Ministry of Higher Education & Scientific Research
Al-Rasheed University College
Department of Medical Laboratory Technique

وزارة التعليم العالي والبحث العلمي
كلية الرشيد الجامعة
قسم تقنيات المختبرات الطبية

حقيبة تعليمية

بعنوان: الفسلجه البشريه

إعداد

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٢٠٢٢ ـ ٢٠٢٣

المقدمة

يمكن تعريف علم الوظائف (الفسيولوجي) :- بأنه ذلك الفرع من العلوم الحيوية الذي يتعامل مع الوظائف الكاملة للأعضاء المختلفة للجسم وهي بكامل صحتها ويؤكد على التغيرات التي تطرأ على الجسم بأكمله عند نشاط وعمل هذه الأعضاء أثناء قيامها بفعالياتها الأساسية والتحري عن سبب وكيفية أنجاز تلك الوظائف الحيوية الضرورية لإدامة حياة الكائن الحي . أما أبسط تعريف يمكن أن ينطبق على الفسلجة :- هو علم وظائف الكائنات الحية أو دراسة وظائف جميع أعضاء الجسم.
يعتبر علم وظائف الأعضاء أو الفسيولوجي (بالإنجليزية: Physiology) فرعاً من فروع علم الأحياء. بحسب معجم ويبستر فإن علم وظائف الأعضاء هو علم يقوم على دراسة وظائف المادة الحية.

يتضمن علم وظائف الأعضاء دراسة وظائف وكيفية عمل الأجهزة العضوية، والخلايا، والجزيئات الحيوية الداخلة في العمليات الكيميائية والفيزيائية في الكائنات الحية كالإنسان والنبات والحيوان. والبحث في علم وظائف الأعضاء يساعد على فهم كيفية عمل الآليات في الجسم مثلاً: معرفة كيفية التحكم في معدل ضربات القلب، وكيف يستجيب الجسم، وكيف يتكيف.

يدور علم الفسيولوجي حول فهم كيف يحافظ الجسم على حالة مستقرة والتكيف مع الظروف الخارجية، مثل كيف يحافظ على درجة حرارة الجسم ودرجة حموضة الدم ونسبة السكر في الدم. من خلال إلقاء الضوء على وظائف الجسم الطبيعية، يمكن لعلم الفسيولوجي اكتشاف التغيرات التي تحدث أثناء المرض وهذا الشيء يساعد الأطباء على فهم الأمراض ومعالجتها.

يساعد علم وظائف الأعضاء أيضاً على فهم كيفية جعل الجسم يعمل بكفاءة أكبر مثلاً في الطب الرياضي يساعد علم وظائف الأعضاء على فهم كيفية التعافي بشكل أسرع. أولئك الذين يحققون إنجازات كبيرة في تخصص علم الفسيولوجي تمنحهم الأكاديمية الملكية للعلوم جائزة نوبل في الطب وعلم وظائف الأعضاء. وتعتبر هذه الجائزة كأرفع جائزة علمية يحصل عليها أصحاب الإنجازات.

فهرس المحتويات

وصف المقرر الدراسي
TEMPLATE FOR COURSE SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

COURSE SPECIFICATION

This Course Specification provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It should be cross-referenced with the programme specification.

1. Educational institution	Al-Rasheed University College
2. Section scientific / Center	Medical laboratory techniques
3. Course name / code	Human physiology - HuPh250

4. Programme (s) to which it contributes	Medical laboratory technician
5. Available attendance shapes	online
6. season/year	Electronic platform / Practical presence
7. The number of school hours (total)	First and second semester 2022/2023
8. The date this description was prepared	60 hours
	2022

9. Aims of the Course
Introducing the student to the components of somatic cells and the various components of the blood to enable the student to prepare to practice his work in the future.
Physiology is the study of the organs of an organism's body and the organs that compose it. It provides a lot of information about the functions of the human body through experiments on animals.
This course deals with the study of the basic functions of the human body, starting with the cell, then tissues, then organs, and ending with the body's systems. To keep its internal environment constant and stable, the practical lessons are well designed that allows the student to conduct practical experiments and examine models and models of the organs and systems of the body

10· Learning Outcomes, Teaching, Learning and Assessment Methode
A- Knowledge and Understanding 1-Describe cellular functions at the organelle and molecular level. 2-Indicate and explain the functions of the various components of blood. 3-Describe the structure, characteristics, and functions of the heart muscle in general
B. Subject-specific skills 1-Conducting blood tests: estimating the percentage of hemoglobin in the blood, bleeding and clotting times, and determining the hematocrit value, bleeding and clotting times, and blood groups. 2-Perform the most important respiratory function tests 3-separation of blood components 4-Calculating the number of red and white blood cells 5-Perform urine and semen tests

Teaching and Learning Methods
1-give lectures the theory 2- Special practical laboratories 3- Presentations
Assessment methods
-Theoretical assessment exam for the middle and end of the semester -Practical assessment exam at the end of the semester -Short exams during the semester -attendance of students
C. Thinking Skills C1. understanding of core physiological concepts while building the critical thinking skills that will prepare them for success in their future careers. C2.Critical thinking exercises help students apply their knowledge of physiology

Assessment methods
-midterm exam -Sudden short quizzes -Evaluation Customer reports -final exam

D. General and Transferable Skills (other skills relevant to employability and personal development)
D1-Use powerpoint to display educational models D2-Using the Internet to search for recent topics to develop the curriculum D3-Using e-books to develop lectures D4-Use the interactive teaching method

11. Course Structure					
Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
1	2 hours	Learn about physiology. Understand the meaning of the cell and its basic components	General Introduction to Physiology Cell Physiology: General Functions, Cell Membrane Transport	Data show, whiteboard	Miscellaneous exams
2	2 hours	A general idea of bodily fluids, their types and methods of measurement	General Idea about Body fluids: Types, Composition, and Functions. Unit of Measurement, Conversion and Conversion factor.	Data show, whiteboard	presentation
3	2 hours	Identification of blood components and methods for their isolation	Blood: Composition, Specific Functions of each Compartment. Plasma and Serum Differences and Separation.	Data show, whiteboard	Various exams and reports
4	2 hours	Identification of red blood cells and their normal ratio in the blood and their composition Definition of the term hemoglobin and its normal level in the blood	RBCs: Definition, Structure, and Normal Value; Hb Definition, Structure, and Normal Value; Blood Groups.	Data show, whiteboard	seminar

5	2 hours	red blood cell generation process	Erythropoiesis, Homeostasis, Death and Disposal.	Data show, whiteboard	Miscellaneous exams
6	2 hours	Identifying white blood cells, their different types, and their normal percentage in the blood	White Blood Cells: Classification, Specific Function,Normal Value.	Data show, whiteboard	presentation
7	2 hours	Definition of platelets and their normal ratio in the blood	Platelet: Definition, Function, Normal Value, Thrombopoiesis and Hemostasis.	Data show, whiteboard	Miscellaneous exams
8	2 hours	Physiology of the human heart	Heart Physiology: Conductive System, Cardiac Output (Mechanics and Control), and Factor Affecting.	Data show, whiteboard	presentation
9	2 hours	Mechanism of heart work and blood pressure identification	Vascular (Blood Vessels) Physiology: Mechanics and Control; blood pressure; and Factor Affecting.	Data show, whiteboard	Various exams and reports
10	2 hours	Bring back the previous lab	Vascular (Blood Vessels) Physiology: Mechanics and Control; blood pressure; and Factor Affecting.	Data show, whiteboard	seminar

11	2 hours	Lymphatic System Physiology	Lymphatic Physiology: Organs: Composition, Function of each part. Lymph: Structure, Hemodynamic and Factor Affecting their Movement.	Data show, whiteboard	Miscellaneous exams
12	2 hours	Respiratory physiology	Respiratory Physiology: Parts and Specific Functions; Ventilation: Mechanics and Control	Data show, whiteboard	presentation
13	2 hours	Transport of respiratory gases through the blood	External Respiration, Gas Blood Transport, Internal Respiration: Mechanics, Control and Factor affecting.	Data show, whiteboard	Various exams and reports
14	2 hours	Learn about lung size and its normal values	Lung Volumes: Normal Values and Factor Affecting; Conscious and Un-Conscious Control of Respiration. Role of Pons and Medulla in Respiratory Transient.	Data show, whiteboard	seminar

15 th	2 hours	Explain the acid-base balance	Acid-Base Balance: Definition, Buffer Systems, and Role of Body Systems In the Regulation.	Data show, whiteboard	Miscellaneous exams
16	2 hours	Introduction to physiology of the digestive system, basic functions and movement of food	Digestive Physiology: GIT: Part General Function, Food Movement, and Control. Swallowing Reflex	Data show, whiteboard	presentation
17	2 hours	Explain chemical digestion. Absorption control	Digestive Physiology: GIT Chemical Digestion, Absorption, and Control. Deficiency Reflex	Data show, whiteboard	Various exams and reports
18	2 hours	Introducing the types of glands attached to the digestive system and their role in digesting food	Digestive Physiology: Accessory Organs: Secretion and Their Role in Digestion. Secretion Control.	Data show, whiteboard	seminar

19	2 hours	Explanation of the physiology of the urinary system Definition of urine, its components and properties	Urinary Physiology: General Functions of US. Urine: Definition and Normal Constitute. Physical and Chemical Property of Urine.	Data show, whiteboard	Miscellaneous exams
20	2 hours	Understand the role of the kidneys in the formation of urine	Role of Kidney in Urine Formation and Maintenance of Body Fluids and The Role In Acid-Base Balance.	Data show, whiteboard	presentation
21	2 hours	Explanation of the parts of the urinary tract The amount of normal urine per day and the factors affecting it	Urinary Tract: Parts and Function. Urine Hemodynamic and Control. Normal Urine Daily Volume and Factor Affecting.	Data show, whiteboard	Various exams and reports
22	2 hours	Explanation of what is meant by endocrine physiology Hormones: their types, natural proportions, and their function	Endocrine Physiology: Endocrine Glands Types and Secretion. Hormone: Types, Normal Value, Function and Control of Secretion.	Data show, whiteboard	seminar

23	2 hours	Physiology of the reproductive system Physiology of the male reproductive system	Reproductive Physiology: Male Sex Physiology:Function of Genital Organs. Male Sex Hormones: Normal Value, Production, Control, and Their Role in Reproduction.	Data show, whiteboard	Miscellaneous exams
24	2 hours	Physiology of the female reproductive system	Female Sex Physiology: Function of Genital Organs. Normal Value of Female Sex Hormone, Production, and Control. Female Cycle, Pregnancy, Parturition, and Lactation: Hormonal Fluctuation and Control.	Data show, whiteboard	presentation
25	2 hours	muscular system physiology	Muscles Physiology: Types and Functions. Generation of Action Potential, Contraction, and Sliding-Filament theory.	Data show, whiteboard	Various exams and reports

26	2 hours	physiology of the nervous system	Nervous Physiology: Neuroglia: Definition, Types, and Function. Neurons: Definition, Types, and Function. CSF: Composition, Function, and Clinical Importance	Data show, whiteboard	Miscellaneous exams
27	2 hours	Explanation of the term synapse: its types and functions	Generation of Action Potential.Neuronal Conduction: Types and Speed. Synapsis: Types, and Function.	Data show, whiteboard	presentation
28	2 hours	Parts and functions of the central nervous system	CNS: Parts and Functions	Data show, whiteboard	Various exams and reports
29	2 hours	Parts and functions of the spinal cord peripheral nervous system	Spinal Cord: Parts, General Functions, and Spinal Reflexes. PNS: Types and Function.	Data show, whiteboard	seminar

12. Infrastructure	
Required reading: · CORE TEXTS · COURSE MATERIALS · OTHER	Sherwood, L. (2011). Fundamentals of human physiology. Cengage Learning. Human Physiology, RF Schmidt, G. Thews 2013 Youmans, WB (1962). Fundamentals of Human Physiology. For Students in the Medical Sciences. Academic Medicine, 37(5), 527.
Special requirements (include for example workshops, periodicals, IT software, websites)	Waugh, A. Grant, A. (2010). Ross and Wilson Anatomy and Physiology in Health and Illness. (11thEdition). Churchill Livingstone Elsevier http://teachmeanatomy.info/
Community-based facilities (include for example, guest Lectures, internship , field studies)	Lectures and field studies

13. Admissions	
Pre-requisites	
Minimum number of students	15 students
Maximum number of students	20 students

إرشادات للطلبة

- الرغبة والحماس للتعليم
- كن مشاركاً في جميع الأنشطة
- احترم أفكار المدرس والزملاء
- أنقد أفكار المدرس والزملاء بأدب إن كانت هناك حاجة.
- احرص على استثمار الوقت
- تقبل الدور الذي يسند إليك في المجموعة
- حفز أفراد مجموعتك في المشاركة في النشاطات
- احرص على بناء علاقات طيبة مع المدرس والزملاء أثناء المحاضرة
- احرص على ما تعلمته في المحاضرة وطبقه في الميدان .
- ركز ذهنك بالتعليم واحرص على التطبيق المباشر
- تغلق الموبايل قبل الشروع بالمحاضرة

الوحدة الأولى - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1. Define physiology.
2. Explain cell membrane and its composition and functions.
3. List the cytoplasmic organelles and their functions.
4. Enumerate the structures of nucleus.
5. Compare between ectoplasm and endoplasm.

موضوعات المحاضرة الاولى:

1- General Introduction to Physiology.
2- Cell Physiology: General Functions, Cell Membrane Transport.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• نشاط التعارف (١/١/١) • محاضرة • مناقشة • سؤال وجواب	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الأولى	الأولى	الترحيب بالطلبة والتعارف معهم	٩٠ دقيقة
		التعريف بالبرنامج وأهدافه وأهميته	
		القاء المحاضرة مستخدما جهاز العرض والسبورة	
		طرح بعض الاسئلة خلال القاء المحاضرة	
		نشاط (١/١/١) تمرين تعريف وتعداد	

المادة العلمية:

Human Physiology

Physiology is defined as the study of functions of various systems and different organs of the body. Physiology is of different types namely, Human Physiology, Animal Physiology and Plant Physiology. Human Physiology and Animal Physiology are very much inter-related. Knowledge of Human Physiology is essential to understand the other allied subjects like Biochemistry, Pharmacology, Pathology, Medicine, etc.

Cell Physiology

All the living things are composed of cells. A single cell is the smallest unit that has all the characteristics of life .

Structure of the Cell

Each cell is formed by a cell body and a membrane covering the cell body called the cell membrane. Cell body has two parts, namely nucleus and cytoplasm surrounding the nucleus. Thus, the structure of the cell is studied under three headings:

1. Cell membrane.
2. Cytoplasm.
3. Nucleus.

Cell Membrane

Cell membrane is a protective sheath, enveloping the cell body. It is also known as plasma membrane. This membrane separates the fluid outside the cell called extracellular fluid (ECF) and the fluid inside the cell called intracellular fluid (ICF). The cell membrane is a

semipermeable membrane. So, there is free exchange of certain substances between ECF and ICF.

Composition of Cell Membrane

Cell membrane is composed of three types of substances:

1. Protein (55).
2. Lipids (40%).
3. Carbohydrates (5%).

Functions of Cell Membrane

1. Protective function: Cell membrane protects the cytoplasm and the organelles present in the cytoplasm
2. Selective permeability: Cell membrane acts as a semipermeable membrane, which allows only some substances to pass through it and acts as a barrier for other substances
3. Absorptive function: Nutrients are absorbed into the cell through the cell membrane
4. Excretory function: Metabolites and other waste products from the cell are excreted out through the cell membrane
5. Exchange of gases: Oxygen enters the cell from the blood and carbon dioxide leaves the cell and enters the blood through the cell membrane
6. Maintenance of shape and size of the cell: Cell membrane is responsible for the maintenance of shape and size of the cell.

Cytoplasm

Cytoplasm of the cell is the jelly-like material formed by 80% of water. It contains a clear liquid portion called cytosol and various particles of different shape and size. These particles are proteins, carbohydrates, lipids or electrolytes in nature. Cytoplasm also contains many organelles with distinct structure and function .

Cytoplasm is made up of two zones:

1. Ectoplasm: Peripheral part of cytoplasm, situated just beneath the cell membrane
2. Endoplasm: Inner part of cytoplasm, interposed between the ectoplasm and the nucleus.

