وزارة التعليم العالي والبحث العلمي
الجامعة التقنية الشمالية
المعهد التقني كركوك

الحقيبة التعليمية

القسم العلمي:	تقنيات صحة المجتمع
اسم المقرر:	الكيمياء الحياتية
المرحلة / المستوى:	الاول
الفصل الدراسي:	الاول
السنة الدراسية:	٢٠٢٤_٢٠٢٥

معلومات عامة

اسم المقرر:	**الكيمياء الحياتية**					
القسم:	تقنيات صحة المجتمع					
الكلية:	المعهد التقني الطبى كركوك					
المرحلة / المستوى	الاول					
الفصل الدراسي:	الاول					
عدد الساعات الاسبوعية:	نظري	١	عملي	٣		
عدد الوحدات الدراسية:	٤					
الرمز:	CHT113					
نوع المادة	**نظري**		**عملي**		**كلهما**	**نعم**
هل يتوفر نظير للمقرر في الاقسام الاخرى	لايوجد					
اسم المقرر النظير	لايوجد					
القسم	لايوجد					
رمز المقرر النظير	لايوجد					

معلومات تدريسي المادة

اسم مدرس (مدرسي) المقرر:	**م.م. هەوار صباح عبدالله**
اللقب العلمي:	**مدرس مساعد**
سنة الحصول على اللقب	٢٠٢٤
الشهادة :	**ماجستير**
سنة الحصول على الشهادة	**٢٠٢٣**
عدد سنوات الخبرة (تدريس)	**٨ اشهر**

الوصف العام للمقرر

تدريس وتعليم الطلبة على كافة المعلومات الضرورية واللازمة الخاصة بمادة الكيمياء الحياتية مما يؤهلهم للعمل والبحث في كافة مجالات الكيمياء الحياتية.
يشمل هذا المقرر دراسة الكيمياء الحياتية تبدأ بشكل عام عن علم الكيمياء, وتاريخ الكيمياء الحياتية ومجالات تطبيقها وعن توازن المعادن في جسم الانسان (الماء و المعادن و العمليات الايضية) وشملت المقرر عن الاحماض الامينية والبروتينات ,الانزيمات , الكاربوهيدرات , الدهون , الهرمونات , الاحماض النووية والفيتامينات ويسمح للطالب فهم بعض الفحوصات التحليلية المختبرية والامراض التي تصيب الانسان.

الاهداف العامة

- تمكين الطلبة من الحصول على المعرفة والفهم للكيمياء الحياتية.
- تمكين الطلبة من الحصول على المعرفة والفهم للتراكيب الكيميائية للمركبات الحياتية.
- تمكين الطلبة من الحصول على المعرفة والفهم لميكانيكية التفاعلات الحياتية وطرق الكشف عن المركبات الحياتية.
- تمكين الطلبة من الحصول على المعرفة والفهم للتجارب العملية للكيمياء الحياتية.

الأهداف الخاصة

يهدف هذا المقرر إلى إكساب الطلبة المعلومات المرتبطة بعلم وظائف الاعضاء الوصفي والوظيفي ووظائف اجهزة الجسم المرتبطة به والتي تشمل:

١. سيكون الطالب قادرا على تعريف علم الكيمياء العام .
٢. سيكون الطالب قادرا على فهم التفاعلات الكيميائية الحياتية
٣. سيكون الطالب قادرا على التعرف المعادن في جسم الانسان ومستواها الطبيعي
٤. سيكون الطالب قادرا على التعرف وتصنيف واهمية الاحماض الامينية والبروتينات والانزيمات والكاربوهيدرات والدهون والهرمونات والاحماض النووية والفيتامينات ومستواها الطبيعي في جسم الانسان عن طريق الفحوصات الكيميائية ..

أمثلة الأهداف التعليمية.

- إكساب المتعلم مهارات القراءة .
- إلمام المتعلم بمعرفة عناصر الكيمياء الحياتية في جسم الانسان ومكوناته .

أمثلة أهداف تدريسية:

بعد الانتهاء من الدرس (المحاضرة) سيكون الطالب قادرا على ان:

- يميز بين عناصر الكيمياء الحياتية ومكوناته .

المتطلبات السابقة

- يجب ان يسجل في مقرر الكيمياء الحياتية في الفصل الاول.

الأهداف السلوكية او نواتج التعلم		
ت	تفصيل الهدف السلوكي او مخرج التعليم .	آلية التقييم
١	أن يعرف الطالب مقدمة عن الكيمياء العامة	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة
٢	ان يعرف الطالب عن الكيمياء الحيوية الخلوية	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة
٧	ان يستعرض الطالب ميكانيكية تنظيم مستوى الاس الهيدروجيني	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة
٨	ان يعرف الطالب اهمية الماء والالكتروليتات وانوعها .	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة
٩	ان يعرف الطالب تصنيف ومصادر الاحماض الامينية والبروتينات .	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة
١٠	ان يعرف الطالب تعريف وتصنيف الانزيمات	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة
١١	ان يعرف الطالب تعريف وتصنيف واهمية الكاربوهيدرات	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة
١٢	ان يعرف الطالب تعريف وتركيب وتصنيف الليبدات	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة
١٣	ان يتعلم الطالب تعريف ووظائف والية عمل وافراز الهرمونات.	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة
١٤	ان يعرف الطالب كيمياء الاحماض النووية .	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة
١٥	ان يعرف الطالب تعريف وتصنيف ومصادر الفيتامينات	الاختبارات والامتحانات ،التقارير ، النقاشات، الملاحظة

أساليب التدريس (حدد مجموعة متنوعة من أساليب التدريس لتناسب احتياجات الطلاب ومحتوى المقرر)

الاسلوب او الطريقة	مبررات الاختيار
1. التنظيم التقليدي (المحاضرات مباشرا)	وذلك لتنظيم الوقت وسهولة التنفيذ والوضوح وللسيطرة على الفصل الدراسي والحفاظ على النظام والتركيز
2. التعليم التعاوني	وذلك لتعزيز مهارات التواصل وتنمية مهارات العمل التعاوني وزيادة الدافعية والتحفيز
3. الفحوصات العملية	وذلك لتنمية مهارات البحث والتحليل وتطوير التعلم الذاتي والاستقلالية
4.المناقشة والحوار	وذلك لتطوير مهارات التفكير النقدي وتعميق الفهم ويعزز الابتكار والابداع

الكيمياء الحياتية						
عنوان الفصل	الوقت					
التوزيع الزمني	النظري	العملي	العنوان الرئيسي	العنوان الفرعي	طريقة التدريس	التقنيات	طرق القياس
الأسبوع الأول	1 ساعة	3 ساعة	General chemistry	Atoms, elements, molecules and compound .	محاضرة	عرض تقديمي، شرح، أسئلة وأجوبة, مناقشة	الاختبارات القصيرة ،الاسئلة والمناقشة ، تحليل الردود
				Types of forces in molecules .			
				Chemical reaction.			
				Measurements in chemistry.			
الاسبوع الثاني	1 ساعة	3 ساعة	History and scope of biochemistry	Cell biochemistry	محاضرة	عرض تقديمي، شرح، أسئلة وأجوبة, مناقشة	الاختبارات القصيرة ،الاسئلة والمناقشة ، تحليل الردود
				Subcellular organelles and cell membranes			
				Cellular buffers			
				Mechanism of regulation of PH			
				Acid-base balance			
				Homeostasis mechanism			
				Transport through biological			

	الوقت						
	النظري	العملي	العنوان الرئيسي	العناوين الفرعية	طريقة التدريس	التقنيات	طرق القياس
الاسبوع الثالث	1 ساعة	3 ساعة	Water and electrolytes balance and imbalance	Water disturbance and balance intake and output of water	محاضرة	عرض تقديمي، شرح، أسئلة وأجوبة, مناقشة	الاختبارات القصيرة ،الاسئلة والمناقشة ، تحليل الردود
				Electrolyte Composition and disorder of (sodium , potassium , iron , calcium , chloride)			
				Biomolecules			
				Metabolic process			
الاسبوع الرابع والخامس	1ساعة	3 ساعة	Amino acid and proteins	Amino acid and proteins	محاضرة	عرض تقديمي، شرح، أسئلة وأجوبة, مناقشة	الاختبارات القصيرة ،الاسئلة والمناقشة ، تحليل الردود
				Classification and properties of amino acid			
				General metabolism of amino acid & formation of ammonia			
				Peptide synthesis			
				Structure , properties &classification of protein			
				Functions of protein			
				Catabolism &nitrogen balance			
				Urea cycle			

عنوان الفصل	الوقت		العنوان الرئيسي	العناوين الفرعية	طريقة التدريس	التقنيات	طرق القياس
التوزيع الزمني	نظري	عملي					
الاسبوع السادس	1 ساعة	3 ساعة	Enzyme	Definition & general characteristic	محاضرة	عرض تقديمي، شرح، أسئلة وأجوبة, مناقشة	الاختبارات القصيرة ،الاسئلة والمناقشة ، تحليل الردود
				Classification			
				Enzyme specificity			
				Enzyme catalysis &active site			
				Factors influencing enzyme activity			
الاسبوع السابع والثامن	1 ساعة	3 ساعة	Carbohydrate	Definition ,classification , &biological importance	محاضرة	عرض تقديمي، شرح، أسئلة وأجوبة, مناقشة	الاختبارات القصيرة ،الاسئلة والمناقشة ، تحليل الردود
				Glycoside bond			
				Metabolism of carbohydrate Glycolysis &			

			Gluconeogenesis Glycogenolysis &Glycogenesis				
			Metabolism of disaccharide & polysaccharide				
			Energetic of metabolic cycle				
الاسبوع التاسع و العاشر	ا ساعة	3 ساعة	Classification , structure , properties	Lipids	محاضرة	عرض تقديمي، شرح، أسئلة وأجوبة, مناقشة	الاختبارات القصيرة ،الاسئلة والمناقشة ، تحليل الردود
			Natural fats				
			Storage				
			Hydrolysis				
			Metabolism				
			Cholesterol Function & metabolism				
			Lipoprotein structure				

الفصل الرابع (من المحتوى العلمي)							
عنوان الفصل	الوقت						
التوزيع الزمني	نظري	عملي	العناوين الرئيسية	العناوين الفرعية	طريقة التدريس	التقنيات	طرق القياس
الأسبوع الحادي عشر الثاني عشر	1 ساعة	3 ساعة	Hormone	Definition & functions	محاضرة	عرض تقديمي، شرح، أسئلة وأجوبة, مناقشة	الاختبارات القصيرة ،الاسئلة والمناقشة ، تحليل الردود
				Mechanism of hormone action			
				Effect and properties of some hormone			
الاسبوع الثالث عشر والرابع عشر	1 ساعة	3 ساعة	Nucleotides	Chemistry of RNA &DNA	محاضرة	عرض تقديمي، شرح، أسئلة وأجوبة, مناقشة	الاختبارات القصيرة ،الاسئلة والمناقشة ، تحليل الردود
				Degradation			
				Metabolism			
				Free radical			
				Anti oxidant			
الاسبوع الخامس عشر	1 ساعة	3 ساعة	Vitamins	Definition ,sources,	محاضرة	عرض تقديمي، شرح، أسئلة وأجوبة, مناقشة	الاختبارات القصيرة ،الاسئلة والمناقشة ، تحليل الردود
				deficiency			
				excess			

خارطة القياس المعتمدة

المحتوى التعليمي	عناوين الفصول	الأهمية النسبية	الأهداف السلوكية					عدد الفقرات
			المعرفة	الفهم	التطبيق	التحليل	التقييم	
			٢٠%	٢٥%	٢٠%	١٥%	٢٠%	
الفصل الاول	مقدمة في علم الكيمياء العام نوازن الماء والشوارد	١٣%	١	١	١	١	١	٥
الفصل الثاني	الاحماض الامينية البروتينات	٢٠ %	٢	٣	٢	١	٢	١٠
الفصل الثالث	الانزيمات الكربوهيدرات	٢٠%	٢	٢	٢	١	٢	٥
الفصل الرابع	الدهون الهرمونات	٢٠%	١	٢	١	١	١	١٠
الفصل الخامس	الاحماض النووية الفيتامينات	٢٧%	٢	٢	٢	٢	٢	١٠
المجموع		١٠٠%	٨	١٠	٨	٦	٨	٤٠

المحتوى العلمي

المحتويات (لكل فصل في المقرر)

رقم المحاضرة :	الاولى
عنوان المحاضرة:	مقدمة في علم الكيمياء العام
اســـم المدرس:	م.م. هەوار صباح عبدالله
الفئة المستهدفة :	طلاب المستوى الاول
الهدف العام من المحاضرة :	
الأهداف السلوكية او مخرجات التعلم:	1-التعرف على تعريف علم الكيمياء العام 2-التعرف على انواع التفاعلات الكيميائية 3- نسبة المعادن وتوزيعها في جسم الانسان
استراتيجيات التيسير المستخدمة	عرض تقديمي، شرح، الصورة
المهارات المكتسبة	مهارات التعلم على الكيمياء ,الحياتية, مهارات العرض والتقديم
طرق القياس المعتمدة	الاختبارات التحريرية ،الاسئلة والمناقشة ، تحليل الردود

- الاسئلة القبلية:

Q1:Define Chemistry , Element , Atom,

Chemistry: is the study of the composition, structure and properties of matter.

It is often called the "**central science**" because it combines physics, math, biology, and even environmental science.

It includes the study of individual elements, chemical compounds, the transformation of these elements and compounds, as well as energy input and output during these transformations.

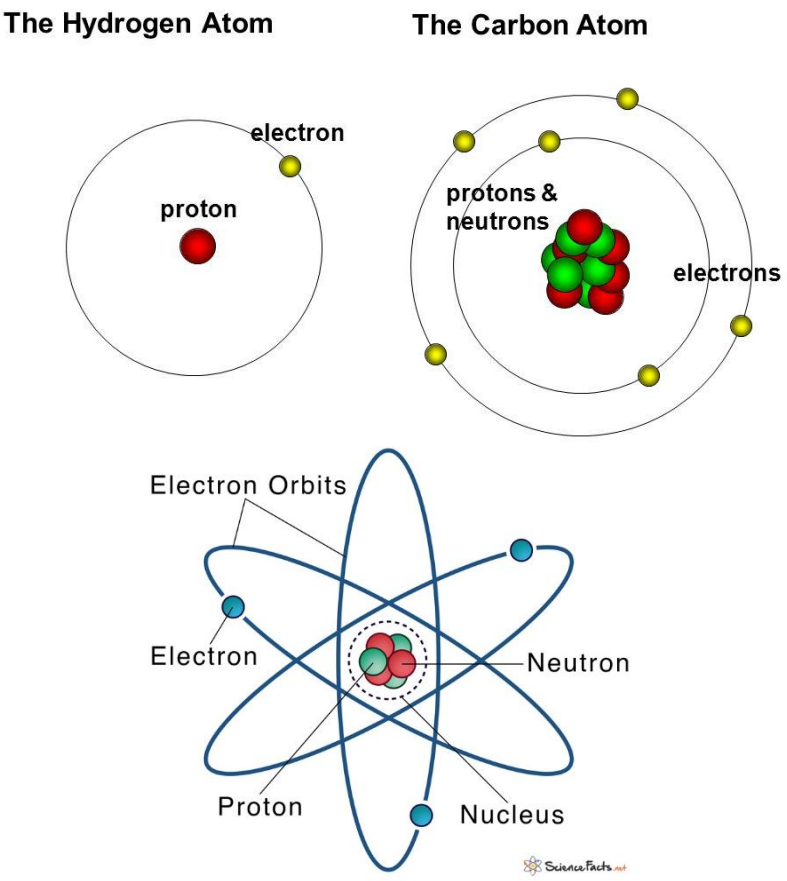
Simply put, it is the study of matter and energy.

Biochemistry : is the study of chemical processes in living organisms, much of biochemistry deals with the structures and functions of cellular components such as proteins ,carbohydrates ,lipids and other .

Biochemistry : a study the molecular structure and function of organic compounds with living organisms .

Atom : it is the smallest unit of a substance. All atoms are made up of a number of protons, neutrons and electrons.

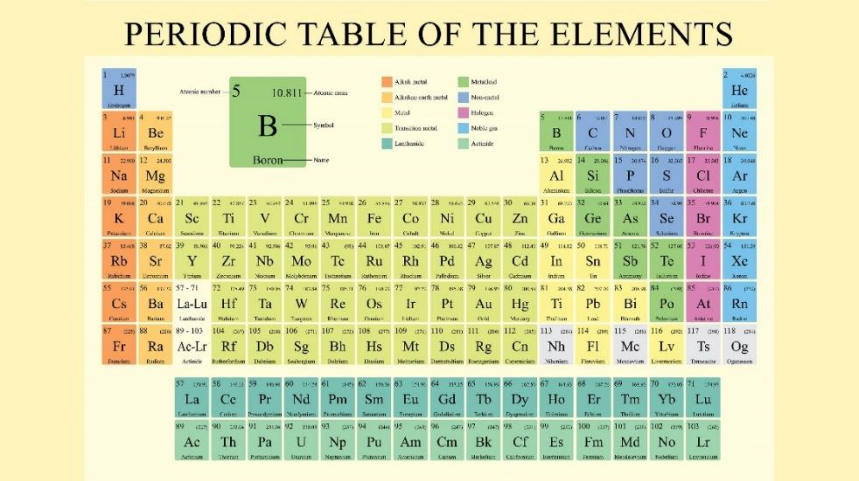
Two Examples of Atoms



Element : chemical element, also called element, any substance that cannot be decomposed into simpler substances by ordinary chemical processes.

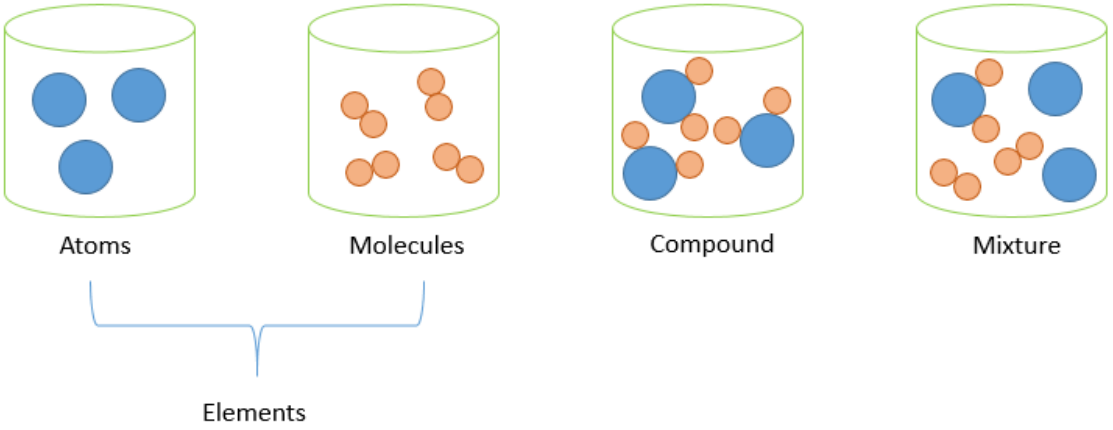
Elements are the fundamental materials of which all matter is composed. An element a substance made up of only one type of atom, all with the same number of protons. Pure gold is a famous example.

