

Students Learning Outcomes

After studying this chapter, students will be able to:

- Identify the different organs of urinary system.
- Relate the structure of the kidney with its function.
- State that nephron is the excretory unit of kidney.
- Locate the different parts of nephrons and relate them with their function.
- State that main role of the kidney is urine formation.
- Describe that urine formation involves three processes i.e., filtration, reabsorption and secretion.
- Explain that the kidney plays an important role in osmoregulation.
- Identify the causes and treatment of kidney stones.
- Outline the causes of kidney failure and treatments.

Subjective Type Questions

Long Questions prepared in the light of new Examination Techniques
(Knowledge, Understanding, Application, Analytical & Conceptual)

4.1

Human Urinary System

Q.1: Write the components and functions of human urinary system.

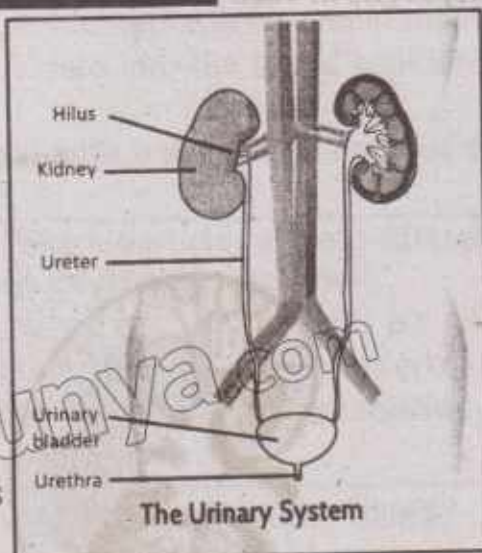
Ans. Human Urinary System:

The human Urinary system also known as excretory system. It consists of:

- (i) A pair of kidneys (ii) A pair of ureters
(iii) A urinary bladder (iv) A urethra

Functions of human urinary system:

- The urinary system regulates the internal environment of body.
- It ensures that waste products and excess substances are removed from body.



Q.2. Describe the physical appearance and structure of kidney.

Ans. Physical Appearance of kidney: Kidneys are bean shaped organs having a concave and a convex side. They are present in the abdominal cavity, below the diaphragm, on the sides of vertebral column. The concave side of each kidney is towards vertebral column. The left kidney is a little higher than the right. Kidneys are dark-red in colour. Each kidney is about 10cm long, 5 cm wide and 4cm thick.

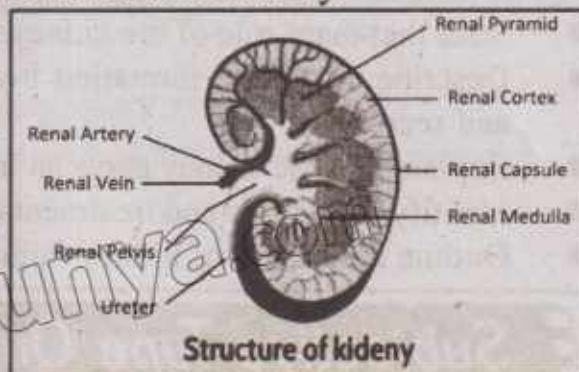
Kidneys remove extra water, salts and nitrogenous wastes from blood and make urine. From each kidney, a tube called ureter carries urine to the urinary bladder. The urinary bladder temporarily stores urine. The urethra is the tube that carries urine from the urinary bladder to the outside.

Kidneys are the major organs of urinary system. Renal arteries supply them blood with metabolic wastes (e.g. urea, extra water and salts). Kidneys filter these wastes from blood and then excrete them in the form of urine.

Structure of kidney:

External Structure: Kidney is surrounded by a tough tissue called renal capsule. On the concave side of the kidney, there is a depression called hilus. It is the point from where renal artery enters in kidney and renal vein and ureter leave kidney.

