ANATOMY & PHYSIOLOGY – II

IMPORTANT QUESTIONS

UNIT 3

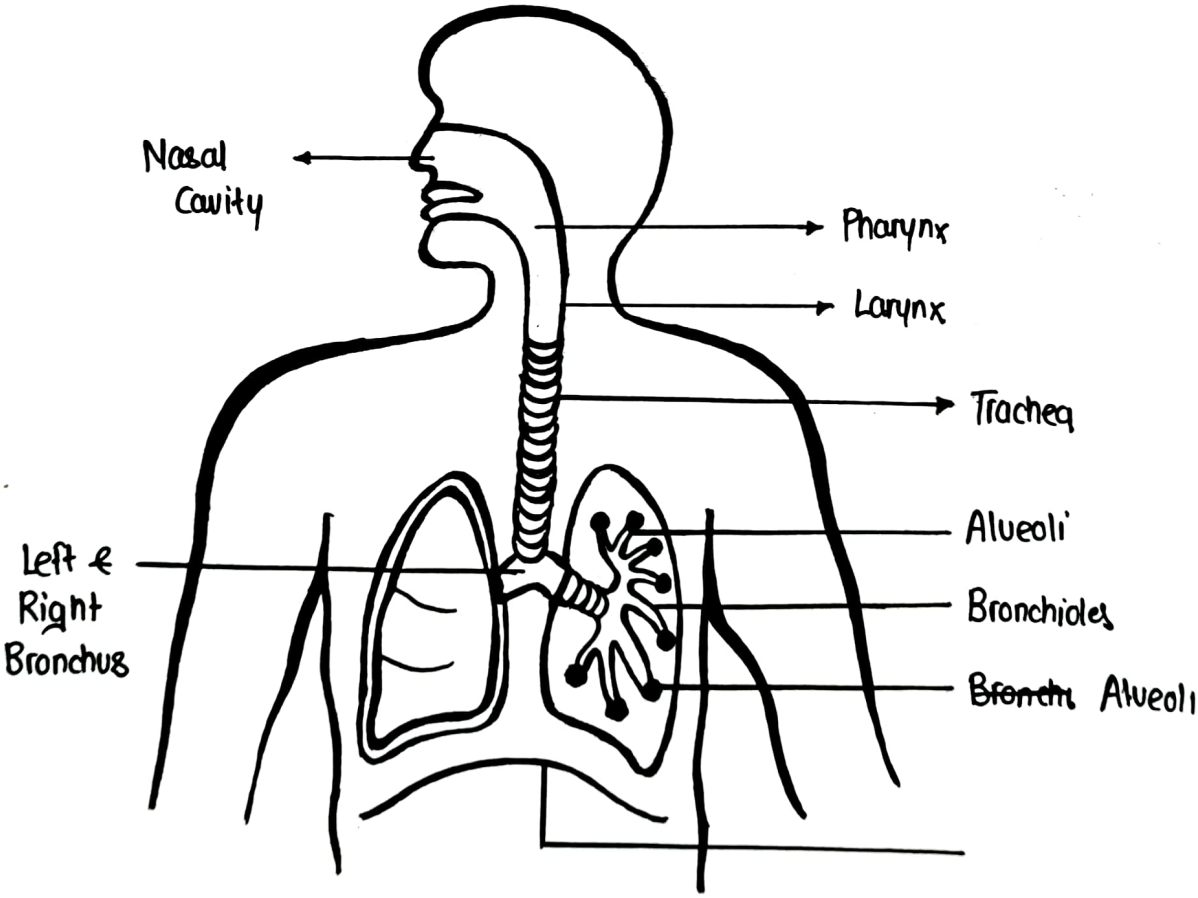
IMPERFECT
PHARMACY

QUESTION - 1

1 WRITE IN DETAIL ABOUT MECAHNISM INVOLVED IN REGULATION OF RESPIRATION
DIFFERENTIATE BETWEEN EXTERNAL AND INTERNAL RESPIRATION

RESPIRATORY SYSTEM

- Respiration is simply defined as process of exchange of gases blw body tissues and external environment.
- Cells of our body continuously use oxygen for the metabolic reactions in which energy is released from nutrient molecules & ATP produces.
- Now during these metabolic reactions CO_2 also released that must be excreted out from body.
- The supply of O_2 & excretion of CO_2 occurs only through Respiration & the system that performs respiration is called Respiratory System.