* 118 elements have been discovered.



Molecules: A molecule is two or more atoms connected by chemical bonds, which form the smallest unit of a substance that retains the composition and properties of that substance. Molecules form the basis of chemistry.

Compound: substance composed of two or more elements that have combined chemically.



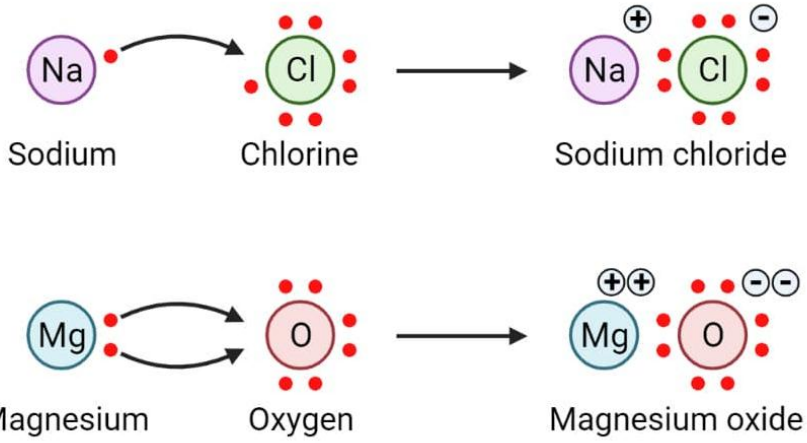
Types of Chemical Bonds

1- ionic bond

is a type of electrostatic interaction between atoms which have a large difference electronegativity.

This chemical bond involves a transfer of an electron, so one atom gains an electron while one atom loses an electron.

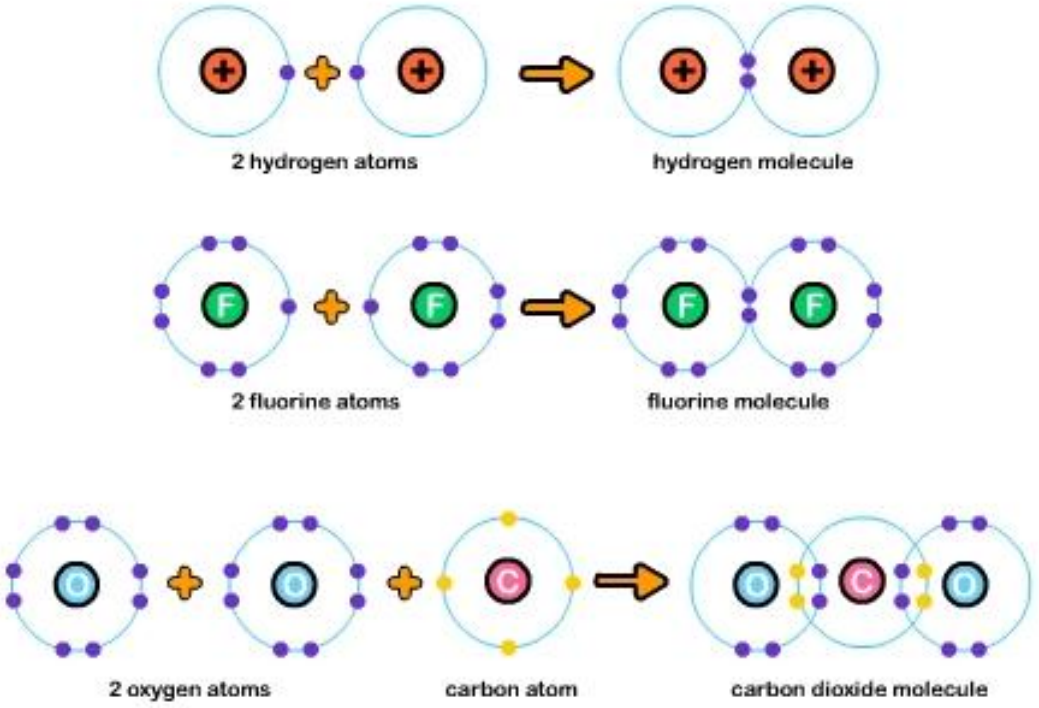
One of the resulting ions carries a negative charge (anion), and the other ion carries a positive charge (cation).



2- Covalent bond

The most common bond in organic molecules, a covalent bond involves the sharing of electrons between two .

The pair of shared electrons forms a new orbit that extends around the nuclei of both atoms, producing a molecule.

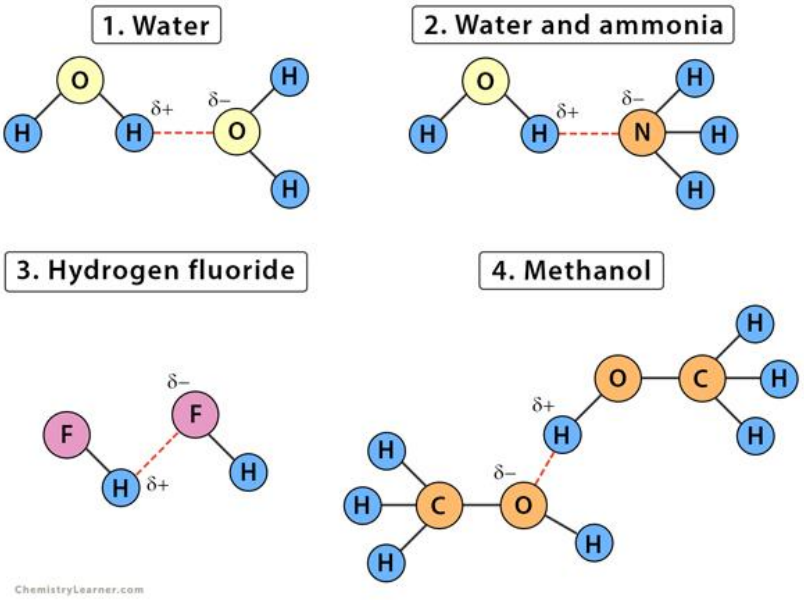


3- Hydrogen bond

Hydrogen bonding is a special type of dipole-dipole attraction between molecules, not a covalent bond to a hydrogen atom.

It results from the attractive force between a hydrogen atom covalently bonded

to a very electronegative atom such as a **N, O, or F** atom and another very electronegative atom.



Chemical Analysis

The analysis chemistry study the determination the chemical structure of compounds **or** substance. and in general it is include the :
quantity regarding the concentration of one or more substances present in a sample or compound.
* Some Quantitative analysis techniques **include** Gravimetric analysis

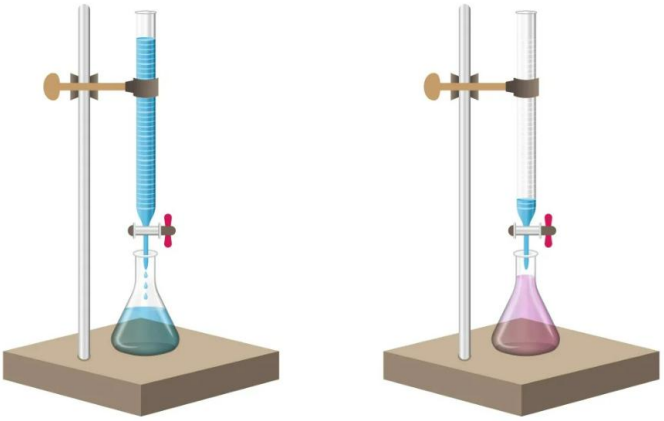
1- Quantitative Analysis : is a method of determining the absolute or relative **and** Volumetric analysis.

2- Qualitative Analysis : deals with the determination of the quality of a particular compound, irrespective of its quantity or concentration.
* The qualitative analysis does not measure the amount of the substance but measures the quality of that material.

Titration

is the slow addition of one solution of a known concentration (called a titrant)
to a known volume of another solution of unknown concentration until the reaction reaches neutralization, which is often indicated by a color change.
Titration is a technique to determine the concentration of an unknown solution.

1- Acid-base titration
2- Redox titration
3- Complexometric titration
4- Precipitation titration



الاسئلة البعدية

Q1: Define biochemistry , Titration,

Q2: Enumerate deferential point between of quantitative and qualitative analysis

Q3: Enumerate types of chemical bond.

رقم المحاضرة :	الثانية
عنوان المحاضرة:	تاريخ ومجالات الكيمياء الحيوية
اســـم المدرس:	م.م. هەوار صباح عبدالله
الفئة المستهدفة :	طلاب المستوى الاول
الهدف العام من المحاضرة :	
الأهداف السلوكية او مخرجات التعلم:	1-التعرف على الكيمياء الحيوية للخلية(التركيب والوظيفة) 2-التعرف محلول المنظم 3- التعرف على الية تنظيم الاس الهيدروجيني
استراتيجيات التيسير المستخدمة	عرض تقديمي، شرح، الصبورة
المهارات المكتسبة	مهارات التعلم الية تنظيم الاس الهيدروجيني, مهارات العرض والتقديم
طرق القياس المعتمدة	الاختبارات التحريرية ،الاسئلة والمناقشة ، تحليل الردود

الاسئلة القبلية

Q1 : Define of the followings : Biochemistry, Cellular biochemistry .

lecture 2

History & scope of biochemistry

Introduction

* CARL NEUBERG a German chemist was the first who introduced the term
  "Biochemistry" in **1903**
* Biochemistry, as the name implies, is the science related to the chemical nature and chemical behavior of the living matter.
* it's related to the study of the nature of chemical constituent of living organisms whether they are plants, animals or micro-organisms.
* The term "biochemistry" in English: biochemistry "derived from bio meaning life" **and** "chemistry meaning chemistry.

Definition of biochemistry

Biochemistry : is the science concerned with studying the various molecules that occur in living organisms and their environment, with their chemical reactions and processes they undergo.

Biochemistry deals with the structures and functions of cellular components such as proteins ,carbohydrates ,lipids and other.

The aim of biochemistry : is to describe and explain all chemical processes of living organisms and their interactions with their environments both in health and disease condition.

Biochemistry study : the molecular structure and function of organic compounds with living organisms.

*A sub-discipline of both chemistry and biology.

History of biochemistry

* The history of biochemistry can be said to have started with the ancient Greeks who were interested in the composition and processes of life

* although biochemistry as a specific scientific discipline has its beginning around the early 19th century.

. **1674** **Anton van Leeuwenhoek** had successfully invented the microscope

1775 **Antoine Lavoisier** first proposed a mechanism for photosynthesis, a process wherein plants take in carbon dioxide and release oxygen.

* The real push to biochemistry was given in **1828** when the synthesis of urea from lead cyanate and ammonia was achieved by **Wöhler**.

He , thus , initiated the synthesis of organic compound from inorganic compounds.

1857 Louis Pasteur did a commendable work on fermentation and pointed out the vital importance of enzyme in this process.

189 Edward Buchner made a breakthrough in enzyme for yeast cell in curd form.

1926 James Sumner established that enzymes are proteins in nature.

* During the first half of **20th** century , Discover Gustave Embden Embden-Meyerhof - Parnas (EMP)pathway the glycolytic pathway as the first metabolic pathway.

1940 Fritz Albert Lipmann describe the role of ATP in biological systems.

1953 Watson and Crick established the structure of DNA

1956 Arthur Kornberg discovered DNA Polymerase.

* The contribution of **Frederick Sanger** in the sequencing of protein in **1953** and nucleic acid in **1977**
* In this way, there was a progressive evolution of biology to **biochemistry** and then to **molecular biology**, **biotechnology**, and **genetic engineering**.

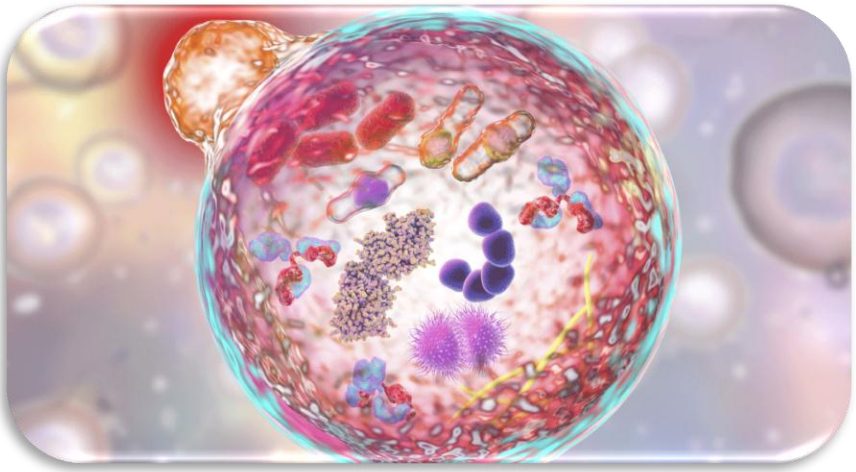
Scope Of Biochemistry

* Biochemistry is the branch of science which is very important in the field of biochemical research.
* It helps in the study of several subjects of agriculture, medical sciences, and nutrition.
* The scope of biochemistry is described by classifying it into different

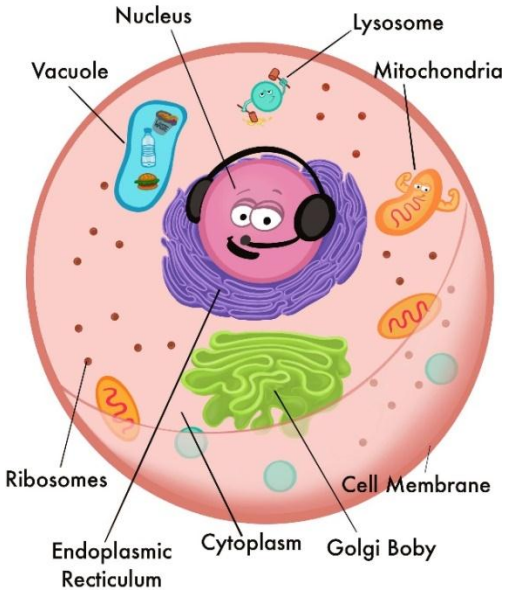
Plant biochemistry
Agriculture biochemistry
Animal biochemistry
Industrial biochemistry

Cellular biochemistry

Cellular biochemistry: is the study of all sorts of processes that occur with in a biological cell and also interactions between different cells.
Studies include: bio molecular structures **and** biochemical mechanisms

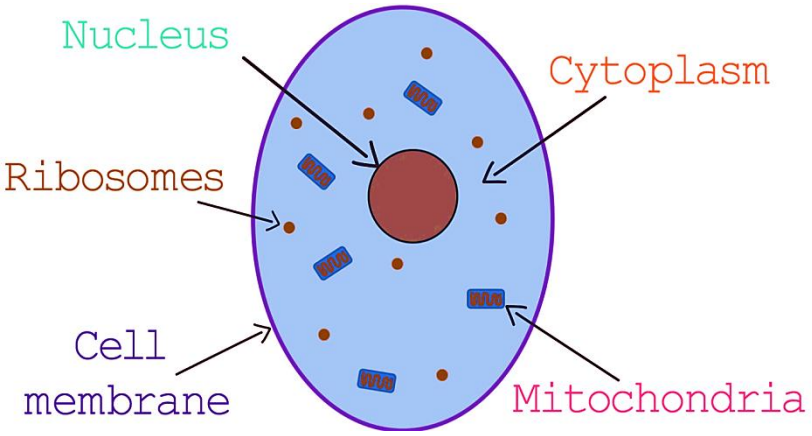


A cell : is the structural and fundamental unit of life and of which all living things are composed
The study of cells from its basic structure to the functions of every cell organelle **is called Cell Biology**.
* Robert Hooke was the first Biologist who discovered cells



Cell structure

1- cell membrane : also known as the plasma membrane (PM)
2- Cytoplasm : that comprises water and enzymes, salts, and various organelles.
3-Nucleus : contains the genetic material
4-Mitochondria : the site of liberation and storage of energy
5- Ribosomes : rich in RNA , site of protein synthesis in the cell.



Cellular buffers

Buffers are the solutions which resist changes in pH when small amounts of acid or alkali is added to them.