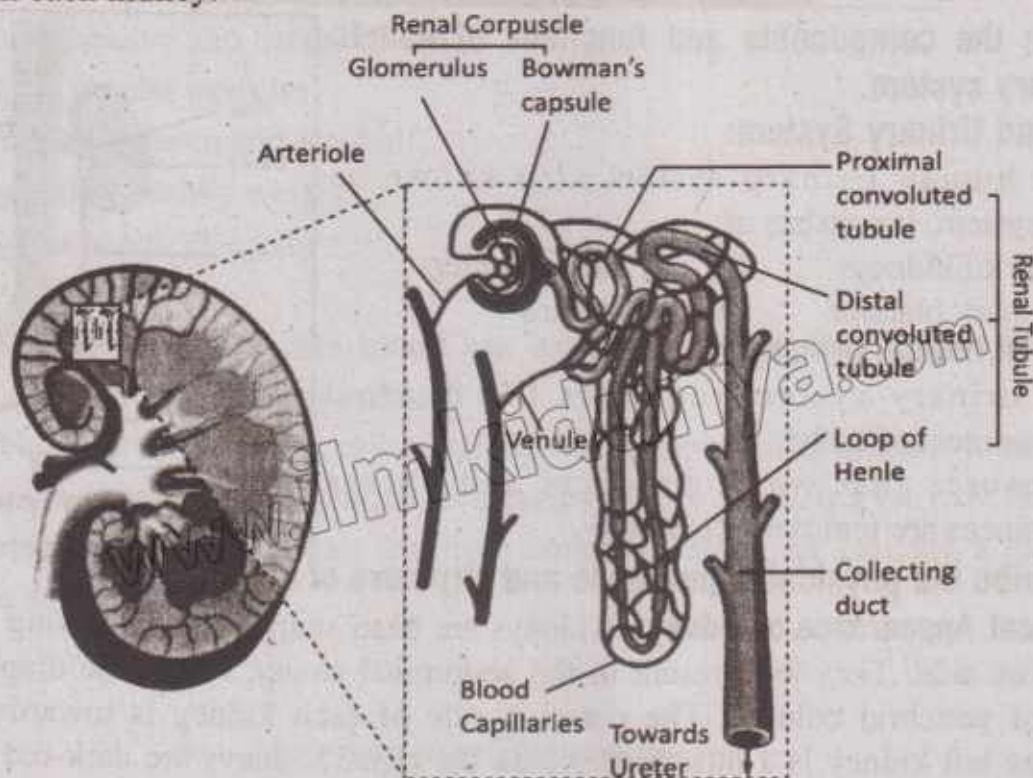
Internal Structure: Internally, a kidney is divided into two regions. The outer region is called renal cortex while the inner one is called renal medulla. There are many cone shaped areas in renal medulla, called renal pyramids. The base of each pyramid faces the renal cortex while its tip is in a cavity called renal pelvis. It extends to outside of kidneys and forms a ureter.



Q.3: Describe a structure of a nephron and draw a labelled diagram.

Ans. Nephron:

The functional unit of kidney are called nephron. There are more than one million nephrons in each kidney.



The Structure of Nephron

Parts of nephron: A nephron consists of two parts:

- (i) Renal corpuscle
 - (ii) Renal tubule
- (i) **Renal corpuscle:** It is the first part of nephron and is composed of glomerulus and the Bowman's capsule.

Glomerulus: It is a network of capillaries.

Bowman's capsule: It is a cup-shaped structure around the glomerulus.

- (ii) **Renal tubule:** It is a long tube attached with the Bowman's capsule. It has three parts:

- (a) Proximal convoluted tubule
- (b) Loop of Henle
- (c) Distal convoluted tubule.

The distal convoluted tubule of many nephrons open in a single collecting duct. Many collecting ducts join together and open into the renal pelvis.

4.2

Functioning of the kidney

Q.4: Describe the process of pressure filtration and re-absorption in kidneys.

Ans. Pressure filtration:

Blood enters kidney through a renal artery. The artery divides into many arterioles. Each arteriole divides into the capillaries of glomerulus.

When blood reaches glomerulus, its pressure is very high. So, many small molecules (water, salts, glucose and urea etc.) move out of glomerulus. These materials enter Bowman's capsule. This step is called pressure filtration. The filtered material in Bowman's capsule is called glomerular filtrate. It is about 20% of the blood plasma that enters the glomerulus.

Reabsorption: The glomerular filtrate moves to the next part of nephron i.e., renal tubule. Many useful materials are reabsorbed from glomerular filtrate into the blood capillaries surrounding the renal tubule.

