

# **BIOLOGY**

**NEET**

**CRASH COURSE**

**EXCRETORY PRODUCTS AND  
THEIR ELIMINATION**

**SMART ACHIEVERS**  
**JEE | NEET | FOUNDATION**

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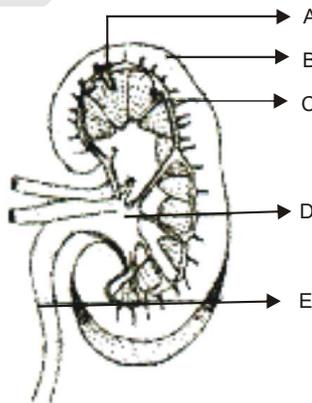
A Unit of SMARTACHIEVERS LEARNING Pvt. Ltd., Delhi

**EXCRETORY PRODUCTS AND THEIR ELIMINATION**

- Many nitrogen containing substances, ions,  $\text{CO}_2$ , water, etc., that accumulate in the body have to be eliminated.
- Nature of nitrogenous wastes formed and their excretion vary among animals, mainly depending on the habitat (availability of water).
- Ammonia, urea and uric acid are the major nitrogenous wastes excreted.  $\text{NH}_3$  is highly soluble in water and most toxic.
- Protonephridia, nephridia, malpighian tubules, green glands and the kidneys are the common excretory organs in animals.
- They not only eliminate nitrogenous wastes but also help in the maintenance of ionic and acid-base balance of body fluids.
- The excretory system of human consists of one pair of kidneys, a pair of ureters, a urinary bladder and a urethra.
- Each kidney has over a million tubular structures called nephrons, which is the functional unit of kidney.
- Nephron has two portions -glomerulus and renal tubule.
- Glomerulus is a tuft of capillaries formed from afferent arterioles, fine branches of renal artery.
- The renal tubule starts with a double walled Bowman's capsule and is further differentiated into a proximal convoluted tubule (PCT), Henle's loop (HL) and distal convoluted tubule (DCT). Glomerulus + Bowman's capsule = Malpighian corpuscles.
- The DCTs of many nephrons join to a common collecting duct many of which ultimately open into the renal pelvis through the medullary pyramids.
- Urine formation involves three main processes, i.e., filtration, reabsorption and secretion.
- Filtration is a non-selective process performed by the glomerulus using the glomerular capillary blood pressure.
- About 1200 ml of blood is filtered by the glomerulus per minute to form 125 ml of filtrate in the Bowman's capsule per minute (GFR).
- JGA, a specialised portion of the nephrons, plays a significant role in the regulation of GFR.
- Nearly 99 per cent reabsorption of the filtrate takes place through different parts of the nephrons.
- PCT is the major site of reabsorption and selective secretion.
- HL primarily helps to maintain osmolar gradient ( $300 \text{ mOsmol L}^{-1}$  to  $1200 \text{ mOsmol L}^{-1}$ ) within the kidney interstitium.
- DCT and collecting duct allow extensive reabsorption of water and certain electrolytes like  $\text{Na}^+$ , which help in osmoregulation:  $\text{H}^+$ ,  $\text{K}^+$  and  $\text{NH}_3$  could be secreted into the filtrate by the tubules to maintain the ionic balance and pH of body fluids.
- A counter current mechanism operates between the two limbs of the loop of Henle and those of vasa recta (capillary parallel to Henle's loop).
- The filtrate gets concentrated as it moves down the descending limb but is diluted by the ascending limb.
- Electrolytes and urea are retained in the interstitium by this arrangement.
- DCT and collecting duct concentrate the filtrate about four times, i.e., from  $300 \text{ mOsmol L}^{-1}$  to  $1200 \text{ mOsmol L}^{-1}$ , an excellent mechanism of conservation of water.
- Urine is stored in the urinary bladder till a voluntary signal from CNS carries out its release through urethra, i.e., micturition.
- Skin, lungs and liver also assist in excretion.