* Buffers are of main importance in regulating the pH of the body fluids and tissues Many biochemical reactions including those catalyzed by enzymes require pH control which is provided by buffers.
* This is important for processes or reactions which require specific and stable pH ranges

Acid –Base balance

* Acids are H^+ donors

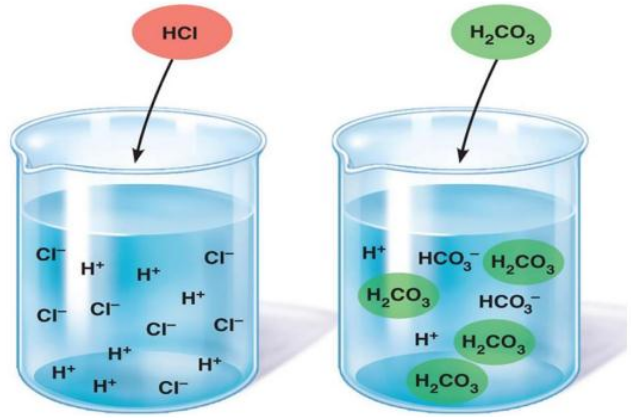
  Bases are H^+ acceptors

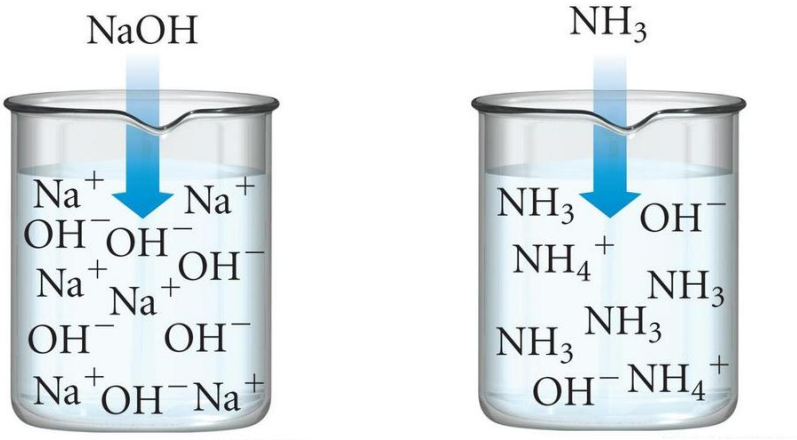
* Strong acid ⟶ HCl (complete dissociation)

  Weak acid ⟶ H_2CO_3 (Partial dissociation)

* Strong base ⟶ NaOH (complete dissociation)

  Weak base ⟶ NH_3 (Partial dissociation)



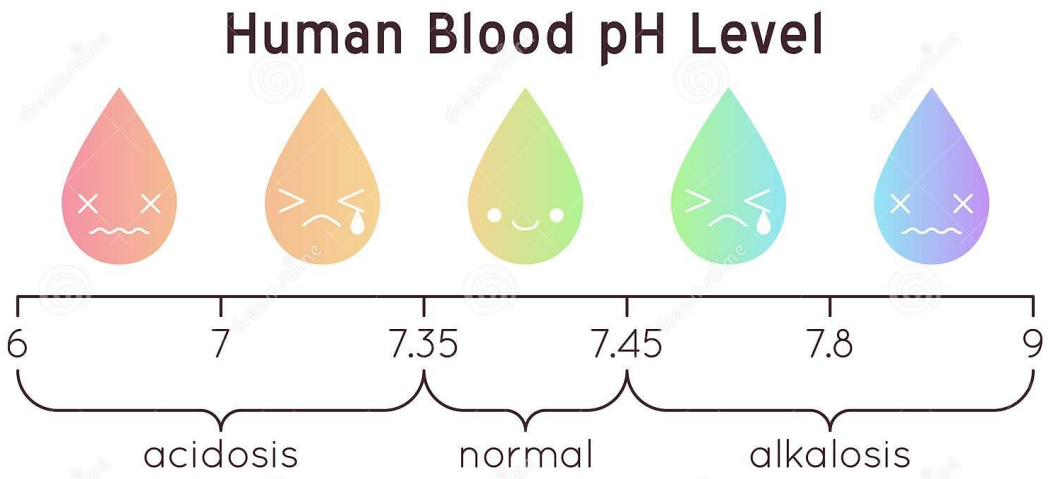


* pH represent H+ concentration

* normal range of pH

in general	0-14
in the blood	7.35 - 7.45
in the urine	4.6 to 8.0

* Calculates the pH from **pH= - log [H^+]**



Systems that regulate pH

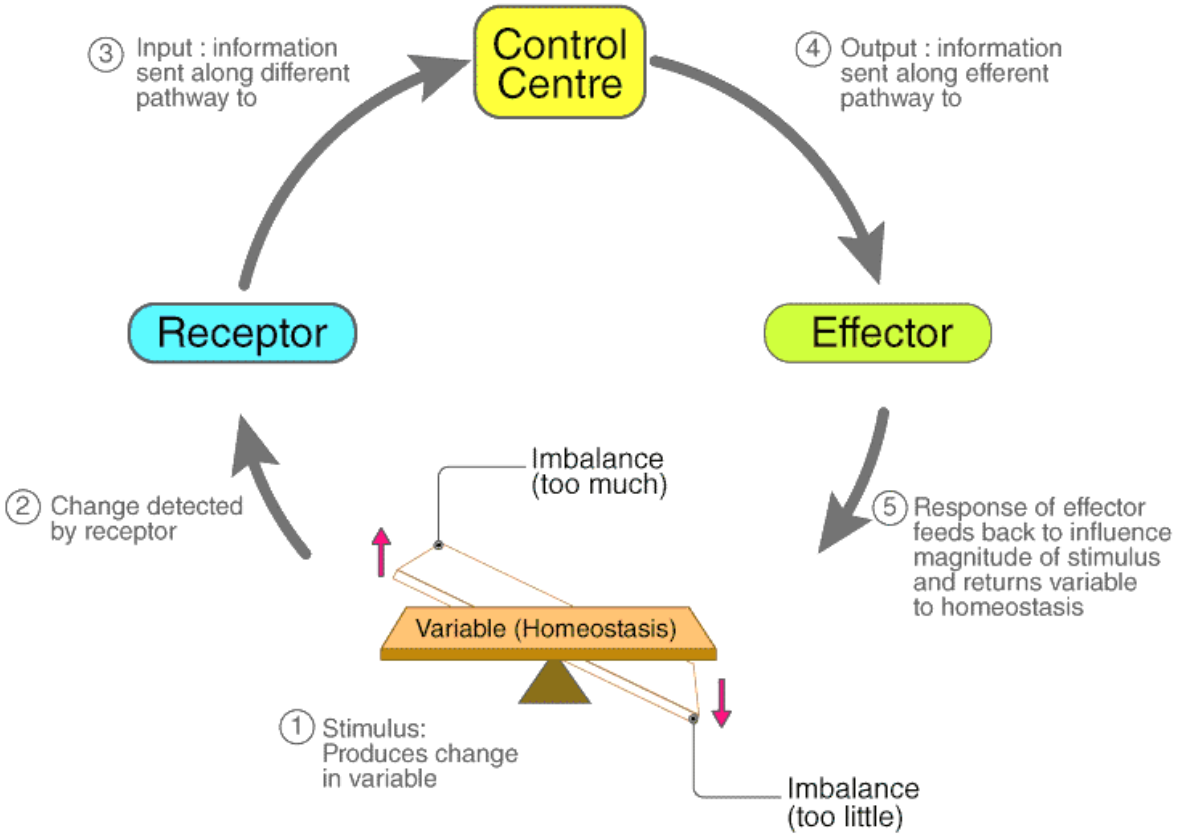
1- Chemical buffer system (first line)
2- Physiological buffer system (second line)
*** Chemical buffer system**
1. Bicarbonate buffer
2. Phosphate buffer
3. Protein buffer
*** Physiological buffer system**
1. Respiratory system (from minutes to hours)
2. Renal system (from hours to days) The most effective regulator of pH

Homeostasis

* is a self-regulating process by which biological systems maintain stability while adjusting to changing external conditions.
* The body maintains homeostasis by controlling a host of variables
  - body temperature
  - pH of various fluids
  - concentration of different ions
  - body sugar level.
* The regulation of homeostasis depends on three mechanisms:

1- Effector
2- Receptor
3- Control Center

Homeostasis mechanisms



الاسئلة البعدية

Q1 :Draw and label the structure of cell

Q2 : Classify the scope of biochemistry.

Q3: Complete of the following with suitable statements:

1- It is the smallest unit of the substance called ……..

2- in…….. Summer established that enzymes are …… in nature.

رقم المحاضرة :	الثالثة
عنوان المحاضرة:	الماء والمعادن
اســـــم المدرس:	م.م. هەوار صباح عبدالله
الفئة المستهدفة :	طلاب المستوى الاول
الهدف العام من المحاضرة :	
الأهداف السلوكية او مخرجات التعلم:	1-التعرف على توزيع وتوازن الماء 2-التعرف على مكونات المعادن والاضطربات 3- التعرف على الكيمياء الجزيئية 4- التعرف على عمليات الايض
استراتيجيات التيسير المستخدمة	عرض تقديمي، شرح، الصبورة
المهارات المكتسبة	مهارات التعلم على المعادن في جسم الانسان , مهارات العرض والتقديم
طرق القياس المعتمدة	الاختبارات التحريرية ،الاسئلة والمناقشة ، تحليل الردود

الاسئلة القبلية

Q1 / Match between column (A) and column (B): **(20 Mark)**

Column A	Column B
1- Pasteur	a- cation
2- biomolecule	b- products
3- reactants	c- protein
4- Na^+	d- energy store
5- tissues, liver	e fermentation

:

Water & electrolyte balance

Water : is an inorganic, transparent, tasteless, odorless, and nearly colorless chemical substance, which is the main constituent of Earth's hydrosphere and the fluids of all known living organisms

* Chemical formula ⟶ H_2O

* The body replenishes its water supply in three ways:

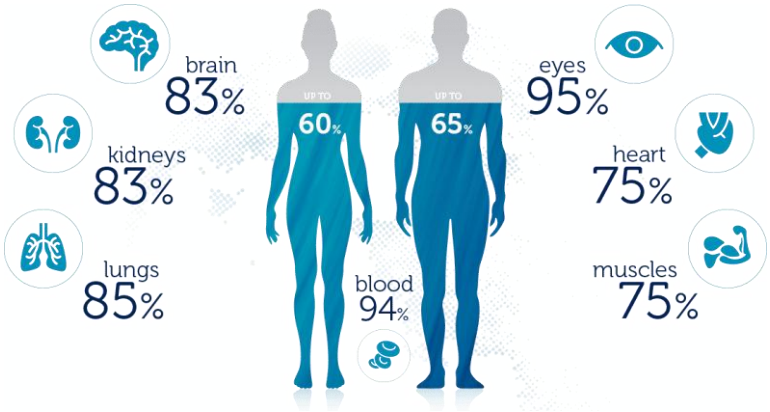
1- By liquids

2- By foods , such as meats ,vegetables and fruits, all of which contain very high percentage of water .

3- By metabolic processes taking place normally in the body.

Water balance

* Body is composed of about 60-70 % water.
* Water balance is the daily relationship between the amount of water entering an organism versus the amount of water lost.
* The kidneys are the human body's greatest balancing act. The role of the kidney is to regulate the amount of water in the body.

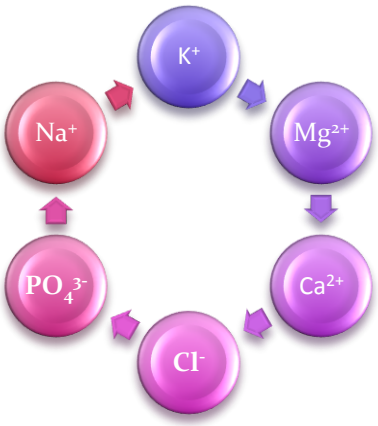


Electrolytes (Minerals)

Electrolytes: are minerals in body that have an electric charge.

* They are in blood, urine, tissues, and other body fluids
* They're also a key way to diagnose a wide range of medical conditions and diseases
* The levels of electrolytes in the blood can become too high or too low, leading to an imbalance.
* Electrolyte levels can change in relation to water levels in the body, as well as other factors.
* Body gets electrolytes or their components from eat and drink

* Electrolytes found in your body include:



Sodium
Potassium
Chloride
Calcium
Magnesium
Phosphate

* When these minerals dissolve in a fluid, they form electrolytes — positive or negative ions used in metabolic processes.

* Importance of Electrolytes to the Body

1- Regulate the body's pH level, which ensures a proper balance between acid and base in the body
2- Balance the quantity of water that is present in the body
3- Assist with the flow of fluid between the body's cells
4- Move substances into and out of cells, thus ensuring that nutrients go in and waste goes out
5- Enable key systems of the body, including the nervous, muscular, cardiovascular, and central nervous systems, to function properly

Sodium (Na^+)

* It's the most abundant electrolyte ion found in the body.
* Is most often found outside the cell.
* Sodium plays a critical role in helping cells maintain the right balance of fluid.

* It's also used to help cells absorb nutrients.
* Important in nerve and muscle function.

Normal level: 135 to 145 mEq/L

Potassium (K^+)

* Potassium resides mainly inside the cells of the body.
* is particularly important for regulating heart function.
* Regulates fluid, ion balance inside cell.

Chloride Cl^-

* Chloride is the second-most abundant ion in the body.
* It's also a key part of how your cells maintain their internal and external balance of fluid.
* It also plays a role in maintaining the body's natural pH balance.

Normal level: 96 to 109 mEq/L

Calcium Ca^{2+}

* Calcium is important as an extracellular cation
* Calcium is a key element in body,
* it does more than just build strong bones and teeth.
* It's also used to control muscles, transmit signals in nerves and more.

Normal level: 8.5 to 10.5 mEq/L

Magnesium Mg^{2+}

* Magnesium is an important electrolyte
* It works with other electrolytes, such as sodium, potassium, and calcium.
* Magnesium helps cells as they turn nutrients into energy.
* Brain and muscles rely heavily on magnesium to do their job

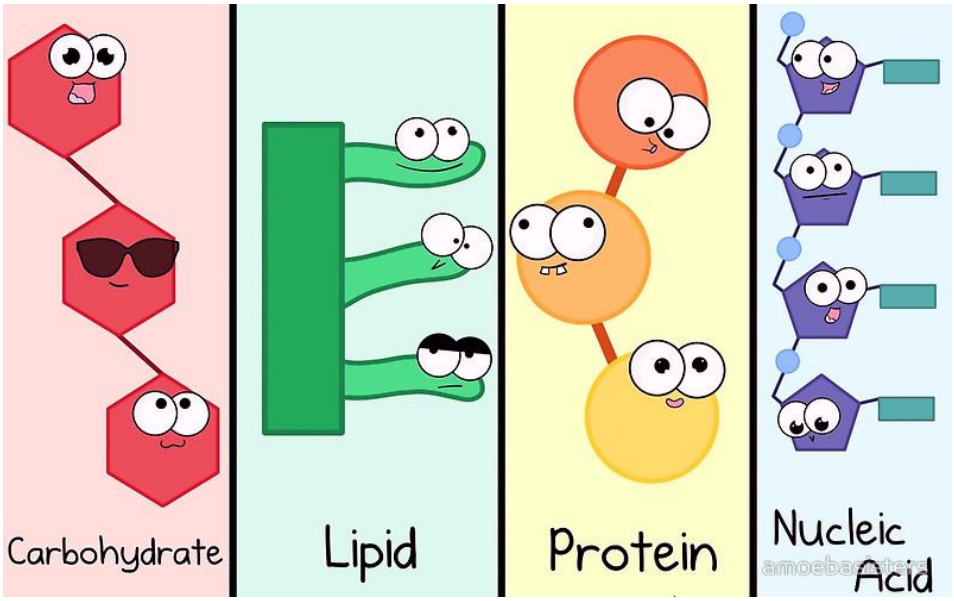
Normal level: 1.5 to 3 mEq/L

* Key terms to know:

Hyper: A condition that starts with "hyper" means it involves too much of something.
Hypo: A condition that starts with "hypo" means it involves too little of something.
Ion: An atom that has an electrical charge.
Cations: Ions with a positive charge.
Anions: Ions with a negative charge.
Acidic: Has a pH of less than 7.

Neutral: Has a pH of 7.
Basic: Has a pH of more than 7

Biomolecules



Biomolecule

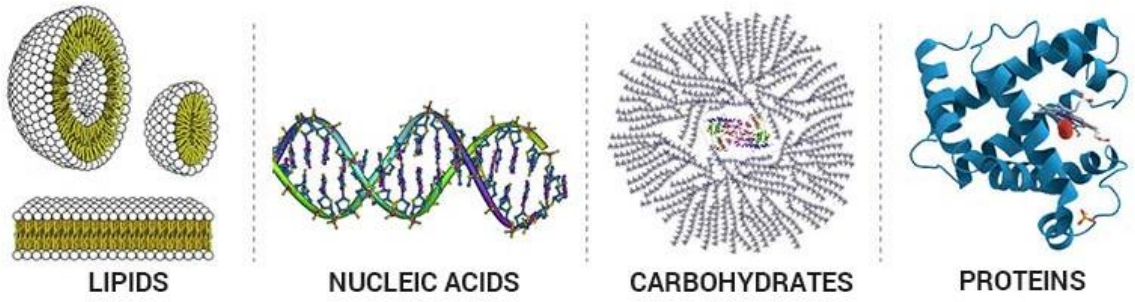
Biomolecule: also called biological molecule, any of numerous substances that are produced by cells and living organisms.

* Biomolecules have a wide range of sizes and structures and perform a vast array of functions.
* The four major types of biomolecules are carbohydrates, lipids, nucleic acids and proteins.
* Biomolecules are an important element of living organisms, those

biomolecules are often endogenous, produced within the organism

* Most biomolecules are organic compounds, and just four elements oxygen, carbon, hydrogen and nitrogen
* Make up 96% of the human body's mass.

Biomolecules structure

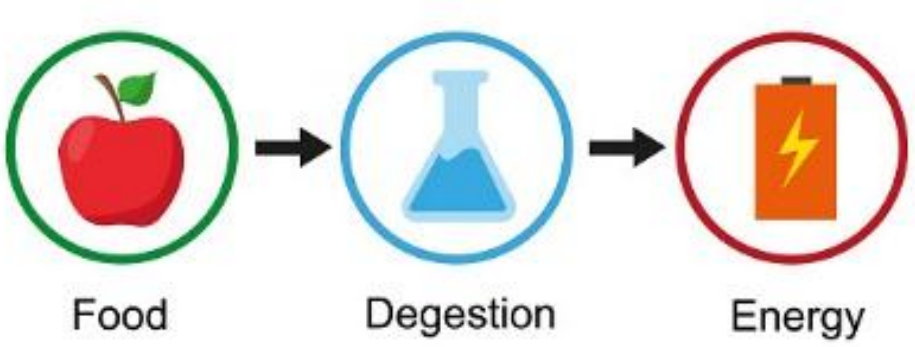


Carbohydrates	• Monosaccharides
Proteins	• Amino acids
lipids	• Fatty acids and glycerol
Nucleic acids	• Nucleotides

Metabolism

Metabolism: is the chemical reactions in the body's cells that change food into energy.

* Our bodies need this energy to do everything from moving to thinking to growing.
* Specific proteins in the body control the chemical reactions of metabolism.
* Thousands of metabolic reactions happen at the same time — all regulated by the body — to keep our cells healthy and working



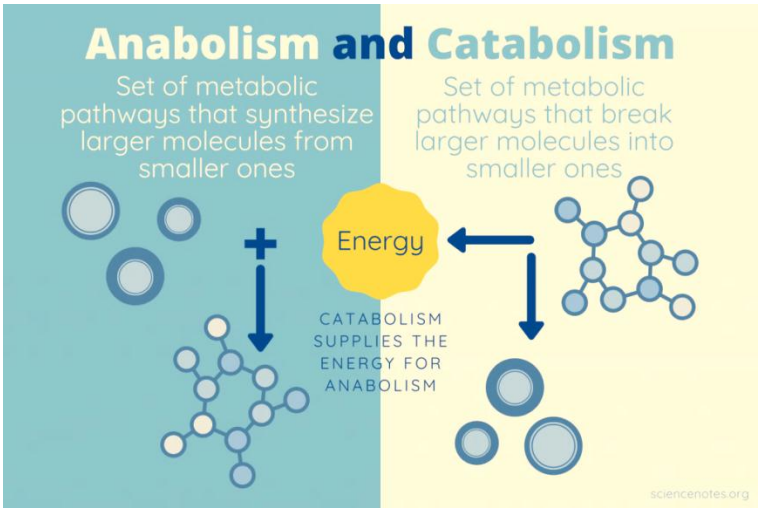
Metabolism Work

1- After we eat food, the digestive system uses enzymes to:
- break proteins down into amino acids
- turn fats into fatty acids
- turn carbohydrates into simple sugars (for example, glucose)

The body can use sugar, amino acids, and fatty acids as energy sources when needed. These compounds are absorbed into the blood, which carries them to the cells.

2- After they enter the cells, other enzymes act to speed up or regulate the chemical reactions involved with "**metabolizing**" these compounds. During these processes, the energy from these compounds can be released for use by the body or stored in body tissues, especially the liver, muscles and body fat.

