

NEET Important Questions with Solutions from Excretory Products and Their Elimination

Q.1. Descending limb of Henle allows the reabsorption of:

- A) Sodium and Chloride ions only
- B) Hydrogen and Potassium only
- C) Water only
- D) Glucose and Amino acids only

Answer: Water only

Solution: The loop of Henle follows the proximal convoluted tubule. This is a 'U' shaped structure with a:

- Descending limb which is relatively thinner and longer. This part is permeable to water and has squamous epithelium. This is impermeable to ions. Thus, water is reabsorbed in this limb.
- Ascending limb is shorter and thicker and is impermeable to water. This part is permeable to Na^+ , K^+ and Cl^- ions.

Q.2. Match column I with II and select the correct option from the codes given below.

	Column I		Column II
(a)	Nephridia	(i)	Crustaceans
(b)	Malpighian tubules	(ii)	Annelids
(c)	Antennal gland or Green glands	(iii)	Insects

- A) a-(i), b-(ii), c-(iii)
- B) a-(iii), b-(ii), c-(i)
- C) a-(ii), b-(iii), c-(i)
- D) a-(ii), b-(i), c-(iii)

Answer: a-(ii), b-(iii), c-(i)

Solution: Different animals have different organs for the excretion of waste products, in order to maintain homeostasis. Lower organisms excrete through their general body surface. Members of phylum Platyhelminthes or flatworms have solenocytes or flame cells. Members of phylum Aschelminthes have rennet cells. Annelids like Earthworm have a different kind of nephridia. Different classes of Arthropoda have different excretory organs like class Arachnida excretes through the coxal gland, class Crustacea through the green gland or antennary gland, and class Insecta through Malpighian tubules. Higher vertebrates have kidneys of different origin, in order to aid excretion.

Q.3. Glomerular filtration is possible because

- A) Afferent glomerular capillary is wider than efferent glomerular capillary
- B) Afferent glomerular capillary is narrower than the efferent glomerular capillary
- C) Afferent glomerular arteriole is narrower than the efferent glomerular arteriole
- D) Afferent glomerular arteriole is wider than the efferent glomerular arteriole

Answer: Afferent glomerular arteriole is wider than the efferent glomerular arteriole

Solution: Blood enters the glomerulus through afferent arteriole and leave the glomerular through its efferent arteriole. The smaller diameter of the efferent arteriole than that of the afferent arteriole subjects the blood to an increased pressure in the glomerular and hence ultrafiltration occurs.



Q.4. Kidney crystals are solid clusters of:

- A) Calcium nitrate and uric acid
- B) Phosphate and uric acid
- C) Calcium carbonate and uric acid
- D) Calcium oxalate and uric acid

Answer: Calcium oxalate and uric acid

Solution: **Kidney stones:** The solidified deposition of salts present in the urine in any part of the urinary tract is called renal calculus or kidney stone. The condition arises due to high amount of calcium or uric acid in plasma. In kidney excess of calcium gets converted into oxalates and stored.

Q.5. The tadpole of frog is

- A) uricotelic
- B) ammonotelic
- C) ureotelic
- D) guanine

Answer: ammonotelic

Solution: Nitrogenous waste products are of mainly three types Ammonia, Urea and Uric acid. Organisms which excrete ammonia are called Ammonotelic, which excrete urea are called ureotelic and which excrete uric acid are called Uricotelic. Ammonia is the most toxic while uric acid is the least toxic waste product. Some animals may be guanotelic.

The larval stage of frog is called tadpole. Frog belongs to class Amphibia.

Q.6. During urine formation, which of the following process helps in maintaining osmotic pressure in the uriniferous tubule?

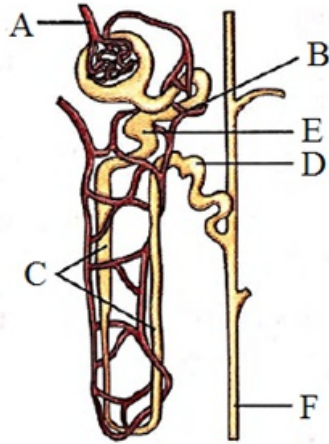
- A) Active Na^+ absorption, followed by absorption of Cl^-
- B) Active Cl^- absorption, followed by absorption of Na^+
- C) Active secretion of Na^+ into efferent arteriole followed by absorption of Cl^- into efferent renal arteriole
- D) Active secretion of Cl^- and absorption of Na^+ into efferent renal arteriole

Answer: Active Na^+ absorption, followed by absorption of Cl^-

Solution: Osmotic pressure is a measure of the tendency to take water by osmosis. During urine formation, 2/3 of NaCl and water filtered in Bowman's capsule, is immediately absorbed by PCT. The function of the proximal tubule is essentially reabsorption of filtrate in accordance with the needs of homeostasis.