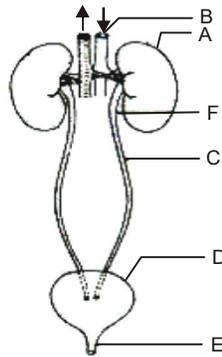
**EXERCISE**

- Q.1 Which of the following nitrogenous substance is highly toxic  
 (1) Urea (2) Uric acid (3) Amino acid (4) Ammonia
- Q.2 Reptiles are :  
 (1) Ammonotelic (2) Uricotelic  
 (3) Ureotelic in water and uricotelic on land (4) ureotelic
- Q.3 Which of the following are uricotelic animals  
 (1) Rohu and frog (2) Lizard and crow (3) Camel and frog (4) Earthworm and eagle
- Q.4 Correct order of excretory organs in Cockroach, Earthworm and Rabbit respectively  
 (1) Skin, malpighi tubules, kidney (2) Malpighi tubules, nephridia, kidney  
 (3) Nephridia, malpighi tubule, kidney (4) Nephridia, kidney, green gland
- Q.5 Fresh water bony fishes maintain water balance by  
 (1) Excreting a hypotonic urine (2) Excreting salt across their gills  
 (3) Drinking small amount of water (4) Excreting wastes in the form of uric acid
- Q.6 Refer the following diagram and identify the parts of a kidney indicated



- (1) A=cortex, B=nephron, C=pelvis, D=medulla, E=ureter  
 (2) A=cortex, B=medulla, C=nephron, D=pelvis, E=ureter  
 (3) A=nephron, B=cortex, C=medulla, D=ureter, E=pelvis  
 (4) A=nephron, B=cortex, C=medulla, D=pelvis, E=ureter
- Q.7 "Columns of Bertini" in the kidney of mammals are formed as the extension of  
 (1) Medulla into cortex (2) Cortex into medulla  
 (3) Medulla into pelvis (4) Pelvis into ureter
- Q.8 In mammalian kidney Henle's loop is present in  
 (1) Cortex (2) Caput epididymus (3) Medulla (4) Ureter
- Q.9 Other function performed by kidney apart from excretion is  
 (1) Osmoregulation (2) Temperature regulation  
 (3) Hormonal regulation (4) Spermatogenesis

- Q.10 In the diagram of excretory system of human beings given below, different parts have been indicated by alphabets choose the answer in which these alphabets have been correctly matched with the parts which they represent



- (1) A = Kidney, B = Abdominal aorta, C = Ureters, D = Urinary bladder, E = Urethra, F = Renal pelvis  
 (2) A = Kidney, B = Abdominal aorta, C = Urethra, D = Urinary bladder, E = Ureters, F = Renal pelvis  
 (3) A = Kidney, B = Renal pelvis, C = Urethra, D = Urinary bladder, E = Ureters, F = Abdominal aorta  
 (4) A = Kidney, B = Abdominal aorta, C = Urethra, D = Urinary bladder, E = Renal pelvis, F = Ureters
- Q.11 Podocytes are the cells present in  
 (1) Bowman's capsule (2) Loop of Henle (3) Duct of Bellini (4) Distal convoluted tubule
- Q.12 The basic functional and structural unit of human kidney is  
 (1) Nephron (2) Pyramid (3) Nephridia (4) Henle's loop
- Q.13 The liquid which is collected in the cavity of Bowman's capsule is  
 (1) Concentrated urine (2) Blood plasma minus blood proteins  
 (3) Glycogen and water (4) Sulphates and water
- Q.14 Which one of the following substances is actively secreted into the glomerular filtrate of the kidney tubule  
 (1) Potassium ions (2) Amino acids (3) Sodium ions (4) Chloride ions
- Q.15 The net pressure gradient that causes the fluid to filter out of the glomeruli into the capsule is  
 (1) 50 mm Hg (2) 75 mm Hg (3) 20 mm Hg (4) 30 mm Hg
- Q.16 Glomerular hydrostatic pressure is present in  
 (1) Tubule of kidney (2) Bowman's capsule  
 (3) Glomerulus of uriniferous tubule (4) Malpighian tubule
- Q.17 The glomerular filtration rate in a normal adult is nearly  
 (1) 200ml/minute (2) 250ml/minute (3) 120ml/minute (4) 170ml/minute
- Q.18 Sodium, water and phosphate reabsorption is maximum in  
 (1) Loop of Henle (2) Proximal tubule (3) Distal tubule (4) Collecting tubule
- Q.19 Volume of urine is regulated by  
 (1) Aldosterone (2) Aldosterone, ADH and testosterone  
 (3) Aldosterone and ADH (4) ADH alone