Functions of cytoplasmic organelles

Rough endoplasmic reticulum	Synthesis of proteins
Smooth endoplasmic reticulum	Synthesis of lipids and steroids
Golgi apparatus	Processing, packaging, labeling and delivery of proteins and lipids
Lysosomes	Degradation of macromolecules
Centrosome	Movement of chromosomes during cell division
Ribosomes	Synthesis of proteins
Mitochondria	1. Production of energy 2. Synthesis of ATP
Cytoskeleton	1. Determination of shape of the cell 2. Stability of cell shape 3. Cellular movements

Nucleus

Nucleus is the most prominent and the largest cellular organelle. It has a diameter of 10 µ to 22 µ and occupies about 10% of total volume of the cell. Nucleus is present in all the cells in the body except the red blood cells. The cells with nucleus are called eukaryotes and those without nucleus are known as prokaryotes. Presence of nucleus is necessary for cell division .

Most of the cells have only one nucleus (uninucleated cells). Few types of cells like skeletal muscle cells have many nuclei (multinucleated cells). Generally, the nucleus is located in the center of the cell. It is mostly spherical in shape. However, the shape and situation of nucleus vary in some cells.

Structure of Nucleus

1- Nuclear membrane.
2- Nucleoplasm.
3- Chromatin.
4- Nucleolus.

Q1: Define Physiology
Q2: Enumerates the structures of nucleus.

الوحدة الأولى - المحاضرة الثانيه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الثانيه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Define the body fluids.
2- List the significance of body fluids.
3- List the Composition of Body Fluids
4- How to measure body fluids.

موضوعات المحاضرة الثانيه:

1- General Idea about Body fluids: Types, Composition, and Functions.
2- Unit of Measurement, Conversion and Conversion factor.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• محاضرة • عرض فديو • سؤال وجواب • نشاط (١/٢/١) نشاط فردي	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الثانيه

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الأولى	الثانيه	القاء المحاضرة مستخدما جهاز العرض والسبورة	٩٠ دقيقة
		طرح بعض الاسئلة خلال القاء المحاضرة	
		عرض فديو توضيحي يخص المحاضره	
		نشاط (١/٢/١) تمرين تعداد	

المادة العلمية:

Body Fluids

Body is formed by solids and fluids. Fluid part is more than two third of the whole body. Water forms most of the fluid part of the body. In human beings, the total body water varies from 45% to 75% of body weight. In a normal young adult male, body contains 60% to 65% of water and 35% to 40% of solids. In a normal young adult female, the water is 50% to 55% and solids are 45% to 50%. In females, water is less because of more amount of subcutaneous adipose tissue. In thin persons, water content is more than that in obese persons. In old age, water content is decreased due to increase in adipose tissue. Total quantity of body water in an average human being weighing about 70 kg is about 40 L.

Significance of Body Fluids

1-In Homeostasis

Body cells survive in the fluid medium called **internal environment**. Internal environment contains substances such as glucose, amino acids, lipids, vitamins, ions, oxygen, etc. which are essential for growth and functioning of the cell.

2-In Transport Mechanism

Body water forms the transport medium by which nutrients and other essential substances enter the cells; and unwanted substances come out of the cells. Water forms an important medium by which various enzymes, hormones, vitamins, electrolytes and other substances are carried from one part to another part of the body.

3-In Metabolic Reactions

Water inside the cells forms the medium for various metabolic reactions, which are necessary for growth and functional activities of the cells.

4-In Texture of Tissues

Water inside the cells is necessary for characteristic form and texture of various tissues.

5-In Temperature Regulation

Water plays a vital role in the maintenance of normal body temperature.

Compartments of Body Fluids –Distribution of Body Fluids

Total water in the body is about 40 L. It is distributed into two major compartments:

1. Intracellular fluid (ICF): is the fluid found inside the cell membrane. Its volume is 22 L and it forms 55% of the total body water. The concentration of sodium is low and the concentration of potassium is high.

2. Extracellular fluid (ECF): is the fluid found outside cell membrane. Its volume is 18 L and it forms 45% of the total body water. The concentration of sodium is high and the

concentration of potassium is low. Examples: lymph, Plasma, Fluid in bones and fluid in dense connective tissues like cartilage.

Composition of Body Fluids

Body fluids contain water and solids. Solids are organic and inorganic substances.

1-Organic Substances: are glucose, amino acids and other proteins, fatty acids and other lipids, hormones and enzymes.

2-Inorganic Substances: present in body fluids are sodium, potassium, calcium, magnesium, chloride, bicarbonate, phosphate and sulfate.

Measurement of Body Fluid Volume

Total body water and the volume of different compartment of the body fluid are measured by **indicator dilution method** or **dye dilution method**.

-Principle of indicator dilution method

A known quantity of a substance such as a **dye** is administered into a specific body fluid compartment. These substances are called the **marker substances** or **indicators**. After administration into the fluid compartment, the substance is allowed to mix thoroughly with the fluid. Then, a sample of fluid is drawn and the concentration of the marker substance is determined. For example (**Radioactive substances**) or other substances whose concentration can be determined by using colorimeter are generally used as marker substances.

Q1: Enumerates the two compartments of body fluids

الوحدة الثانيه - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Define blood and list its compositions.
2- Define plasma and serum and differences between them.
3- Enumerates the three types of cells are present in the blood.

موضوعات المحاضرة الاولى:

1- Blood: Composition, Specific Functions of each Compartment.
2- Plasma and Serum: Differences and Separation.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• مناقشة • محاضره • نشاط (١/١/٢) مقارنه	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الثانيه	الأولى	السماح للطلبه بمشركة معلوماتهم قبل البدء بالمحاضره	٩٠ دقيقة
		القاء المحاضرة مستخدما جهاز العرض والسبورة	
		طرح بعض الاسئلة خلال القاء المحاضرة	
		نشاط (١/١/١) تمرين تعريف وتعداد	

المادة العلمية:

Blood

Blood is a connective tissue in fluid form. It is considered as the:

1- **'Fluid of life'** because it carries oxygen from lungs to all parts of the body and carbon dioxide from all parts of the body to the lung.
2- **'Fluid of growth'** because it carries nutritive substances from the digestive system and hormones from endocrine gland to all the tissues.
3- **'Fluid of health'** because it protects the body against the diseases and gets rid of the waste products and unwanted substances by transporting them to the excretory organs like kidneys.

Composition of Blood

Blood contains the blood cells which are called **formed elements** and the liquid portion known as **plasma**.

***Blood Cells**

Three types of cells are present in the blood:

1. Red blood cells or erythrocytes.
2. White blood cells or leukocytes.
3. Platelets or thrombocytes.

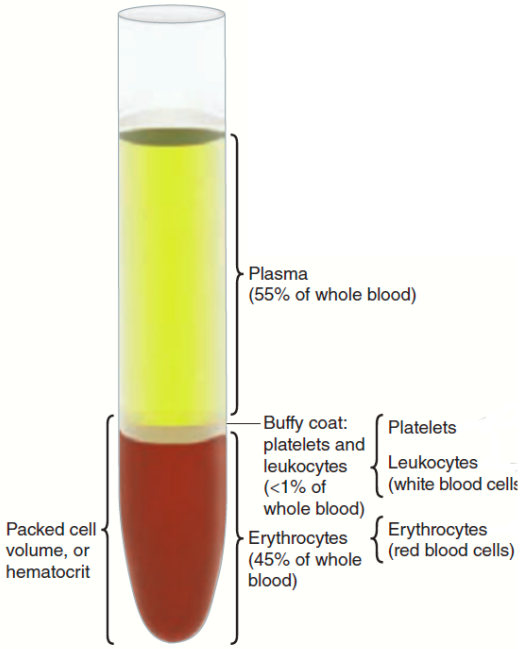
***Plasma:** is the fluid portion of the blood. It constitutes approximately 55% of a given volume of blood. It is a straw-colored liquid, about 90% water. The **functions** of blood plasma include transporting nutrients, gases, and vitamins; regulating electrolyte and fluid balances; and maintaining a consistent blood pH of between 7.35 and 7.45.

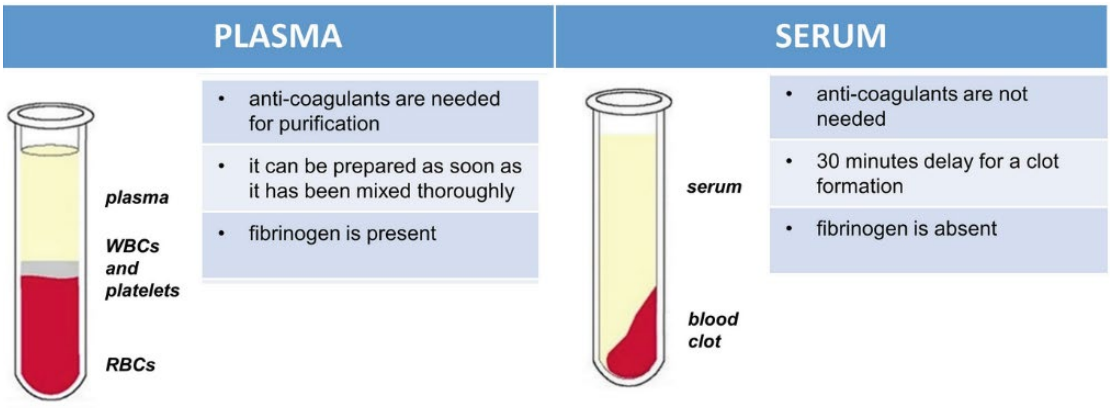
Plasma is obtained by collection the blood to anticoagulant tube (ex: EDTA) put it in the centrifuge at 2500 to 3000 rpm for 10 minutes.

***Serum:** is the clear straw-colored fluid that oozes from blood clot. When the blood is shed or collected in a container, it clots. In this process, the fibrinogen is converted into fibrin and the blood cells are trapped in this fibrin forming the blood clot.

Serum is obtained by allowing the whole blood to clot at room temperature (generally 20–30 minutes). When the clot has formed, centrifuging it at 2500 to 3000 rpm for 10 minutes.

Serum = Plasma – Fibrinogen





Q1: compare between serum and plasma

الوحدة الثانيه - المحاضرة الثانيه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الثانيه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Describe the structure and function of red blood cells.
2- Describe the three anatomic features of erythrocytes contribute to the efficiency with which they transport O2.
3- Be able to differentiate cells in various stages of erythropoiesis.

موضوعات المحاضرة الثانيه:

1- RBCs: Definition, Structure, and Normal Value; Hb Definition, Structure, and Normal Value; Blood Groups.
2- Erythropoiesis, Homeostasis, Death and Disposal.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• نشاط (١/٢/٢) عرض تقديمي يخص احد مواضيع الجلسه • مناقشه	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الثانيه

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الثانيه	الثانيه	نشاط (١/٢/٢) عرض تقديمي يخص احد مواضيع المحاضره الاجابه عن الاسئلة التي تدور في ذهن الطلبه خلال العرض	٩٠ دقيقة

المادة العلمية:

Red blood cells (RBCs)

Red blood cells (RBCs) are the **non-nucleated** formed elements in the blood. Red blood cells are also known as erythrocytes (erythros = red). Red color of the red blood cell is due to the presence of the coloring pigment called hemoglobin. RBCs play a vital role in transport of respiratory gases. RBCs are larger in number compared to the other two blood cells, namely white blood cells and platelets.

***Normal Value**

RBC count ranges between 4 and 5.5 million/cu mm of blood. In adult males, it is 5 million/cu mm and in adult females, it is 4.5 million/cu mm.

***Normal Structure**

Red blood cells are non-nucleated. Only mammal, which has nucleated RBC is camel. Because of the absence of nucleus in human RBC, the DNA is also absent.

Three anatomic features of erythrocytes contribute to the efficiency with which they transport O2.

1- First, erythrocytes are flat, disc-shaped and biconcave. The biconcave shape provides a larger surface area for diffusion of O2 from the plasma across the membrane into the erythrocyte than a spherical shape. Also, the thinness of the cell enables O2 to diffuse rapidly between the exterior and innermost regions of the cell.
2- A second structural feature that facilitates RBCs' transport function is their flexible membrane. Red blood cells, whose diameter is normally 8 mm, can deform amazingly as they squeeze single file through capillaries as narrow as 3 mm in diameter.
3- The third and most important anatomic feature that enables RBCs to transport O2 is the hemoglobin they contain.

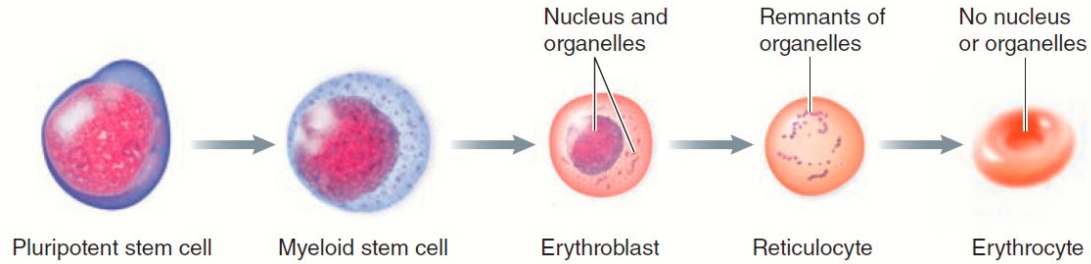
Functions of Red Blood Cells

Major function of RBCs is the transport of respiratory gases. Following are the functions of RBCs:

1. Transport of Oxygen from the Lungs to the Tissues.
2. Transport of Carbon Dioxide from the Tissues to the Lungs.
3. In Blood Group Determination RBCs carry the blood group antigens like A antigen، B antigen and Rh factor.

Erythropoiesis

Erythropoiesis is the process of the origin, development and maturation of erythrocytes. Because erythrocytes cannot divide to replenish their own numbers, the old ruptured cells must be replaced by new cells produced in an erythrocyte factory—the **bone marrow**—which is the soft, highly cellular tissue that fills the internal cavities of bones. The bone marrow normally generates new red blood cells, a process known as **erythropoiesis**, at a rate to keep pace with the demolition of old cells.



Erythrocytes are derived in the red bone marrow from pluripotent stem cells that give rise to all the types of blood cells. Myeloid stem cells are partially differentiated cells that give rise to erythrocytes and several other types of blood cells. Nucleated erythroblasts are committed to becoming mature erythrocytes. These cells extrude their nucleus and organelles, making more room for hemoglobin. Reticulocytes are immature red blood cells that contain organelle (mostly ribosome) remnants. Mature erythrocytes are released into the abundant capillaries in the bone marrow.

س: عرض تقديمي يخص احد مواضيه المحاضره

الوحدة الثانيه - المحاضرة الثالثه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الثالثه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Explain the role of hemoglobin in carrying oxygen and carbon dioxide.
2- Define hemoglobin and mention its composition.
3- Describe the structures of hemoglobin molecules.
4- Know the normal hemoglobin contents.