Q.7. Select the option that correctly identifies the parts labelled from A to F in the given figure of nephron.



- A) A B C D E F
Afferent arteriole PCT Henle's loop DCT Collecting duct Vasa recta
- B) A B C D E F
Efferent arteriole PCT Henle's loop DCT Collecting duct Vasa recta
- C) A B C D E F
Afferent arteriole Peritubular capillaries Henle's loop DCT PCT Collecting duct
- D) A B C D E F
Afferent arteriole Henle's loop Collecting duct PCT DCT Peritubular capillaries

Answer: A B C D E F
Afferent arteriole Peritubular capillaries Henle's loop DCT PCT Collecting duct

Solution: Nephrons are the functional unit of the kidney, they form urine mainly by three processes: Ultrafiltration, selective reabsorption and selective tubular secretion. Nephrons are made up of two parts: The Malpighian corpuscle and the renal tubule. The renal corpuscle is made up of glomerulus and Bowman's capsule and helps in ultrafiltration. The blood in the glomerulus is brought by the afferent arteriole, which is marked as 'A' in the diagram, whereas it is drained out by the efferent arteriole. The renal tubule consists of mainly three parts: The proximal convoluted tubule, the Loop of Henle and the distal convoluted tubule. The renal tubule helps in the process of selective reabsorption and tubular secretion. The cortical region contains the peritubular capillaries, which is marked by 'B', in the diagram, and they are present around the proximal convoluted tubule (PCT) and the distal convoluted tubule (DCT), marked by 'E' and 'D' in the diagram respectively. The DCT opens into the collecting tubules, which are marked by 'F', in the diagram. The loop of Henle present in the medullary region is marked by, 'C' in the diagram.

Q.8. If Henle's loop were to be absent from mammalian nephron, which one of the following is to be expected?

- A) There will be no urine formation
- B) There will be hardly any change in the quality and quantity of urine formed
- C) The urine will be more concentrated
- D) The urine will be more dilute

Answer: The urine will be more dilute

Solution: Henle's loop carries out the process of reabsorption of water and creates concentrated urine for excretion. The loop of Henle's main function is to create a concentration gradient in the medulla of the kidney. By means of a countercurrent multiplier system, which utilizes electrolyte pumps, the loop of Henle creates an area of high urea concentration deep in the medulla, near the collecting duct. Hence, if Henle's loop were to be absent from the mammalian nephron, the urine will be more dilute.



Q.9. In response to decrease in blood volume and blood pressure which of the following does not occur?

- A) Increase in level of Aldosterone
- B) Increase in the level of ADH
- C) Increase in level of Renin
- D) Increase in the level of ANF

Answer: Increase in the level of ANF

Solution: ANF is a vasodilator and hence lowers BP. Atrial natriuretic factor (ANF) is a 28 amino acid polypeptide hormone secreted mainly by the heart atria in response to atrial stretch. ANF acts on the kidney to increase sodium excretion and GFR, to antagonize renal vasoconstriction, and to inhibit renin secretion.

Q.10. A Malpighian body is constituted by

- A) glomerulus only.
- B) glomerulus and Bowman's capsule.
- C) glomerulus and efferent vessel.
- D) glomerulus, Bowman's capsule and efferent vessel.

Answer: glomerulus and Bowman's capsule.

Solution: Nephrons are the functional unit of kidney, they form urine mainly by three processes -ultrafiltration, selective reabsorption and selective tubular secretion. Nephrons are made up of two parts - the Malpighian or renal corpuscle and the renal tubule. The Malpighian corpuscle is present in the cortical region. The renal corpuscle is made up of glomerulus and Bowman's capsule and helps in ultrafiltration. The blood in the glomerulus is brought by the afferent arteriole, whereas it is drained out by the efferent arteriole. The renal tubule consists of mainly three parts: the proximal convoluted tubule, loop of Henle and the distal convoluted tubule.

Q.11. Which one of the following statement is correct w.r.t. kidney function regulation?

