

#424411

**Topic:** Other organs of excretion

Distinguish between simple gland and compound gland.

**Solution**

	Simple Gland	Compound Gland
1	It does not consist the branching duct.	It consists the branched duct.
2	The glandular cells are arranged in form of tubes or sacs.	The glandular cells are present in separate pockets which discharge their contents in the duct.
3	Example: Sweat gland	Example: Duodenal glands, Pancreas

#425015

**Topic:** Other organs of excretion

What is the function of liver?

**Solution**

Liver is the largest and heaviest internal organ of the body. It is not directly involved in digestion, but secretes digestive juices. It secretes bile which plays a major role in the emulsification of fats.

#425020

**Topic:** Excretory system

Define Glomerular Filtration Rate (GFR).

**Solution**

Glomerular filtration rate is the amount of glomerular filtrate formed in all the nephrons of both the kidneys per minute. In a healthy individual, it is about 125 mL/minute. The glomerular filtrate contains glucose, amino acids, sodium, potassium, urea, uric acid, ketone bodies, and large amounts of water.

#425021

**Topic:** Excretory system

Explain the autoregulatory mechanism of GFR.

**Solution**

The mechanism by which the kidney regulates the glomerular filtration rate is autoregulative. It is carried out by the juxtaglomerular apparatus. Juxtaglomerular apparatus is a microscopic structure located between the vascular pole of the renal corpuscle and the returning distal convoluted tubule of the same nephron.

It plays a role in regulating the renal blood flow and glomerular filtration rate. When there is a fall in the glomerular filtration rate, it activates the juxtaglomerular cells to release renin. This stimulates the glomerular blood flow, thereby bringing the GFR back to normal. Renin brings the GFR back to normal by the activation of the renin-angiotensin mechanism.

#425023

**Topic:** Physiology of excretion

Indicate whether the following statements are true or false.

- (a) Micturition is carried out by a reflex.
- (b) ADH helps in water elimination, making the urine hypotonic.
- (c) Protein-free fluid is filtered from blood plasma into the Bowman's capsule.
- (d) Henle's loop plays an important role in concentrating the urine.
- (e) Glucose is actively reabsorbed in the proximal convoluted tubule.

**Solution**

(a) The act of passing the urine is called as micturition. It is a reflex reaction. Distension stimulates the stretch receptors located in the wall of the bladder and the reflex activity carried out. Hence, the statement is true.

(b) ADH (Anti diuretic hormone) is produced by the hypothalamus and secreted by the neurohypophysis (posterior pituitary gland). ADH increases the re-absorption of water in the collecting ducts and reduces the formation of urine. Hence, the statement is false.

(c) Glomerular filtrate contains all the components of plasma except protein. Hence, the statement is true.

(d) The counter current multiplication in the loop of Henle plays a responsible role for concentrating the urine. Hence, the statement is true.

(e) Glucose and sodium are absorbed by the proximal convoluted tubule and returned back to the blood by active transport. Hence, the statement is true.

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**#425024**

**Topic:** Physiology of excretion

Indicate whether the given statement is true or false.

ADH helps in water elimination, making the urine hypotonic.

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**Solution**

ADH (Anti diuretic hormone) is produced by the hypothalamus and secreted by the neurohypophysis (posterior pituitary gland). ADH increases the re-absorption of water in the collecting ducts and reduces the formation of urine.

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**#425025**

**Topic:** Physiology of excretion

Indicate whether the given statement is true or false. Protein-free fluid is filtered from blood plasma into the Bowman's capsule.

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**Solution**

The statement is true. The blood enters into the glomerulus by afferent arteriole at very high pressure which filters the component of the blood. This process of filtration of the blood in the Bowman's capsule is ultrafiltration. The filtrate leaving the Bowman's capsule is very similar to blood plasma (filtrate or glomerular filtrate is composed of blood plasma minus plasma protein, i.e., it contains all the components of blood plasma except the proteins) in composition as it passes into the proximal convoluted tubule.

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**#425026**

**Topic:** Physiology of excretion

Indicate whether the given statement is true or false.

Henle's loop plays an important role in concentrating the urine.

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**Solution**

The given statement is a true statement. Henle loop consists of two parts ascending loop and descending loop. It maintains the concentration of urine.