موضوعات المحاضرة الثالثه:

1- Hemoglobin

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• تبادل الادوار • مناقشة • نشاط (١/٣/٢) تعريف وتعداد	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الثالثه

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الثانيه	الثالثه	القاء المحاضرة بشكل تفاعلي مع الطلبه والسماح لهم بقراءة المحاضره و تفسير ماهو مفهوم منها	٩٠ دقيقة
		الاجابه على اسئلة الطلبه	
		نشاط (١/٣/٢) تعريف وتعداد	

المادة العلمية:

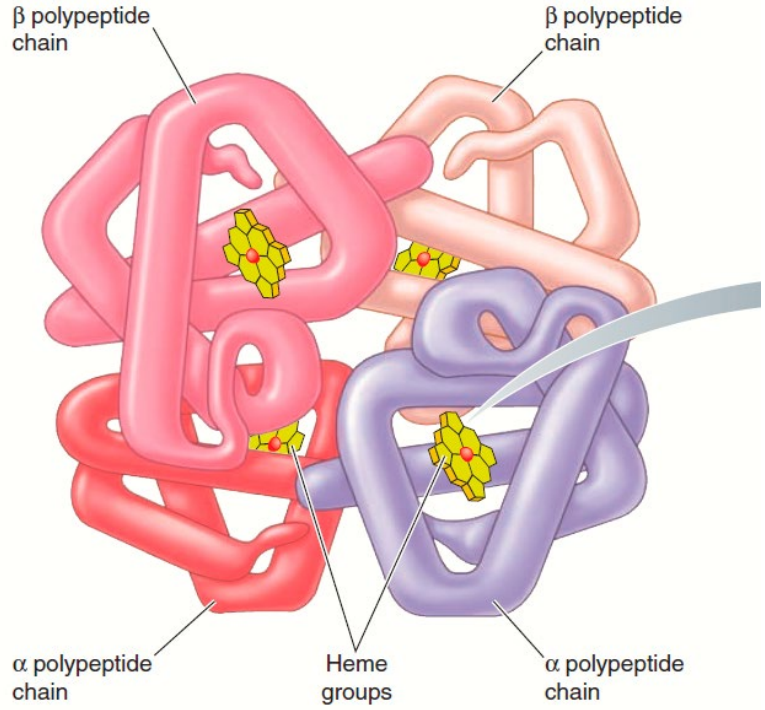
Hemoglobin

Hemoglobin is found only in red blood cells; it is a pigment. Because of its iron content, it appears reddish when combined with O2 and bluish when deoxygenated. Thus, fully

oxygenated arterial blood is red, and venous blood, which has lost some of its O_2 load at the tissue level, has a bluish cast.

A hemoglobin molecule has two parts:

1- The globin portion, a protein made up of four highly folded polypeptide chains (two A subunits and two B subunits).
2- Four iron containing، nonprotein groups known as heme groups, each of which is bound to one of the polypeptides. Each of the four iron atoms can combine reversibly with one molecule of O2; thus, each hemoglobin molecule can pick up four O2 passengers in the lungs.



Normal Hemoglobin Content

Average hemoglobin (Hb) content in blood is 14 to 16 g/dL. However, the value varies depending upon the age and sex of the individual.

Age	
At birth :	25 g/dL
After 3rd month :	20 g/dL
After 1 year :	17 g/dL
From puberty onwards :	14 to 16 g/dL

At the time of birth,	hemoglobin content is very high because of increased number of RBCs
Sex	
In adult males :	15 g/dL
In adult females :	14.5 g/dL

Q1: Define hemoglobin and mention its composition.

الوحدة الثانيه - المحاضرة الرابعه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الرابعه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Define WBCs cells.
2- Know the normal white blood cell count
3- Know the differences between WBCs and RBCs.
4- List the different types of WBCs and their functions.

موضوعات المحاضرة الرابعه:

1- White Blood Cells: Classification, Specific Function, Normal Value.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• سؤال وجواب • محاضرة • نشاط (١/٤/٢) تعداد	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الرابعه

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الثانيه	الرابعه	مناقشة موضوع المحاضره مع الطلبه وتدوين الاسئله للاجابه عنها خلال المحاضره	٩٠ دقيقة
		القاء المحاضرة مستخدما جهاز العرض والسبورة	
		نشاط (١/٤/٢) تعداد	

المادة العلمية:

White blood cells (WBCs) or leukocytes

Definition: are the colorless and nucleated formed elements of blood (leuko is derived from Greek word leukos = white). Compared to RBCs, the WBCs are larger in size and lesser in number. Its **function**, important like RBCs because of their role in defense mechanism of body and protect the body from invading organisms by acting like soldiers.

Differences between WBCs and RBCs

Feature	WBCs	RBCs
Color	Colorless	Red
Number	Less: 4,000 to 11,000/cu mm	More: 4.5 to 5.5 million/cu mm
Shape	Irregular	Disk-shaped and biconcave
Nucleus	Present	Absent
Granules	Present in some types	Absent
Types	Many types	Only one type
Lifespan	Shorter ½ to 15 days	Longer 120 days

Classification

Based on the presence or absence of granules in the cytoplasm, the leukocytes are classified into two groups:

1. Granulocytes

Depending upon the staining property of granules, the granulocytes are classified into three types:

- ❖ Neutrophils with granules taking both acidic and basic stains.
- ❖ Eosinophils with granules taking acidic stain.
- ❖ Basophils with granules taking basic stain.

2. A-granulocytes

A-granulocytes have plain cytoplasm without granules.

- ❖ Monocytes.
- ❖ Lymphocytes.

Normal White Blood Cell Count

Total WBC count (TC): 4,000 to 11,000/cu mm of blood.

Functions of White Blood Cells

Generally, WBCs play an important role in defense mechanism. These cells protect the body from invading organisms or foreign bodies, either by destroying or inactivating them. However, in defense mechanism, each type of WBCs acts in a different way.

1- Neutrophils play an important role in the defense mechanism of the body. Along with monocytes, the neutrophils provide the first line of defense against the invading microorganisms.
2- Eosinophils play an important role in the defense mechanism of the body against the parasites and its count increases also during allergic diseases like asthma.
3- Basophils play an important role in healing processes. So their number increases during healing process.
4- Lymphocytes play an important role in immunity.

Q1: List the functions of white blood cells.

الوحدة الثانيه - المحاضرة الخامسه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الخامسه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Describe the physiological variations of platelets.
2- Describe the role of platelets in (in blood clotting clot retraction, in prevention of blood loss, hemostasis, repair of ruptured blood vessel and defense mechanism).
3- List the functions of platelets.

موضوعات المحاضرة الخامسه:

1- Platelet: Definition, Function, Normal Value, Thrombopoiesis and Hemostasis.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• نشاط (١/٥/٢) عرض تقديمي • مناقشة • سؤال وجواب •	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الثانيه	الخامسه	نشاط (١/٥/٢) عرض تقديمي	٩٠ دقيقة
		مناقشه ماشاهدوه الطلبه في العرض التقديمي والاجابه على الاسئلة	

المادة العلمية:

Platelets

Platelets or thrombocytes are the formed elements of blood. Platelets are small colorless, non-nucleated and considered to be the fragments of cytoplasm.

Normal Count and Variations

Normal platelet count is 2,50,000/cu mm of blood. It ranges between 2,00,000 and 4,00,000/cu mm of blood.

Physiological Variations

1. Age: Platelets are less in infants (1,50,000 to 2,00,000/cu mm) and reaches normal level at 3rd month after birth.
2. Sex: There is no difference in the platelet count between males and females. In females, it is reduced during menstruation.
3. After meals: After taking food, the platelet count increases.

Functions of Platelets

Normally, platelets are inactive and execute their actions only when activated.

1. Role in blood clotting

Platelets are responsible for the formation of prothrombin activator. This substance is responsible for the onset of blood clotting.

2. Role in clot retraction

In the blood clot, blood cells including platelets are entrapped in between the fibrin threads.

3. Role in prevention of blood loss (hemostasis)

By formation of temporary plug, the platelets seal the damage in blood vessels.

4. Role in repair of ruptured blood vessel

There are substances formed in cytoplasm of platelets is useful for the repair of the endothelium and other structures of the ruptured blood vessels.

5. Role in defense mechanism

By the property of agglutination, platelets encircle the foreign bodies and destroy them.

Thrombocytosis

Increase in platelet count is called thrombocytosis. It occurs in the following conditions: Allergic conditions, surgical operations and Trauma (wound or injury or damage caused by external force).

Hemostasis

Hemostasis is defined as arrest or stoppage of bleeding. For bleeding to take place from a vessel, a break must be present in the vessel wall and the pressure inside must be greater than the pressure outside the vessel to force blood out through the defect.

It includes several stages:

1- Vasoconstriction.
2- Platelet plug formation.
3- Coagulation of blood.

Stages of Hemostasis

When a blood vessel is injured, the injury initiates a series of reactions, resulting in hemostasis. It occurs in three stage:

1. **Vasoconstriction**: Immediately after injury, the blood vessel constricts and decreases the loss of blood from damaged portion. Usually, arterioles and small arteries constrict.

2. **Platelet plug formation**: Platelets get adhered to the collagen of ruptured blood vessel and secrete adenosine diphosphate (ADP) and thromboxane A2. These two substances attract more and more platelets and activate them. All these platelets aggregate together

and form a loose temporary platelet plug or temporary hemostatic plug, which closes the ruptured vessel and prevents further blood loss.

3. **Coagulation of blood**: During this process, the fibrinogen is converted into fibrin. Fibrin threads get attached to the loose platelet plug, which blocks the ruptured part of blood vessels and prevents further blood loss completely.

الوحدة الثالثه - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1. Define and identify the function of the circulatory system.
2. Identify and describe the functions of the heart, blood, and blood vessels.
3. Describe heart valves and their locations.
4. Explain the cardiac cycle
5. Explain the heart sounds and the reasons that produce them.

موضوعات المحاضرة الاولى:

1- Heart Physiology.
2- Conductive System, Cardiac Output (Mechanics and Control), and Factor Affecting.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• مناقشة المحاضره السابقه مع الطلبه بشكل مختصر • محاضرة • نشاط (١/١/٣) مقارنه	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الثالثه	الأولى	مناقشة المحاضره السابقه مع الطلبه بشكل مختصر	٩٠ دقيقة
		القاء المحاضرة مستخدما جهاز العرض والسبورة	
		نشاط (١/١/٣) مقارنه	

المادة العلمية:

The Circulatory System

The many functions of the circulatory system can be grouped into two broad areas: **transportation** and **protection**.

1. **Transportation.** All of the substances involved in cellular metabolism are transported by the circulatory system. These substances can be categorized as follows:

A. Respiratory: Red blood cells called **erythrocytes** transport oxygen to the tissue cells. Carbon dioxide produced by cellular respiration is carried by the blood to the lungs for elimination in the exhaled air.

B. **Nutritive:** The digestive system is responsible for the mechanical and chemical breakdown of food to forms that can be absorbed through the intestinal wall into the blood and lymph vessels. The blood then carries these absorbed products of digestion through the liver to the cells of the body.

C. Excretory: Metabolic wastes, excess water and ions are filtered through the capillaries of the kidneys into kidney tubules and excreted in urine.

D. Regulatory: The blood carries hormones and other regulatory molecules from their site of origin to distant target tissues.

2. Protection. The circulatory system protects against injury and foreign microbes or toxins introduced into the body. The clotting mechanism protects against blood loss when vessels are damaged, and white blood cells called **leukocytes** render the body immune to many disease-causing agents.

Heart

Heart: is a muscular organ that pumps blood throughout the circulatory system. It is situated in between two lungs. It is made up of four chambers, two atria and two ventricles. The musculature of ventricles is thicker than that of atria.

- Right side of the heart has two chambers, right atrium and right ventricle. Right atrium is a thin walled and low pressure chamber receives venous (deoxygenated) blood.
- Left side of the heart has two chambers, left atrium and left ventricle. Left atrium is a thin walled and low pressure chamber. It receives oxygenated blood from the lungs.

Layers of Wall of the Heart

Heart is made up of three layers of tissues:

1- Outer pericardium: is the outer covering of the heart.
2- Middle myocardium: Myocardium is the middle layer of wall of the heart and it is formed by cardiac muscle fibers or cardiac myocytes. Myocardium forms the bulk of the heart and it is responsible for pumping action of the heart.

3- Inner endocardium:

Valves of the Heart

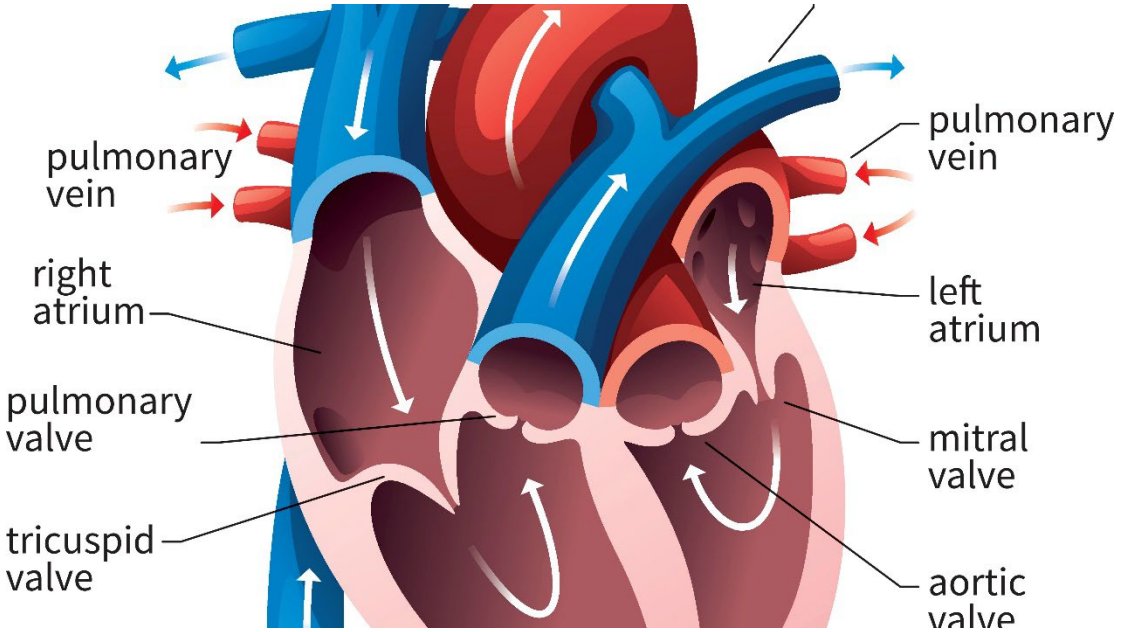
There are four valves in human heart. Two valves are in between atria and the ventricles called **atrioventricular** valves (Tricuspid **Valve, Mitral Valve)**. Other two are the semilunar valves, placed at the opening of blood vessels arising from ventricles، namely **(Aortic Valve)** and **(pulmonary Valve**). Valves of the heart permit the flow of blood through heart in only one direction.

A- Tricuspid Valve: Separates the top right chamber (right atrium) from the bottom right chamber (right ventricle) .Opens to allow blood to flow from the right atrium to the right ventricle. Prevents the back flow of blood from the right ventricle to the right atrium.

B-Pulmonary Valve: Separates the right ventricle from the pulmonary artery .Opens to allow blood to be pumped from the right ventricle to the lungs (through the pulmonary artery) where it will receive oxygen .Prevents the back flow of blood from the pulmonary artery to the right ventricle.

C-Mitral Valve: Separates the top left chamber (left atrium) from the bottom left chamber (left ventricle) .Opens to allow blood to be pumped from the lungs to the left atrium .Prevents the back flow of blood from the left ventricle to the left atrium.

D- Aortic Valve: Separates the left ventricle from the aorta .Opens to allow blood to leave the heart from the left ventricle through the aorta and the body .Prevents the backflow of blood from the aorta to the left ventricle.



Cardiac Cycle

Definition: Cardiac cycle is defined as the (sequence of) **coordinated events** taking place in the heart during each beat. Each heartbeat consists of two major periods called systole and diastole. During systole, heart contracts and pumps the blood through arteries. During diastole, heart relaxes and blood is filled in the heart. All these changes are repeated during every heartbeat, in a cyclic manner.

Cardiac Output

Cardiac output is the amount of blood pumped from each ventricle. Cardiac output is the most important factor in cardiovascular system, because rate of blood flow through different parts of the body depends upon cardiac output.

Heart Sounds

Heart sounds are the sounds produced by mechanical activities of heart during each cardiac cycle.
Heart sounds are produced by:
1. Flow of blood through cardiac chambers
2. Contraction of cardiac muscle
3. Closure of valves of the heart.

Q1: Compare between cardiac cycle and cardiac output.

الوحدة الثالثه - المحاضرة الثانيه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الثانيه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Describe the classes of blood vessels.
2- Define the following terms (elastic arteries, muscular arteries, arterioles, venous system and capillaries).

