
| **3. Department/ College** | **Food technoloy/AGRICULTURE** |
| **4. Contact** | **e-mail: sazanhaidary @yahoo.om****0704484547** |
| **5. Time (in hours) per week**  | **Theory: 2** **Practical: 6**  |
| **6. Office hours** |  **Sunday, ( 9.0 am to 1.0 pm)**  |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **Dr. Sazan Mumtaz haidary** |
| **9. Keywords** |  |
| **Course Content:** The lectures involves best information about different types Carbohydrate molecules or compounds, this is related to their structure, nomenclature physical properties, risks of them and their effects on the human health, their chemical properties with the mechanism of reaction occuring .Also the course contents the type of bonds which they connect elements or various atoms to form these compounds.  * The most important solvents within the Carbohydrates, lipids are also within the course content their importance effects and relation.
* The Biochemistry compounds which are taken in this course are: Monosaccharide

Disaccharides, polysaccharides, starch. * **Carbohydrates** (glycans) have the following basic composition.
* (CHO)n
* Aim: to describe and explain, *in molecular terms*, all chemical processes of living cells
	+ Structure-function
	+ Metabolism and Regulation
	+ How life began

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| **Course Description:** The topics listed in the syllabi will be covered in the lectures.The students will be asked to study all topics in the lectures at home.To get the best of the course it is suggested that the students attend classes as much as possible. Lectures note, are for supporting not for submitting the reading material try as much as possible to participate in classroom preparing the assignments given in the course. I will assign an extensive selection of problems, it will be assume that every students works out each of these problems.The activity of the students in each lecture will be recorded for progressing the role of teaching ,most of the students contributing in theDebating and giving the critical thinking about the problems.  |
| **Course Objectives:** This course is a natural continuation of a course in Biochemistry, but the material is more focused. The basic goal is to establish a connection between the chemical structure of Biochemistry compounds and their activity in chemical reactions, preparation in food products. The more general objective of this course is to continue providing a deeper understanding and working knowledge of Carbohydrate, lipids compounds, while in the process strengthening analytical skills increasing students ability to communicate practical usage of chemical solvents and their properties, making them comfortable with reading and understanding chemical compounds & the relation between chemical structure on their own and continuing to develop their appreciation for abstract Biochemistry . |
|  **Course Reading List and References‌** |
| Main references | Magazines and review (Internet) |
| 1-Chemistry of Protein Assay” Thermo Scientific Protein Methods Library. <http://www.piercenet.com>2- Wolever, Thomas M. S. (2006), [http://books.google.com/books?id=\_UkSoDwCN80C&pg=PA65&dq=sugar+absorbed+more+rapidly&hl=en&sa=X&ei=kAr3UMrzFZC68wTalYFo&ved=0CEcQ6AEwBA - v=onepage&q=sugar%20absorbed%20more%20rapidly&f=false](http://books.google.com/books?id=_UkSoDwCN80C&pg=PA65&dq=sugar+absorbed+more+rapidly&hl=en&sa=X&ei=kAr3UMrzFZC68wTalYFo&ved=0CEcQ6AEwBA#v=onepage&q=sugar%20absorbed%20more%20rapidly&f=false)Daly ME, Vale C, Walker M, Littlefield A, Alberti KG, Mathers JC (2000).3- Fahy E, Subramaniam S, Murphy RC, Nishijima M, Raetz CR, Shimizu T, Spener F, van Meer G, Wakelam MJ, Dennis EA. (2009). | 1. Wolever *et al*., 1993; Lee and Wolever, 1998).
2. Vance JE, Vance DE. (2002). Biochemistry of Lipids, Lipoproteins and Membranes. Amsterdam: Elsevier. [*ISBN*](https://en.wikipedia.org/wiki/International_Standard_Book_Number) [*978-0-444-51139-3*](https://en.wikipedia.org/wiki/Special%3ABookSources/978-0-444-51139-3).
3. Mashaghi S, Jadidi T, Koenderink G, Mashaghi A. (2013). "Lipid nanotechnology". International Journal of Molecular Sciences **14** (2): 4242–4282. [*doi*](https://en.wikipedia.org/wiki/Digital_object_identifier):[*10.3390/ijms14024242*](https://dx.doi.org/10.3390/ijms14024242)
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 **Syllabus**

