

9 The Excretory System

Book: Selina

A. MULTIPLE CHOICE TYPE

Q – 1 Multiple choice questions

- Excretion primarily involves
 - Removal of all byproducts during catabolism,
 - Removal of byproducts during anabolism,
 - Removal of nitrogenous wastes,
 - Throwing out excess of water
- Maximum amount of water from the glomerular filtrate is reabsorbed in
 - Proximal convoluted tubule,
 - Descending limb of loop of Henle,
 - Ascending limb of loop of Henle,
 - Distal convoluted tubule
- Which one of the following in real sense is not an excretory activity?
 - Giving out carbon dioxide,
 - Passing out faecal matter,
 - Sweating,
 - Removal of urea
- In humans, urea is formed in
 - Ureter,
 - Liver,
 - Spleen,
 - kidney

B. VERY SHORT ANSWER TYPE

Q – 1 Name the following:

- The outer region of kidney containing the Bowman's capsule.
Cortex
- The tuft of capillaries inside the Bowman's capsule.
Glomerulus
- The part of kidney tubules where the term urine is first used for the fluid in it.
Collecting duct
- The organ which filters urea.
Kidney
- The organ through which urea is released outside the body of a human being.
Liver
- The specific pigment found in urine.
Urochrome
- The vein in which urea concentration is maximum.
Renal artery (Renal vein has urea but renal artery has higher concentration of urea as compared to renal vein).
- The organ which produces urea.
Liver

Q – 2 Given below are two sets (a and b) of five terms each. Rewrite the terms in their correct order so as to be in logical sequence.

- Afferent arteriole, renal vein, capillary network, glomerulus, efferent arteriole

Afferent arteriole, glomerulus, efferent arteriole, capillary network, renal vein

2. Renal artery, urethra, ureter, kidney, urinary bladder

Renal artery, kidney, ureter, urinary bladder, urethra

Q – 3 In each of the following sets of body parts/substances/processes, pick out the one item which overall includes the remaining four

1. Glomerular filtrate, Bowman's capsule, ultrafiltration, glomerulus, blood plasma.

Ultrafiltration

2. Skin, liver, lungs, kidneys, excretion.

Excretion

3. ADH, water, pituitary, osmoregulation, urine.

Osmoregulation

4. CO₂, bile pigments, water, excretion, urea.

Excretion

Q – 4 Name the diseases caused due to the following abnormal constituents in urine.

Abnormal Constituents	Diseases
(1) Blood	Haematuria
(2) Glucose	Glycosuria
(3) Albumin	Albuminuria
(4) Bile pigments	Anaemia, hepatitis , liver cirrhosis

C. SHORT ANSWER TYPE

Q – 1 Write down the functional activity of the following parts:

1. Glomerulus www.safaleducationacademy.in

The main function of the glomerulus is to filter plasma to produce glomerular filtrate, which passes down the length of the nephron tubule to form urine. It is concerned mainly with the process of ultrafiltration. The liquid part of the blood which is plasma including urea, salts, glucose filters out from the glomerulus into the renal tubule.

2. Collecting duct

The collecting duct system is the final component of the kidney to influence the body's electrolyte and fluid balance. It receives the contents of many kidney tubules and pours it as urine in the pelvis of the kidney.

3. Ureter

Ureter carries urine to the urinary bladder by ureteral peristalsis.

4. Vasa recta

The vasa recta is a secondary capillary network that branches out of the efferent arteriole. It consists of long, hairpin-shaped blood vessels that run parallel to the loops of Henle. The hairpin turns slow the rate of blood flow, which helps maintain the osmotic gradient required for water reabsorption.

5. Urethra

Urethra is involved in the process of micturition i.e. expelling urine out of the body.

6. Henle's loop

Henle's loop is involved in reabsorption of water and sodium ions.

7. Renal artery

Renal artery supplied blood to the kidney.

Q – 2 Match the following:

Column A		Column B		Ans
A	Bowman's Capsule	1	Renal artery	A – 4
B	Contains more CO ₂ and less urea	2	Regulates amount of water excreted	B – 3
C	Anti-diuretic hormone	3	Renal vein	C – 2
D	Contains more urea	4	Glomerulus	D – 1

Q – 3 Fill in the blanks in the following passage to make it a meaningful description.