Urine is concentrated by two counter-current systems :

1. The descending loop has low permeability to ions and salts. It has high permeability to water. So most of the water leaks through the walls of the descending loop and urine becomes highly concentrated.
2. The ascending loop has high permeability to water and low permeability towards salts. So, water enters through the wall by endosmosis and urine becomes dilute.

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**#425027**

**Topic:** Physiology of excretion

Indicate whether the given statement is true or false.

Glucose is actively reabsorbed in the proximal convoluted tubule.

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**Solution**

The given statement is true.

The proximal convoluted tubule extends from the Bowman's capsule and helps in selective reabsorption in the nephron. Glucose present in the renal blood needs to be absorbed by PCT. It is absorbed actively by the sodium glucose transporter present in the membranes of PCT. The transporter pumps the glucose and sodium inside the PCT and the ions are reabsorbed.

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**#425030**

**Topic:** Physiology of excretion

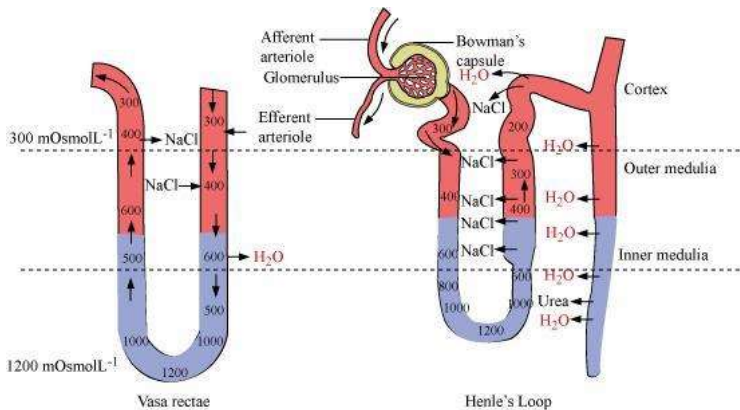
Give a brief account of the counter current mechanism.

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**Solution**

The counter current mechanism operating inside the kidney is the main adaptation for the conservation of water. There are two countercurrent mechanisms inside the kidneys. They are Henle's loop and vasa rectae.

Henle's loop is a U-shaped part of the nephron. Blood flows in the two limbs of the tube in opposite directions and this gives rise to counter currents. The Vasa recta is an efferent arteriole, which forms a capillary network around the tubules inside the renal medulla. It runs parallel to Henley's loop and is U-shaped. Blood flows in opposite directions in the two limbs of vasa recta. As a result, blood entering the renal medulla in the descending limb comes in close contact with the outgoing blood in the ascending limb.



The osmolarity increases in the inner medulla by counter current mechanism. It helps in maintaining the concentration gradient, which in turn helps in easy movement of water from collecting tubules. The gradient is a result of the movement of NaCl and urea.

#### #425032

**Topic:** Other organs of excretion

Describe the role of liver, lungs and skin in excretion.

#### Solution

Liver, lungs, and skin also play an important role in the process of excretion.

**Role of the liver:** Liver is the largest gland in the human body. It changes the decomposed haemoglobin pigment into bile pigments called bilirubin and biliverdin. It helps in the excretion of cholesterol, steroid hormones, vitamins, drugs, and other waste materials through bile. Urea is formed in the liver. Ammonia is quickly changed into urea in the liver and then eliminated from the body.

**Role of the lungs:** Lungs help in the removing waste materials such as carbon dioxide and water as vapour in expired air.

**Role of the skin:** Skin has two types of glands which help in excretion of waste products – sweat and sebaceous glands. (i) Sweat glands are highly vascular and tubular glands that excrete excess salt and water from the body in the form of sweat. Sweat helps in thermoregulation. (ii) Sebaceous glands are branched glands that secrete an oily secretion called sebum. It prevents the drying up of skin.

#### #425034

**Topic:** Physiology of excretion

Explain micturition.

#### Solution

Micturition is the process by which the urine from the urinary bladder is excreted. As the urine accumulates, the muscular walls of the bladder expand. The walls stimulate the sensory nerves in the bladder, setting up a reflex action. This reflex stimulates the urge to pass out urine. To discharge urine, the urethral sphincter relaxes and the smooth muscles of the bladder contract. This forces the urine out from the bladder. An adult human excretes about 1 – 1.5 litres of urine per day.