موضوعات المحاضرة الثانيه:

1- Vascular System

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• نشاط (١/٢/٣) املئ الفراغات • مناقشة مفردات المحاضره قبل شرحها • سؤال وجواب • محاضرة	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الثانيه

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الثالثه	الثانيه	نشاط (١/٢/٣) املئ الفراغات	٩٠ دقيقة
		القاء المحاضرة مستخدما جهاز العرض والسبورة	
		طرح بعض الاسئلة خلال القاء المحاضرة	

المادة العلمية:

Vascular System

The body requires oxygen and nutrients and needs to eliminate waste products to maintain metabolic stability. The vascular system has a crucial role in bringing oxygen and nutrients to every organ and tissue, and removing waste products, via a series of blood vessels. In conjunction with the heart, which acts as a pump, it forms the cardio-vascular system. Arteries leaving the heart with oxygenated blood provide oxygen, nutrients, hormones and other substances throughout the body. Veins leaving the organs and tissues return to the heart carrying metabolic waste.

Classes of Blood Vessels

There are five classes of blood vessels: arteries and arterioles (the arterial system), veins and venules (the venous system), and capillaries (the smallest bloods vessels, linking arterioles and venules through net-works within organs and tissues).

Anatomy of The Vascular System

1- **Arterial system:** Arteries supply the body with oxygenated blood – with the exception of the pulmonary arteries from the heart; these carry deoxygenated blood to the lungs, and the umbilical artery, which carries deoxygenated blood from the

fetus to the placenta. Blood travels from the arteries to the arterioles and on to the capillaries, where gaseous exchange takes place.

Arteries can be divided into:

A- **Elastic arteries:** The elastic arteries are the largest (1-2.5cm in diameter) and comprise large amounts of elastin as well as smooth muscle. They have a large lumen with low resistance to blood flow, and can expand and recoil to accommodate changes in blood volume.

B- **Muscular arteries:** Muscular arteries regulate local blood flow and deliver blood to individual organs. They measure 0.3mm-1cm in diameter and possess more smooth muscle but less elastin than elastic arteries.

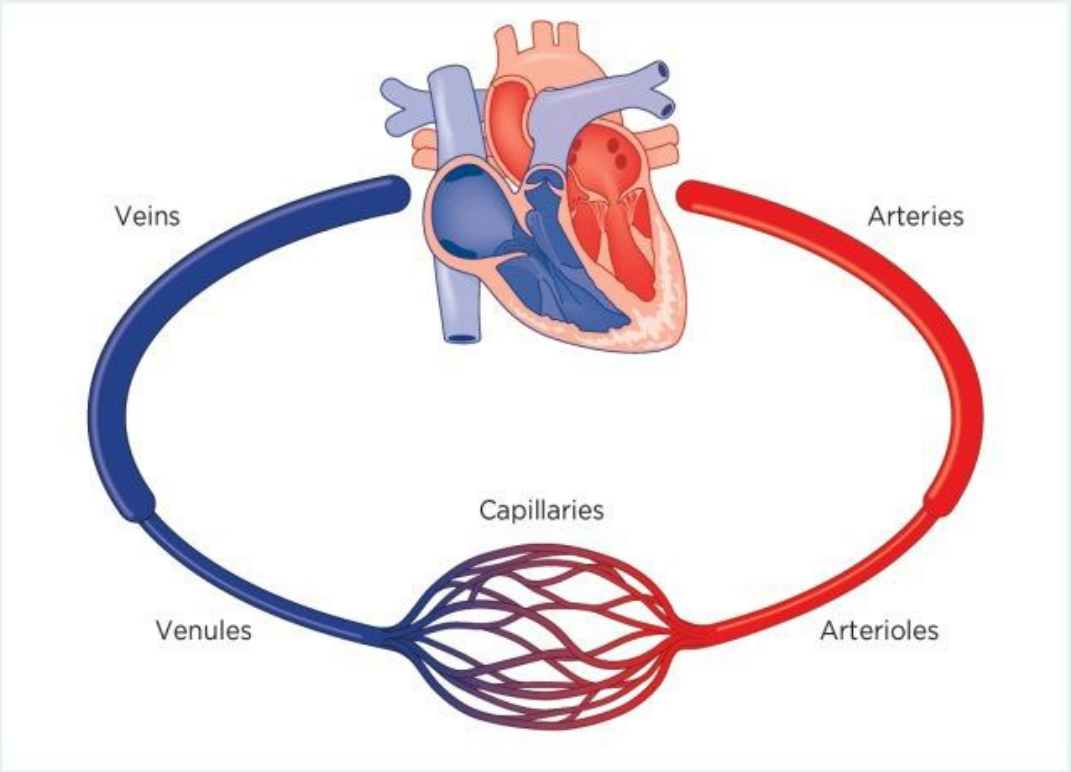
C- **Arterioles:** The arterioles are the smallest arteries (0.01-0.3mm in diameter). When they are close to the capillaries, they comprise a single smooth muscle layer overlying endothelial cells.

2- Venous system:

The veins are thin, elastic vessels that act as a reservoir of blood. They do not need large amounts of elastin and smooth muscle, since they transport low-pressure blood back to the heart. They have a large lumen, as well as valves that ensure a one-way flow of blood to the heart.

3- **Capillaries:** The capillaries can be compared to the smallest branches of a tree and connect arterioles to venules. The arteries divide into arterioles, which in turn divide into capillaries.

Fig 1. **The five types of blood vessels**



Q1: Fill in the blanks:

1- Arteries can be divided into ……. And …….
2- There are five classes of blood vessels ……., …….. and ……
3- Capillaries connect …… to …….

الوحدة الثالثه - المحاضرة الثالثه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الثالثه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Define the lymph.
2- Describe the structure of the lymphatic system as including lymph, lymph nodes, and lymph vessels.
3- Explain Acquired Immunodeficiency Syndrome (AIDS).
4- List general functions of lymphatic system.

موضوعات المحاضرة الثالثه:

1- Lymphatic Physiology: Organs: Composition, Function of Each part.
2- Lymph: Structure, Hemodynamic and Factor Affecting their Movement.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• محاضرة • مناقشة • سؤال وجواب • نشاط (١/٣/٣) تعداد	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الثالثه

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الثالثه	الثالثه	القاء المحاضرة مستخدما جهاز العرض والسبورة	٩٠ دقيقة
		طرح بعض الاسئلة خلال القاء المحاضرة	
		نشاط (١/٣/٣) تعداد	

المادة العلمية:

Lymphatic system

Lymphatic system: is a closed system of lymph channels or lymph vessels, through which lymph flows. It is a **one-way system** and allows the lymph flow from tissue spaces toward the blood.

General Functions of Lymphatic System

1- **Returns Fluid from Tissues to Blood: ~85%** of fluids that leak out of blood returns to blood via blood capillaries. **~15%** returns via lymph capillaries. If lymphatic system becomes blocked cause edema.

2- **Returns Large Molecules to Blood: ~25-50%** of blood proteins leak out of capillaries each day. They cannot get back into capillaries. Instead lymphatic capillaries pick them up and return them to the blood.
   - If lymphatics are blocked blood protein decreases.

3- **Absorb and Transport Fats:** special lymphatic capillaries in villi of small intestine absorb all lipids and fat-soluble vitamins from digested food bypasses liver much goes straight to adipose tissues.

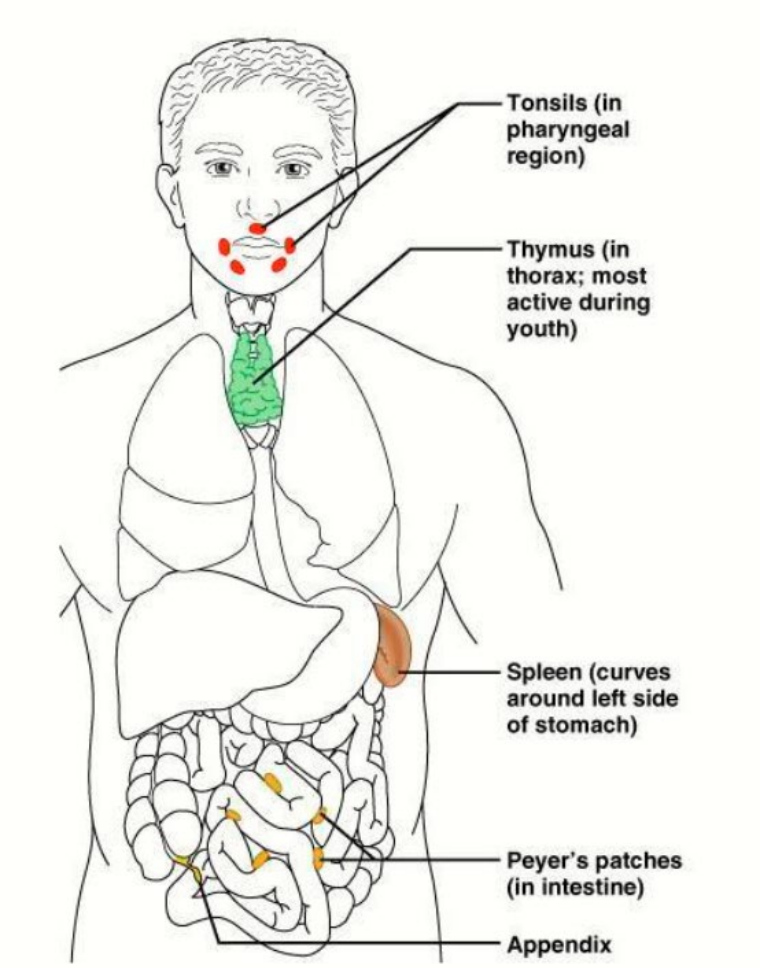
4- **Hemopoiesis:** some WBC's (lymphocytes, monocytes) are made in lymphatic tissues (not bone marrow).

5- **Body Defense/Immunity**: lymphoid tissue is an important component of the immune system.
   - The major role of WBC's is in body defense.
   - Lymphatic system screens body fluids and removes pathogens and damaged cells.

Lymph: is a clear watery fluid that resembles blood plasma but: has fewer proteins. its composition varies depending on organs that it drains.

Major Accessory Lymphatic Organs

1- Spleen
2- Thymus
3- Tonsils
4- Appendix



Acquired Immunodeficiency Syndrome (AIDS)

Caused by the Human Immunodeficiency Virus (HIV) which infects lymphocytes and suppresses immunity.

• HIV infects lymphocytes and (particularly helper T-cell) and some epithelial cells. The exact mechanism of pathogenesis is still unknown, but the most popular hypothesis is that HIV directly destroys T-cells, resulting in a strong suppression of the immune system.

• HIV can also infect macrophages or "hide" inside macrophages and monocytes for a long time.

• HIV is usually spread by blood, sexual contact, drug needle, or through pregnancy; and not by food, water, coughing, sneezing, kissing, hugging, utensils, shaking hands, or toilet seats.

Q1: List lymphatic system organs

الوحدة الرابعه - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- List the structures of the respiratory system.
2- Know the differences between the upper respiratory system and lower respiratory system.
3- List the major functions of the respiratory system.
4- List the common respiratory disorders.
5- List the Phases of Respiration.
6- Describe the respiratory and Non-respiratory Functions of the Respiratory System.

موضوعات المحاضرة الاولى:

1- Respiratory Physiology.
2- Parts and Specific Functions; Ventilation: Mechanics and Control.
3- External Respiration, Gas Blood Transport, Internal Respiration: Mechanics, Control and Factor affecting.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• نشاط (١/١/٤) تعداد • السماح للطلبه بالقاء المحاضره وتفسير ماتم فهمه • مناقشة	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الرابعه	الأولى	نشاط (١/١/٤) تعداد	٩٠ دقيقة
		السماح للطلبه بالقاء المحاضره وتفسير ماتم فهمه	
		طرح بعض الاسئلة خلال القاء المحاضرة	

المادة العلمية:

Respiratory System

The primary function of respiration is to obtain O2 for use by the body cells and to eliminate the CO2 the cells produce.

Basic Structure of the Respiratory System

Respiratory tract is the anatomical structure through which air moves in and out. It **includes:**

1- Nose.

2- Pharynx.

3- Larynx.

4- Trachea.

5- Bronchi.

6- Lungs.

- The structures of the **upper respiratory system** include the nose, pharynx, and associated structures.
- The **lower respiratory system** includes the larynx, trachea, bronchial tree and lungs.

Types of Respiration

Most people think of respiration as the process of breathing in and breathing out. In physiology, however, respiration has a broader meaning.

Respiration is classified into two types:

1. **External respiration** that involves exchange of respiratory gases, i.e. oxygen and carbon dioxide between lungs and blood
2. **Internal respiration,** which involves exchange of gases between blood and tissues.

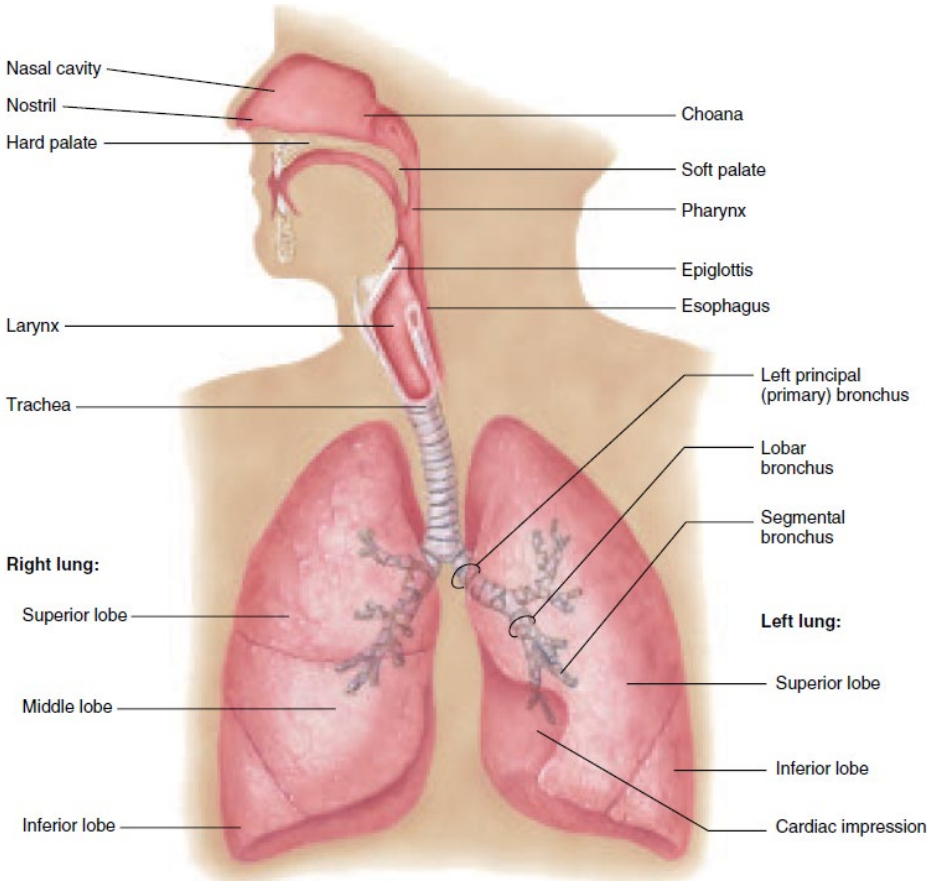
Non-respiratory Functions of the Respiratory System

1- It enables speech, singing, and another vocalization.
2- It defends against inhaled foreign matter.
3- It removes, modifies, activates, or inactivates various materials.
4- The nose, a part of the respiratory system, is the organ of smell.

Phases of Respiration

Respiration occurs in two phases:

1. **Inspiration**: during which air enters the lungs from atmosphere.
2. **Expiration**: during which air leaves the lungs.



Common Respiratory Disorders

1- Cough.
2- common cold.
3- Influenza: Influenza virus.
4- Pneumonia: Pneumococcus bacterium.
5- Tuberculosis: Tuberculosis bacteria.
6- Cancer.

Q1: List the respiratory system parts.
Q2: Common respiratory system disorders.

الوحدة الخامسه - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Demonstrate learn about how food moves through the digestive system.
2- Define digestion and explain their types.
3- Explain the differences between primary digestive organs and accessory digestive organs.