- A) During summer when body loses a lot of water by evaporation, the release of ADH is suppressed
- B) When someone drinks a lot of water, ADH release is suppressed
- C) Exposure to cold temperature stimulates ADH release
- D) An increase in glomerular blood flow stimulates formation of Angiotensin II

Answer: When someone drinks a lot of water, ADH release is suppressed

Solution: Person is thirsty and drinks more water. Blood water level returns to normal. Hypothalamus detects too much water in blood. Pituitary gland releases less ADH. Part of the brain, the hypothalamus, detects that there is not enough water in the blood. The hypothalamus sends a message to the pituitary gland which releases ADH. This travels in the blood to your kidneys and affects the tubules so more water is reabsorbed into your blood. As a result you make a smaller volume of more concentrated urine. The level of water in your blood increases until it is back to normal.

Q.12. Urea is a product of breakdown of

- A) Fatty acids
- B) Amino acids
- C) Glucose
- D) Fats

Answer: Amino acids



Solution: Amino acid are the monomers which combine to form protein. When these amino acids break they produce urea which is toxic and eliminated by the body. It is the material that occurs not only in the urine of all mammals but also in their blood, bile, milk, and perspiration.

Q.13. Which of the following is correct?

- A) Afferent arteriole is narrower than efferent arteriole.
- B) Efferent arteriole is narrower than afferent arteriole.
- C) Afferent and efferent arterioles have equal diameter.
- D) Efferent arteriole is narrower than glomerular capillaries.

Answer: Efferent arteriole is narrower than afferent arteriole.

Solution: Bowman's capsule is a part of nephron that named after Sir William Bowman (1816 to 1892). The glomerulus is the capillary network within this Bowman's capsule, which helps in ultrafiltration.

The blood is supplied to the Bowman's capsule by afferent arteriole and returned by an efferent arteriole. The efferent arteriole is smaller in diameter than the afferent arteriole. The difference in these diameters will cause a net filtration pressure which will cause the formation of primary urine.

Q.14. The glomerulus along with Bowman's capsule is called.

- A) Malpighian tubule.
- B) Renal corpuscle.
- C) Malpighian body.
- D) Both (B) and (C).

Answer: Both (B) and (C).

Solution: Each kidney is divided into two zones: An outer cortex and an inner medulla. The medulla is divided into few medullary pyramids (conical masses) that project into the calyces. Each nephron has two parts:
A. Glomerulus: It is a tuft of capillaries in Bowman's capsule.
B. Renal tubule: It is divisible into Bowman's capsule (Malpighian body or renal corpuscle) consists of a glomerulus and Bowman's capsule, Proximal convoluted tubule, Henle's loop, Distal convoluted tubule, and collecting duct.

Q.15. Match I with II and select the correct option from the codes given below.

	Column I		Column II
(a)	Delivers blood to glomerulus	(i)	Ascending and descending limbs
(b)	Carries urine to pelvis	(ii)	Renal artery
(c)	Collects filtrate from Bowman's capsule	(iii)	Collecting duct
(d)	Loop of Henle	(iv)	PCT

- A) a – (ii), b – (iii), c – (iv), d – (i)
- B) a – (i), b – (iii), c – (ii), d – (iv)
- C) a – (ii), b – (iv), c – (i), d – (iii)
- D) a – (iv), b – (iii), c – (ii), d – (i)

Answer: a – (ii), b – (iii), c – (iv), d – (i)



Solution:

- The kidney receives the blood by a renal artery that arises from the dorsal aorta. In the kidney, the renal artery divides and subdivides to send an afferent arteriole to the Bowman's capsule. Here, the afferent arteriole forms a globular bunch of about 50 parallel capillaries called the glomerulus. The glomerular capillaries rejoin to form an efferent arteriole by which a reduced volume of blood leaves the glomerulus.
- Collecting Ducts larger tubes, every one of them receiving the collecting tubules of several nephrons. They pass into the renal medulla and join each other, forming still larger ducts of Bellini. These run through the medullary pyramids and open into calyces, which lead into the pelvis. The collecting ducts are lined by cuboidal and columnar cells in different regions.
- Proximal Convoluted Tubule (PCT): It starts from the neck of the Bowman's capsule and is greatly twisted. It also lies in the renal cortex. Its wall consists of a single layer of columnar cells bearing microvilli on the free surface and resting on a basement membrane
- Loop of Henle: It is a U-shaped segment of the nephron located in the renal medulla. It consists of two straight parallel limbs, a descending limb which is a continuation of PCT into the renal medulla, and an ascending limb that reenters the renal cortex and joins the DCT. Each limb has a thick region toward the cortex and a thin region on the other side. The thick regions are walled by columnar cells and the thin regions by flat cells.