#### #425042

**Topic:** Modes of excretion

Terrestrial animals are generally either ureotelic or uricotelic, not ammonotelic, why?

#### Solution

Terrestrial animals are either ureotelic or uricotelic, and not ammonotelic. This is because of the following two main reasons:

(a) Ammonia is highly toxic in nature. Therefore, it needs to be converted into a less toxic form such as urea or uric acid.

(b) Terrestrial animals need to conserve water. Since ammonia is soluble in water, it cannot be eliminated continuously. Hence, it is converted into urea or uric acid. These forms are less toxic and also insoluble in water. This helps terrestrial animals conserve water.

#425044

Topic: Physiology of excretion

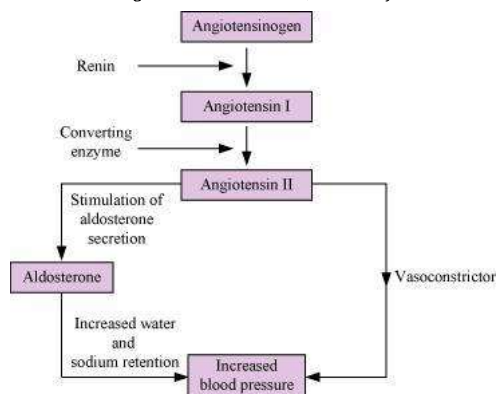
What is the significance of juxta glomerular apparatus (JGA) in kidney function?

**Solution**

Juxtaglomerular apparatus (JGA) is a complex structure made up of a few cells of the glomerulus, distal tubule, and afferent and efferent arterioles. It is located in a specialised region of a nephron, wherein the afferent arteriole and the distal convoluted tubule (DLT) come in direct contact with each other.

The juxtaglomerular apparatus contains specialised cells of the afferent arteriole known as juxtaglomerular cells. These cells contain the enzyme renin that can sense blood pressure. When glomerular blood flow (or glomerular blood pressure or glomerular filtration rate) decreases, it activates juxtaglomerular cells to release renin.

Renin converts the angiotensinogen in blood into angiotensin I and further into angiotensin II. Angiotensin II is a powerful vasoconstrictor that increases the glomerular blood pressure and filtration rate. Angiotensin II also stimulates the adrenal cortex of the adrenal gland to produce aldosterone. Aldosterone increases the rate of absorption of sodium ions and water from the distal convoluted tubule and the collecting duct. This also leads to an increase in blood pressure and glomerular filtration rate. This mechanism, known as the renin-angiotensin mechanism, ultimately leads to an increased blood pressure.



#425051

Topic: Excretory system

Name the following.

Cortical portions projecting between the medullary pyramids in the human kidney.

**Solution**

The cortical portions projecting between the medullary pyramids in the human kidney are the columns of Bertini. They represent the cortical tissues present within the medulla.

#425059

Topic: Physiology of excretion

(a) Ascending limb of Henle's loop is ..... to water whereas the descending limb is ..... to it.

(b) Reabsorption of water from distal parts of the tubules is facilitated by hormone .....

(c) Dialysis fluid contain all the constituent as in plasma except .....

(d) A healthy adult human excretes (on an average) .....gm of urea /day

**Solution**

(a) Henle's loop consists of three parts: Descending limb, Ascending limb, Hair pin bend. Descending limb is permeable to water and impermeable to salt or ions. Ascending limb is impermeable to water and permeable to salt or ions.

Hence, Ascending limb of Henle's loop is impermeable to water whereas the descending limb is permeable to it.

(b) Vasopressin (Antidiuretic hormone, ADH) is secreted by the posterior pituitary. It increases the permeability of the distal convoluted tubules, increasing water reabsorption.

Hence, Reabsorption of water from distal parts of the tubules is facilitated by hormone Vasopressin.

(c) The fluid and solutes in a dialysis process that simply flows through the dialyzer and does not pass through the semipermeable membrane, gets discarded along with removed toxic substances after they flow back out of the dialyzer. It contains sodium, potassium, calcium, bicarbonate, magnesium, chloride and glucose.