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| **No.** | **Title of the Subject** |
|  **Week 1**  | Sources of Carbohydrates, Biochemistry definition, Aim, Carbohydrates, Aldopentoses and Aldohexoses, Types of Carbohydrates |
| **Week 2** | Monosaccharides, Monosaccharides: Single Sugars D vs L DesignationSugar NomenclatureHemiacetal & hemiketal formation |
| **Week 3** |  Haworth projections, 6-member pyranose, 5-member furanose ringCyclization of glucose produces a new asymmetric center Chair, boat  |
| **Week 4** | Sugar derivativesN-acetylneuraminate (N-acetylneuraminic acid, also called sialic acid), Glycosidic Bonds, Disaccharides |
| **Week 5** | Maltose, Sucrose, LactoseComplex CarbohydratesOligosaccharidesComplex Carbohydrates  |
| **Week** 6 | Polysaccharides, Amylose, StarchAmylase, amylopectin, Glycogen,  |
| **Week** 7 | Cellulose, Microfibers, Dietary Fiber, Functional FiberGlycosaminoglycans, Hyaluronate, glycosaminoglycanJoining and Cleaving Sugar Molecules |
| **Week** 8 | Examination + discussion. |
| **Week** 9 | Lipids, Types of Lipids, Fatty Acids, Fats, and OilsChemical Properties of Triglycerides,Types of Lipids |
| **Week** 10 |  Lipid Molecule, Fatty Acids, Fatty Acids CommonlyLipid Classes, Saturated and Unsaturated Fatty Acids1- Saturated: C–C bonds: the SFA’s of a lipid have no double bonds between carbons in chain.2- Unsaturated: one or more C=C bonds |
| **Week** 11 | Structures, Unsaturated fatty acids,Cis double bonds,Properties of Saturated Fatty Acids |
| **Week 12** | Wax, Fats and Oils, Triglycerides (tri acylglcerols)Learning Check L2What are the fatty acids in the following triglyceride?Solutions L2: What are the fatty acids in the following triglyceride? |
| **Week 13** | Properties of Triglycerides* Hydrogenation
* Hydrolysis

Hydrogenation, Product of HydrogenationSaponification and Soap |
| **Week 14** | Saponification: saponification:Hydrolysis of fats with alkalisuch as NaOH or KOH yields soaps (saponification), salts of ionized fatty acids.Phospholipides |
| **Week 15** | Phosphatylcholine, Glycolipid ,Characterization of fats. Essential Fatty Acids. |

**Patterns of questions and answers or Examination question sample:**

**Q1/ Choose the correct answer**

**1. The secondary structure of protein represents**

a) Linear sequence of amino acids joined by peptidebond

b) 3dimensionalstructure of protein

c) & helix and beta plated sheet

d) sub unit structure of protein

**2. Carbohydrates are**

a) polyhydroxy aldehydes and phenols

b) polyhydroxy aldehydes and ketones

c) polyhydroxy ketones and phenols

d) polyhydroxy phenols and alcohols

Q2/ Complete the following reaction:

1. Glucose + C6H5NH2

(CH3CO) 2O

2. Glucose

 Pyridine

 NaBH4

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Q3/Answer the following:

 A- How are proteins constructed?

B- What is the Classification of lipids?

C- What are the enzymes involved in digestion of lipids?

**Syllabus of Practical Biochemistry for the second stages**

1. **General tests for the identification of carbohydrates, mono di and polysaccharides.**

**Tests:**

- Molischs test

- Anthrone test

- Bials test

- Aniline test

- Resorcinol (selivanoffs test )

- Reducing sugars (Fehling's, Benedict's and Barfoed's reagents)

- Music acid test

- Hydrolysis and inversion of sucrose

- Picric acid test

- Phenyl hydrazine test

- Iodine test

- Starch hydrolysis

**2- Lipids:**

**The physical properties of lipid, saturated and unsaturated are identified by the following tests:**

* grease – spot formation
* solubility
* Emulsification
* Acrolein Test
* Dunstan's test for free glycerol
* Cupric acetate test
* Free fatty acid test
* Halogenations test

**3- Quantitative analyses for fats and oils are performed by the bellow tests:**

**1) Saponification value**

**2) Iodine value**

**3) Acids value**

**4) Peroxide value**

**4- Identification of cholesterol:**

1. **Tests of Cholesterol**
2. **Cries qualitative test**

Lecturer

Dr. sazan mumtaz haidary