Stages Of Respiration

There are basically 3 stages of Respiration :

① Breathing / Ventilation
② Internal Respiration
③ Cellular Respiration

BREATHING : It is simply defined as the exchange of Gases b/w environment & lungs.

INTERNAL RESPIRATION : It is simply defined as exchange of gases between lungs & blood

CELLULAR RESPIRATION : It is simply defined as exchange of gases between blood & body tissues (cells)

Types of Respiration

There can be two types of respiration :

① Aerobic Respiration
② Anaerobic Respiration

AEROBIC RESPIRATION :
- It occurs in the presence of oxygen.
- It always releases CO_2 & water.
- This process produces much more energy.

ANAEROBIC RESPIRATION :
- It occurs in the absence of oxygen.
- May or may not produces CO_2
- It produces less energy.

MECHANISM OF RESPIRATION

Mechanism of respiration involves two major steps :

- Breathing mechanism
- Exchange of Gases

Mechanism of Breathing

- The process in which air moves in & out of the lungs is known as Breathing.
- The breathing mechanism involves two major process :

① Inspiration
② Expiration

INSPIRATION

- The process of ~~intake~~ of intake of atmospheric air is simply known as Inspiration.
- In this process air moves from atmosphere to lungs.
- The process is also known as Inhalation.
- It is an active process.

Muscles involved in Inspiration

Two types of muscles mainly involved in Inspiration.

- Diaphragm
- External - Inter - coastal muscles

EXCHANGE OF GASES

- The gaseous exchange occurs in alveoli of lungs.
- It depends upon pressure difference b/w blood & tissues.
- Exchange of Gases takes place in following manner:

(i) Transport of Oxygen
(ii) Cellular Respiration
(iii) Transport of Carbon di Oxide

Transport of O_2

When O_2 is transferred from alveoli to blood then it is carried by Haemoglobin & then it is further transported to cells for cellular respiration.

Cellular Respiration

The O_2 received by the cell is further used for the process of cellular respiration in which cells uses O_2 to breakdown the glucose into CO_2 & energy should be produced.

Transport of CO_2

Now CO_2 is a waste product hence it is further transferred from cells to blood & then blood to lungs & then finalled exhaled out.

Inspiration Mechanism

Contraction of Diaphragm Muscles
↓
Enlargement of Thoracic cavity
↓
Decrease in pressure inside thoracic cavity
↓
Filling of air inside the lungs

EXPIRATION

- The process in which the air moves from lungs to the atmosphere is known as Expiration.
- It is also known as Exhalation.
- It is a passive process (doesn't require energy)

Expiration Mechanism

Relaxement of Diaphragm Muscles
↓
Decrease in volume of thoracic cavity
↓
Increase in pressure inside thoracic cavity
↓
Exhalation of air

Regulation Of Respiration

- The regulation of respiration refers to physiological mechanism that controls rate & depth of breathing to maintain appropriate levels of oxygen (O_2) & CO_2 in body.
- The regulation is essential for ensuring efficient gas exchange in lungs & maintaining Acid-Base balance in Bloodstream.
- There are two types of regulation of respiration :

① Neural Regulation
② Chemical Regulation

Neural Regulation

- The neural regulation of respiration refers to control of breathing by neural circuits in brainstem, specially within medulla oblongata & pons.
- These neural centres coordinate & regulate the rythm, rate & depth of breathing to ensure efficient gas exchange & maintain homeostasis of O_2, CO_2 & pH levels in body.
- There are following neural centres that regulates respiration :

① Dorsal Respiratory Group (DRG)
② Ventral Respiratory Group (VRG)
③ Pneumotaxic Centre
④ Apneustic Centre

① Dorsal Respiratory Group

- It present in dorsal portion of Medulla Oblongata.
- It controls basic respiratory mechanism.
- It primarily controls inspiration.
- It stimulates the diaphragm & external intercostal muscles.

② Ventral Respiratory Group

- It is present in ventral portion of Medulla Oblongata.
- During normal respiration its inactive
- It controls forceful respiration.

③ Pneumotaxic Centre

- It ~~cent~~ is located dorsally in upper pons.
- It controls switch off point of inspiration.

④ Apneustic Centre

- It controls Dorsal Respiratory Group.
- It delays switch off point of respiration.