Q.16. Ketone bodies are observed in urine of patients with

- A) Starvation
- B) Diabetes mellitus
- C) Both (A) and (B)
- D) Diabetes insipidus

Answer: Both (A) and (B)

Solution:

Ketonuria occurs when fatty acids are moved from triglyceride stores in the body due to inadequate intake or non-availability of carbohydrates. For abnormal carbohydrate metabolism, for example, the condition in diabetes mellitus, ketone bodies are accumulated in the blood (ketonemia) and are excreted via the urine (ketonuria). The accumulation of ketone bodies often results in acidosis and coma in diabetic patients.

Ketonuria may also be caused due to conditions, like Starvation, Digestive disturbances, Dietary imbalance (high fat/low carbohydrate diet), Eclampsia, Prolonged vomiting, and diarrhoea, Glycogen storage diseases, Sustained exercise, etc.

Q.17. DCT is present in

- A) cortex
- B) medulla
- C) urethra
- D) pelvis

Answer: cortex

Solution:

DCT is a continuation of the loop of Henle. It is the shortest segment of the nephron. It regulates pH by absorbing bicarbonate and secreting protons (H^+) into the filtrate or absorbing protons and secreting bicarbonate. Sodium and potassium levels are controlled by secreting K^+ and absorbing Na^+ . The hormone aldosterone mediates sodium absorption by the distal tubule. DCT is present in the cortex of the kidney.

Q.18. Which of the following component of blood is not found in the filtrate of uriniferous tubule?

- A) Glucose.
- B) Urea.
- C) Alanine.
- D) Albumin.

Answer: Albumin.



Solution: Glomerular filtration or Ultrafiltration: About 1100 – 1200 ml of blood (20% of cardiac output) is filtered at the level of the glomerulus of both kidneys per minute. Filtration is a non-selective process. The glomerular capillary blood pressure results in the filtration of blood.

The filtered components of blood pass through 3 layers:

A. Endothelium of glomerular blood vessels.

B. Basement membrane (middle layer).

C. Epithelium of Bowman's capsule– It consists of cells called podocytes, that have some minute spaces in between which are termed as filtration slits or slit pores.

Filtrate (or Nephric filtrate) = Plasma– proteins. Plasma proteins, e.g., albumin, globulin, etc., are not part of the nephric filtrate.

Q.19. 'Juxta glomerular apparatus' is responsible for production and release of

A) Angiotensin I

B) Angiotensinogen

C) Renin

D) Angiotensin II

Answer: Renin

Solution: Renin is a protein hormone secreted by juxta glomerular cells of the kidney that influences the conversion of a plasma protein angiotensinogen to peptide angiotensin.

Q.20. Which of the following hormone is responsible for facultative reabsorption of water from the distal parts of the nephron?

A) Renin

B) Rennin

C) Vasopressin

D) Atrial natriuretic factor

Answer: Vasopressin

Solution: In PCT (Proximal convoluted tubule) and Loop of Henle about 75-80% of water absorption takes place which is compulsory and is not changed, so it is called obligatory absorption of water.

While from collecting duct about 19-20% water absorption takes place which may be variable and depends on the amount of vasopressin or anti-diuretic hormone (ADH), so it is called facultative absorption of water.

Renin is an enzyme, which is used in RAAS, to increase blood pressure.

Rennin is a proteolytic enzyme, which is responsible for digestion of milk protein casein.

Atrial natriuretic factor (ANF) is a vasodilator which decreases blood pressure.

Q.21. The kidneys are covered by fibrous connective tissue called

A) Glisson's Capsule

B) tunica albugenia

C) renal capsule/renal fascia

D) serous layer

Answer: renal capsule/renal fascia



Solution: The human, excretory system comprises of a pair of kidneys, a pair of ureters, a urinary bladder and a urethra . The kidneys are bean shaped structures and a reddish brown in color , they are situated between the T12 and L3 vertebra and which are covered by fibrous connective tissue called renal capsule or renal fascia. The kidney has two zones - an outer cortex and an inner medulla . The medulla is divided into medullary pyramids which projects into calyces . The cortex extends between these medullary pyramids forming renal columns. The renal medulla which is light red in color is situated below cortex and striated in appearance. The ureters are tube like structures connecting the kidney to the urinary bladder and act as passage way for the filtered urine to pass. The human, excretory system comprises a pair of kidneys, a pair of ureters, a urinary bladder and a urethra. Urinary bladder is a pyriform sac, it differs in shape and size according to the amount of urine stored in.