* Metabolism is a balancing act involving two kinds of activities that go on at the same time: Anabolism
Catabolism



الاسئلة البعدية

Q1/ Complete of the following with word statements:

Electrolytes	Found	Function	Normal level
	Outside		135-145 mEq/L
	Second abundant ion in body	pH balance	
K^+			3.5-5 mEq/L
	Important electrolyte		1.5-3 mEq/L
Ca^+		Control muscles , transmit signals in nerves	

رقم المحاضرة :	الرابعة والخامسة
عنوان المحاضرة:	الاحماض الامينية والبروتينات
اســـم المدرس:	م.م. هەوار صباح عبدالله
الفئة المستهدفة :	طلاب المستوى الاول
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الأهداف السلوكية او مخرجات التعلم:	1-التعرف على تعريف وتصنيف الاحماض الامينية 2-التعرف على تعريف وتصنيف البروتينات والمستوى الطبيعي
استراتيجيات التيسير المستخدمة	عرض تقديمي، شرح، الصبورة
المهارات المكتسبة	مهارات التعلم على فحوصات الكيميائية للمستوى الطبيعي للبروتينات , مهارات العرض والتقديم
طرق القياس المعتمدة	الاختبارات التحريرية ،الاسئلة والمناقشة ، تحليل الردود

الاسئلة القبلية

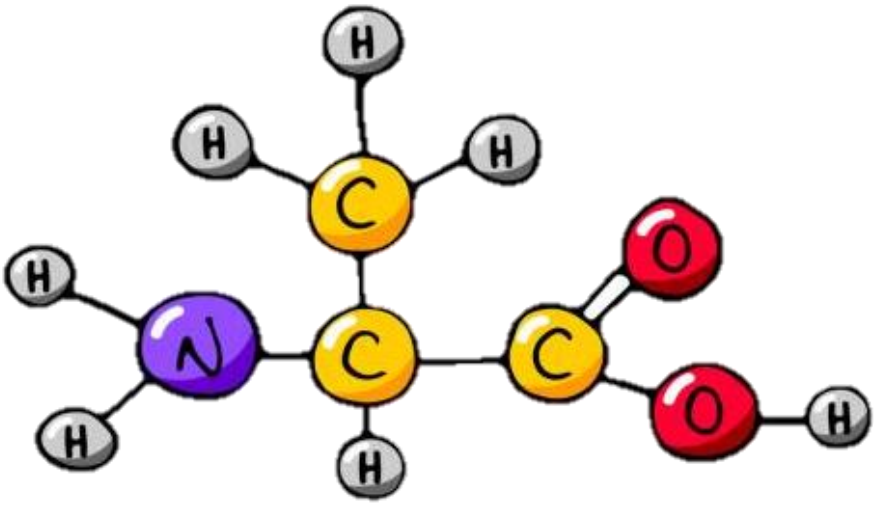
Q1/ Define of the followings: protein . amino acid.

Q2/ Answer by true or false of the followings:

1-Conditional amino acids are usually not essential, except in times of illness and stress.

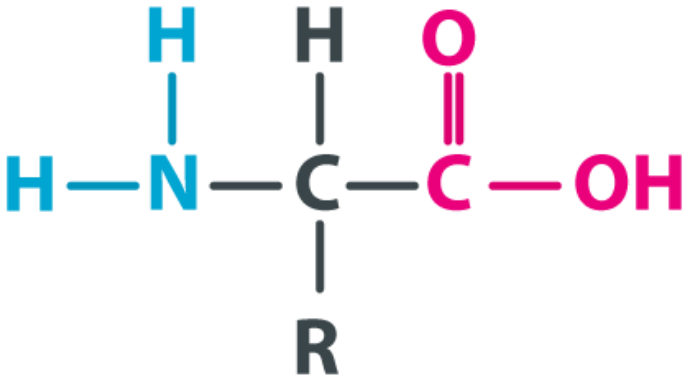
2- Each amino acid has 4 different groups attached to α- carbon .

Amino Acids



Amino Acids

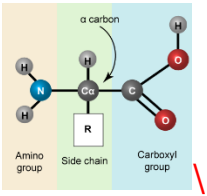
Amino acids: are organic compounds that contain both amino and carboxylic acid functional groups



* Amino Acids are the building units of proteins.
* There are about 300 amino acids occur in nature.
  Only 20 of them enter in proteins synthesis.

*** Amino acid structure**

Each amino acid has 4 different groups attached to α- carbon .
These 4 groups are: amino group
COOH group
Hydrogen atom
side Chain (R).



Side chain (R) \
This is the variable radical group and is different for every amino acid

***Amino Acids are classified into three groups:**

1- Essential amino acids

2- Nonessential amino acids

3- Conditional amino acids

1- Essential amino acids

* There are **9** Essential Amino Acids
* Essential amino acids cannot be made by the body
* Food is the main source of it.
* **phenylalanine**, **valine**, **threonine**, **tryptophan**, **methionine**, **leucine**, **isoleucine**, **lysine**, and **histidine**

2- Nonessential amino acids

* There are **11** Nonessential Amino Acids
* Nonessential amino acids can be made by the body
* **alanine**, **arginine**, **asparagine**, **aspartic acid**, **cysteine**, **glutamic acid**, **glutamine**, **glycine**, **proline**, **serine** and **tyrosine.**

3- Conditional amino acids

* Conditionally amino acids are, in normal conditions, non-essential, which can be synthesized by the body
* But if the body is exposed to stress or disease, the body becomes unable to manufacture enough of it

* **arginine**, **cysteine**, **glutamine**, **tyrosine**, **glycine**, **ornithine**, **proline**, and **serine.**

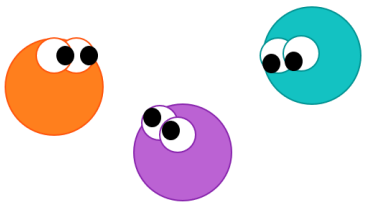
Essential	Conditionally Non-Essential	Non-Essential
Histidine	Arginine	Alanine
Isoleucine	Asparagine	Asparatate
Leucine	Glutamine	Cysteine
Methionine	Glycine	Glutamate
Phenylalanine	Proline	
Threonine	Serine	
Tryptophan	Tyrosine	
Valine		
Lysine		

Protein

In biology and biochemistry, a protein is a biomolecule or a macromolecule.

Proteins are polymers of amino acids linked by peptide bonds.

* Proteins contain Carbon, Hydrogen, Oxygen and Nitrogen as the major components
  while Sulfur and Phosphorus are minor constituents.
* Proteins differ from each other through their amino acid composition and
  sequence, location and function.

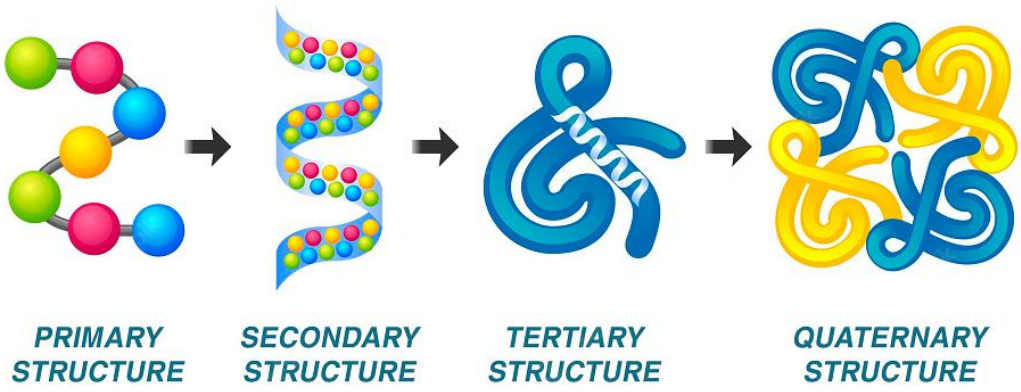


Amino acid monomers who only just met and haven't bonded yet

The amino acids have bonded and become friends – and a protein!

protein structure

The 20 standard amino acids join through peptide bonds to form proteins.
Protein has four levels of structure namely primary, secondary, tertiary and quaternary.
* The primary structure of proteins is the amino acid sequences that are linked by peptide bonds.



PROTEIN STRUCTURE

Classification of Proteins

1- On the basis of shape

A- Fibrous protein

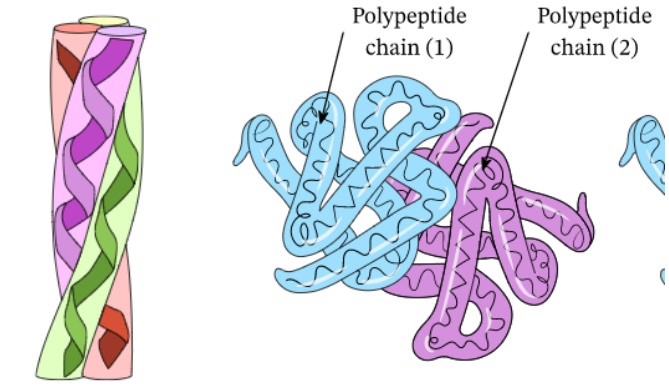
* insoluble in water
* are coiled and exist in threadlike structures to form fiber
* we can find these proteins in animals

for example : collagen, actin, and keratin in hair

B- Globular proteins

* soluble in water
* They are made up of polypeptides that are coiled about the themselves to form oval or spherical molecules.

for example : albumin, insulin and hormones.



Fibrous protein Globular protein

2- On the basis of Constitution

A- Simple proteins: These proteins are made up of amino acids only.
for example albumins, prolamins

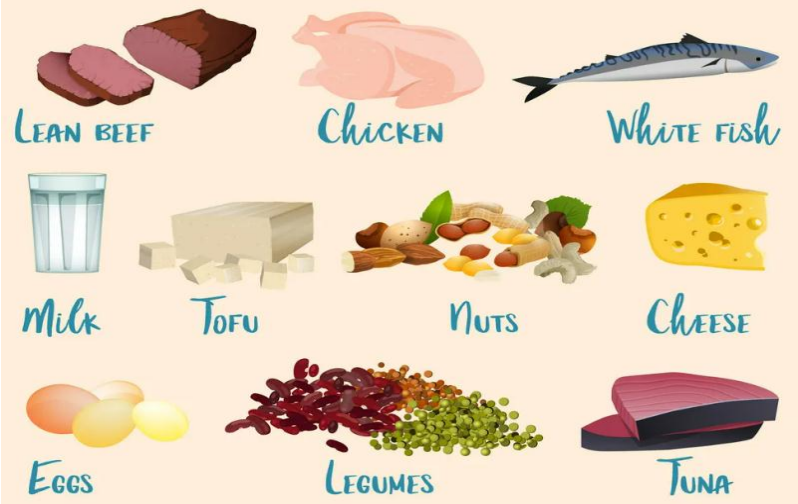
B- Conjugated protein: they are complex molecules of protein consisting of protein and non-protein moieties.
for example Glycoproteins, Chromoproteins, Lipoproteins, Metalloprotein and Phosphoprotein

C- Derived protein: These are proteins derived by partial to complete hydrolysis from the simple or conjugated proteins by the action of acids, alkalies or enzymes.
for example metaprotein

Functions of proteins

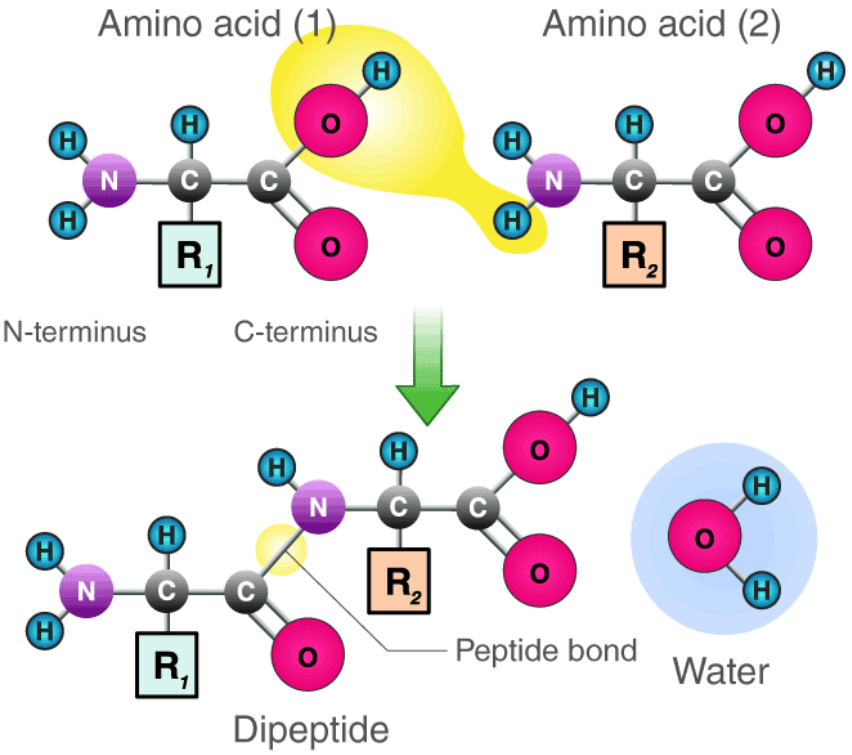
1- Acts as enzymes (catalytic function).
2- Hormones (regulatory function).
3- Antibodies- immunoglobulins (defense protein).
4- Coagulation factors.
5- Carrier proteins (e.g. albumin, thyroglobulin)

6- Proteins act as intracellular buffer in maintaining the acid-base balance



A peptide bond: is a chemical bond formed between two molecules when the carboxyl group of one molecule reacts with the amino group of the other molecule, releasing a molecule of water (H_2O).

* Living organisms use peptide bonds to form long chains of amino acids, known as proteins

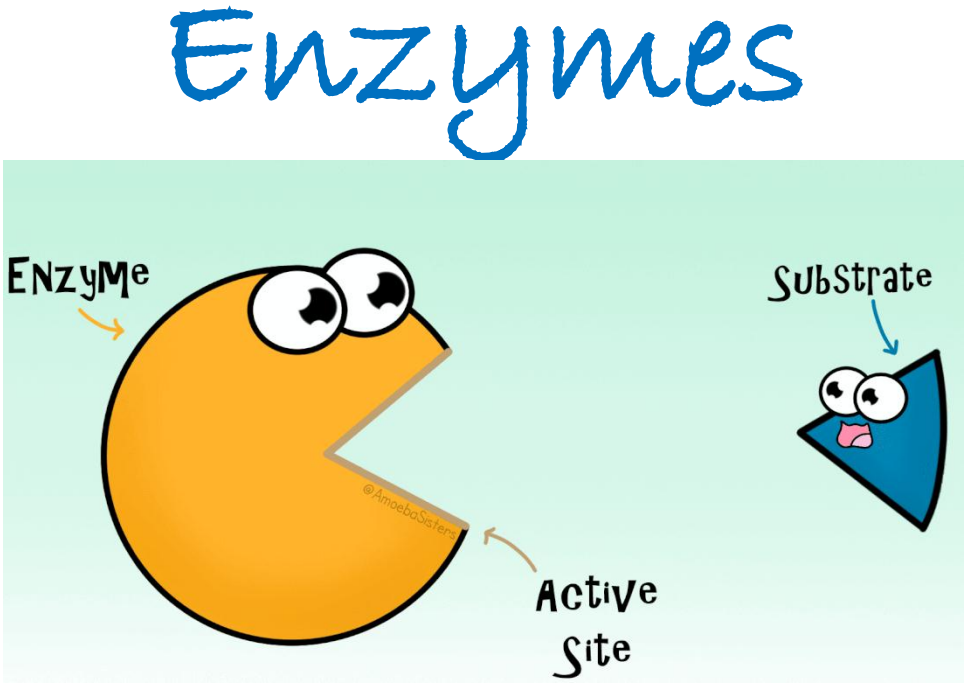


الاسئلة البعدية :

Q1: Mention the Classification of Proteins.
Q2: Classify amino acid.

رقم المحاضرة :	السادسة
عنوان المحاضرة:	الانزيمات
اســـم المدرس:	م.م. هەوار صباح عبدالله
الفئة المستهدفة :	طلاب المستوى الاول
الهدف العام من المحاضرة :	
الأهداف السلوكية او مخرجات التعلم:	1-التعرف على تعريف الانزيمات 2-التعرف على تصنيف الانزيمات 3- التعرف على العوامل التي تحفز الانزيمات
استراتيجيات التيسير المستخدمة	عرض تقديمي، شرح، الصبورة
المهارات المكتسبة	مهارات التعلم على الفحوصات الكيميائية للانزيمات , مهارات العرض والتقديم
طرق القياس المعتمدة	الاختبارات التحريرية ،الاسئلة والمناقشة ، تحليل الردود

Q1 / Define enzyme.:



Enzymes

Enzymes: are proteins that help speed up metabolism, or the chemical reactions in our bodies.

* They build some substances and break others down.
* All living things have enzymes.
* One of the most important roles of enzymes is to **aid in digestion.**

Digestion: is the process of turning the food we eat into energy.

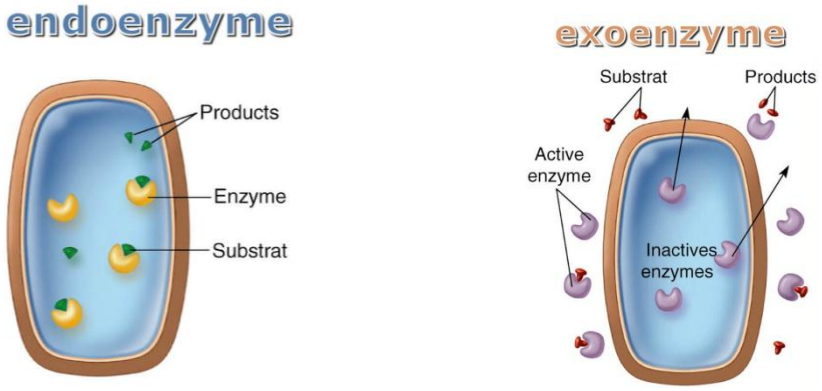
* There are enzymes in our saliva, pancreas, intestines and stomach

Intracellular Enzymes (Endoenzymes

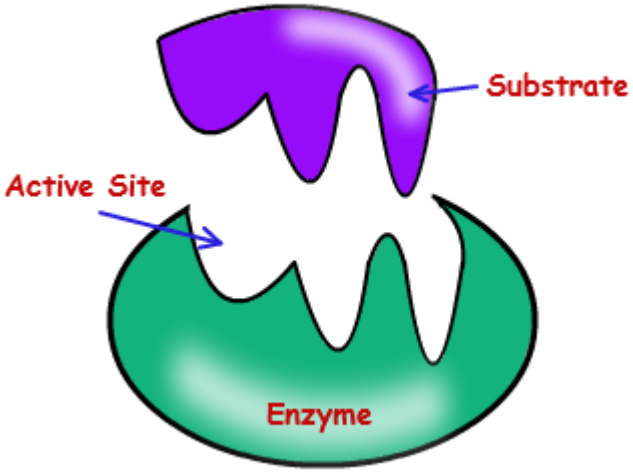
- They function within the cell.
- Most of the enzymes are intracellular.
- Functions: Photosynthesis, DNA replication, Cellular respiration, Protein synthesis, etc.
- Examples: DNA and RNA polymerase, ATP synthetase, etc

Extracellular Enzymes (Exoenzymes)

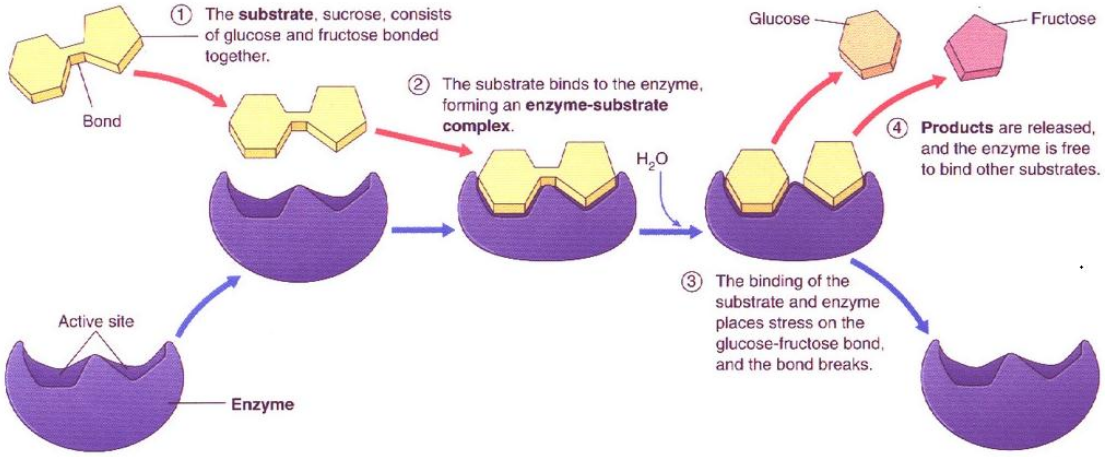
- They function outside the cell.
- Very few enzymes are extracellular.
- Functions: Extracellular digestion, Decomposition, etc.
- Examples: Peptidase, amylase, trypsin, pepsin, maltase ,etc



Each enzyme has an "**active site**" This area has a unique shape.
The substance an enzyme works on is a substrate.
The substrate also has a unique shape.
* The enzyme and the substrate must fit together to work.