In a nephron, the _____ flows through the _____ under great pressure. The reason for this great pressure is that the _____ (outgoing) _____ is narrower than the _____ (incoming). This high pressure causes the _____ part of the blood to filter out from the _____ into the _____ capsule.

Answer

In a nephron, the **blood** flows through the **glomerulus** under great pressure. The reason for this great pressure is that the **efferent** (outgoing) **arteriole** is narrower than the **afferent arteriole** (incoming). This high pressure causes the **liquid** part of the blood to filter out from the **glomerulus** into the **renal** capsule.

Q – 4 Name the following:

1. Three nitrogenous wastes of our body.

Urea, Uric acid

Three nitrogenous wastes of our body: Urea, Uric acid, Ammonia

2. Three organic wastes of our body.

Three organic wastes of our body: Urea, Uric acid, Creatinine

3. Three inorganic wastes of our body.

Three inorganic wastes of our body: Common salt (NaCl), Iron, Calcium

4. Three main parts of our urinary system.

Kidney, ureter, urinary bladder, urethrs

5. Six main parts of naphron.

Six main parts of nephron: Bowman's capsule, Glomerulus, Renal capsule, Proximal convoluted tubule (PCT), Henle's Loop, Distal convoluted tubule (DCT)

6. Three stages of urine formation.

Ultrafiltration, reabsorption, tubular secretion

7. Three types fluids in different parts of a nephron.

Three types of fluids in different parts of a nephron: Glomerular filtrate, Glomerular filtrate with glucose and sodium, Urine

Q – 5 Choose the odd one out in the following sets and write the category for the remaining terms:

1. Kidney, ureter, neuron, urethra, urinary bladder

Others are part of urinary system

2. Ammonia, urea, excess sodium chloride, uric acid

Others are organic waste

3. Cortex, medulla, loop of Henle, hilum

Others are parts of kidney

4. Glomerulus, collecting duct, papilla, Bowman's capsule

Others are part of Kidney tubules

Q – 6 Write full forms of the following abbreviations:

1. PCT – Proximal Convoluted Tubule

2. DCT – Distal Convoluted Tubule

3. ADH – Antidiuretic hormone

4. ORS – Oral rehydration solution

Q – 7 Write the exact location of each of the following:

1. Kidney –

It is located on either side of vertebral column in the abdominal cavity.

2. Uriniferous tubule

Uriniferous tubule begins in the cortex; the tubule dips down to the medulla, then return to the cortex before draining into the collecting duct.

3. Malpighian capsule

It comprises of Bowman's capsule and glomerulus and is located in the kidney tubule.

4. Loop of Henle

It is runs in medulla to turn back and to re-enter the cortex to continue into the next convoluted region of the tubule.

D. DESCRIPTIVE TYPE

Q – 1 Define the following terms.

1. Excretion

The process of removal of chemical wastes mainly nitrogenous waste from the body is known as excretion.

2. Kidney

The kidneys are two bean shaped organs about 10 cm long and 6 cm wide located on the either side of the backbone and protected by the last two ribs.

3. Micturition

The process of expelling urine out of the body through urethra by opening the sphincter muscles passing of urine involving relaxation of sphincter muscles between the urinary bladder and urethra.

4. Osmoregulation

It is a process of maintaining the blood composition of the body i.e. the normal osmotic concentration of water and salts in the body.

5. Ultrafiltration

The process of the filtration of blood in the glomerulus under great pressure during which the liquid part of the blood i.e. plasma along with urea, glucose, amino acids and other substances enter the renal tubule.

6. Renal pelvis

Renal pelvis is the expanded front end of the ureters into the kidney.

7. Urea

A nitrogenous waste produced primarily in the liver due to the break down dead protein remains and extra amino acids.

Q – 2 Differentiate between the following pairs of the terms:

1. Bowman's capsule and malpighian capsule

Bowman's capsule	Malpighian capsule
Bowman's capsule is a thin walled (single-cell thick epithelium) cup, containing the glomerulus.	The Bowman's capsule along with the knot-like mass of blood capillaries called glomerulus together are known as malpighian capsule.