موضوعات المحاضرة الاولى:

1- Digestive Physiology.
2- Digestive Physiology: GIT: Part General Function, Food Movement, and Control. Swallowing Reflex.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• سؤال وجواب • نشاط (١/١/٥) مقارنه	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الخامسه	الأولى	توزيع اوراق واقلام الى الطلبه والسماح لهم بتدوين الاسئله التي تتعلق بموضوع المحاضره	٩٠ دقيقة
		شرح المحاضره عن طريق الاجابه على اسئلة الطلبه	
		نشاط (١/١/٥) مقارنه	

المادة العلمية:

Gastrointestinal Tract

The digestive system is made up of the digestive tract. This consists of a long tube of organs that runs from the mouth to the anus and includes the **esophagus**, **stomach**, **small intestine**, and **large intestine**, together with the **liver**, **gallbladder**, and **pancreas**, which produce important secretions for digestion that drain into the small intestine.

Its **primary function** is to take in food, digests it to extract and absorb energy and nutrients, and expels the remaining waste as feces.

Digestion: is the process by which food is broken down into smaller pieces so the body can use them to build and nourish cells and to provide energy.

Digestion involves the mixing of food, its movement through the digestive tract (also known as the alimentary canal), and the chemical breakdown of larger molecules into smaller molecules.

Gastrointestinal Tract Part:

GI tract is formed by two types of organs:

1. Primary digestive organs: are the organs where actual digestion takes place. Mouth, Pharynx, Esophagus, Stomach, Small intestine and Large intestine.

2. Accessory digestive organs: are those which help primary digestive organs in the process of digestion. Teeth, Tongue, Salivary glands, Exocrine part of pancreas, Liver and Gallbladder.

Digestive System Physiology

The digestive system is responsible for taking whole foods and turning them into energy and nutrients to allow the body to function, grow, and repair itself. The six primary processes of the digestive system include:

1- Ingestion of food.
2- Secretion of fluids and digestive enzymes.
3- Mixing and movement of food and wastes through the body.
4- Digestion of food into smaller pieces.
5- Absorption of nutrients.
6- Excretion of wastes.

Process of Digestive System

1- Ingestion

The first function of the digestive system is ingestion, or the intake of food. The mouth is responsible for this function.

2- Secretion

In the course of a day, the digestive system secretes around 7 liters of fluids. These fluids include:

- Saliva moistens dry food and contains salivary amylase, a digestive enzyme that begins the digestion of carbohydrates.
- Mucus serves as a protective barrier and lubricant inside of the GI tract.
- Hydrochloric acid helps to digest food chemically and protects the body by killing bacteria present in our food.
- Enzymes are like tiny biochemical machines that disassemble large macromolecules like **proteins, carbohydrates, and lipids** into their smaller components.
- Finally, bile is used to emulsify large masses of lipids into tiny globules for easy digestion.

3- Mixing and Movement

The digestive system uses 3 main processes to move and mix food:

1- **Swallowing**: Swallowing is the process of using smooth and skeletal muscles in the mouth, tongue, and pharynx to push food out of the mouth, through the pharynx, and into the esophagus.

2- **Peristalsis**: Peristalsis is a muscular wave that travels the length of the GI tract.

3- Segmentation: Segmentation occurs only in the small intestine as short segments of intestine contract like hands squeezing a toothpaste tube. Segmentation helps to increase the absorption of nutrients.

4- Digestion

Digestion: is the process by which food is broken down into smaller pieces so the body can use them to build and nourish cells and to provide energy.

- **Mechanical digestion:** is the physical breakdown of large pieces of food into smaller pieces. Teeth, stomach and intestine.
- **Chemical digestion:** food is also being chemically digested as larger and more complex molecules are being broken down into smaller molecules that are easier to absorb.

  * Mouth with salivary amylase digest carbohydrates.

  * Pancreas secretes pancreatic juice, which is capable of digesting lipids, carbohydrates, proteins and nucleic acids.

6- Absorption

Absorption begins in the **stomach** with simple molecules like **water** and **alcohol**

Most absorption takes place in the walls of the small intestine.
The large intestine is also involved in the absorption of **water** and vitamins B and K before feces leave the body.

6- Excretion

Defecation: it is the process of the excretion of waste. Defecation removes indigestible substances from the body so that they do not accumulate inside the gut.

Q1: Compare between primary digestive organs and accessory digestive organs.

الوحدة الخامسه - المحاضرة الثانيه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الثانيه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Write the types of movements in stomach.
2- List the gastrointestinal tract part and their functions.
3- Explain the differences between chemical and mechanical digestion.

موضوعات المحاضرة الثانيه:

1- GIT Chemical Digestion, Absorption, and Control. Defecation Reflex
2- Accessory Organs: Secretion and Their Role in Digestion. Secretion Control.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• عرض فديو • سؤال وجواب • نشاط (١/٢/٥) تعريف	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الثانيه

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الخامسه	الثانيه	عرض فديو توضيحي للمحاضره	٩٠ دقيقة
		طرح بعض الاسئلة خلال عرض الفديو والاجابه عليها	
		نشاط (١/٢/٥) تعريف	

المادة العلمية:

Gastrointestinal Tract Part

Mouth:

Mouth is otherwise known as oral cavity or **buccal cavity.**

Functions of mouth include:

1. Ingestion of food materials
2. Chewing the food and mixing it with saliva
3. Appreciation of taste of the food
4. Transfer of food (bolus) to the esophagus by swallowing
5. Role in speech
6. Social functions such as smiling and other expressions.

Teeth

The teeth are 32 small hard organs found along the anterior and lateral edges of the mouth. Its function: for cutting and grinding food into smaller pieces.

Tongue

It is a small organ made up of several pairs of **muscles** covered in a thin, bumpy, skin-like layer. Its function: detect taste molecules in food and helps to push food toward the posterior part of the mouth for swallowing.

Salivary Glands

The salivary glands are accessory organs that produce a watery secretion known as saliva.

Saliva performs a number of important functions:

1- It facilitates swallowing, keeps the mouth moist.

2- Serves as a solvent for the molecules that stimulate the taste buds.

3- Aids speech by facilitating movements of the lips and tongue.

4- keeps the mouth and teeth clean.

5- The saliva also has some antibacterial action.

Pharynx

The pharynx, or throat, is a funnel-shaped tube connected to the posterior end of the mouth.

The pharynx is responsible for:

1- Passing of masses of chewed food from the mouth to the esophagus.
2- In the respiratory system, as air from the nasal cavity passes.

Stomach:

Stomach is a hollow organ situated just below the diaphragm on the left side in the abdominal cavity. Its filled with gastric juice. Gastric juice acts mainly on proteins. Proteolytic enzymes of the gastric juice are pepsin and rennin.

Function:

- Acts as a storage tank for food.
- Contains hydrochloric acid and digestive enzymes that continue the digestion of food that began in the mouth.

Enzyme	Function
Pepsin	Digestion of milk (casein)
Urase	Acts on urea and produces ammonia
Gastric amylase	Degrades starch

Pancreas:

Pancreas is a dual organ having two functions, namely **endocrine function** and **exocrine function.** Endocrine function is concerned with the production of hormones. The exocrine function is concerned with the secretion of digestive juice called pancreatic juice.
Major proteolytic enzymes of pancreatic juice are trypsin and chymotrypsin.

1- Trypsin:

*Digestion of proteins.
*Curdling of milk: It converts **caseinogen** in the milk into **casein**.
*Blood clotting: It accelerates blood clotting.
*It activates the other enzymes of pancreatic juice.

2- Chymotrypsin:

*Digestion of proteins.

*Digestion of milk: Chymotrypsin digests caseinogen faster than trypsin.

3- Collagenase:

It digests collagen.

4- Nucleases

These enzymes convert the ribonucleic acid (RNA) and deoxyribonucleic acid (DNA) into mononucleotides.

Liver
The liver has main function to produce bile and its secretion into the small intestine.
Bile is a dark-green-to-yellowish-brown fluid produced by the liver that aids the digestion of lipids in the small intestine.

Gallbladder
Bile secreted from liver is stored in gallbladder. The capacity of gallbladder is approximately 50 mL.

Small Intestine
Its main function is to absorb the products of digestion (including carbohydrates, proteins, lipids, and vitamins) into the bloodstream. There are three major divisions: Duodenum, Jejunum and Ileum.
Small intestine secretes many GI hormones such as secretin, cholecystokinin, etc. These hormones regulate the movement of GI tract and secretory activities of small intestine and pancreas.
Large Intestine
The large intestine also called the **colon,** consists of the cecum, rectum, and anal canal.
Large intestine secretes mucin.

Movement of GIT

1- Mastication

Mastication or **chewing** is the first mechanical process in the gastrointestinal (GI) tract, by which the food substances are torn or cut into small particles and crushed or ground into a soft **bolus.**

2- Deglutition

Deglutition or swallowing is the process by which food moves from mouth into stomach.

Stages of Deglutition

Deglutition occurs in three stages:

I. Oral stage: when food moves from mouth to pharynx

II. Pharyngeal stage: when food moves from pharynx to esophagus

III. Esophageal stage: when food moves from esophagus to stomach.

3- Movements of Stomach

Activities of smooth muscles of stomach increase during gastric digestion (when stomach is filled with food) and when the stomach is empty.

Types of movements in stomach

1. Hunger contractions: Hunger contractions are the movements of empty stomach. These contractions are related to the sensations of hunger.

2. Receptive relaxation: Receptive relaxation is the relaxation of the upper portion of the stomach when bolus enters the stomach from esophagus. It involves the fundus and upper part of the body of stomach. Its significance is to accommodate the food easily, without much increase in pressure inside the stomach.

3. Peristalsis: When food enters the stomach, the peristaltic contraction or peristaltic wave appears with a frequency of 3 per minute.

4. Movements of Small Intestine

Movements of small intestine are essential for mixing the chyme with digestive juices, propulsion of food and absorption.

* **Chyme:** is the semisolid mass of partially digested food that is formed in the stomach.

5. Movements of Large Intestine

Usually, the large intestine shows sluggish movements.

6. Defecation

Voiding of feces is known as defecation. Feces is formed in the large intestine and stored in sigmoid colon. By the influence of an appropriate stimulus, it is expelled out.

Q1: define Hunger contractions and receptive relaxation.

الوحدة السادسه - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Know the organs of the urinary tract.
2- Explain the purpose of the urinary system.
3- List the functions of the Urinary System.
4- Define urine.
5- Enumerate the physical characteristics of urine.

موضوعات المحاضرة الاولى:

1- General Functions of US.
2- Urine: Definition and Normal Constitute. Physical and Chemical Property of Urine

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• محاضرة • مناقشة • سؤال وجواب • نشاط (١/١/٦) تعريف وتعداد	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
السادسه	الأولى	القاء المحاضرة مستخدما جهاز العرض والسبورة	٩٠ دقيقة
		طرح بعض الاسئلة خلال القاء المحاضرة	
		نشاط (١/١/٦) تعريف وتعداد	

المادة العلمية:

Urinary Physiology

The urinary system, also known as the renal system or urinary tract, consists of:
•The kidneys (two)
•Ureters(two)
•Bladder (one)
•The urethra(one)
•**The purpose of the urinary system**: is to eliminate waste from the body, regulate blood volume and blood pressure, control levels of electrolytes, and regulate blood pH.

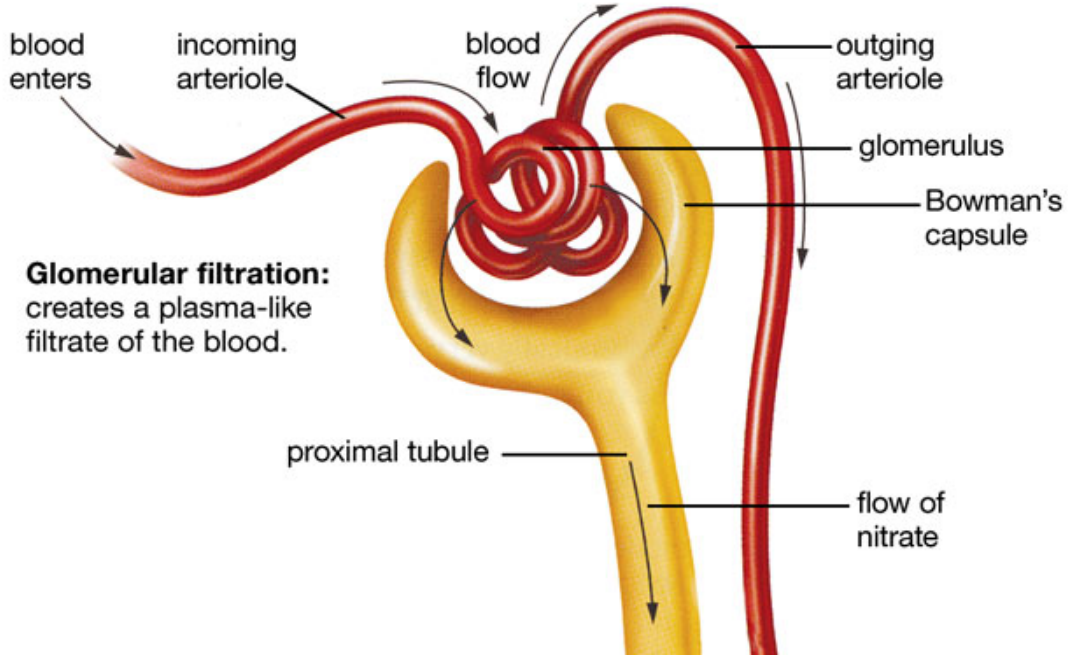
There are several functions of the Urinary System:
•Removal of waste product from the body (mainly urea and uric acid).
•Regulation of electrolyte balance (e.g. sodium, potassium and calcium).
•Regulation of acid-base homeostasis.
•Controlling blood volume and maintaining blood pressure.

Urine Formation

Urine is a liquid by-product of the body secreted by the kidneys through a process called **urination** and excreted through the urethra.
Urine is an aqueous solution of greater than 95% water. Other constituents include urea, chloride, sodium, potassium, creatinine and other dissolved ions, and inorganic and organic compounds.
Urine formation is a blood cleansing function. Normally, about 1,300 mL of blood enters the kidneys. Kidneys excrete the unwanted substances along with water from the blood as urine. Normal **urinary output** is 1 L/day to 2.5 L/day.

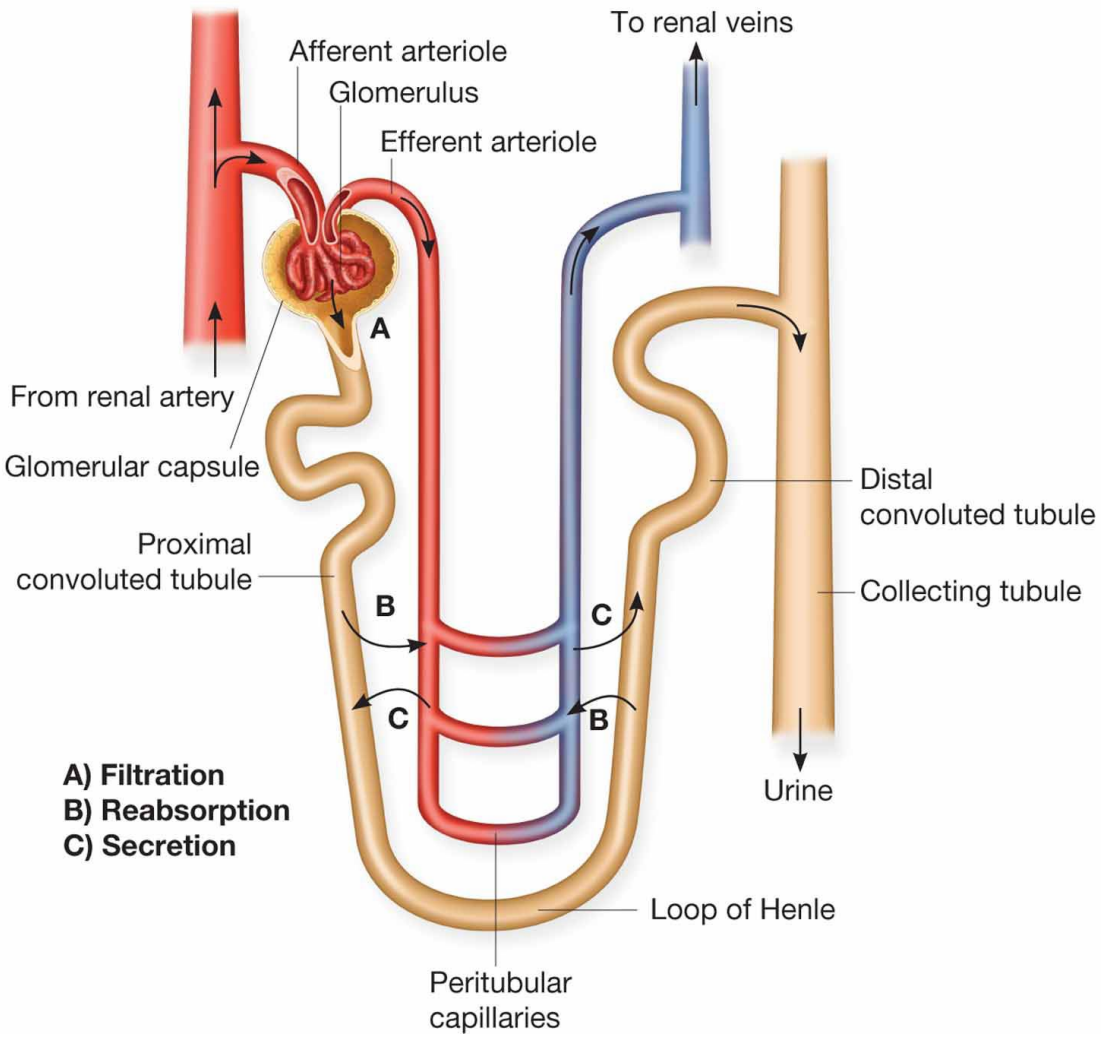
Urine formation includes three processes:
A. Glomerular filtration
B. Tubular reabsorption
C. Tubular secretion.