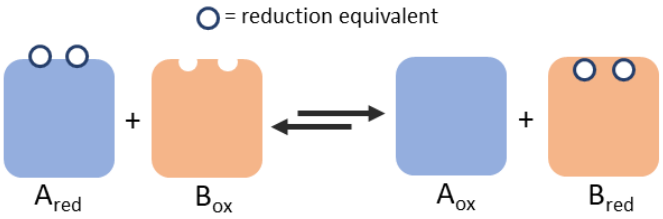
How do enzymes work



Classification

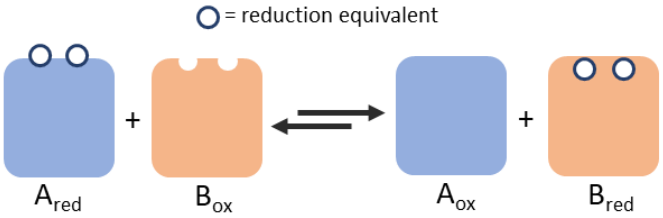
1- Oxidoreductase

They catalyze the oxidation-reduction reaction.



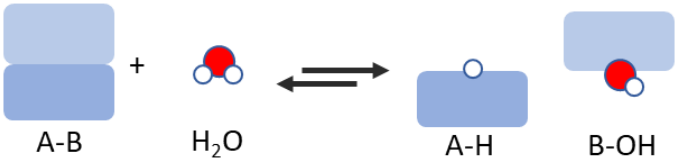
2- Transferase

They involve in the transfer of groups from one molecule to another molecule.



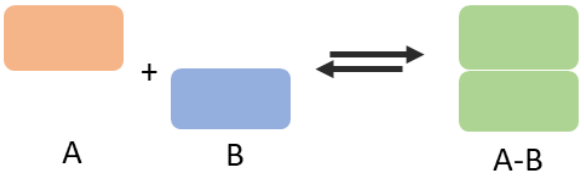
3- Hydrolases

It catalyzes the reaction in which the cleavage of bonds is accomplished by adding water.



4- Lyases

These enzymes catalyze the breaking of C-C, C-O, C-N, and other bonds by processes other than oxidation and hydrolysis.

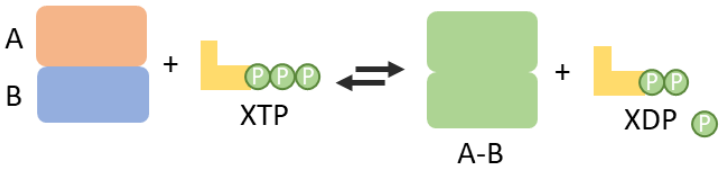


5- Isomerases

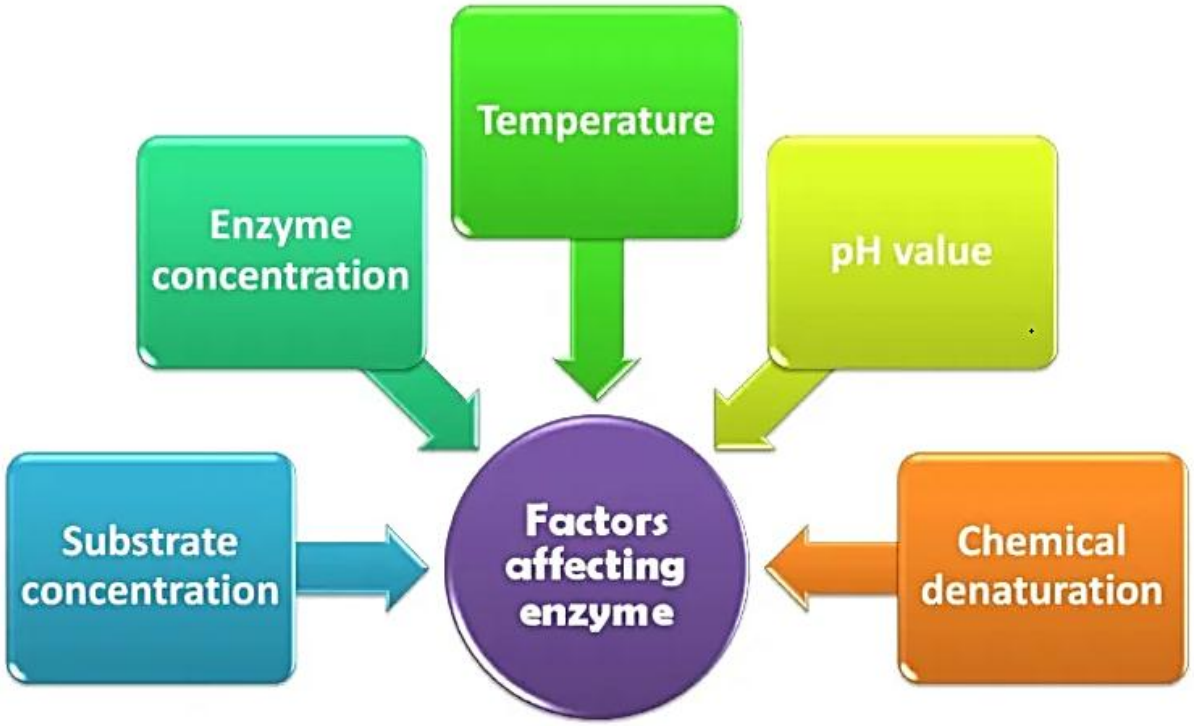
They catalyze the intermolecular rearrangement reaction and produce the isomeric form of substrate.

6- Ligases

Catalyzes the formation of C-C, C-S, C-O, and C-N bonds by removal of the water component.



Factors affecting the enzymatic activity



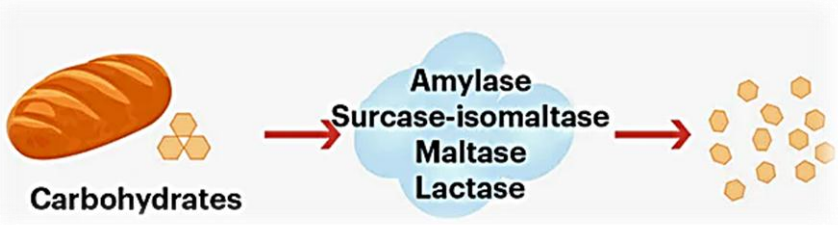
Examples of Enzymes

Amylase: is important for digesting carbohydrates.
It breaks down starches into sugars.
secreted by both the salivary glands and the pancreas.

Sucrase: where it breaks down sucrose into fructose and glucose.
is secreted by the small intestine

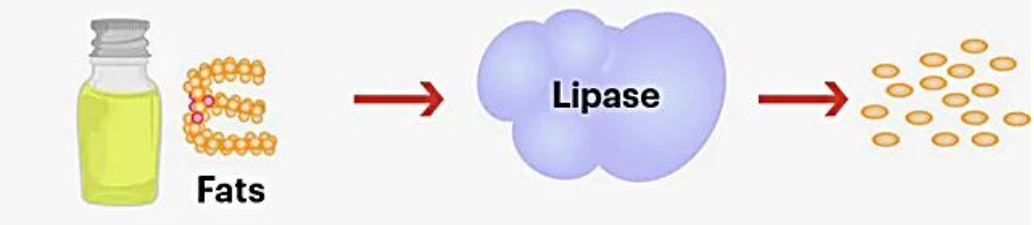
Maltase: which is responsible for breaking down maltose into glucose.
The small intestine releases maltase
The body uses glucose for energy.

Lactase: is an enzyme that breaks down lactose
a sugar found in dairy products.



Lipases: is responsible for the breakdown of fats into fatty acids and glycerol.
It's produced in small amounts by mouth and stomach,

and in larger amounts by your pancreas



Proteases: also called peptidases
break down proteins into amino acids
are produced in the stomach and pancreas.
Pepsin is secreted by the stomach to break down proteins into peptides

Functions of Enzymes

1- Enzymes help in signal transduction.
2- They break down large molecules into smaller substances that can be easily absorbed by the body.
3- They help in generating energy in the body.
4- Enzymes are responsible for the movement of ions across the plasma membrane.
5- Enzymes perform a number of biochemical reactions, including oxidation, reduction, hydrolysis, etc.

الاسئلة البعدية

Q1 / Enumerate the types of enzyme.
Q2 / Enumerate the main functions of enzyme.

رقم المحاضرة :	السابعة والثامنة
عنوان المحاضرة:	الكاربوهيدرات
اســـم المدرس:	م.م. هەوار صباح عبدالله
الفئة المستهدفة :	طلاب المستوى الاول
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الاسئلة القبلية

Q1 : Define carbohydrate , glycogenesis

Carbohydrates

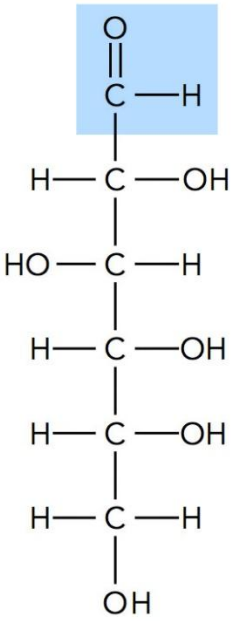
Carbohydrates

Carbohydrates: Carbohydrates are polyhydroxy aldehydes or ketones, or substances that yield such compounds on hydrolysis.

* Carbohydrates are the most abundant biomolecules on earth.
* Composed of carbon, hydrogen and oxygen.
* General molecular formula $C_n(H_2O)_n$

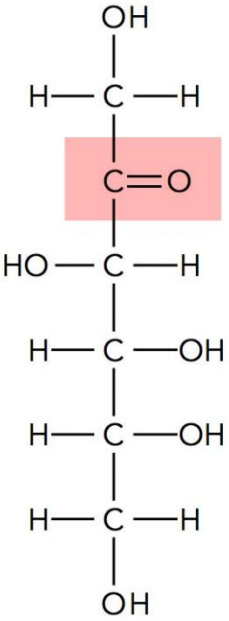
  For example:
  glucose has the molecular formula $C_6H_{12}O_6$

Carbohydrate



Glucose

polyhydroxy aldehyde



Fructose

Polyhydroxy ketone

Classification of carbohydrates

Carbohydrates are classified based on the number of saccharides it contains.

A saccharide: is the basic unit structure or building block of a carbohydrate.

1- A monosaccharide is a carbohydrate with one saccharide

2- A disaccharide is a carbohydrate with two saccharides

3- An oligosaccharide is a carbohydrate with a few (3-10) saccharides

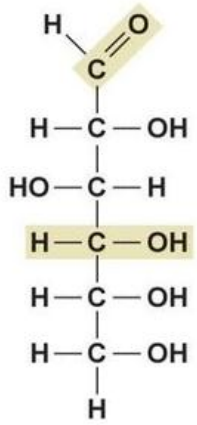
4- A polysaccharide is a carbohydrate with more than 10 saccharides

Carbohydrates: Monosaccharide , Disaccharide , Oligosaccharide , Polysaccharide

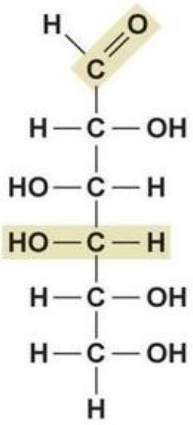
1- A monosaccharide

is a sugar molecule with one saccharide.

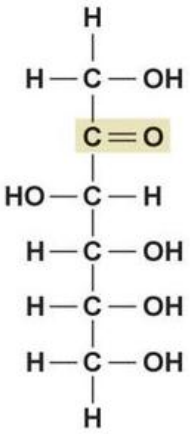
* Examples of monosaccharides include: Glucose, Fructose and Galactose.



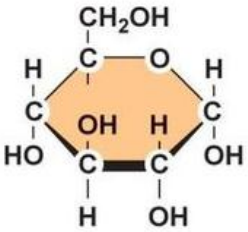
Glucose



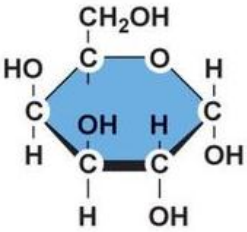
Galactose



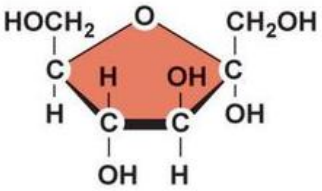
Fructose



Glucose



Galactose



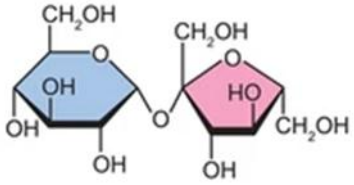
Fructose

2- Disaccharides

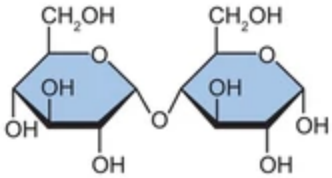
On hydrolysis, disaccharides yield two molecules of either the same or different monosaccharides.

* Examples of Disaccharides include: Sucrose, Maltose and Lactose

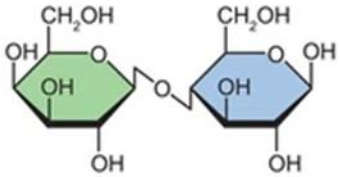
Sucrose Glucose and Fructose



Maltose Glucose and Glucose



Lactose Galactose and Glucose



3- Oligosaccharides

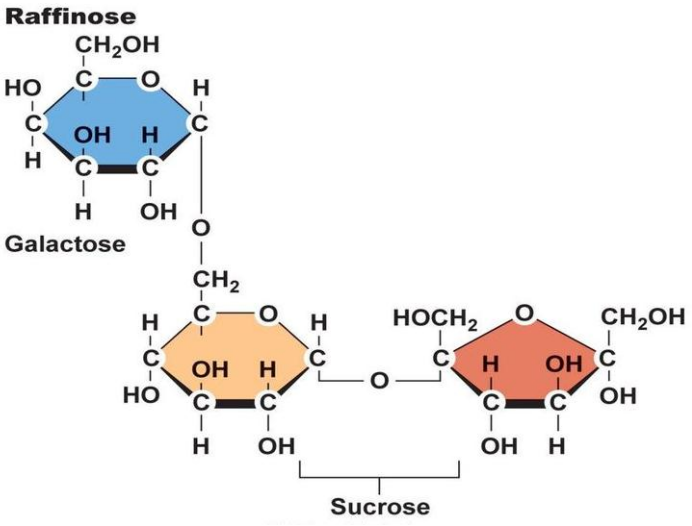
are compounds that yield 3 to 10 molecules of the same or different monosaccharides on hydrolysis

* the oligosaccharides are classified as trisaccharides, tetrasaccharides, pentasaccharides, and so on.

* Examples of Disaccharides include: raffinose

Raffinose

Glucose, Fructose and Galactose

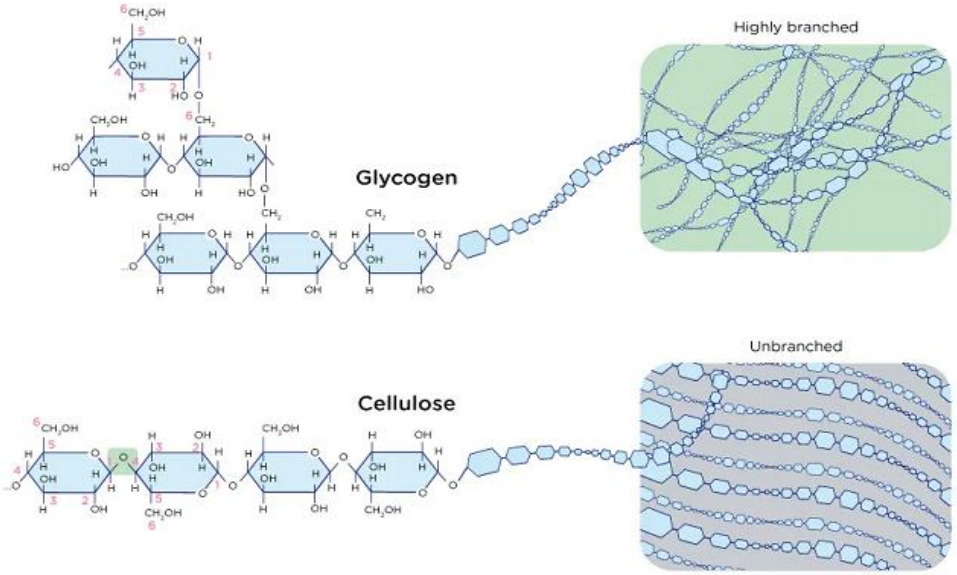


4- Polysaccharides

are a chain of more than 10 carbohydrates joined together through glycosidic bond formation.