2. Diuresis and Uremia (cause and problem)

Diuresis	Uremia
Diuresis results in increased production of urine due to less secretion of ADH.	Uremia is the accumulation of high quantities of urea in blood due to inability of the kidneys to filter out wastes.

3. Renal cortex and renal medulla (location and appearance)

Renal cortex	Renal medulla
The renal cortex is the outer darker region of the kidney.	The renal medulla is the inner lighter region of the kidney.

4. Renal pelvis and renal papilla (structure):

Renal pelvis	Renal papilla
The renal pelvis is the expanded front end of the ureter in the kidney.	The renal papilla is the apex of the renal pyramid which projects into the pelvis.

5. Urea and urine

Urea	Urine
Urea is a chemical compound and is first produced in liver through the metabolism of nucleic acids and amino acids. Urea is the chief excretory product which is excreted in the form of urine.	The filtrate left after reabsorption and tubular secretion which contains 95% water and 5% solid wastes.

6. Excretion and secretion (utility)

Excretion	Secretion
Excretion is the passing out of substances that have no further use in the body or are harmful.	Secretion is giving out by a cell or a gland some substance that has some utility for the body.

Q – 3 Give reason / explain:

1. Excretion is a necessary process for our body.

Excretion helps in removing toxic wastes from our body and it also plays an important role osmoregulation i.e. the maintenance of the homeostasis of the body.

2. If we donate one kidney to a needy patient, it would not cause any harm to us.

If one kidney is donated to a needy patient, the other kidney alone is sufficient for removing wastes or excretion. Thus, the donor can live a normal life.

3. We urinate fewer times in summer than in winter and the urine passed is generally thicker.

During summer, a considerable part of water is lost through perspiration so the kidneys have to reabsorb more water from the urine. This makes urinate fewer times in summer passed is thicker in summer than in winters.

Q – 4 What is a uriniferous tubule? How does it function?

A uriniferous tubule also known as the kidney tubule is the structural and functional unit of the kidney. It takes in impure blood from the renal artery and removes wastes in the form of urine. It also provides a larger surface area for reabsorption of salts and water.

Q – 5 Why is it necessary to maintain a normal osmotic concentration of the blood?

Maintaining a normal osmotic concentration in the body means regulating the percentage of water and salts. If this regulation mechanism fails we either end up losing vital salts and water or may accumulate unwanted salts and excess water in our body.

Q – 6 Explain the terms ultrafiltration and selective absorption.

Ultrafiltration — The blood flows through the glomerulus under great pressure which is much greater than in the capillaries elsewhere. The reason for this greater pressure is that the efferent arteriole is narrower than the afferent arteriole. The high pressure causes the liquid part of the blood to filter out from the glomerulus into the renal tubule. This filtration under extraordinary force is called Ultrafiltration.

Selective Absorption —

The glomerular filtrate entering the renal tubule is an extremely dilute solution containing a lot of useful materials such as glucose and some salts as those of sodium. As this filtrate passes down the renal tubule, a lot of water along with these usable materials is reabsorbed. But their reabsorption is only to extent that normal concentration of blood is not disturbed. This is called Selective Absorption.

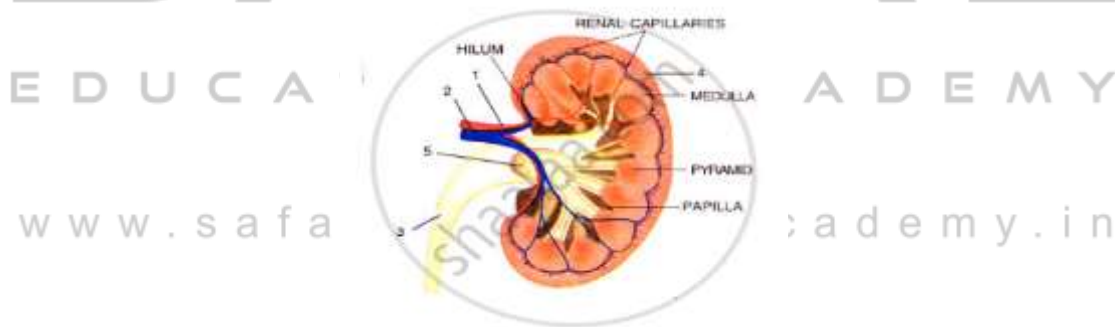
Q – 7 What is dialysis? Under what conditions is it carried out?