A. Glomerular filtration: When blood passes through glomerular capillaries, the plasma is filtered into the Bowman capsule. This process is called glomerular filtration. (water, amino acid, glucose, urea, Na, K, Cl, Hormones and vitamins).



B. Tubular reabsorption: Filtrate from Bowman capsule passes through the tubular portion of the nephron. While passing through the tubule, the filtrate undergoes various changes both in quality and in quantity. Many wanted substances like glucose, amino acids, water, electrolytes (Na, K, Cl), vitamins and hormones are reabsorbed from the tubules. This process is called tubular reabsorption.

C. Tubular secretion: And, some unwanted substances are secreted into the tubule from peritubular blood vessels. This process is called tubular secretion or excretion. Urea, toxins (drugs and antibiotics).



Physical Characteristics of Urine

Characteristic	Normal Values
color	pale yellow
odor	Odorless to slight odor
volume	0.5 – 2.5L/24 hour
pH	4.5–8.0
specific gravity	1.003–1.032

Urine Volumes

Volume condition	Volume	Causes
Normal	1–2 l/day	
Polyuria	>2.5 l/day	Diabetes mellitus; excess caffeine or alcohol; kidney disease; certain drugs, such as diuretics; excessive water intake
Oliguria	0.3–0.5 l/day	Dehydration; blood loss; diarrhea; kidney disease; enlarged prostate
Anuria	<50 ml/day	kidney failure; obstruction, such as kidney stone or tumor; enlarged prostate

The chemical analysis of urine undertaken to evaluate the levels of the following component :

- Urobilinogen.
- Glucose.
- Bilirubin.
- Ketones.
- Specific Gravity.
- Blood.
- pH.
- Protein.
- Nitrite.
- Leukocytes (Pus).

Q1: Define polyuria oliguria and anuria and mentions its causes.

الوحدة السادسه - المحاضرة الثانيه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الثانيه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- The define (kidney, nephrons, renal corpuscle and ureters).
2- Explain the parts of urinary system.

موضوعات المحاضرة الثانيه:

1- Role of Kidney in Urine Formation and Maintenance of Body Fluids and The Role in Acid-Base Balance.
2- Urinary Tract: Parts and Function.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• نشاط (١/٢/٦) تمرين تعريف وتعداد • مناقشة • محاضرة	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الثانيه

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
السادسه	الثانيه	نشاط (١/٢/٦) تمرين تعريف وتعداد	٩٠ دقيقة
		مناقشه موضوع المحاضره مع الطلبه	
		القاء المحاضره	

المادة العلمية:

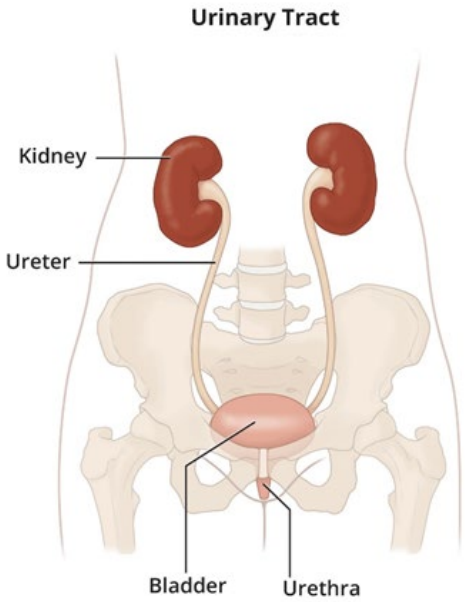
Urinary Tract Parts and Function

Two kidneys. This pair of purplish-brown organs is located below the ribs toward the middle of the back. Their function is to:

1- Remove waste products and drugs from the body.
2- Balance the body's fluids.
3- Release hormones to regulate blood pressure

4- Control production of red blood cells.

The kidneys remove urea from the blood through tiny filtering units called **nephrons**. Urea, together with water and other waste substances, forms the urine as it passes through the nephrons and down the renal tubules of the kidney.



Nephrons

A nephron is the basic structural and functional unit of the kidney. The name nephron comes from the Greek word (**nephrons**) meaning kidney.

Its chief function is to regulate water and soluble substances by filtering the blood, reabsorbing what is needed and excreting their rest as urine.

Nephron s eliminate wastes from the body, regulate blood volume and pressure, control levels of electrolytes and metabolites, and regulate blood pH. Its functions are vital to life and are regulated by the endocrine system by hormones such as anti-diuretic hormone, aldosterone, and parathyroid hormone.

Each nephron is composed of an initial filtering component (**the renal corpuscle**) and a tubule specialized for reabsorption and secretion (**the renal tubule**).

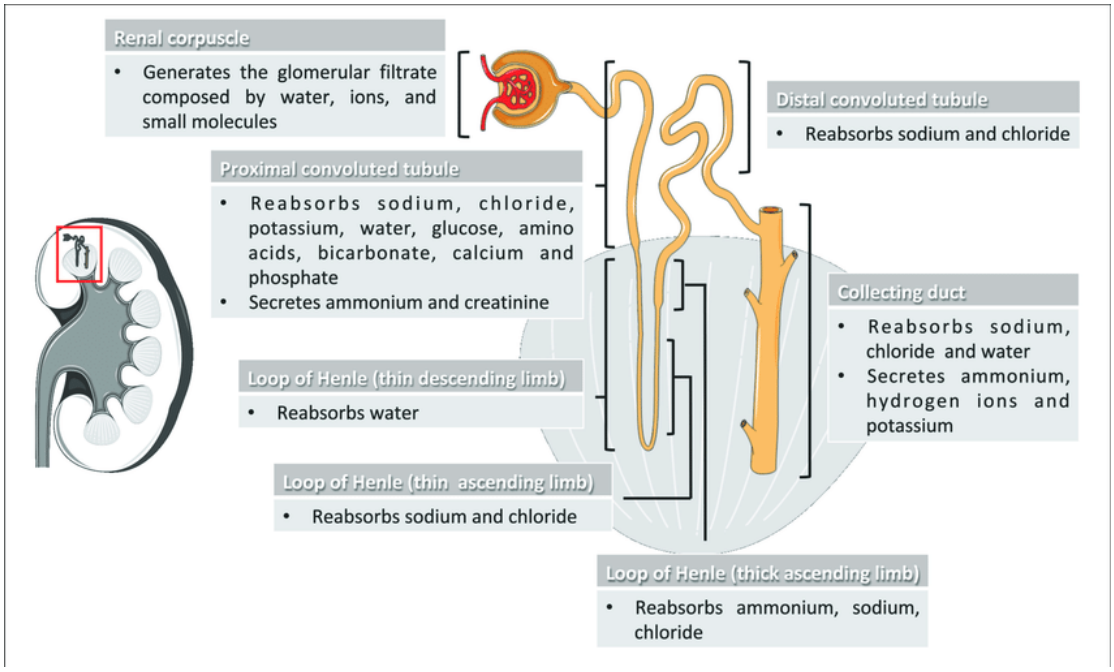
The **renal corpuscle** consists of Bowman's capsule and glomerular capillaries, responsible for plasma filtration.

1- Glomerulus

- Network of capillaries that invaginate into Bowman's capsule.

2- Bowman's capsule

- Forms the distended end of the renal tubule.



The renal tubule is a long and convoluted structure that emerges from the glomerulus and can be divided into three parts based on function.

- The first part is called **the proximal convoluted tubule (PCT)** due to its proximity to the glomerulus.
- The second part is called **the loop of Henle**, or nephritic loop because it forms a loop (with descending and ascending limbs).
- The third part of the renal tubule is called the **distal convoluted tubule (DCT)**.

Q1: define kidney explain the parts of urinary system.

الوحدة السادسه - المحاضرة الثالثه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الثالثه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Explain the parts of urinary system

موضوعات المحاضرة الثالثه:

1- Urinary Tract: Parts and Function. Urine Hemodynamic and Control.
2- Normal Urine Daily Volume and Factor Affecting.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• تبادل الادوار مع الطلبه • سؤال وجواب • نشاط (١/٣/٦) تعريف	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الثالثه

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
السادسه	الثالثه	القاء المحاضرة من قبل الطلبه باستخدام جهاز العرض	٩٠ دقيقة
		خلال القاء المحاضرة يتم الاجابه على الاسئله	
		نشاط (١/٣/٦) تعريف	

المادة العلمية:

Two ureters: These narrow tubes carry urine from the kidneys to the bladder. Smooth muscles in the ureter walls continually tighten and relax forcing urine downward, away from the kidneys. At the entrance to the bladder, the ureters have sphincters that prevent the backflow of urine. If urine backs up, or is allowed to stand still, a kidney infection can develop. About every 10 to 15 seconds, small amounts of urine are emptied into the bladder from the ureters.

The walls of the ureters are composed of multiple layers of different types of tissues.

a. The innermost layer is a special type of epithelium, called **transitional epithelium**. it is capable of stretching and does not produce mucus. Transitional epithelium allows these organs to stretch and expand as they fill with urine or allow urine to pass through.

b. The next layer of the ureter walls is made up of **loose connective tissue** containing elastic fibers, nerves, and blood and lymphatic vessels.
c. After this layer are two layers of **smooth muscles**. The smooth muscle layers can contract in waves of peristalsis to propel urine down the ureters from the kidneys to the urinary bladder.
d. The outermost layer of the ureter walls consists of **fibrous tissue**.

Urinary Bladder: This triangle-shaped, hollow organ is located in the lower abdomen. The bladder's walls relax and expand to store urine, and contract and flatten to empty urine through the urethra. Urine leaves the bladder through a sphincter called the internal **urethral sphincter**. When the sphincter relaxes and opens, it allows urine to flow out of the bladder and into the urethra.
Like the ureters, the bladder is lined with **transitional epithelium**, which can flatten out and stretch as needed as the bladder fills with urine. The next layer (**lamina propria**) is a layer of loose connective tissue, nerves, and blood and lymphatic vessels. This is followed by a **submucosa layer**, which connects the lining of the bladder with the detrusor muscle in the walls of the bladder. The outer covering of the bladder is **peritoneum**.

Urethra. This tube allows urine to pass outside the body. The brain signals the bladder muscles to tighten, which squeezes urine out of the bladder. At the same time, the brain signals the sphincter muscles to relax to let urine exit the bladder through the urethra. When all the signals occur in the correct order, normal urination occurs.
In males, the urethra carries semen (as well as urine), but in females, it carries only urine. Like the ureters and bladder, the proximal (closer to the bladder) two-thirds of the urethra are lined with **transitional epithelium**. The distal (farther from the bladder) third of the urethra is lined with **mucus-secreting epithelium**. The mucus helps protect the epithelium from urine, which is corrosive.

Q:1 Define urethral sphincter.

الوحدة السابعه - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Define glands and know the differences between endocrine glands and exocrine glands.
2- Write the important functions of hormones.
3- Classify hormones to different categories.
4- Enumerate some types of glands with their hormones.

موضوعات المحاضرة الاولى:

1- Endocrine Physiology:
2- Endocrine Glands Types and Secretion .
3- Hormone: Types, Normal Value, Function and Control of Secretion.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• عرض نقطع فديو توضيحي لمواضيع المحاضره • سؤال وجواب • نشاط (١/١/٧) صح وخطا	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
السابعه	الأولى	استخدام جهاز العرض لعرض فديو توضيحي للمادة	٩٠ دقيقة
		الاجابه على الاسئله التي تدور في اذهان الطبه خلال عرض الفديو	
		نشاط (١/١/٧) صح وخطا	

المادة العلمية:

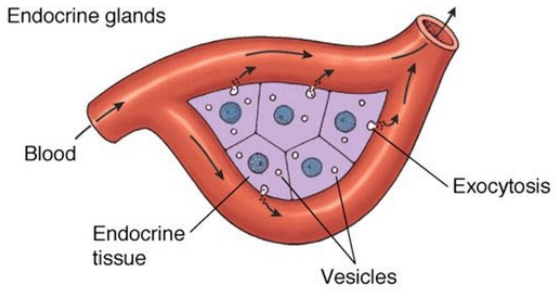
Endocrine Physiology

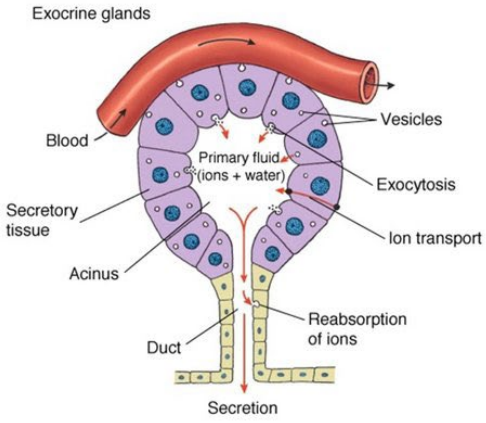
Glands: are special secreting organs which pour their secretions either directly or indirectly into the bloodstream.

Kinds of Glands:

a) Duct Glands or Exocrine Glands: Have ducts or canals through which they pour out their secretions. These include lacrimal (tear) glands, sebaceous (sweat), salivary, gastric, mammary glands.

b) Ductless or Endocrine Glands: Pour their secretions called hormones directly into the bloodstream.





Endocrine glands: are glands of the endocrine system that secrete their products, hormones, directly into the blood rather than through a duct. They are also called ductless glands because they do not have ducts to secrete their hormones.

A hormone: is a chemical substance that is secreted into the internal body fluids by one cell or group of cells and has a physiological control effect on other cells of the body.