* They are classified into two groups: homopolysaccharides --- Starch and cellulose

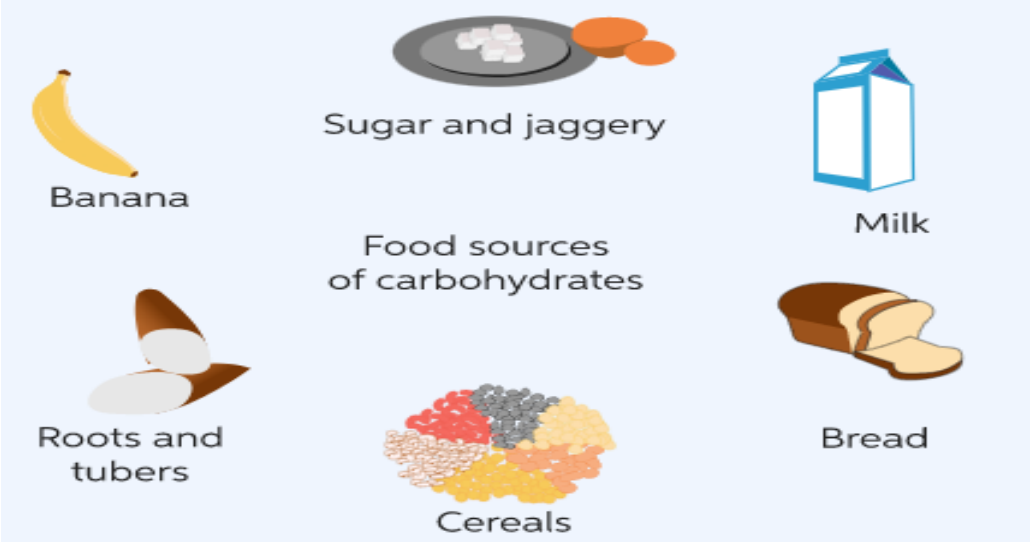
heteropolysaccharides --- glycogen



Functions of Carbohydrates

1- Carbohydrates are the main sources of energy in the body.
2. Storage form of energy (starch and glycogen).
3. Excess carbohydrate is converted to fat.
4. Glycoproteins and glycolipids are components of cell membranes and receptors.
5. Structural basis of many organisms

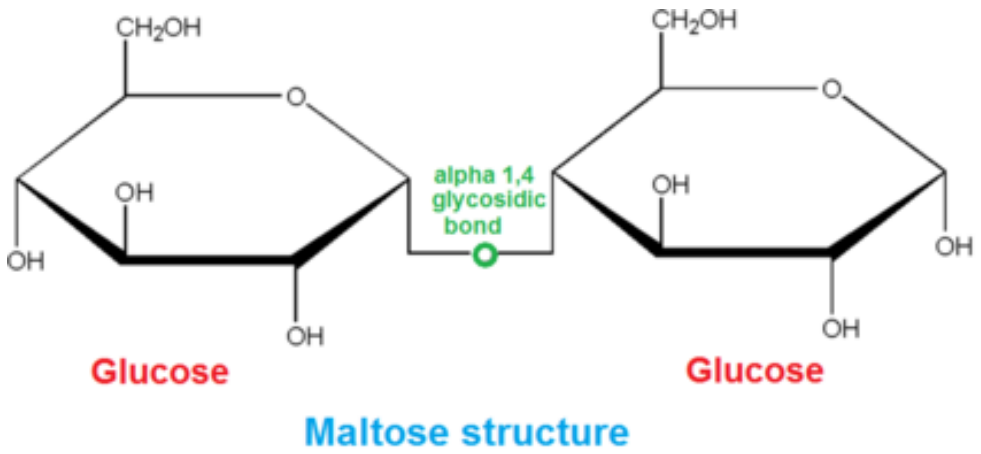
Carbohydrates sources



Glycosidic bond

A glycosidic bond: is a type of covalent bond that joins a carbohydrate (sugar) molecule to another group, which may or may not be another carbohydrate.

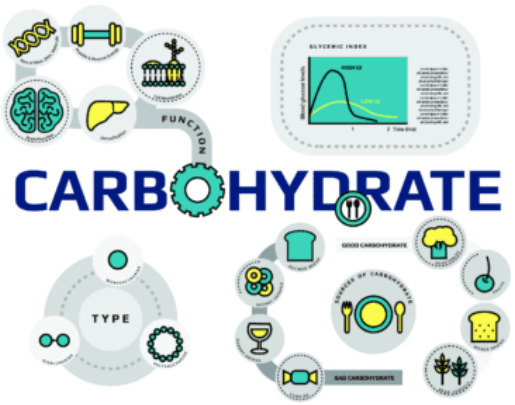
* There are two types of Glycosidic bond



Maltose structure

Carbohydrate metabolism

* is a fundamental biochemical process that ensures a constant supply of energy
  to the living cells.
* It is the central metabolic pathway associated with the formation and breakdown of carbohydrates with energy generation.
* The most important carbohydrate is glucose, which is broken down via glycolysis, enter into the Kreb's cycle and oxidative phosphorylation to



Glycolysis

Is converted glucose to pyruvate or lactate

Site of reactions: All the reaction steps take place in the cytoplasm.

Glucose a major fuel of most tissues so the pathway starts with glucose

Gluconeogenesis (The Synthesis of Glucose)

formation of glucose from non–carbohydrate precursors like pyruvate and related three and four carbon compounds.

Glycogenolysis

When glucose is not needed to meet energy needs,
it can be stored as the polysaccharide glycogen and used for future energy needs.

The liver and the muscles are where glycogen is synthesized and stored.

When energy stores (glycogen) are full, this means that Additional glucose is converted to body fat.

Glycogenesis

It is biosynthesis of glycogen from glucose,
occurs especially in skeletal muscle and liver muscle glycogen is reserve for muscle Contraction

الاسئلة البعدية

Q1: Explain metabolism of carbohydrate.

Q2: Enumerate functions of carbohydrate.

رقم المحاضرة :	التاسعة والعاشرة
عنوان المحاضرة:	الدهون
اســـــم المدرس:	م.م. ههوار صباح عبدالله
الفئة المستهدفة :	طلاب المستوى الاول
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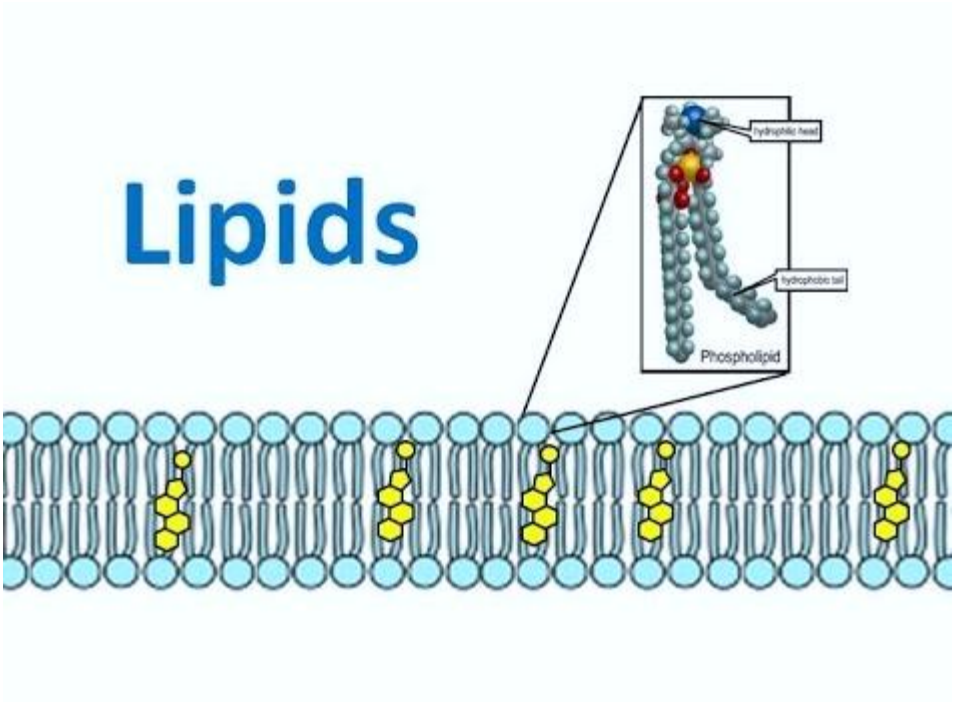
الاسئلة القبلية

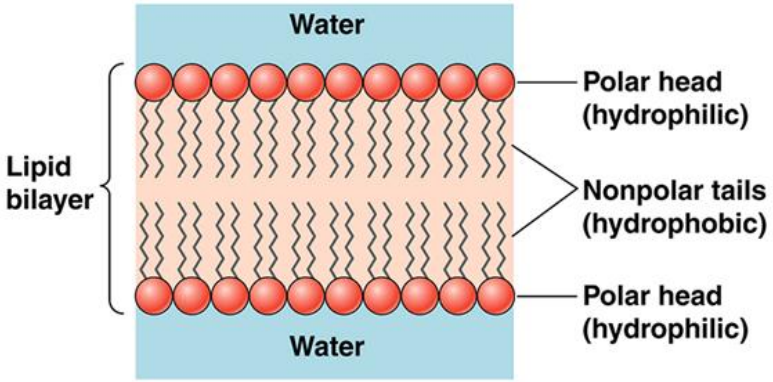
Q1 / Define of the following : lipid , fatty acid , - Derived lipids



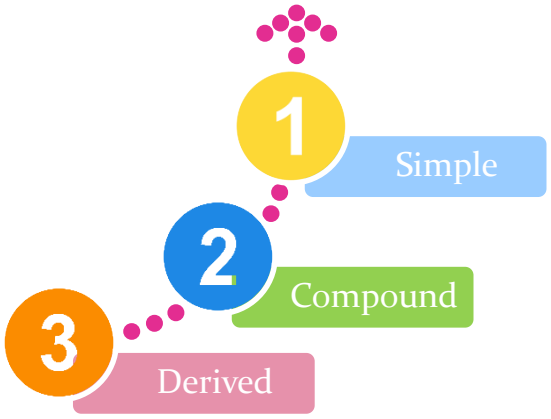
Lipids

Lipids: are organic compounds that are fatty acids or derivatives of fatty acids

* which are nonpolar molecules so, they insoluble in water but soluble in nonpolar organic solvents.
* nonpolar organic solvents (e.g. ether, chloroform, acetone and benzene)
* Common lipids include triglycerides , phospholipids and steroids.



Classification of Lipids



1- Simple Lipids

are the esters of fatty acids with alcohols.

a- Fats

fats are triglycerides since, three molecules of fatty acids condense with one molecule of glycerol.

b- Waxes

is an ester of fatty acids and long chain aliphatic alcohols.

2- Compound Lipids

contain some additional groups or elements besides fatty acids are alcohol.

-The addition group may contain phosphorus, nitrogen, sulphur or it may be a protein.

a- Phospholipids

b- Glycolipids

c- lipoproteins

3- Derived lipids

Derived lipids are the product of hydrolysis of simple lipids and compound

lipids and in addition other compounds

a- steroids

b- fatty acids

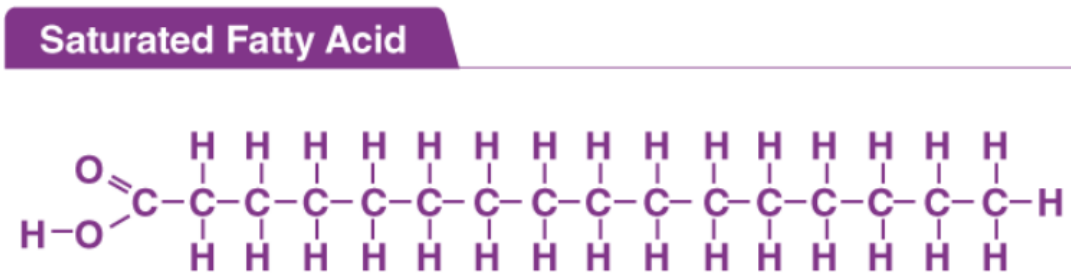
Fatty acids

Fatty acids: are comprised of hydrocarbon chains terminating with carboxylic acid groups.

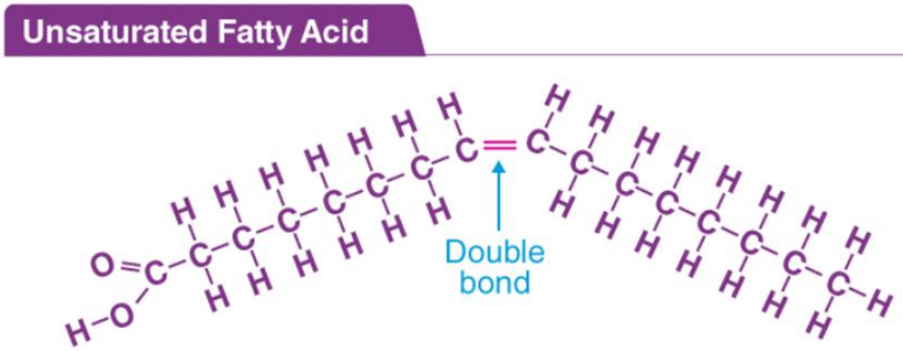
* The length of the chain is usually between 14 and 22 carbons long.
* Fatty acids are major components of lipids.

There are two types of fatty acid:

1. Saturated fatty acids (there are no carbon-carbon double bonds).

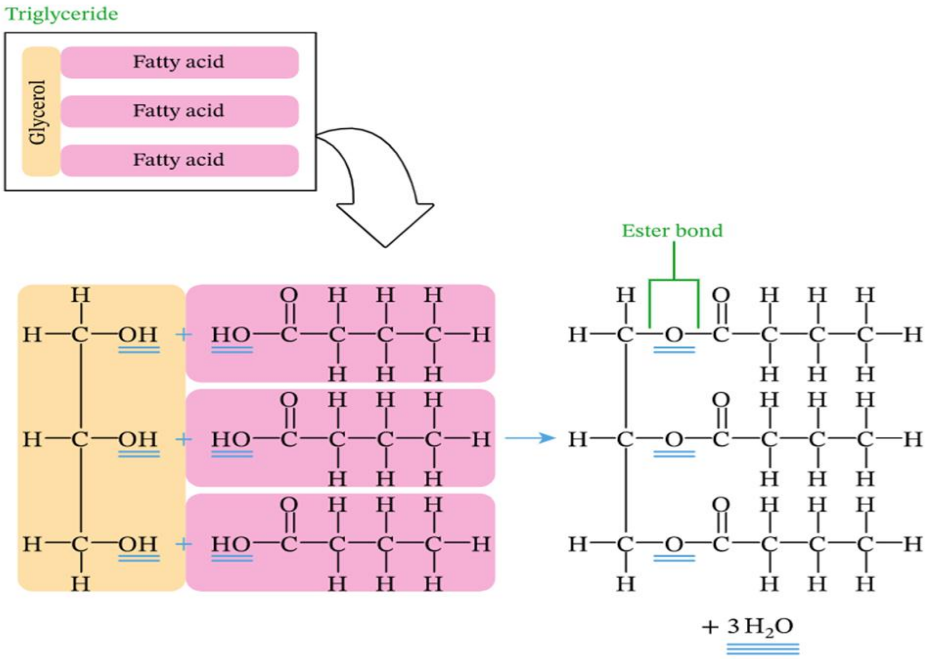


2. Unsaturated fatty acids (has more than one double bond).



Triglycerides (TG)

made up of 3 fatty acid chains attached to a glycerol molecule.
"**Tri**" refers to the three fatty acids,
"**glyceride**" refers to the glycerol backbone that the three fatty acids are bonded to.
* The bond between the fatty acid chain and the glycerol is called an ester bond.



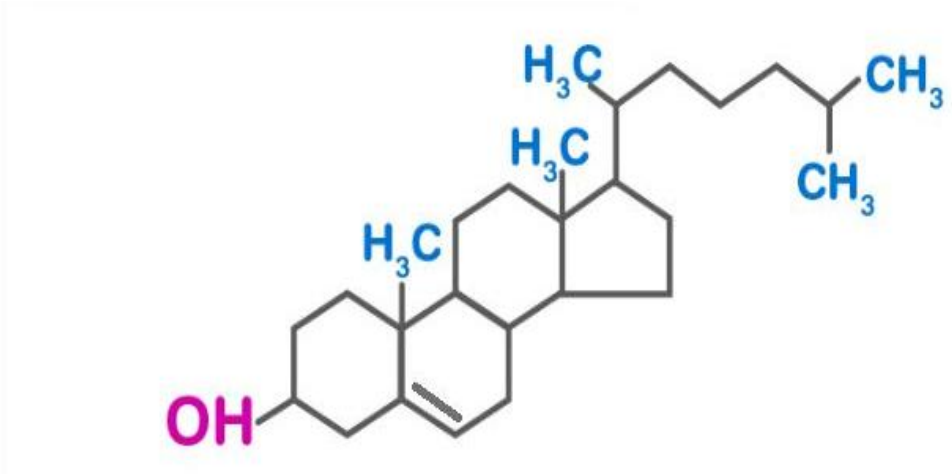
Cholesterol

Cholesterol: is a waxy, fat-like substance that's found in all the cells in body.

* It is an organic compound and is a type of lipid.
* In the human body, cholesterol is synthesized in the liver.

Molecular formula ⟶ $C_{27}H_{46}O$

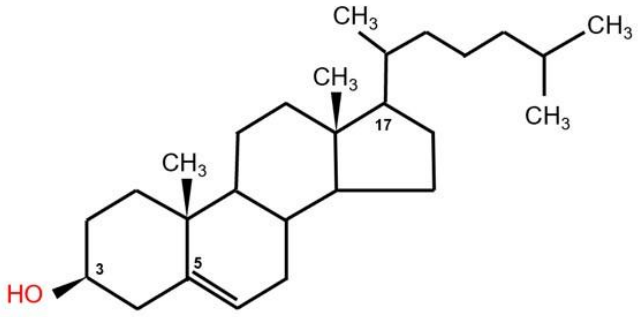
Chemical structure



*** Cholesterol is present in blood in two forms:**

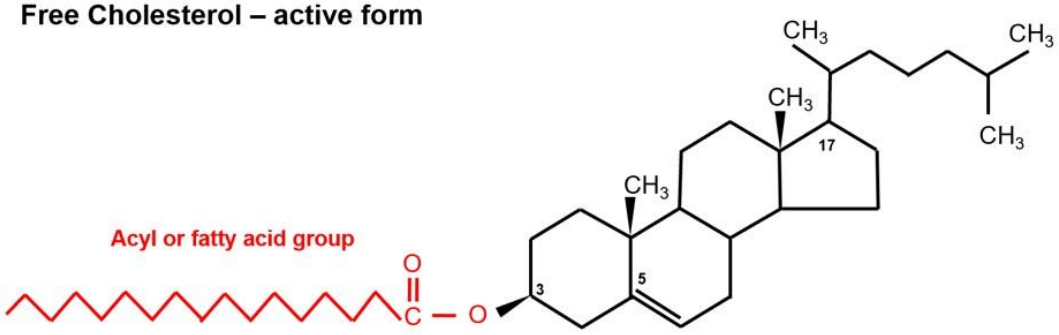
1- Free cholesterol

2- cholesterol esters



CH_3 = methyl group
HO = hydroxy group

Free Cholesterol – active form



Cholesteryl ester – inactive or storage form

Lipoproteins

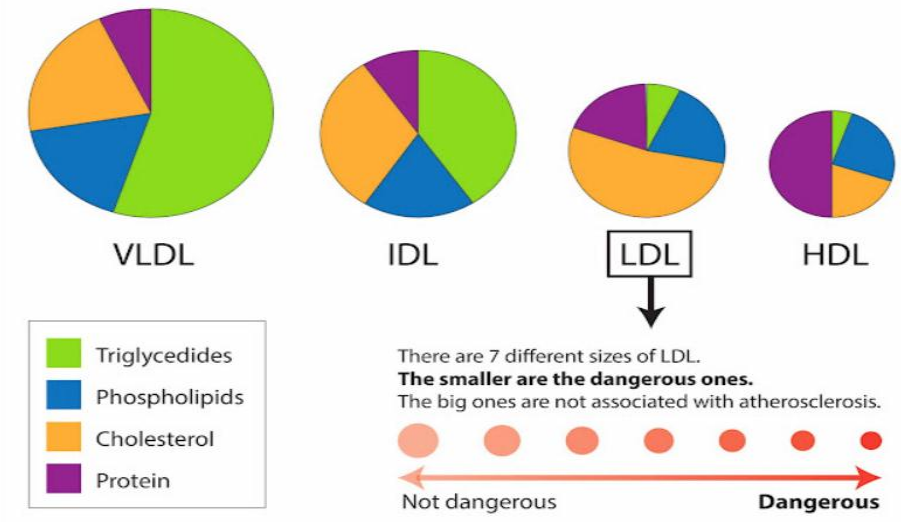
Lipoproteins: are a type of protein that transports cholesterol, a fatty substance,
in the blood.