Dialysis involves the use of artificial kidney or a dialysis machine. The patient's blood is from the radial artery is led through the machine where excess salts and urea is removed. The purified blood is then returned to a vein in the same arm.

Dialysis is carried out in case of failure of both the kidneys. In case there is a permanent damage, then the dialysis is to be repeated for about 12 hours twice a week.

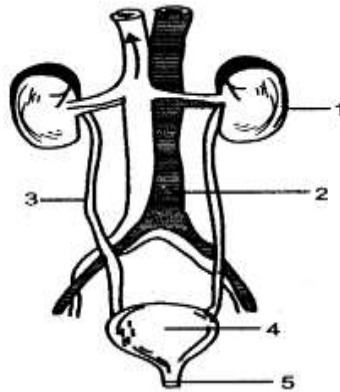
E. STRUCTURE / APPLICATION / SKILL TYPE

Q – 1 Look at the figure given below. It is a section of human kidney as seen from the front.



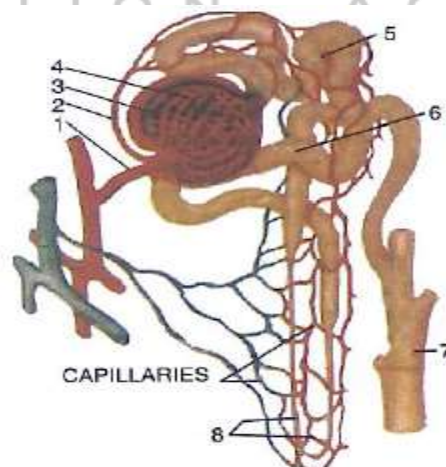
- Is it a longitudinal section or a cross-section?
It is a longitudinal section of the kidney.
- Name the parts numbered 1-5.
1-renal artery, 2-renal vein, 3-ureter, 4-cortex, 5-pelvis
- Which area/part (give its name and number given on the diagram) which contains the following:
 - Malpighian capsule
4/cortex
 - The pyramids
medulla
 - Freshly collected urine
5/pelvis

Q – 2 Given below is the figure of certain organs and associated parts in the human body. Study the same and answer the questions that follow:



1. Name all the organ-systems shown completely or even partially.
Excretory system and Circulatory system.
2. Name the parts numbered 1 to 5.
1-kidney, 2-renal artery, 3-ureter, 4-urinary bladder, 5-urethra
3. Name the structural and functional unit of the part marked '1'.
Nephron
4. Name the two main organic constituents of the fluid that flows down the part labeled '3'.
Urea and ammonia
5. Name the two major steps involved in the formation of the fluid that passes down the part labeled '3'.
Ultrafiltration and selective reabsorption

Q – 3 Following diagram represents a mammalian kidney tubule (nephron) and its blood supply.



Parts indicated by the guidelines 1 to 8 are as follows:

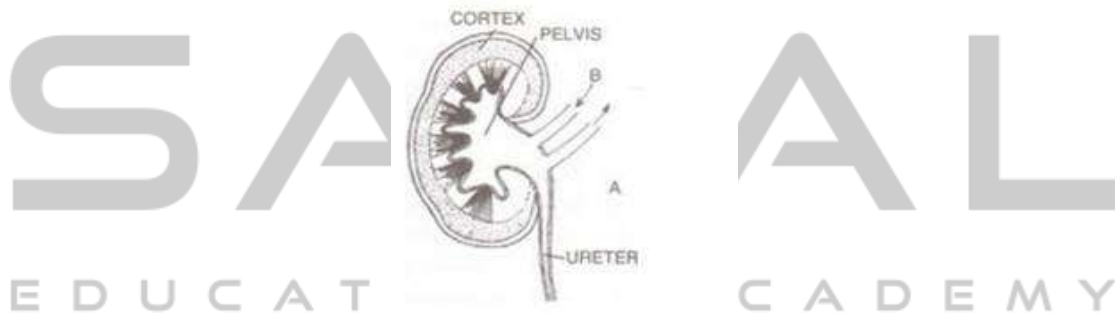
1. Afferent arteriole from renal artery
2. Efferent arteriole
3. Bowman's capsule
4. Glomerulus
5. Proximal convoluted tubule with blood capillaries
6. Distal convoluted tubule with blood capillaries