Hence, Dialysis fluid contain all the constituent as in plasma except nitrogenous waste.

(d) About 95% of nitrogen is excreted as urea through urine. A healthy adult person normally excretes about 25 - 30 grams of urea per day.

#425062

Topic: Physiology of excretion

Reabsorption of water from distal parts of the tubules is facilitated by the hormone

**Solution**

ADH is the hormone secreted by the posterior pituitary. It regulates the water absorption in the collecting tubule of the nephron. It induces the translocation of aquaporin-CD water channels in the plasma membrane of collecting duct cells and helps to transport water from the collecting duct to the blood in the renal vein.

**#425064****Topic:** Disorders of excretory system

Dialysis fluid contain all the constituents as in plasma except

**Solution**

Dialysis fluid contains all the constituents as in plasma, except the nitrogenous wastes. The dialysis fluid contains water, glucose, salts and various substances at the correct concentration for the body. The dialysing membrane allows small particles such as water and mineral ions to pass through it. Due to the absence of nitrogenous waste in the dialysing fluid, they easily pass through the membrane from the blood to the dialysis fluid due to the concentration gradient.

**#425067****Topic:** Modes of excretion

A healthy adult human excretes (on an average) ..... gm of urea/day.

**Solution**

A healthy adult human excretes (on an average) 25-30 gm of urea/day. Urea is a nitrogen-containing substance which is produced in the liver, in order to deal with excess amino acids in the body. The urea is then removed from the body by the kidneys, in a separate process.

**#425089****Topic:** Modes of excretion

Match the items of column I with those of column II:

Column I	Column II
(a) Ammonotelism	(i) Birds
(b) Bowman's capsule	(ii) Water reabsorption
(c) Micturition	(iii) Bony fish
(d) Uricotelism	(iv) Urinary bladder
(e) ADH	(v) Renal tubule

**Solution**

Column I	Column II
(a) Ammonotelism	(iii) Bony fish
(b) Bowman's capsule	(v) Renal tubule
(c) Micturition	(iv) Urinary bladder
(d) Uricotelism	(i) Birds
(e) ADH	(ii) Water reabsorption

**#464798****Topic:** Excretory system

The kidneys in human beings are a part of the system for

- A** Nutrition
- B** Respiration
- C** Excretion
- D** Transportation

**Solution**

Kidneys are the bean shaped reddish brown paired organs that serve in maintaining the fluid electrolyte balance and acid base balance of body through the process of urine formation. Excretion refers to removal of metabolic waste from body. This makes kidneys part of excretory system. Nutrition refers to obtaining the food to meet the energy requirement for growth and development. Respiration refers to the process that allows entry of oxygen from air to blood and exit of carbon dioxide from blood to air. Transportation refers to movement of materials, mainly nutrients and gases, from one organ to other.

**#464810****Topic:** Excretory system

Compare the functioning of alveoli in the lungs and nephrons in the kidneys with respect to their structure and functioning.

**Solution**

Alveoli and nephrons.

No.	Alveoli	Nephrons
1.	Alveoli are pouch-like air sacs that are made up of simple squamous epithelium.	1. Nephrons are the elongated tubules that form an anatomical and functional unit of the kidney.
2.	It has a thin cell wall to facilitate gaseous exchange.	2. Each nephron has Bowman's capsule, proximal convoluted tubule, a loop of the nephron, distal convoluted tubule and the collecting ducts.
3.	It is surrounded by blood capillaries.	3. Blood capillaries are present as glomerulus and peritubular capillaries.
4.	Presence of millions of alveoli in lungs provide ample surface area to facilitate gaseous exchange between air in alveoli and blood in capillaries. Oxygen diffuses across the alveolar and capillary wall into the bloodstream while carbon dioxide diffuses from blood across the mentioned walls into the alveoli.	4. It serves in fluid and electrolyte balance of the body through the process of urine formation. Each part performs different role in urine formation.

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**#634596**

**Topic:** Modes of excretion

What is excretion?

**Solution**

The process by which metabolic wastes and other non-useful, toxic wastes such as faeces are eliminated from an organism is called excretion. In vertebrates, excretion is carried out mainly by lungs, kidneys and skin.