* There are two main types of lipoprotein:

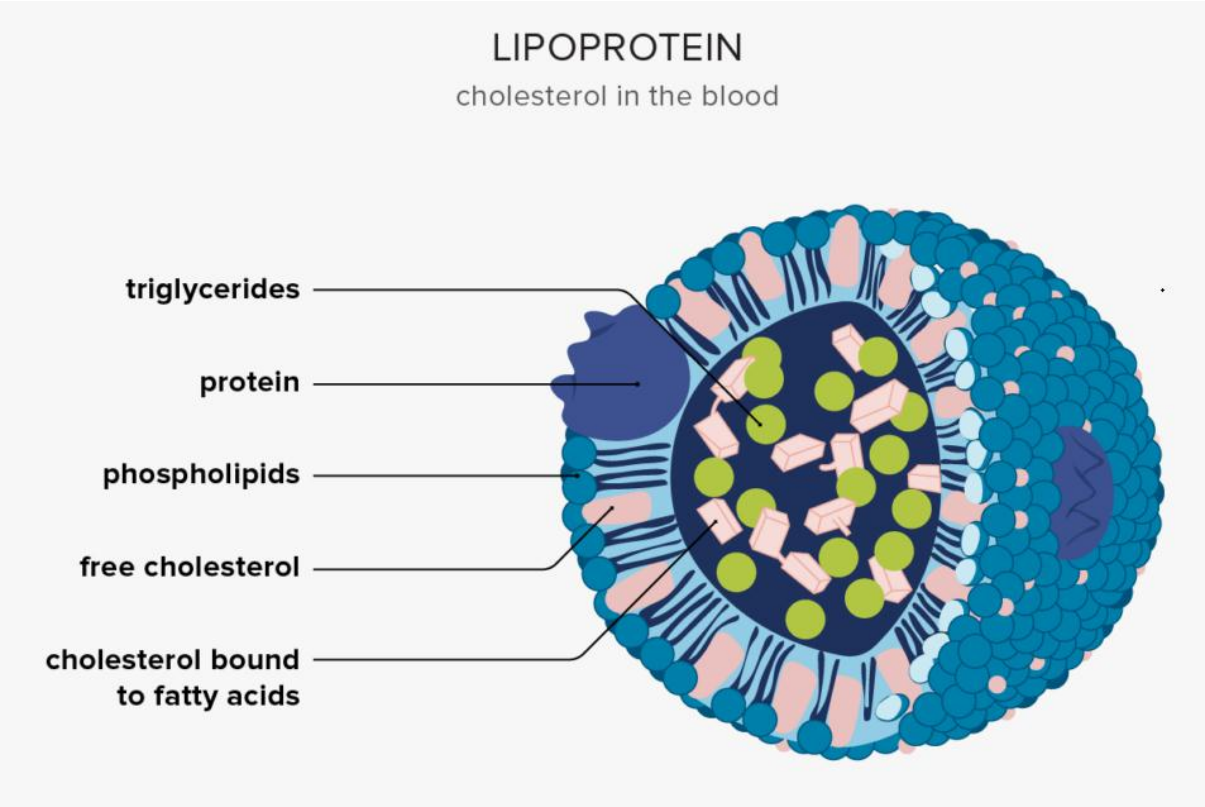
1- Chylomicrons

2- high-density lipoprotein (HDL) cholesterol or good cholesterol. **3-** low-density lipoprotein (LDL), or bad, cholesterol.

2- Very low density lipoproteins (VLDL)



lipoprotein structure



Functions of lipids

1- Storage of energy for long-term use (e.g. triglycerides)
2- Hormonal roles (e.g. steroids such as estrogen)
3- Insulation – both thermal (triglycerides) and electrical
4- Protection of internal organs (e.g. triglycerides and waxes)
5- Structural components of cells (e.g. phospholipids and cholesterol)

Lipids sources

الاسئلة البعدية

Q1 / Mention the functions and source of lipid .

رقم المحاضرة :	الحادي عشر والثاني عشر, والرابع والخامس
عنوان المحاضرة:	الهرمونات
اســـم المدرس:	م.م. هەوار صباح عبدالله
الفئة المستهدفة :	طلاب المستوى الاول
الهدف العام من المحاضرة :	
الأهداف السلوكية او مخرجات التعلم:	1-التعرف على مكونات الجهاز الهضمي 2-التعرف على وظائف الرئيسية للجهاز الهضمي 3- التعرف على العصارات المعدية والمعوية
استراتيجيات التيسير المستخدمة	عرض تقديمي، شرح، الصبورة
المهارات المكتسبة	مهارات التعلم على وصف الجهاز الهضمي ووظائفه الرئيسية , مهارات العرض والتقديم
طرق القياس المعتمدة	الاختبارات التحريرية ،الاسئلة والمناقشة ، تحليل الردود

الاسئلة القبلية

Q1 / Define hormone.
Q2 / Mention the types of hormones.

Hormones

Hormones: are chemical messengers secreted by special cells in an endocrine gland and transported in the bloodstream to the target cells.

* Endocrinology: study of endocrine glands and their secretions (hormones).
* Endocrine gland: a group of cells which secret "messenger" molecules directly into the bloodstream.
* Endocrine Glands:

A-Classical:	B-Recently identified:	
1- Gonads.	1- Kidney.	
2- Pancreas.	2- Heart/blood.	
3- Adrenals.		3- Liver.
4- Thyroid.		4- Brain.
5- Parathyroid.		5- Fat (adipose) tissue.
6- Pituitary.		6- Placenta.

* Classification of hormones:

A. Based on the chemical nature:

1- Protein (peptide) hormones: e.g: oxytocin
2- Steroid hormones: e.g: aldosteron
3- Amino acid derivatives: e.g: Epinephrine

B. Based on mechanism of action:

1- Binds to intracellular receptor: they are lipophilic in nature, and commonly

derived from cholesterol, e.g: estrogens.

2- Bind to cell surface (plasma membrane) receptors: stimulate release (or activation) of special substance (second messengers), because hormone consider first messenger.

* This group subdivided into three categories depending on the chemical nature of second messengers.

I. The second messenger is cAMP, e.g: FSH.

II. The second messenger is cGMP, e.g: ANF.

III. The second messenger is phosphatidylinositol/calcium, e.g: TRH.

IV. The second messenger is a kinase or phosphatase, e.g: Insulin.

*** Stages of hormone action:**

1- Biosynthesis of specific hormone in particular tissue.

2- Storage and/or secretion of the hormone.

3- Transport of the hormone to the target tissue(cell).

4- Recognition of the hormone by specific receptor.

5- Relay and amplification of the received signal causing cellular specific response.

6- Breakdown of the hormone.

*** Hormone secretion can be stimulated and inhibited by:**

1- Other hormones (stimulating- or releasing -hormones).

2- Plasma concentrations of ions or nutrients, as well as binding globulins.

3- Neurons and mental activity.

4- Environmental changes, e.g., of light or temperature

الاسئلة البعدية

Q1 / Enumerate the Stages of hormone action.

رقم المحاضرة :	الثالث عشر والرابع عشر
عنوان المحاضرة:	الاحماض النووية
اســـم المدرس:	م.م. هەوار صباح عبدالله
الفئة المستهدفة :	طلاب المستوى الاول
الهدف العام من المحاضرة :	
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استراتيجيات التيسير المستخدمة	عرض تقديمي، شرح، الصبورة
المهارات المكتسبة	مهارات التعلم رسم تخطيطي للحامض النووي , مهارات العرض والتقديم
طرق القياس المعتمدة	الاختبارات التحريرية ،الاسئلة والمناقشة ، تحليل الردود

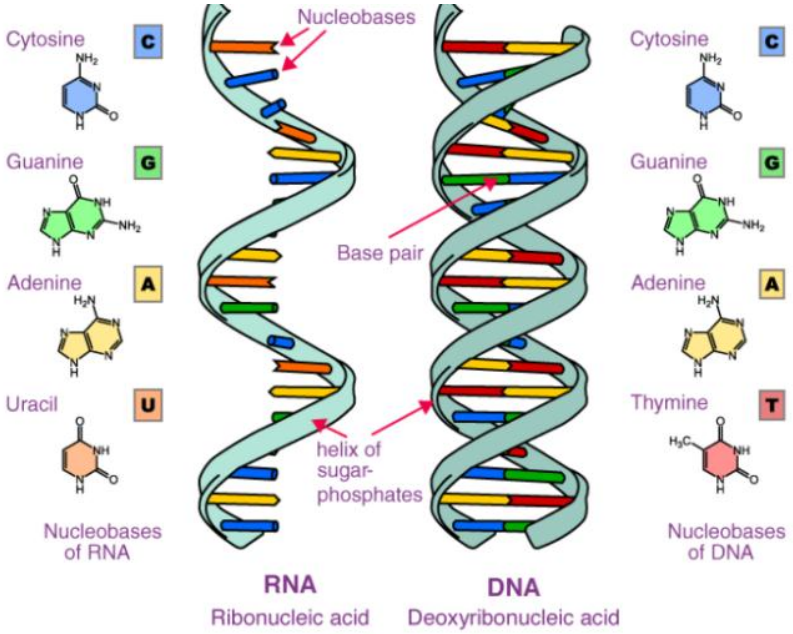
الاسئلة القبلية

Q1 / Define nucleic acids

Q2 / Enumerates the major classes of nucleic acids.

lecture 11

Nucleic acids



Nucleic acids : are naturally occurring chemical compounds that serve as the primary information carrying molecules in cells and makeup the genetic material.

* The first isolation of DNA was accomplished by Johann Friedrich 1870. In the
1920's nucleic acids were found to be major components of chromosomes.

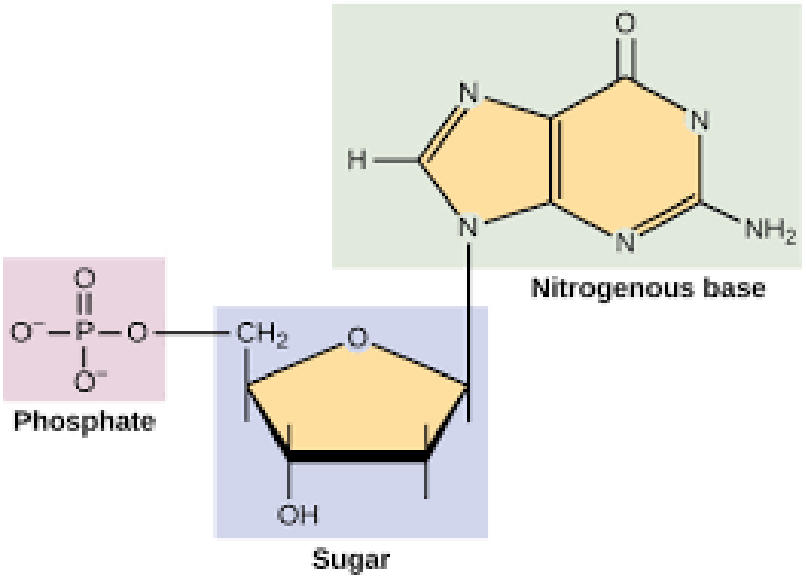
* Nucleic acids are the third class of biopolymers (polysaccharides and proteins
being the others)

* Elemental analysis of nucleic acids showed the presence of phosphorus, in
addition to the usual C, H, N & O.

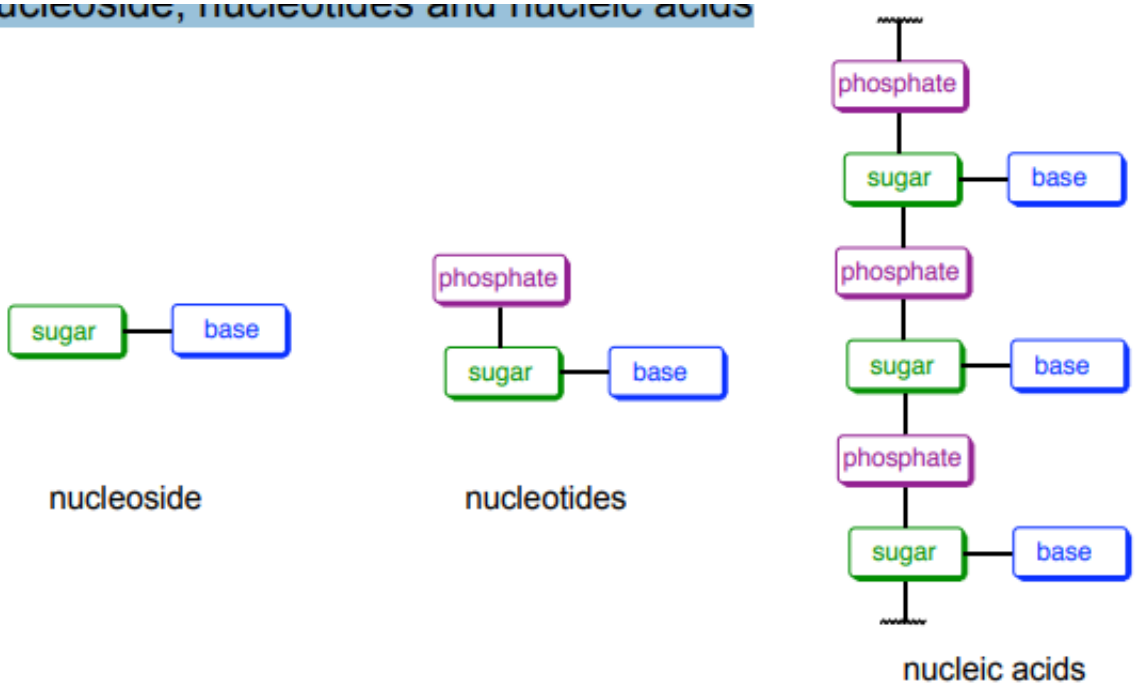
* Unlike proteins, nucleic acids contained no sulfur.

* **Two major classes of nucleic acids**
- Deoxyribonucleic acid (DNA): carrier of genetic information
- Ribonucleic acid (RNA): an intermediate in the expression of genetic information and other diverse roles

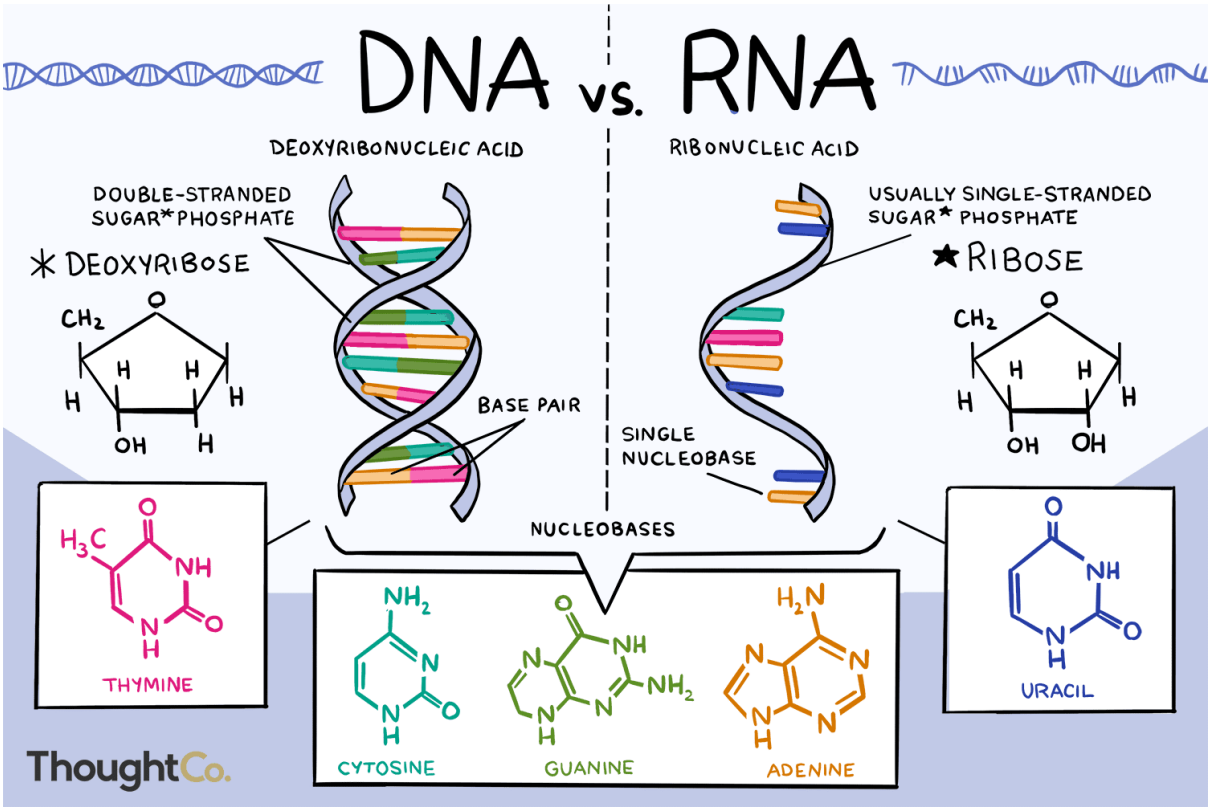
* The monomeric units for nucleic acids are nucleotides
* Nucleotides are made up of three structural subunits
1- Sugar: ribose in RNA, 2-deoxyribose in DNA
2- Heterocyclic base
3- Phosphate



* Nucleoside, nucleotides and nucleic acids .



* The chemical linkage between monomer units in nucleic acids is a phosphodiester



Q1 / Drew and liable the diagrammatic figure of DNA & RNA .