Important Functions of hormones include:

1. Growth and development of Prompting cell or tissue
2. Food metabolism
3. Initiating and maintaining sexual development and reproduction
4. Maintaining body temperature
5. Regulating mood and cognitive functioning

Types of Hormones

Hormones are classified by various criteria:

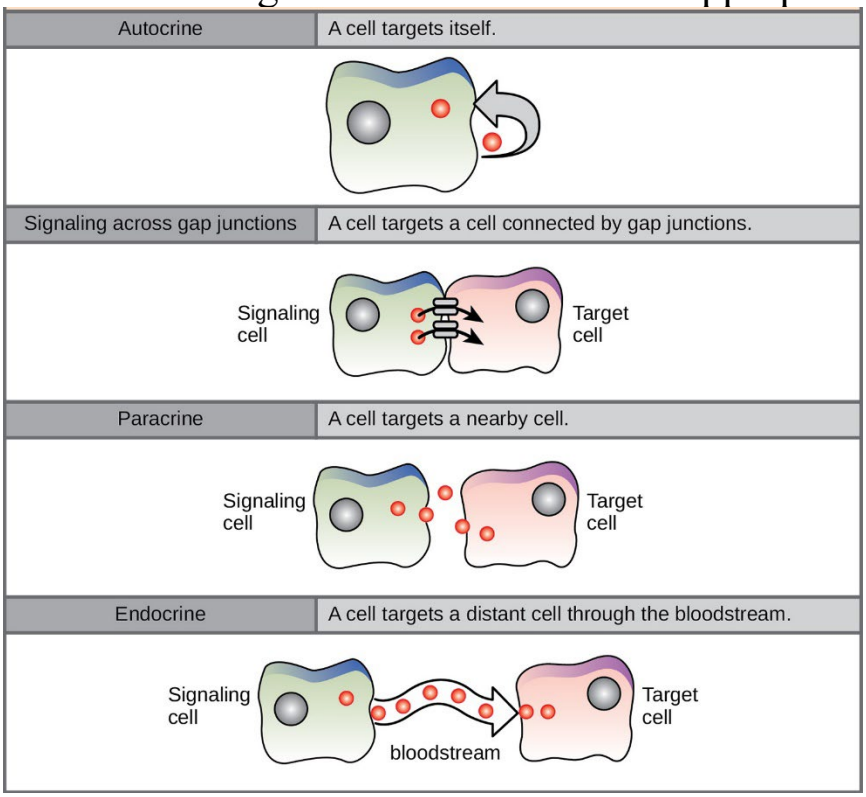
1. By Proximity of their site of synthesis to their site of action.
2. By their chemical structure.
3. By their degree of solubility in aqueous medium.

3 classes of hormones based on proximity of site of Synthesis to Site of Action:

1.Autocrine Hormones: those that act on the same cells that synthesize them.

2.Paracrine Hormones: those that are synthesized very close to their site of action.

3.Endocrine Hormones: those that are synthesized by endocrine glands and transported in the blood to target cells that contain the appropriate receptors.



Two classes of hormones based on solubility in aqueous medium: -

1.Hydrophilic Hormones: Hormones that are soluble in aqueous medium. They cannot cross the cell membrane. Examples: Insulin, Glucagon, Epinephrine.

2. Lipophilic Hormones: Hormones that are not soluble in aqueous medium, but soluble in lipid. They can easily cross the cell membrane. Examples: Thyroid hormones, Steroid hormones.

The main endocrine glands include:

Gland	Hormone
Pituitary gland	-Growth hormones regulate body growth (height and weight) and development. -Hormones regulate the thyroid gland (Thyroid Stimulating Hormones (TSH). -Stimulate milk production in the breasts.
Thyroid Gland	-Thyroxine -Triidothyronine: increase the rates of chemical reaction in almost all cells of the body, thus increasing the general level of body metabolism. -Calcitonin: - It promotes the deposition of calcium in the bones.
Pancreas	Insulin: It controls blood sugar levels.
Adrenal gland	Adrenaline: It is the key in regulating body's stress response.
Ovaries	-Estrogen: - It stimulates the development of the female sex organs, the breasts and various secondary sexual characteristics. -Progesterone: During pregnancy, progesterone also stimulates development of the glands in the breasts that are responsible for milk production.
Testis	-Testosterone: - It stimulates growth of the male sex organs, also promotes the development of male secondary sex characteristics.

Q1: Answer with True or False

1- **Estrogen: - It stimulates the development of the male sex organs.**
2- **Sweat glands are one of ductless glands.**
3- **Paracrine Hormones: those that are synthesized very close to their site of action.**

الوحدة الثامنه - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Define reproductive system.
2- List male reproductive system organs and their functions.
3- Describe male hormones.

موضوعات المحاضرة الاولى:

1- Male Sex Physiology: Function of Genital Organs .
2- Male Sex Hormones: Normal Value, Production, Control, and Their Role in Reproduction.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• نشاط (١/١/٨) مقارنه • مناقشه	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الثامنه	الأولى	نشاط (١/١/٨) مقارنه	٩٠ دقيقة
		مناقشه سؤال النشاط قبل البدء بالمحاضره	
		القاء المحاضره مع عرض رسومات ومخططات توضيحيه	

المادة العلمية:

Reproductive System

Reproductive system ensures the continuation of species. **Gonads** are the primary reproductive organs which produce the gametes (egg or ovum); a pair of testes (singular = testis) produces sperms in males and a pair of ovaries produces ovum in females.
Normally, most of the animals including humans are either definite males or definite females. However, in some organisms like earthworms and snails, both sexes may be present in the same organism and this condition is known as **hermaphroditism.**

Male Sex Physiology

Reproductive organs include:
1. Primary sex organs: testes.
2. Accessory sex organs: Seminal vesicles, Prostate gland, Urethra and Penis.

Functions of Testes
Testes performs two functions:
1. Gametogenic function: Spermatogenesis
2. Endocrine function: Secretion of hormones.

Gametogenic Functions of Testes – Spermatogenesis
Spermatogenesis is the process by which the male gametes called **spermatozoa** (sperms) are formed from the primitive **spermatogenic cells** (spermatogonia) in the testis. It takes 74 days for the formation of sperm from a **primitive germ cell.** Throughout the process of spermatogenesis, the spermatogenic cells have cytoplasmic attachment with Sertoli cells. **Sertoli cells** supply all the necessary materials for spermatogenesis through the cytoplasmic attachment.

Hormones Secreted by Testes
Testes secrete male sex hormones, which are collectively called the **androgens.**

Androgens secreted by testes are:
1. Testosterone

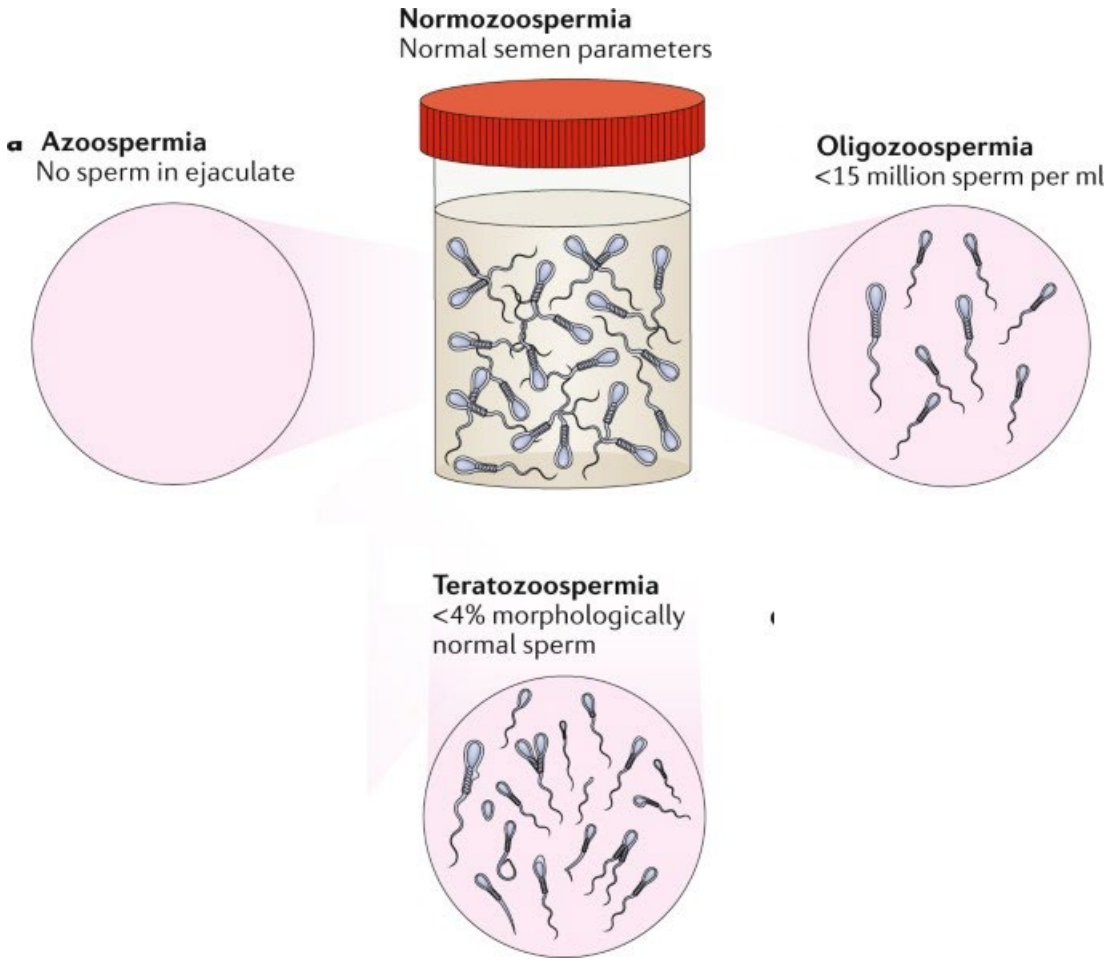
Role of testosterone
1. play a role in development of male reproductive tissues such as testes and prostate.
2. Increase muscle, bone mass.
3. Deeping of the voice and growth of facial hair.

2. Dihydrotestosterone
3. Androstenedione.

Among these three androgens, testosterone is secreted in large quantities. However, dihydrotestosterone is more active. Female sex hormones, namely estrogen and progesterone are also found in testes.

Semen is a white or grey fluid that contains sperms. It is the collection of fluids from testes, seminal vesicles, prostate gland and bulbourethral glands. Semen is discharged during sexual act and the process of discharge of semen is called ejaculation.
Sperm is the male gamete (reproductive cell), developed in the testis. It is also called spermatozoon (plural = spermatozoa). Matured sperm is 60 µ long.

Azoospermia	It is the condition characterized by lack of sperm in semen.
Oligozoospermia	It is the low sperm count with less than 20 million of sperms/mL of semen. Oligozoospermia causes infertility.
Teratozoospermia	It is the condition characterized by presence of sperms with abnormal morphology. It is also called teratospermia. The abnormal morphology of sperm results in infertility.
Aspermia	It is the lack of semen. It occurs due to retrograde ejaculation. Retrograde ejaculation is the entrance of semen into urinary bladder instead of entering urethra.
Oligospermia	Oligospermia is a genetic disorder characterized by low volume of semen.
Hematospermia	Hematospermia is the appearance of blood in sperm. It occurs due to infection of urethra or prostate.



Q1: Compare between:

Teratozoospermia	Aspermia

الوحدة الثامنه - المحاضرة الثانيه - الزمن: ٩٠ دقيقة

أهداف المحاضرة الثانيه:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Explain the functions of the female reproductive system.
2- Compare between the primary and secondary sex organs.
3- List types of female hormones and their functions.

موضوعات المحاضرة الثانيه:

1- Female Sex Physiology: Function of Genital Organs.
2- Normal Value of Female Sex Hormone, Production, and Control.
3- Female Cycle, Pregnancy, Parturition, and Lactation: Hormonal Fluctuation and Control.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• محاضرة • مناقشة • سؤال وجواب • نشاط (١/٢/٨) تعريف وتعداد	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الثانيه

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الثامنه	الثانيه	القاء المحاضرة مستخدما جهاز العرض والسبورة	٩٠ دقيقة
		طرح بعض الاسئلة خلال القاء المحاضرة	
		نشاط (١/٢/٨) تعريف وتعداد	

المادة العلمية:

Female Sex Physiology

The functions of the female reproductive system are:
1- produce ova.
2- Secrete sex hormones.
3- Receive the spermatozoa from the male.
4- Provide sites for fertilization and fetal development.
5- Facilitate parturition, or delivery of the baby.
6- Provide nourishment for the baby through the secretion of milk from the mammary glands in the breasts.

Female reproductive system comprises of primary sex organs and accessory sex organs.

1- **Primary Sex Organs**
   Primary sex organs are a pair of ovaries, which produce eggs or ova and secrete female sex hormones, the estrogen and progesterone.
2- **Accessory Sex Organs**

Note: Mammary glands are not the female genital organs but are the important glands of female reproductive system.

Types of Female Hormones

Estrogen
Estrogen is the most well-known female sex hormone.
Produced in: the adrenal glands, ovaries.
Its function is:

1- Assist breast growth in puberty.
2- Help in the growth of uterus lining during the menstrual cycle.
3- Maintaining the bones strength by collaborating with vitamin D, calcium, and minerals.

Note: A little amount of estrogen is present in man's body also.

Progesterone
Produced in: the adrenal tissue and ovaries.
Its function is:

- It forms the uterus lining for the eggs to be implanted after ovulation.
  Note: Low levels of progesterone could be behind symptoms like mood swings, irritability, depression, weight gain, osteoporosis, and other joint pains.

HCG-Human Chorionic Gonadotrophin

Produced in: HCG is made in the cells that make up the placenta at the time of pregnancy.

Its function is: The role of HCG in pregnancy is to maintain the production of progesterone that keeps the body warm and maintains the uterus lining in pregnancy.

Note: This hormone is found in both urine and blood tests for pregnancy. Studies show that the levels of HCG double every third day and the reduce after the 12th week of pregnancy.

Testosterone

Testosterone is typically considered to be a male hormone but similar to a small amount of estrogen is formed in men, a little amount of testosterone is also formed in women.

Its function is: Testosterone performs similar functions as it performs in men but to a lesser extent. In females, it increases a woman's energy level, bones, libido along with sexual responsiveness to stimulation.

Q1: Define estrogen and list its functions.

الوحدة التاسعه - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Define myology.
2- Define muscles.
3- List the basic properties of muscle tissues.
4- Classify muscles.
5- Compare between skeletal Muscle, cardiac muscle and smooth muscles.

موضوعات المحاضرة الاولى:

1- Muscles Physiology
2- Types and Functions. Generation of Action Potential, Contraction, and Sliding-Filament theory.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• مناقشة • محاضرة • نشاط (١/١/٩) مقارنه	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
التاسعه	الأولى	مناقشة موضوع المحاضره مع الطلبه و معرفه مدى اطلاعهم على موضوعاتها	٩٠ دقيقة
		القاء المحاضرة مستخدما جهاز العرض والسبورة	
		نشاط (١/١/٩) مقارنه	

المادة العلمية:

Muscles Physiology

Myology is the study of muscles. More than 600 skeletal muscles make up the muscular system.

Muscle: is a contractile tissue which brings about the movement of the organs and body as a whole.

Basic properties of muscle tissue:

1- **Excitability (irritability):** Electrical nerve impulse stimulates the muscle cell to contract.
2- **Contractility:** When stimulated the muscles contracts lengthwise leading to its shortening.
3- **Extensibility:** Muscle can be stretch up to 20% Muscle assumes a desired shape regardless of how it might be stretched.
4- **Elasticity:** Once the stimulus is removed, the muscle fibers return to their original length.

Classification of muscles

Muscles are classified by three different methods, based on different factors:

I. Depending upon the presence or absence of striations; the muscles are divided into two groups:

1. Striated Muscle: Striated muscle is the muscle which has a large number of cross striations (transverse lines). Skeletal muscle and cardiac muscle belong to this category.

2. Non-striated Muscle: Muscle which does not have cross-striations is called nonstriated muscle. It is also called plain muscle or smooth muscle. It is found in the wall of the visceral organs.

II. Depending upon the control:

1. Voluntary Muscle: Voluntary muscle is the muscle that is controlled by the will. Skeletal muscles are the voluntary muscles. These muscles are innervated by somatic nerves.

2. Involuntary Muscle: Muscle that cannot be controlled by the will is called involuntary muscle. Cardiac muscle and smooth muscle are involuntary muscles. These muscles are innervated by autonomic nerves.

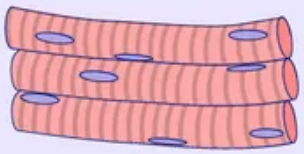
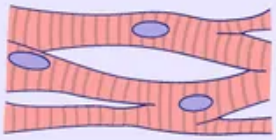
III. Depending upon the situation

1. **Skeletal muscle:**
   - These are most abundant & mostly attached to skeleton.
   - Microscopic: cross striation, multinucleated cylindrical cells.
   - It is under voluntary control.
   - Respond quickly to stimuli, rapid contraction & so get fatigued easily.

2. **Cardiac muscle:**
   - It forms myocardium of heart.
   - Each muscle fiber having single nucleus which is centrally placed.
   - Cross striations less prominent than skeletal muscle.
   - Intermediate, being satiated & same time involuntary.
   - Main characteristic feature of cardiac muscle is intercalated disc.