CHEMICAL CONTROL

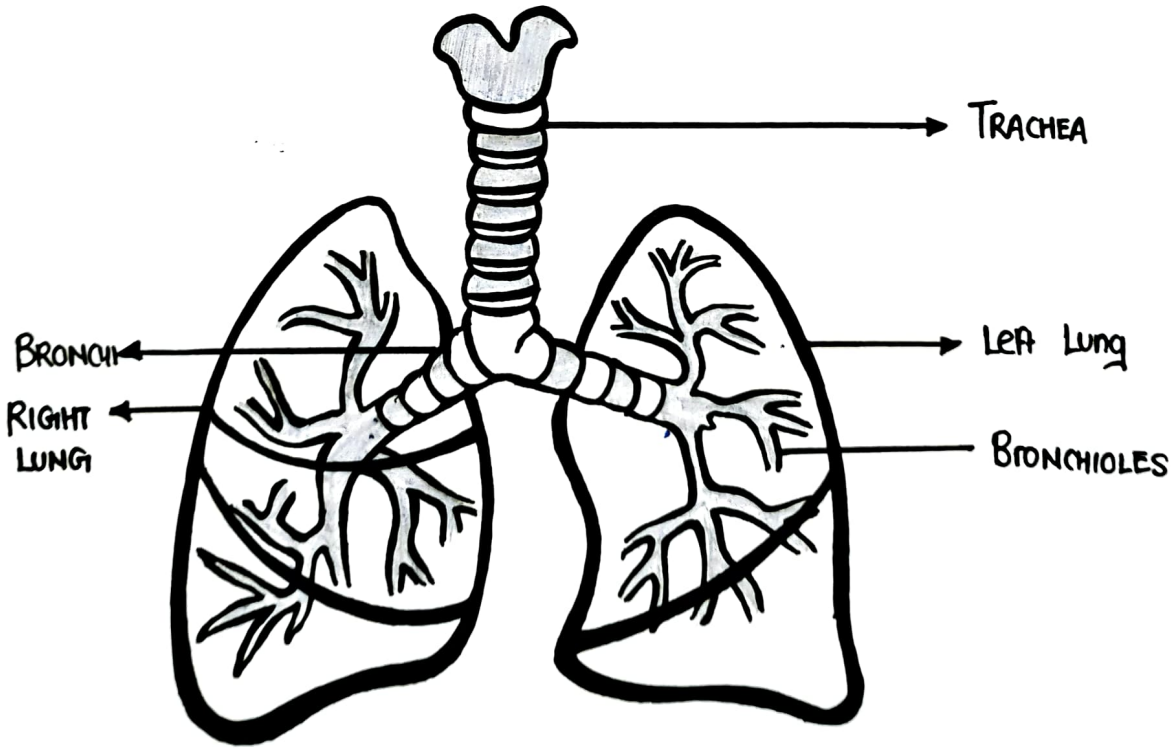
- Chemical regulation of respiration refers to control of breathing rate & depth in response to changes in levels of gases & chemicals in bloostream.
- These changes primarily involves oxygen (O_2), carbon dioxide (CO_2) & Hydrogen ion (H^+) concentrations, which are detected by specialized receptors throughout the body.
- In this rythm centre activates & give signal to diaphragm to start inspiration.

QUESTION - 2

1 WRITE STRUCTURE AND FUNCTION OF LUNGS EXPLAIN DIFFERENT TYPES OF LUNG CAPACITY AND LUNG VOLUMES

LUNGS

- Lungs are the poinaple organ of respiration.
- The lungs are pair of spongy air filled cone shaped organ located on either side of chest.
- They are present in pair i.e. left lung & right lung.
- Lungs are covered by a double membrane known as Pleural membranes.
- Outer Membrane : Parietal Pleura
- Inner Membrane : Visceral Pleura
- Between both the membranes a fluid is present known as Pleural fluid.
- The left lung is slightly smaller than right lung.
- Right lung has three lobes while left lung has only 2 lobes.



Surfaces Of Lungs

The lungs can be divided into 4 parts.

- Apex : Narrow Superior portion
- Base : Broad Inferior portion.
- Costal : Surface against ribs
- Surface : lateral boundary of Mediastinum.

Lobes of Lungs

Lungs of each side contains different no. of lobes :

RIGHT LUNG : Right lung is subdivided into 3 lobes :

- Superior Lobe
- Middle Lobe
- Inferior Lobe

LEFT LUNG : Left Lung is subdivided into 2 lobes :

- Superior Lobe
- Inferior Lobe

LUNG VOLUMES

- Lung volumes are also known as respiratory volumes.
- It refers to the volume of gas in the lungs at a given time.
- There are various types of Lung volumes :

① Tidal Volume
② Inspiratory Reserve Volume
③ Expiratory Reserve Volume
④ Residual Volume

Tidal Volume

- It is simply defined as amount of air inhaled or exhaled during normal breath.
- Its value is about 500 ml

Inspiratory Reserve Volume

- It is the maximum amount of air inhaled by a deep inspiration process.
- Its about 2500 - 3000 ml.

Expiratory Reserve Volume

- It is simply defined as maximum amount of air exhaled by a deep expiration process.
- Its about 1000 - 1200 ml

Residual Volume

- It is the amount of air that remains inside lungs after forceful exhalation. 1200 - 1500 ml

LUNG CAPACITY

- Lung capacities are derived from summation of different lung volumes :
- They are also of different types :

(i) Total lung capacity
(ii) Vital capacity
(iii) Expiratory capacity
(iv) Residual Capacity
(v) Inspiratory Capacity

Total Lung Capacity :
- Total volume of air that person can hold in its lungs after a forced inhalation.
- Sum of all volumes. M → 6000 ml F → 4500 ml

Vital Capacity :
- It is amount of air that a person move in & out.
- Sum of tidal volume & inspiratory reserve volume & expiratory reserve v.

Inspiratory Capacity :
- Amount of air that can be inhaled after tidal ~~Volume~~. expiration.
- Sum of tidal volume & inspiratory reserve volum.

Expiratory Capacity :
- It is simply amount of air exhaled by a person.

Residual Capacity :
- Amount of air remains after a normal tidal expiration.
- Sum of expiratory reserve volume & residual volume.

QUESTION - 3 & 4

3 WRITE STRUCTURE AND FUNCTION OF KIDNEYS WITH WELL LABELLED DIAGRAM

4 EXPLAIN DIFFERENT TYPES AND PARTS OF NEPHRONS DISCUS PHYSIOLOGY OF URINE FORMATION

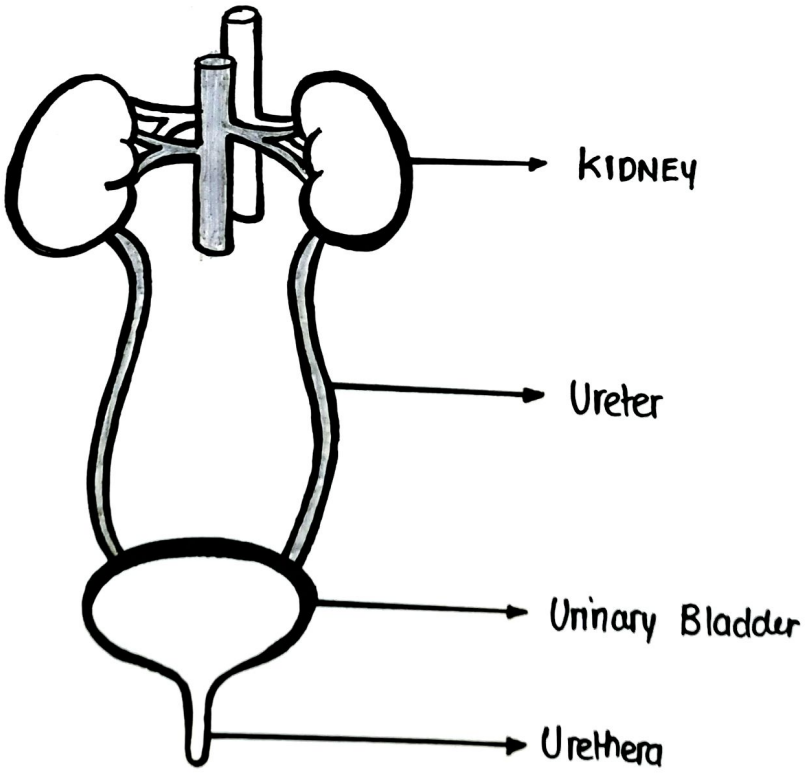
URINARY SYSTEM

- Excretion is the process by which unwanted substances & metabolic wastes are eliminated from the body.
- Although there are various systems in our body that are involved in the excretion process, but Urinary System has major excretory capacity, hence it is known as major excretory system of human body.
- It is also known as Renal System.

Parts Of Urinary System

Urinary System mainly consist of:

- A pair of kidneys
- Ureters
- Urinary Bladder
- Urethera



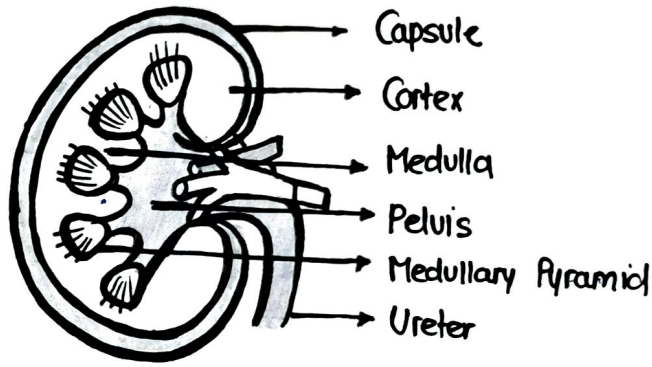
KIDNEY

- They are present in a pair in our body.
- kidneys are two bean shaped organ located on each side of vertebral column. (T-12 - L3).
- It is Reddish- brown in colour.
- It is about 10-12 cm long & 5-7 cm wide
- Its weight is about 120- 170 gram.

Layers of kidney

kidney mainly contains 3 layers :

① Outer Cortex
② Inner Medulla
③ Renal Pelvis



NEPHRONS

- Nephrons are the major functional unit of kidney.
- Nephron is mainly consist of two parts :

① Renal Corpuscle
② Renal Tubule

RENAL ~~CAPSULE~~ CORPUSCLE

- It is present in the cortex of kidney.
- The major function of renal corpuscle is filteration of blood.
- It can be further subdivided into two portions

① Glomerulus : Bunch of capillaries.
② Bowman's Capsule : Upper end of renal tubule.

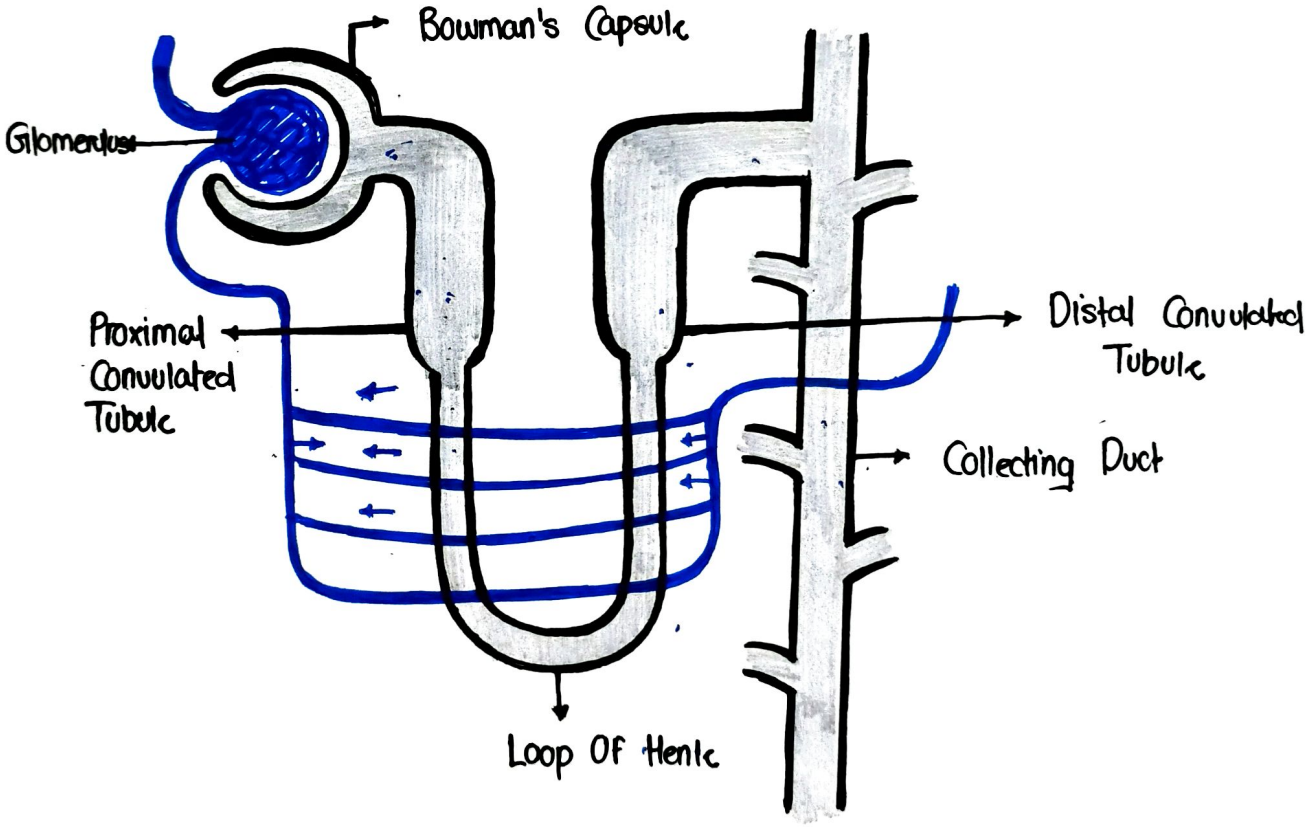
RENAL TUBULE

- It is a tube like structure and the continuation of Bowman's capsule.
- ~~Proximal~~ ∈ Renal tubule mainly consist of 3 parts :

① Proximal Convoluted Tubule : Present in Cortex
② Loop of Henle : Present in Medulla
③ Distal Convoluted Tubule : Present in Cortex

- Loop of Henle can be further subdivided into 2 parts :

(i) Descending Limb
(ii) Ascending Limb



NEPHRON

Types Of Nephrons

Nephrons are of basically two types :

① Cortical Nephrons : 85%, short Loop of Henle

② Juxta-Medullary Nephrons : 15%, Long Loop of Henle.

PHYSIOLOGY OF URINE FORMATION

- Urine formation is a Blood Cleansing function.
- Normally about 1300 ml of blood enters into the kidney.
- kidney excreted the unwanted substances from the blood as Urine.
- Normal Urine output is 1-1.5 Litre/day.

Formation Of Urine

It mainly involves 3 steps :

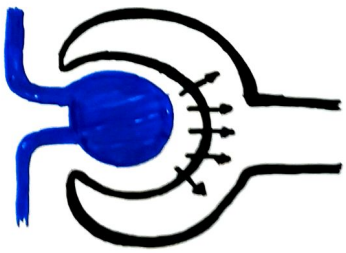
① Glomerular Filteration

② Tubular Reabsorbtion

③ Tubular Secretion

① GLOMERULAR FILTERATION

- It is a process by which blood is filtered while passing through glomerular capillaries by filteration membrane.
- It is first step of Urine formation.
- When blood passes through glomerular capillaries the plasma is filtered in bowman's capsule.



- All the substance of plasma filtered in glomerular filteration except plasma protein & filtered fluid is known as Glomerular Filterate.

Glomerular filteration Rate

- Glomerular filteration rate (GFR) is defined as total quantity of filterate formed in all the nephrons of both the kidney in the given unit of time.
- Normal GFR is 125 ml / minute or
  180 L / day

Factors Affecting GFR

- Renal blood flow
- Glomerular capillary Pressure
- Colloidal Osmotic Pressure
- Hydrostatic pressure in bowman's capsule.

② TUBULAR REABSORBTION

- As we clearly saw that about 180 L filterate formed per day but only 1.5 litre urine is excreted out from our body that means about 99% part of filterate again reabsorbed in blood.
- It is the process by which water & other necessary substances are reabsorbed from **Renal Tubule** to **Blood**.
- The reabsorbed substances moves into the interstitial fluid of renal medulla & after that they moved into ~~cap~~ tubular capillaries.
- Tubular reabsorbtion is a selective reabsorbtion as the tubular cells reabsorbs only those substances that are necessary for our body.
- Essential substances get reabsorbed while unwanted substances excreted out from body.

Site of Reabsorbtion

Proximal Convulated Tubule	Loop Of Henle	Distal Co. Tubule
Glucose, Amino Acids Sodium, Potassium Calcium, Bicarbonates Chlorides, Phosphates Urea, Uric Acid Water	Sodium Chloride	Sodium Calcium Bicarbonate Water

③ Tubular Secretion

- It is process in which substance are transported from blood to renal tubules.
- The unwanted substances that are not get filtered from blood to Bowman's Capsule in first step are directly transported to renal tubules later in this process.

Substance secreted in different segment of renal ~~capsu~~ tubule

- Proximal Convulated Tubule : Potassium, Ammonia, H^+ ions.
- Loop of Henle : Urea
- Distal Convulated Tubule : Potassium, H^+ ions
- Collecting Ducts : Potassium

FUNCTIONS OF KIDNEY

- It helps in the excretion of waste products
- It maintains water- electrolyte balance.
- It maintains acid- base balance.
- It also helps in the process of erythropoiesis by secreting erythropoeitin & also in thrombopoeisis by secreting thrombopoeitin.
- It secretes renin, prostaglandin harmones.
- It also helps in regulation of blood pressure.
- It also regulates blood- calcium level.

QUESTION - 3

5 EXPLAIN ROLE OF KIDNEY IN ACID BASE BALANCE

ROLE OF KIDNEY IN ACID BASE BALANCE

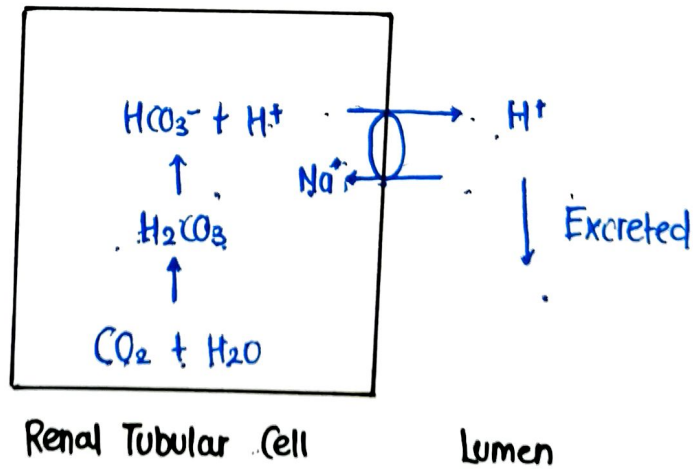
- Acid base balance is a part of homeostasis process that deals with maintainance of pH
- Most of the reactions in our body occurs at a specific pH & change in this pH can lead to major disturbances.
- The normal pH value of blood is approx 7.42 & survival range of pH in blood is between 6.8 - 8.0, now if the pH limit crosses this value then it may lead to death, so it becomes very important to maintain pH balance of our body.
- Now, there are various mechanism in our body to regulate this acid- base balance but the renal mechanism is the most effective & final process of acid- base balance in which kidneys play major role.

Renal Mechanism of Acid base balance

It mainly works by 2 mechanism :-

- Excretion of H^+
- Reabsorbtion of bicarbonate ions

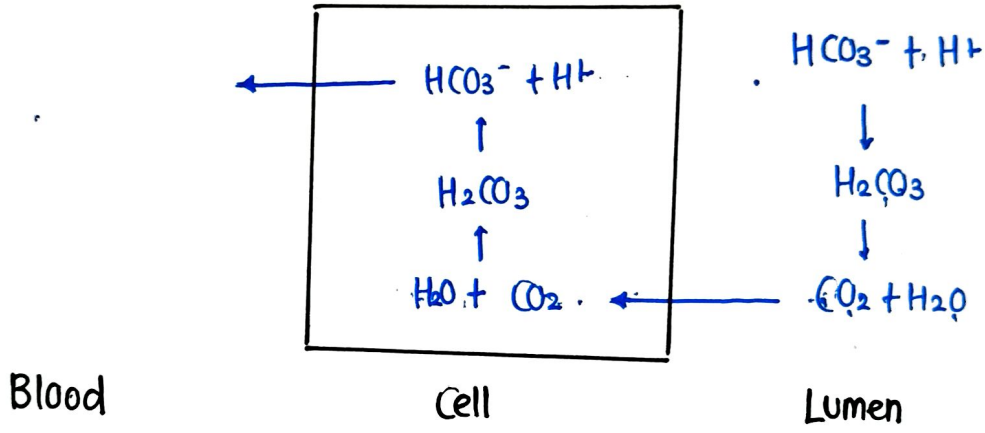
Excretion of H^+



STEPS

- This step mainly occurs proximal tubule.
- CO_2 combines with H_2O to form H_2CO_3
- Now H_2CO_3 dissociates into HCO_3^- & H^+
- H^+ is secreted in Lumen in exchange to Na^+
- Now this H^+ is excreted out from body through urine.

② REABSORBTION OF BICARBONATE IONS

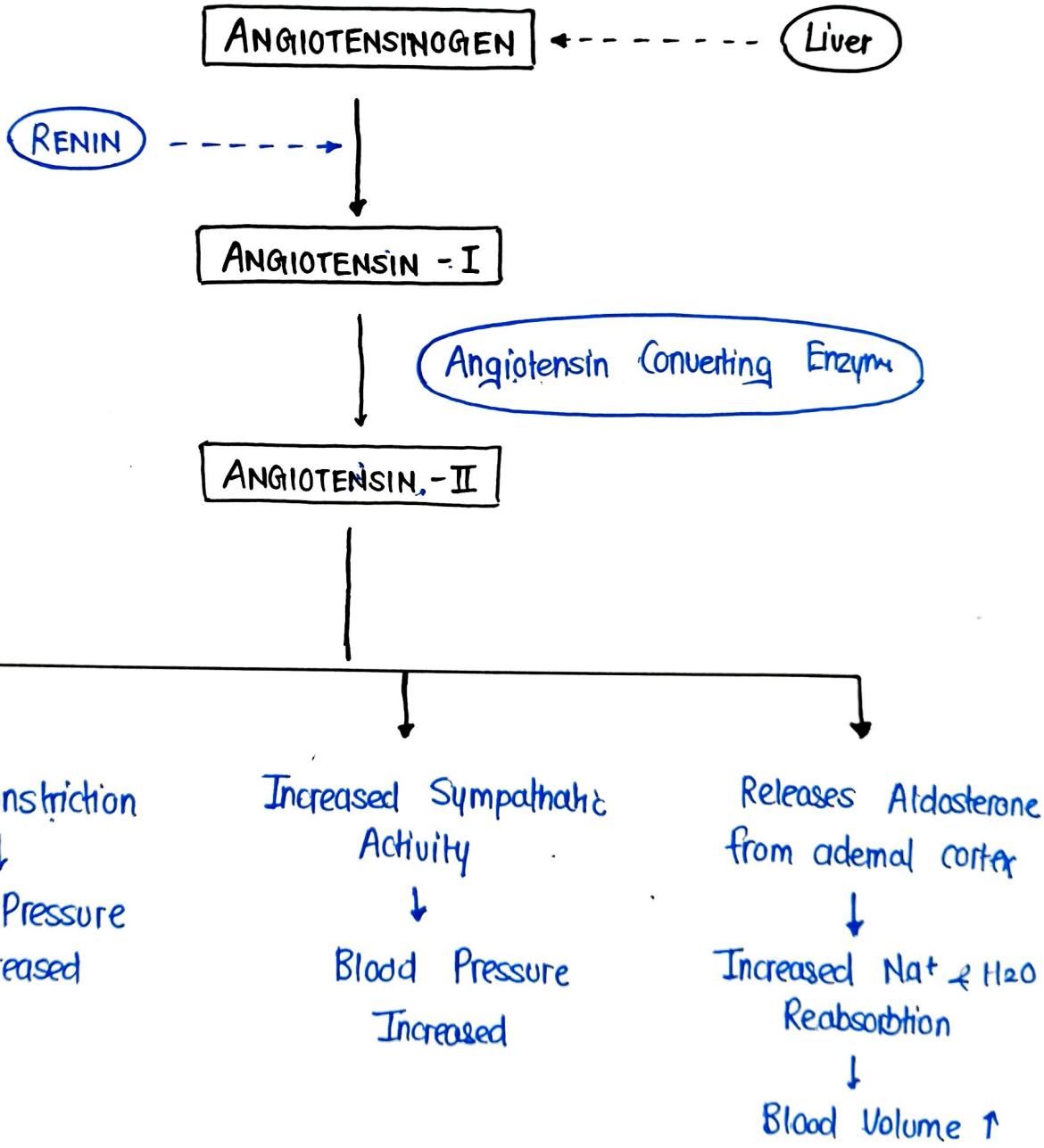


QUESTION - 5

5 EXPLAIN RAAS PATHWAY / RAS SYSTEM

Role Of RAS In kidney

- RAS stands for Renin Angiotensin System.
- Renin Angiotensin system is a physiological harmone system involved in the regulation of arterial blood pressure & plasma sodium concentration
- Renin is a harmone secreted by Juxtaglomerular Apparatus.
- Angiotensinogen is a plasma protein released by liver



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