7. Collecting tubule
8. U-shaped loop of Henle

Study the diagram and answer the questions that follow:

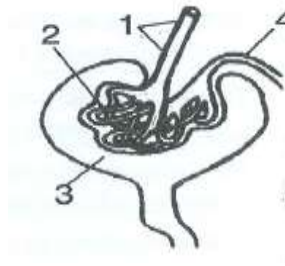
1. Where does ultrafiltration take place?
4/Glomerulus
2. Which structure contains the lowest concentration of urea?
2/Efferent arteriole
3. Which structure contains the highest concentration of urea?
1/ Afferent arteriole from renal artery
4. Which structure (normally) contains the lowest concentration of glucose?
7/Collecting tubule
5. Where is most water reabsorbed?
5/ Proximal convoluted tubule with blood capillaries

Q – 4 Given below is a highly simplified diagram of the human kidney cut open longitudinally. Answer the questions that follow:



1. Define excretion.
The process of removal of chemical wastes especially nitrogenous waste from the body is known as excretion.
2. Name the functional units of the kidneys.
Nephrons
3. Why does the cortex of the kidney show a dotted appearance?
As the cortex region contains numerous nephrons or kidney tubules, therefore, it shows a dotted appearance.
4. Mention two functions of the kidney.
Kidneys help in removing wastes or excretion and osmoregulation.
5. Write two differences in composition of the blood flowing through the blood vessels, 'A' and 'B'.
The blood vessel 'B' is renal artery and the blood vessel 'A' is renal vein. So the blood vessel 'B' contains oxygenated blood with high concentration of urea and glucose whereas the blood vessel 'A' contains deoxygenated blood with low concentration of urea and glucose as compared to renal artery.

Q – 5 Study the diagram given alongside and then answer the questions that follow:



1. Name the region in the kidney where the above structure is present?

The structure is a Bowman's capsule, which is part of the nephron. The Bowman's capsule is found in the cortex of the kidney.

2. Name the parts labelled 1, 2, 3, and 4.

1 - Afferent arteriole , 2 - Glomerulus , 3 - Bowman's capsule, 4 - Efferent arteriole

3. Name the stages involved in the formation of urine.

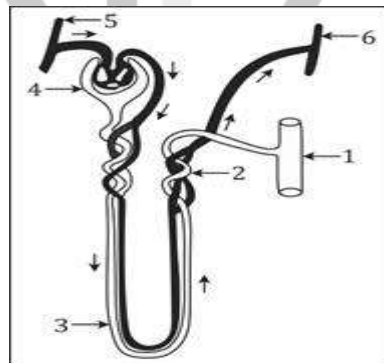
Urine formation occurs in two steps - ultrafiltration and reabsorption.

4. What is the technical term given to the process occurring in 2 and 3? Briefly describe the process.

The process occurring in 2 and 3 is known as ultrafiltration.

In the glomerulus, the blood flows under high pressure because of the narrow lumen of the capillary network of the glomerulus. This forces most of the components (both waste and useable materials) of the blood out of the capillaries. This process of the filtration of blood under high pressure in the Bowman's capsule is known as ultrafiltration.

Q – 6 The given diagram represents a nephron and its blood supply. Study the diagram and answer the following questions:



1. Label parts 1, 2, 3 and 4.

1 - Collecting duct, 2 - Distal convoluted tubule (DCT), 3 - Descending limb of loop of Henle, 4 - Bowman's capsule

2. State the reason for the high hydrostatic pressure in the glomerulus.

The diameter of the efferent arteriole is narrower than the diameter of the afferent arteriole which builds high hydrostatic pressure in the glomerulus.

3. Name the blood vessel which contains the least amount of urea in this diagram.

Efferent arteriole

4. Name the two main stages of urine formation.

Two main stages of urine formation are ultrafiltration and tubular reabsorption.

5. Name the part of the nephron which lies in the renal medulla.

Henle's loop and collecting tubules