3. Smooth muscle:

- These muscles often encircle/surround the viscera.
- Each muscle fiber is an elongated, spindle shaped nucleus with single central nucleus.
- Do not shows cross striation.
- Not under voluntary control.
- Response slowly to stimuli, being capable to sustain contraction so do not fatigue easily.
- Provide motor power for regulating the internal environment related to digestion, circulation, secretion & excretion.

	Main features	Histology
Skeletal muscle	• Fibers: striated, tubular and multi nucleated • Voluntary • Usually attached to skeleton	
Smooth muscle	• Fibers: non-striated, spindle-shaped, and uninucleated • Involuntary • Usually covering wall of internal organs	
Cardiac muscle	• Fibers: striated, branched and uninucleated • Involuntary • Only covering walls of the heart	

Q1: Compare between:

Skeletal Muscles	Cardiac Muscles	Smooth Muscles

الوحدة العاشره - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Define neurons.
2- Classify the nervous system.
3- Mention the functions of nervous system parts.

موضوعات المحاضرة الاولى:

1. Nervous Physiology: Neuroglia: Definition, Types, and Function.
2. Neurons: Definition, Types, and Function .
3. CSF: Composition, Function, and Clinical Importance

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• سؤال وجواب • محاضره • نشاط (١/١/١٠) عدد	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
العاشره	الأولى	توزيع اوراق واقلام على الطلبه والسماح لهم بتدوين اسئلة تخطر في بالهم بخصوص موضوع المحاضره قبل القائها	٩٠ دقيقة
		القاء المحاضرة مستخدما جهاز العرض والسبورة	
		نشاط (١/١/١٠) عدد	

المادة العلمية:

The Nervous System

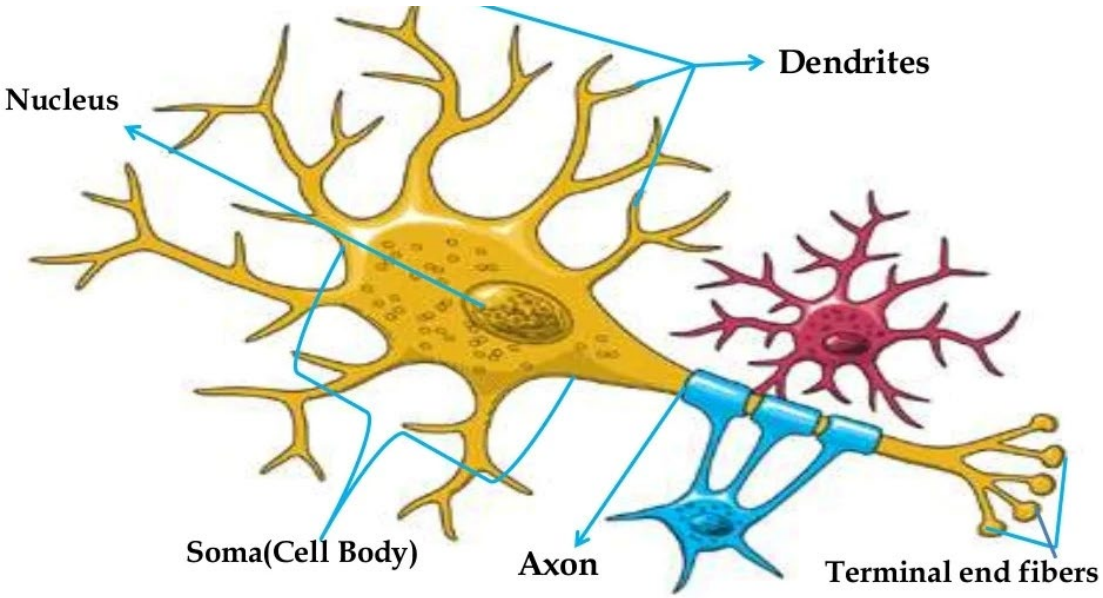
➢ The nervous system is very important in helping to maintain the homeostasis (balance) of the human body.

> A series of sensory receptors work with the nervous system to provide information about changes in both the internal and external environments.

> The human nervous system is a complex of interconnected systems in which larger systems are comprised of smaller subsystems each of which have specific structures with specific functions.

Structures and functions

Neurons (nerve cells) are the basic elements of the nervous system .



Neurons

➢ **Cell Body** > The main processing center of the cell.

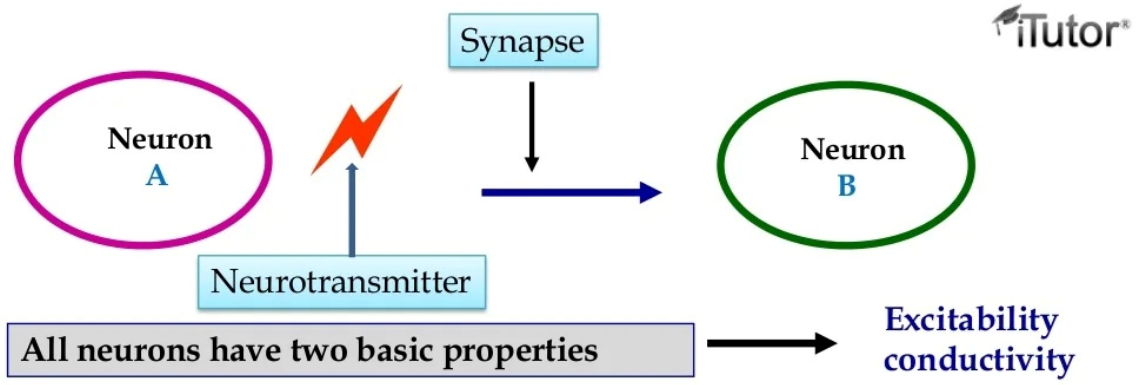
➢ **Dendrites** > Thin branching extensions of the cell body that conduct nerve impulses toward the cell body.

➢ **Axon** ➢ A single branch (in most neurons) which conducts nerve impulses away from the cell body.

> **Myelin sheath and neurilemma** are coverings.

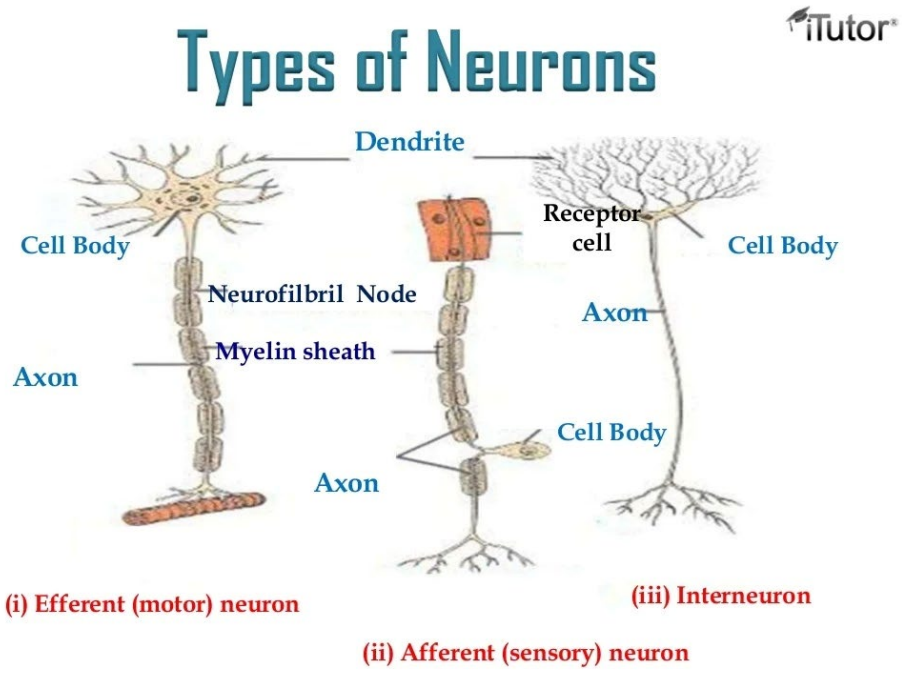
Neurons

➢ Impulse Transmission ➢Terminal end fibers are located at the ends of the axon and they transmit impulses leaving the neuron across a synapse to the next neuron.



Three Types of Neurons

1. **Efferent (motor)** > Conveys information from the CNS to muscles and glands.
2. **Afferent (sensory)** > Carry information from sensory receptors to the CNS.
3. **Interneuron** > Carry and process sensory information.



Nervous System

➢All bodily activities, voluntary and involuntary, are controlled by the nervous system.

Two Major Components

1. **Central Nervous System (CNS)** • Made up of the brain and spinal cord
2. **Peripheral Nervous System (PNS)** • Made up of all the nerves that lead into and out of the CNS.

Central Nervous System

➢The central nervous system is composed of two major interconnected organs:

1. The brain
2. The spinal cord .

These organs work together to integrate and coordinate sensory and motor information for the purpose of controlling the various tissues, organs, and organ systems of the body .

The central nervous system is responsible for higher neural functions, such as memory, learning, and emotion.

Brain

➢ Weighs about 3 pounds in adults

➢ 75% water

➢ 20% of oxygen

➢ Contains over 100 billion neurons

➢Controls bodily functions and interactions with the ou side world

Four Parts:

1. ❑ Cerebrum
2. ❑ Diencephalons
3. ❑ Brain stem
4. ❑ Cerebellum

Brainstem

> Made up of the midbrain; Pons and the medulla oblongata.

Midbrain : Involved with visual reflexes

Pons:

• Located between the midbrain and the medulla oblongata

• Controls certain respiratory functions Medulla Oblongata: • Contains centers that regulate heart and lung functioning, swallowing, coughing, vomiting and sneezing

Cerebellum

- Area that coordinates musculoskeletal movement to maintain posture, balance, and muscle
- Inferior to the occipital lobes of the cerebrum.
- Posterior to the pons and medulla oblongata.

Cerebrum

- Located above the cerebellum.
- Contains two hemispheres with an outer portion called the cerebral cortex.
- The two hemispheres are connected by a bridge of nerve fibers that relay information between the two hemispheres called the corpus callosum.
- The left and right lobes are each divided into four lobes or parts parietal lobe • Frontal lobe • Temporal lobe • Occipital lobe
- Diencephalon: The deep portion of the brain containing: • Thalamus • Hypothalamus • Epithalamus • Ventral thalamus
- Serves as relay center for > Heart rate > Blood pressure > Temperature control

Spinal Cord

> Extends from the medulla oblongata of the brain to the area around the first lumbar vertebra in the lower back.

> Nerves from the peripheral nervous system extend out from the spinal cord.

> Protected by: ■ Vertebral column • Cerebrospinal fluid ■ Meninges > Meninges are three layers of membranes that cover the brain and spinal cord.

Peripheral Nervous System

<The peripheral nervous system (PNS) is a collection of peripheral nerves, ganglia and specialized sensory structures that, as a system, carries sensory and motor information between the central nervous system and all other organs and tissues of the body.

The peripheral nervous system is functionally divided into two major divisions:

- The Sensory or Afferent Division
- the Motor or Efferent Division

Somatic Nervous System

Responsible for receiving and processing sensory input from the skin, muscles, tendons, joints, eyes, tongue, nose and ears as well as excite the voluntary contraction of skeletal muscles.

Autonomic Nervous System

➢ Carries impulses from the central nervous system to glands, various smooth muscles, cardiac muscle and various membranes .

➢Stimulates organs, glands, and senses .

Q1: Mention the pats of nervous system and its main function.

الوحدة الحادية عشر - المحاضرة الأولى - الزمن: ٩٠ دقيقة

أهداف المحاضرة الاولى:

يتوقع في نهاية الجلسة أن يكون الطالب قادراً على:

1- Define sensation.
2- Define Perception.
3- List the types of sensory system.
4- List the types of receptors.

موضوعات المحاضرة الاولى:

1. Sensory System: Classification and General Function.
2. Special Sense Organs: Types and General Function.

الأساليب والأنشطة والوسائل التعليمية

م	الأساليب والأنشطة التدريبية	الوسائل التدريبية
١	• عرض فديو توضيحي للمحاضره • مناقشه • محاضرة • نشاط (١/١/١١) تعداد	• جهاز حاسوب • جهاز عرض • سبورة • اوراق واقلام

خطة إجراءات تنفيذ المحاضرة الاولى

الوحدة	المحاضرة	الإجراءات	الزمن بالدقيقة
الحادية عشر	الأولى	عرض فديو توضيحي للمحاضره مع مناقشتة ما يشاهدوه الطلبه	٩٠ دقيقة
		القاء المحاضرة مستخدما جهاز العرض	
		نشاط (١/١/١١) تعداد	

المادة العلمية:

Sensory System

Humans can perceive various types of sensations, and with this information, our motor movement is determined. We become aware of the world by way of sensation. Sensations can also be protective to the body, by registering environmental cold or warm, and painful needle prick, for example. From the soft touch of the child to the painful punch of a boxer, all the daily activities carry associations with sensations.

Broadly, these sensations can classify into two categories.

- **First**: general sensations which include touch, pain, temperature, proprioception, and pressure.
- **Second:** Vision, hearing, taste, and smell are special senses which convey sensations to the brain through cranial nerves. In this activity, the discussion will be limited to general sensations.

Sensation is the activation of sensory receptor cells at the level of the stimulus. **Perception** is the central processing of sensory stimuli into a meaningful pattern.

Types of Sensory Receptors

Sensory receptors in humans can be classified into just four types Sensations:

1- **Chemoreceptors** respond to chemical substances in the immediate vicinity. The senses of taste and smell are well known to have this type of sensory receptor, but there are also chemoreceptors in various other organs that are sensitive to internal conditions. Chemoreceptors in certain blood vessels monitor the hydrogen ion

concentration [H_] in the blood, and if the pH lowers, the breathing rate increases. As more carbon dioxide is expired, the blood pH will rise.

2- **Pain receptors** are a type of chemoreceptor. They are naked dendrites that respond to chemicals released by damaged tissues. Pain receptors are protective because they alert us to possible danger. Without the pain of appendicitis, we may never seek the medical help that is needed to avoid a ruptured appendix.
3- **Mechanoreceptors** are stimulated by mechanical forces, which are most often pressure of some sort. The sense of touch is dependent on pressure receptors that are sensitive to either strong or slight pressures. Pressure receptors located in certain arteries detect changes in blood pressure, and stretch receptors in the lungs detect the degree of lung inflation. Proprioceptors, which respond to the stretching of muscle fibers, tendons, joints, and ligaments make us aware of the position of our limbs. Even hearing is dependent on mechanoreceptors. In this case, the receptors are sensitive to pressure waves in inner ear fluid. Pressure receptors that provide information regarding equilibrium are also located in the inner ear.
4- **Thermoreceptors** are stimulated by changes in temperature. Those that respond when temperatures rise are called warmth receptors, and those that respond when temperatures lower are called cold receptors. There are internal thermoreceptors in the hypothalamus and surface thermoreceptors in the skin.
5- **Photoreceptors** respond to light energy. Our eyes contain photoreceptors that are sensitive to light and thereby provide us with a sense of vision. Stimulation of the photoreceptors, known as rod cells, results in black and white vision, while stimulation of the photoreceptors, known as cone cells, results in color vision.

Types of Senses

Senses are divided into the somatic senses and the special senses.

1- **Somatic Senses**: Senses associated with the skin, muscles, joints, and internal organs are called **somatic senses.** Mechanoreceptors in the skin give us a sense of touch and throughout the body a sense of pressure. Asense of temperature is due to receptors located in the skin and the brain. A sense of pain is due to pain receptors located in the skin and also among internal organs. Proprioception, which helps maintain posture and balance, is due to proprioceptors like Golgi tendon organs in tendons and muscle spindles in skeletal muscles.

2- **Special Senses:** The sense organs for taste, smell, vision, balance, and hearing contain a number of receptors all specialized to give us a particular sense. Table 18.1 lists the **special senses** and their associated sense organs.

Receptors

1- **Exteroceptors:** Detect stimuli near outer body surface.
2- **Interceptors**: Detect stimuli from inside the body.
3- **Proprioceptors:** Detect stimuli deep within the body.

Q1: Enumerate the types of sensory receptors in humans