The urinary bladder consists of apex, fundus and neck. The fundus has a triangular area called trigone and the ureters open into it. The neck has two sphincters i.e an internal sphincter and an external sphincter. The urinary bladder has three layers i.e. an outer adventitia, middle muscular and an inner mucosa. The muscle which makes up the muscular coat is called detrusor muscle which helps in detrusion.

The urine is temporarily stored in the urinary bladder. The process of voiding of urine is called micturition. During this, the sphincters in the fundus of the urinary bladder undergoes relaxation as signaled by the cerebral cortex. The signal is voluntary in nature. The wall of urinary bladder has both sympathetic and parasympathetic innervation .

Q.22. Which of the following glands does not help in excretion?

- A) Liver
- B) Sweat glands
- C) Pancreas
- D) Both (A) and (B)

Answer: Pancreas

Solution: Apart from the kidney, skin, lungs and liver are involved in the elimination of waste substances, and they are referred to as accessory excretory organs.

Sweat Glands Of Skin: Their secretion is called sweat, it is a filtrate of blood having 99% water. The solids include salts, antibodies, lactic acid and traces of metabolic wastes such as urea, uric acid and ammonia. The skin consists of two glands i.e sebaceous glands(oil) and sudorific glands(sweat). Sebaceous glands release sebum which contains waxes and sterols mainly. This forms a protective oily layer and its secretion increases mainly during the puberty stage.

Lungs are involved in the excretion of carbon dioxide. Normally in an adult per minute about 200 ml of carbon dioxide is produced. This is eliminated by the lungs. Also, water in the form of vapours, diffuse from the moist surface of alveoli of the lungs.

The liver helps in the conversion of toxic ammonia into urea through a pathway called the ornithine cycle. It converts have obtained from the breakdown of haemoglobin into bile pigments. These pigments are largely thrown out along with faecal matter. Cholesterol is also secreted into the bile and transported to the intestine. It also helps in the detoxification of several ingested drugs and other foreign bodies. Breakdown of hormones is carried out by the liver.

But the pancreas does not help in excretion. It is a heterocrine gland situated below the stomach and pours their secretion in the duodenum for digestion of carbohydrates, protein, and fat. it releases hormones that control the glucose level in blood.

Q.23. Find the incorrect statement regarding the mechanism of urine formation:

- A) GFR is around 125L/min
- B) Counter-current mechanism helps to dilute urine
- C) Renal fluid, isotonic to cortical fluid, is found in PCT and DCT
- D) The osmolarity of interstitial fluid in cortex of kidney is 300mOsm/L

Answer: Counter-current mechanism helps to dilute urine

Solution: Counter-current mechanism: The osmotic medullary gradient is mainly developed due to NaCl and urea. The transport of these substances becomes possible only because of the special arrangement of Henle's loop and vasa recta, which is termed as the counter-current mechanism. The development of such medullary interstitium facilitates the movement of water from the collecting tubule, thus making the urine nearly 4 times concentrated than the initial filtrate formed.



Q.24. Sodium is actively reabsorbed mainly in which part of the nephron?

- A) Proximal convoluted tubule
- B) Ascending limb of Henle's loop
- C) Distal convoluted tubule
- D) Bowman's capsule

Answer: Proximal convoluted tubule

Solution: In the proximal convoluted tubule, maximum reabsorption of nutrients like glucose, amino acids, and ions like Na^+ , K^+ occurs. The ascending limb of the loop of Henle is permeable to Na^+ , in distal convoluted tubule, conditional reabsorption of water and Na^+ occurs while Bowman's capsule takes part in ultrafiltration.

Q.25. Which one of the following is not a part of a renal pyramid?

- A) Peritubular capillaries
- B) Loops of Henle
- C) Collecting ducts
- D) Convoluted tubules

Answer: Convoluted tubules

Solution: The renal pyramid consists of loops of Henle, collecting ducts, peritubular capillaries. The renal cortex consists of convoluted tubules together with the renal corpuscles. The renal corpuscles or malpighian body are formed by the glomerulus along with Bowman's capsules.

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