- Q.20 What will happen if the stretch receptors of the urinary bladder wall are totally removed  
 (1) Urine will not collect in the bladder  
 (2) Micturition will continue  
 (3) Urine will continue to collect normally in the bladder  
 (4) There will be no micturition
- Q.21 The yellow colour of urine of the vertebrates is due to  
 (1) Cholesterol (2) Urochrome (3) Uric acid (4) Melanin
- Q.22 Kidneys are not the only organs of excretion, their work is supplemented by  
 (1) Liver (2) Skin (3) Heart (4) Large intestine
- Q.23 A person is undergoing prolonged fasting. His urine will be found to contain abnormal quantities of  
 (1) Fats (2) Aminoacids (3) Glucose (4) Ketones
- Q.24 Presence of RBC in urine is known as  
 (1) Proteinuria (2) Alkaptonuria (3) Haematuria (4) Uraethiasis

### AIIMS Special

#### Instructions for following questions (Q.25 to Q.36).

- (1) If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).
- (2) If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).
- (3) If Assertion is true statement but Reason is false, then mark (3).
- (4) If both Assertion and Reason are false statements, then mark (4).

- Q.25 **Assertion :** Pregnant women may show some presence of glucose in their post prandial urine although they have no diabetes.  
**Reason :** In pregnant women the glomerular filtration rate is slightly increased. As a result the tubular load of glucose exceeds the tubular maximum for glucose reabsorption.
- Q.26 **Assertion :** Atrial Natriuretic factor is released by wall of atria.  
**Reason :** It inhibits the release of renin from Juxta glomerular apparatus.
- Q.27 **Assertion :** Inner wall of Bowman's capsule is lined with specialized cells -podocytes having a number of projections.  
**Reason :** These projections increases the surface area for absorptions.
- Q.28 **Assertion :** Kidneys are retroperitoneal in position.  
**Reason :** Kidneys are covered with peritoneum only on ventral surface.
- Q.29 **Assertion :** Uric acid is produced by metabolism of purine and pyrimidine.  
**Reason :** Uric acid has high toxicity and soluble in water.

- Q.30 **Assertion :** Kidneys of the vertebrates are retroperitoneal and extra-coelomic.  
**Reason :** Structural and functional units of the kidneys are nephrons.
- Q.31 **Assertion :** The glomerular filtrate resembles the protein free plasma in composition and osmotic pressure.  
**Reason :** The glomerular capillary wall and inner membrane of Bowman's capsule are impermeable to large molecules.
- Q.32 **Assertion :** During micturition, urine is prevented from flowing back into the ureters.  
**Reason :** Urethral sphincters relax during micturition.
- Q.33 **Assertion :** Kidneys maintain the osmotic concentration of the blood.  
**Reason :** Kidneys eliminate either hypotonic or hypertonic urine according to the need of the body.
- Q.34 **Assertion :** ADH reduces chloride loss in urine.  
**Reason :** ADH decreases water absorption.
- Q.35 **Assertion :** Excretion of urea is much helpful than ammonia.  
**Reason :** The synthesis of urea requires energy.
- Q.36 **Assertion :** Micturition is done by urinary bladder.  
**Reason :** Urinary bladder stores urine.

**ANSWER KEY**

Q.1	4	Q.2	3	Q.3	2	Q.4	2	Q.5	1	Q.6	4	Q.7	2
Q.8	3	Q.9	1	Q.10	1	Q.11	1	Q.12	1	Q.13	2	Q.14	1
Q.15	3	Q.16	3	Q.17	3	Q.18	2	Q.19	3	Q.20	2	Q.21	2
Q.22	2	Q.23	4	Q.24	3	Q.25	1	Q.26	2	Q.27	3	Q.28	1
Q.29	4	Q.30	2	Q.31	1	Q.32	2	Q.33	1	Q.34	4	Q.35	2
Q.36	1												

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