رقم المحاضرة :	الخامس عشر
عنوان المحاضرة:	الفيتامينات
اســـم المدرس:	م.م. هەوار صباح عبدالله
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استراتيجيات التيسير المستخدمة	عرض تقديمي، شرح، الصبورة
المهارات المكتسبة	مهارات التعلم على مصادر الفيتامينات, مهارات العرض والتقديم
طرق القياس المعتمدة	الاختبارات التحريرية ،الاسئلة والمناقشة ، تحليل الردود

الاسئلة القبلية

Q1 / Mention the Classification of vitamin

.

Vitamins

Vitamins: Vitamins are organic compounds required by the body in small for metabolism. amounts

* The vitamins are natural and essential nutrients.
* There are different types of vitamins and all are required for the metabolic processes.
* vitamins they cannot be synthesized by the body. Must be obtained by outside sources.

Types of Vitamins

* Based on the solubility, Vitamins have been classified into two different groups:

1- Fat-Soluble Vitamins.

- is one that dissolves in fat
- Fat-soluble vitamins are absorbed along with fats in the diet
- They are stored with fats in fat tissue and livers.
- Vitamins **A**, **D**, **E** and **K** are fat-soluble.

2- Water-Soluble Vitamins

- Water-soluble vitamins aren't long-term like fat-soluble vitamins.

- The water-soluble vitamins are readily absorbed by the tissues due to their easy dissolution in water.
- water-soluble vitamins cannot be stored by the body.

B1 (thiamine), **B2**(riboflavin), **B3**(niacin), **B5**(pantothenic acid), **B6**(Pyridoxine)
B7(Biotin), **B9**(Folic acid), **B12**(cobalamin) and Vitamin **C.**

Vitamin A

Vitamin A: is a group of fat-soluble compounds.
* That can be differentiated into two categories depending on whether the food source is an animal or a plant.

1- Vitamin A found in foods that come from animals is called **preformed vitamin A** or **retinol**.
2- Vitamin A found in fruits and vegetables is called **provitamin A carotenoid**.

Carotenoids: are pigments responsible for plant's red, yellow and orange colors, which our bodies can absorb and convert to vitamin A.
* One of the most well-known and abundant carotenoids in nature is beta-carotene.

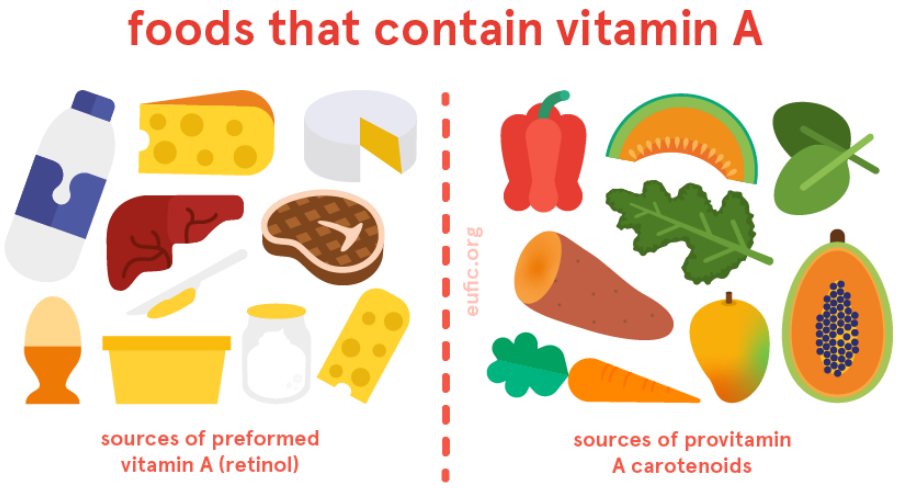
foods contain vitamin A:

Foods rich in retinol include:

1- meat.
2- butter.
3- dairy.
4- eggs.

Foods rich in carotenoids include

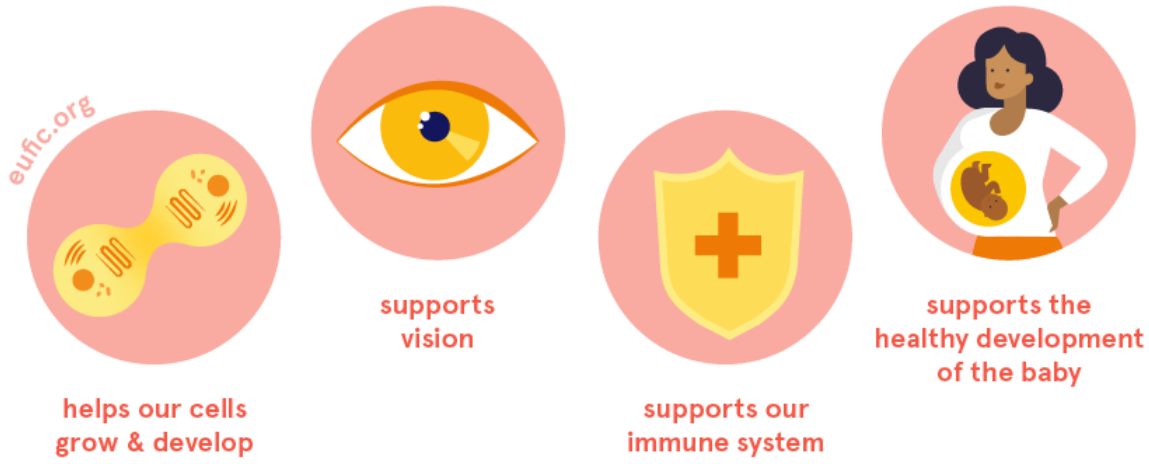
1- sweet potatoes.
2- Carrots.
3- Pumpkins.
4- dark green leafy vegetables.
5- sweet red peppers.
6- Mangoes.
7- melons.



650-750 µg RE per day

functions of vitamin A

1- plays a key role in developing and supporting our vision
2- keeping our immune system functioning properly.
3- helping our cells and tissues grow and develop.
4- is particularly important for reproduction, as it helps the normal growth and development of the embryo.



Vitamin D

Vitamin D: is a fat-soluble vitamin that we can get from foods, but also produce in our bodies when the skin is directly exposed to the sun.

* Food sources of this vitamin are particularly important during the times when our exposure to sunlight is lower

foods contain vitamin D:

1- fatty fish (salmon).

2- meat and meat products.
3- egg yolks.
4- fortified foods

15 µg of vitamin D per day.

Vitamin K

Vitamin K: is a fat-soluble vitamin that has three forms: vitamin K1, K2 and K3.
1- Vitamin K1, also known as phylloquinone, is the most abundant in foods and we can find it mainly in **plants**.

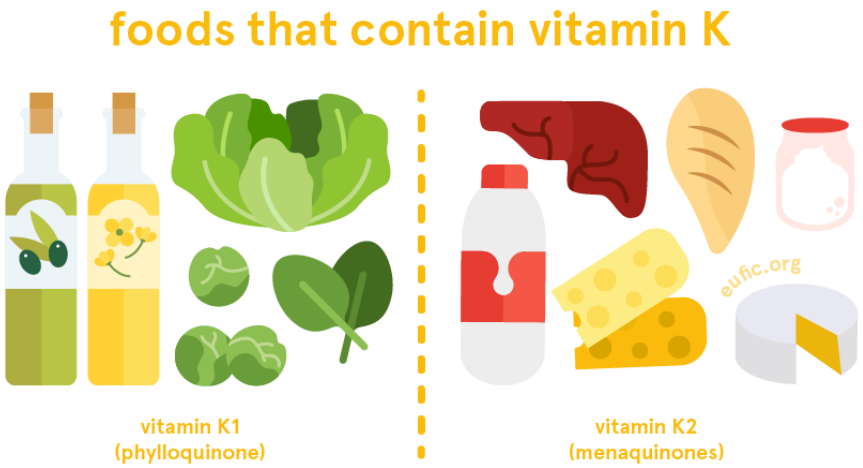
2- Vitamin K2, also known as menaquinone, is produced by bacteria and yeast and we can find it mainly in **animal products**.
3- Vitamin K3, also known as menadione, is the synthetic form of the vitamin and can only be found in **supplements**.

foods contain vitamin K:

Plant foods rich in vitamin K include:
1- dark green leafy vegetables.

2- some seed and vegetable oils.

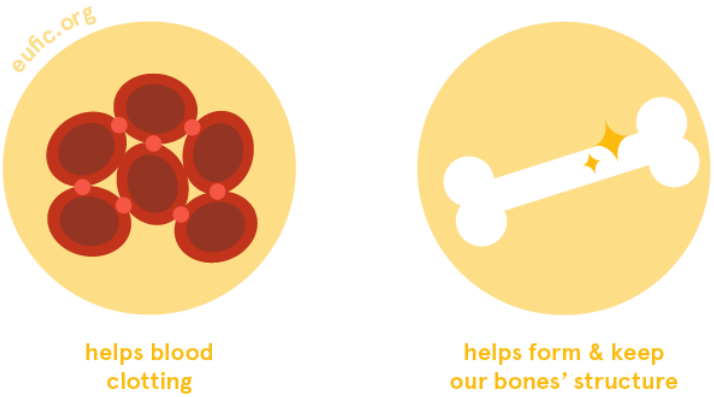
Animal foods rich in vitamin K include:
1- meat and meat products
(particularly liver products)
2- cheese and other dairy products
3- blended fats and oils.



70 µg of vitamin K per day

functions of vitamin K

Vitamin K is involved in many bodily functions.
1- Our bodies use vitamin K to form key proteins that keep the normal coagulation.
2- help form and maintain the structure of our bones.



Vitamin E

Vitamin E: is a fat-soluble vitamin that exists in eight different for of those, our bodies only uses α-tocopherol.

* Vitamin E is one of our cells' most important bodyguards, protecting their membranes from damage caused by free radicals.
Free radicals: are unstable molecules formed in our bodies during normal metabolism or during exposure to environmental factors such as cigarette smoke or pollution.

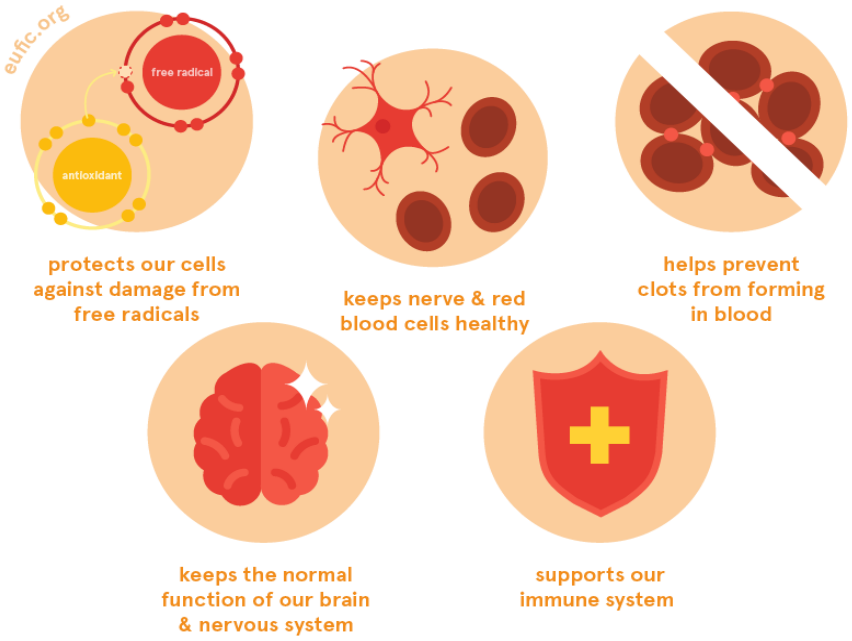
foods contain vitamin E:

1- vegetable oils.
2- nuts and seeds.
3- some fatty fish.
4- egg yolk.
5- whole-grain cereals

between 11-13 mg of vitamin E per day

functions of vitamin E

1- Vitamin E helps neutralize free radicals.
2- keeps our blood cells healthy and helps our nerves functioning properly.
3- it plays a role in preventing clots from forming in our blood.
4- supports the healthy function of our immune system.



Vitamin B1

Thiamin, also referred to as vitamin B1 is a water-soluble vitamin that belongs to the B-vitamins family.

foods contain vitamin B1:

1- wholegrains
2- pulses
3- meat (particularly liver)
4- fish

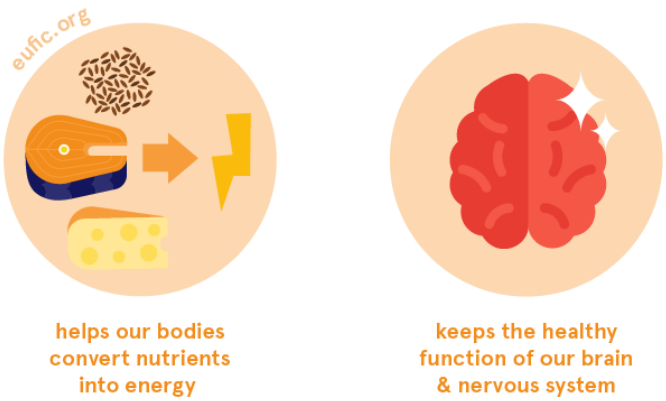
1 mg of thiamin per day

functions of vitamin B1

Thiamin is involved in many bodily processes and it's important to help our cells grow and function.

1- Our bodies also use thiamin to convert nutrients into energy

2- Keep the healthy function of our brain and nervous system

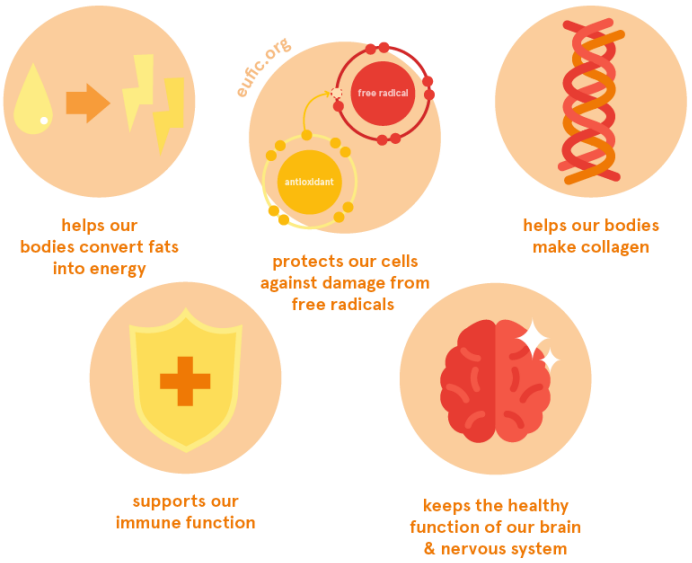


Vitamin C

Vitamin C, also known as ascorbic acid
is a water-soluble vitamin found in a variety of foods.

functions of vitamin C

1- protecting our cells against damage caused by free radicals.
2- supporting our immune response.
3- helping our bodies produce energy.
4- Vitamin C is also needed to produce collagen.
5- keep the healthy functioning of our brain and nervous system



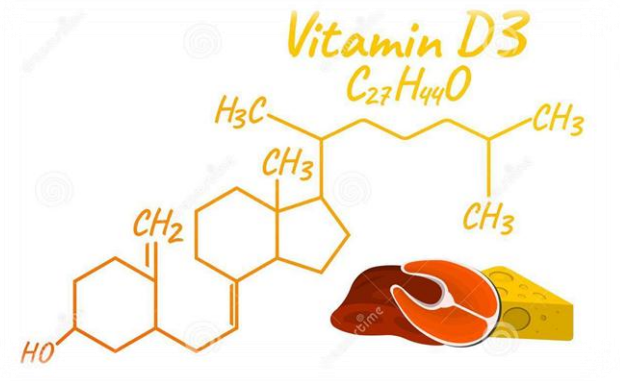
foods contain vitamin C:

1- fruits.
2- vegetables
3- Some herbs and spices
4- Usually, meat and fish don't have much vitamin C, but liver are good animal sources of this vitamin.

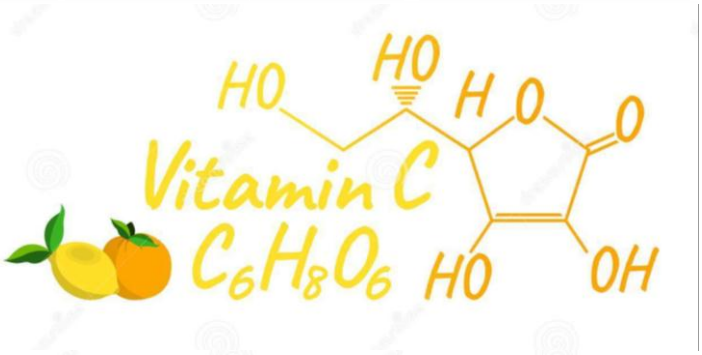
foods that contain vitamin C

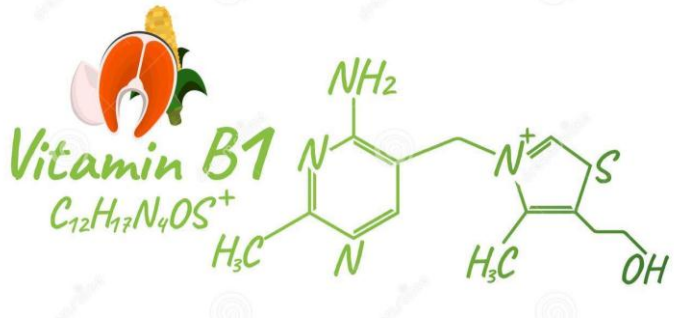
between 95-110 mg of vitamin C per day

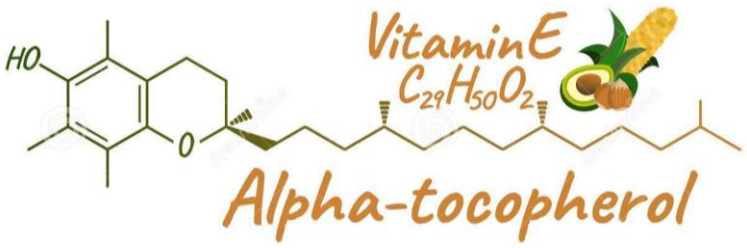
structure of Vitamins


Vitamin D3
$C_{27}H_{44}O$
H_3C
CH_3
CH_3
CH_3
CH_2
HO


O
O
Vitamin K
$C_{31}H_{46}O_2$


HO
HO
H
O
O
Vitamin C
$C_6H_8O_6$
HO
OH


Vitamin B1
$C_{12}H_{17}N_4OS^+$
NH_2
N
N^+
S
H_3C
N
H_3C
OH



الاسئلة البعدية

Q1 / Mention the functions of K , A , E , C vitamin

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1- Jaroslav Racek and Daniel Rajdl , Clinical Biochemistry, first ed ,2016

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3- Vijay Kumar Kiran Dip Gill, Basic Concepts in Clinical Biochemistry: A Practical Guide,2018

4- Uma Bhardwaj & Ravindra Bhardwa, Biochemistry for Nurses,2012

DM Vasudevan , Sreekumari S &Kannan Vaidyanathan,Textbook of -5 Biochemistry for Medical Students,2013

المصادر المقترحة:

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روابط مقترحة ذات صلة: