The Excretory System

2019

Q1. (c) Describe Nephron. (4M) - (5M)

The basic functional unit of kidney is Nephron. There are approx 1 - 1.3 million nephrons in each kidney.

The different parts of nephron are: Bowman's Capsule, Glomerulus, Proximal convoluted tubule (PCT), Loop of Henle, distal convoluted tubule (DCT), collecting tubules.

A. Bowman's Capsule: Initial dilated part of the nephron.

B. Glomerulus: It is entry of capillaries into Bowman's capsule. These capillaries are supplied by afferent arteride and blood leave ~~from~~ by efferent arteriole.

Bowman's Capsule + Glomerulus constitute Malpighian ~~Capsule~~ Corpuscle. This part of nephron is responsible for ultrafiltration.

C. Proximal convoluted tubule: It is continous with Bowman's Capsule. It consist single layer of cells with brush border which increase surface area for absorption.

D. Loop of Henle: It consist of descending limb in continuity with PCT. Descending limb continous into thin segment. ~~from~~ from this segment thick ascending limb arises.

E. Distal convoluted tubule: It is continue with thick segment. It is close proximity to afferent and efferent arterioles of the glomerulus.

F. Collecting Tubules: DCT join to form CT. Passes through Renal cortex and medulla to empty into peluis of kidney

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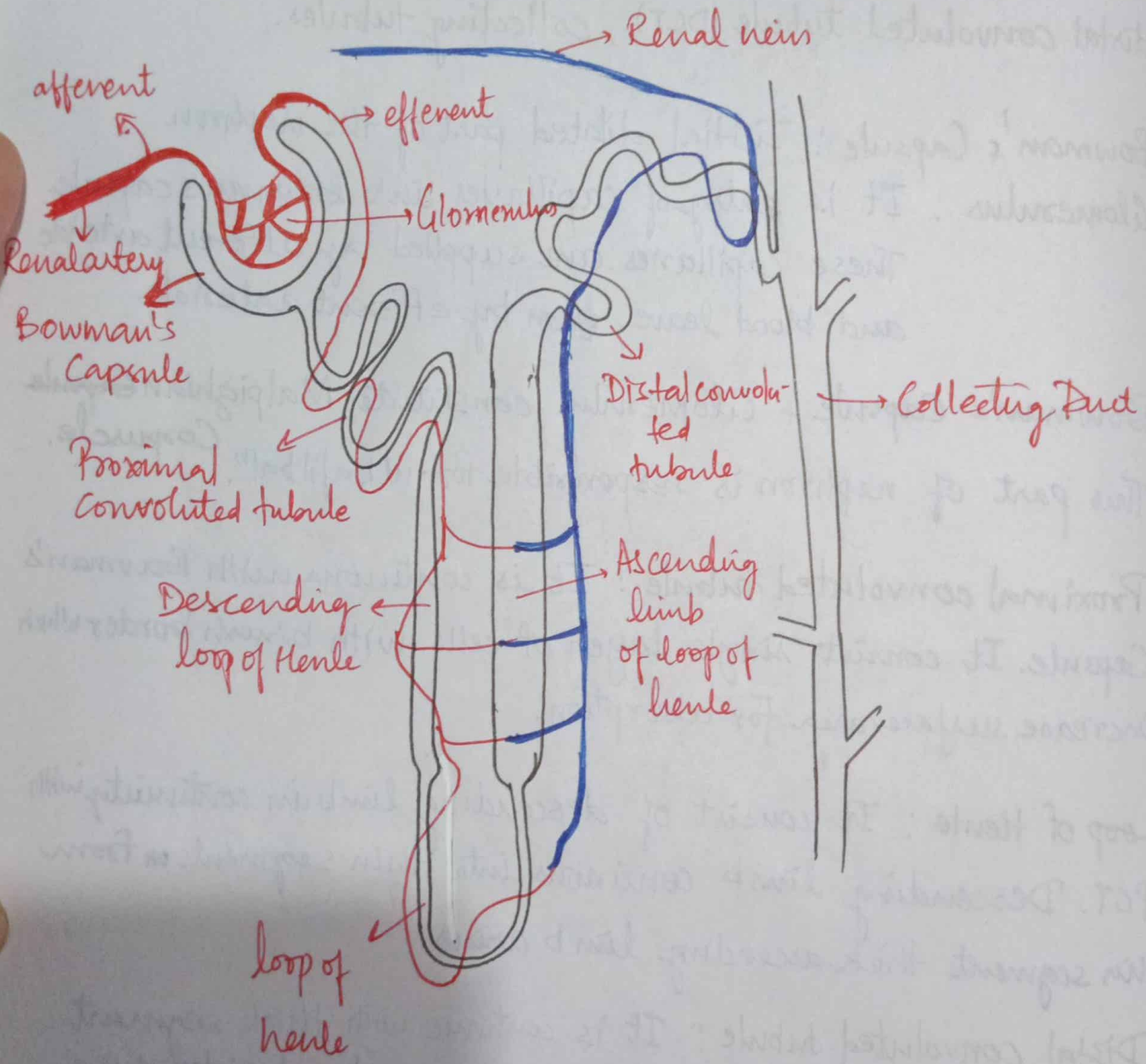
- Nephron regulates water and soluble substances in the blood by filtering the blood reabsorbing.
- It's function is homeostasis of blood volume, blood pressure and plasma osmolarity.
- Nephron helps in maintenance of blood pH.
- Nephron regulates level of metabolites and electrolytes.



Q4 (c) Give brief description of "Formation of Urine"?

As blood passes through the kidneys, the nephrons clear the plasma of some substances e.g urea while retaining other essential substances such as water.

There are three linked mechanism in formation of urine.

1. Glomerular filtration.
3. Renal tubular secretion.
3. Reabsorptive processes.

Glomerular filtration

It is the initial step in urine formation. The blood that enter into glomerular capillaries is filtered by highly permeable — glomerular membrane and resultant fluid is called Glomerular filtrate is passed into Bowman's Capsule.

water, waste products, excess salts glucose and other chemicles filtered out of blood.

Glomerulus filtration Rate = 125ml/min i.e 180L/day

Reabsorptive process

Movement of substances out of the Renal tubules back into blood capillaries (located around tubules).

Substances that reabsorb are water, glucose and other of nutrients, Na^+ and other ions.

It begins in the PCT and continue in loop of Henle, DCT & CT.

About 99% of 180L of water that leave the blood by the glomerular filtration return to blood from PCT through the Passive reabsorption.

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Glucose entirely reabsorbed into blood from PCT. Na^+ and other ions are partially reabsorbed from renal tubules into blood.

Reabsorption amount depends on how much salt we take in food.

Na^+ intake ↑ = Na^+ reabsorption in blood ↓

Secretion

- Substances move into the distal and collecting tubules from blood in capillaries around these tubule.

Secretion = Reverse of Reabsorption i.e Substance from blood to the tubules.

Substances secreted through an active process or diffusion across membrane.

Secretion help in maintaing acid-base balance.

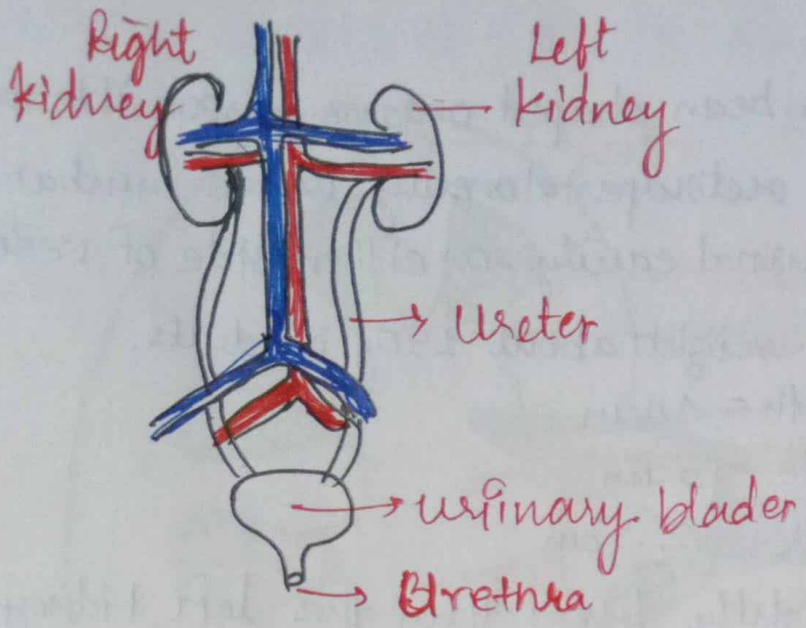
2018 2017 2016 2012 Q3. Name the structure belonging to excretory system. Give description of kidneys? (10.5 M)

OR

Name parts of urinary system. Describe briefly structure structure of kidney. (11M)

The urinary system is one of the excretory systems of the body. It consists of following structures:

1. Two kidneys
2. Two ureters
3. One urinary bladder
4. One urethra



Urinary System
OR
Excretory System

Kidney: Main organ for excretion. Every individual have a pair of kidneys.
Kidney have structural and functional unit called — Nephron. Each kidney consist of millions of nephrons. They all function to filter blood and expel waste products.

Ureter: 25-30 cm long tubes with a extends from the hilum to urinary bladder.
It conveys urine from the kidneys to the urinary bladder by peristaltic contractions.

Urinary bladder: Smooth muscle hollow organ.
It store urine in the bladder and composition remain unchanged.

Urethra: It is tube that arises from the urinary bladder. Its function is to expel urine outside by micturition.

In males common path for urine and sperms.

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Structure of kidney

The kidneys are two bean shaped organs responsible for filteration.

Location: It located retroperitoneally in the lumbar region of the abdominal cavity on either side of vertebral column.

Structure: kidney weight about 150g in adults.

- Length = 10cm
- Wide = 5cm
- Thick = 2.5cm

Right kidney is slightly lower than the left kidney due to space occupied by liver.

Vertical section of kidney shows:

(i) Outer cortex - Reddish in color

(ii) Inner medulla - Pale in color. Contains 10-15 pyramids, which terminated medially in renal papillae.

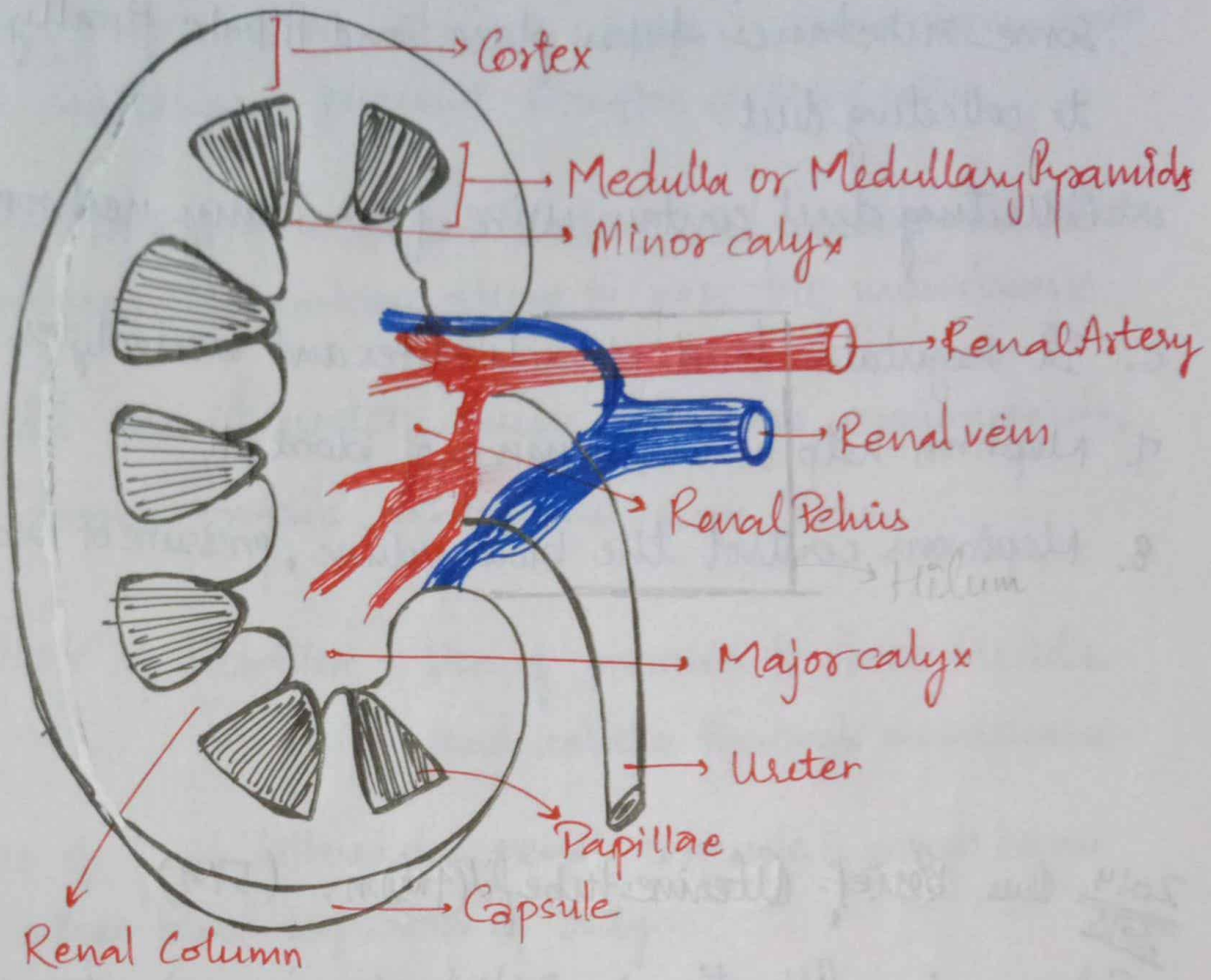
- Papillae projects into calyces. 10-15 minor calyces join to form two major calyces.
- These major calyces come out through the pelvis of kidney to wide end of ureter.
- Ureter exit from hilus of kidney and pass to urinary bladder.
- The blood vessels, lymphatic and nerves enter into or exit from kidney via Hilus.

The Basic structural and functional unit of kidney is Nephron.

1 - 1.3 million nephrons in each kidney.

Different parts of nephron are - Malpighian corpuscles, PCT, loop of Henle (ascending, descending), DCT, Collecting tubules.

Ques Draw labelled diagram of Kidney [L.S] (2M) 2015



Vertical Section of kidney

2015 Ques. Describe functioning of Nephron. (5M)

1. The blood enters the kidney through the renal artery, which branches into many capillaries associated with glomerulus.
2. The water and solute are transferred to nephron at Bowman's Capsule.
3. In PCT, some substances such as amino acids, glucose, salts are selectively reabsorbed and unwanted molecules are added in the urine.
4. The filtrate then moves down into loop of Henle, more water is absorbed.

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5. Filtrate move upwards into the DCT. Here resorption of some substances takes place. and filtrate finally reach to collecting duct.
Collecting duct contain urine from many nephrons.

6. It regulates level of metabolites and electrolytes.
7. Nephron help in maintenance of blood pH.
8. Nephrons control the blood volume, pressure of blood.

2014 / 2015 Ques. Brief Glomerular filtration. (5M)

Glomerular filtration is initial step in urine formation. It is the process that kidneys use to filter excess fluid and waste products out of blood into urine. CT of kidney.

The Filtration Membrane

The glomerular capillaries and podocytes, form a leaky barrier known as the filtration membrane.

This permits filtration of water and small solutes but prevents filtration of most plasma proteins and blood cells.

Substances filtered from blood cross three filtration barriers - A glomerular endothelial cell, The basement membrane, a filtration slit formed by podocyte.

Glomerular endothelial cells are quite leaky because they have large pores. This size permits all solutes in Blood plasma to exit glomerular capillaries & prevent filtration of Blood cells.

The basement membrane, allow water and most small solutes to pass through. No proteins allow to pass the membrane.

Filtration slit permit water, glucose, vitamins, amino acids, very small plasma proteins, ammonia, urea, ions.

The principle of filtration - Use of pressure to force fluids and solutes through membrane.

The volume of fluid filtered by renal corpuscle is much larger than in other blood capillaries of body.

Glomerular filtration depends on three main pressures.
One pressure promotes filtat^{n}. (Glomerular blood hydrostatic pressure)
(two) 2nd pressure oppose filtrat^{n}. (Capsular hydrostatic pressure and blood colloid osmotic pressure)

Glomerular filtration Rate! The amount of filtrate formed in all renal corpuscles of both kidneys each minute is GFR.
Normal Value: (125 ml/minute = 170-180 L per day)

This Glomerular filtrate, is passed into Bowman's Capsule.

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