- Large amount of water, nearly 100% of glucose and amino acids, and most of the salts are reabsorbed from proximal convoluted tube.
- Some water is reabsorbed from descending limb of the loop of Henle. Large amounts of salts are reabsorbed from ascending limb of the loop of Henle.
- Some water is also reabsorbed from distal convoluted tubule and collecting duct.

Q. Which particles are not filtered through the glomerular capillaries?

Ans. Blood cells and proteins are not filtered through the glomerular capillaries because they are relatively larger in size.

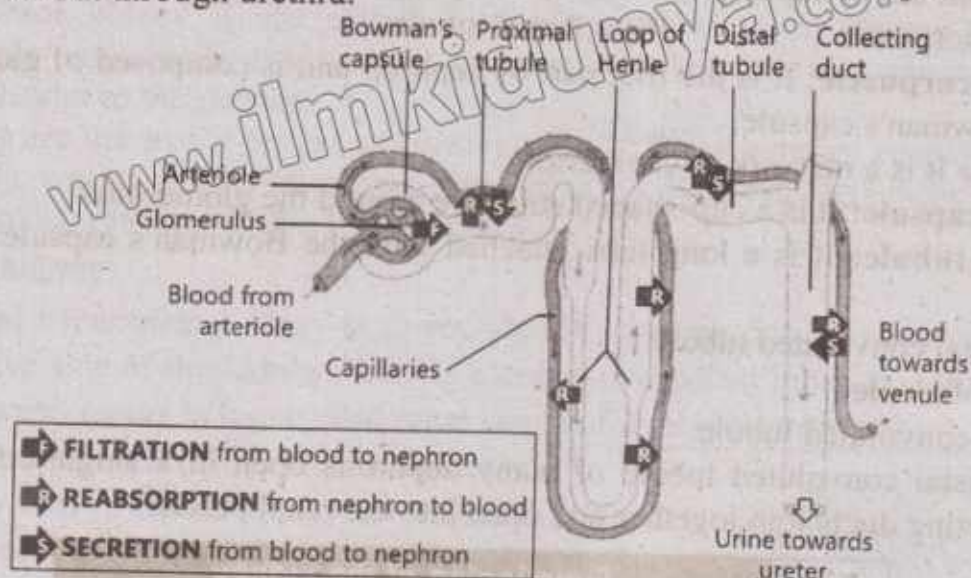
Q.5: What is tubular secretion? How it helps in removing wastes from the blood?

Ans. Tubular Secretion:

When useful materials are reabsorbed into blood, some of the remaining wastes present in blood are secreted from blood capillaries to renal tubule. It is an active transport process and is called tubular secretion.

After reabsorption and tubular secretion, the filtrate in the renal tubules is known as urine. Urine from all nephrons moves to the renal pelvis. From renal pelvis, urine moves to the urinary bladder via ureters. Here it is stored. When the urinary bladder is filled,

urine is passed out through urethra.



Functioning of kidney

Q.6: How kidneys play its role in osmoregulation?

Ans. Osmoregulation:

Osmoregulation means the control of the amount of water according to body's needs.

Role of kidneys in osmoregulation: Kidneys are the main organs which work for osmoregulation. They control the amount of water in blood. So, the amount of water in other body fluids is also controlled.

Diluted urine: If there is excess water in blood, more water is filtered from the glomerulus's to Bowman's capsule. There is less reabsorption of water from renal tubule to capillaries. In this way abundant dilute urine is produced and the amount of water in blood is brought to normal.

Concentrated urine: If the amount of water in blood is less than normal, less water is filtered from the glomerulus to Bowman's capsule. There is more reabsorption of water from renal tubule to capillaries.

In this way, concentrated urine is produced and the water is retained in blood.

4.3

Disorders of Kidney

Q.7: Write a comprehensive note on kidney stones describing the causes, symptoms and treatments.

Ans. Kidney Stones:

Sometimes, the filtered minerals and salts (e.g., calcium oxalate, calcium and ammonium phosphate, and uric acid etc.) gather in kidneys and make hard, crystalline deposits. Such deposits cannot pass in urine and are called kidney stones. Some stones may leave kidneys and may be trapped in ureter or urinary bladder.

Symptoms: Severe pain in kidney or lower abdomen, burning in urethra, frequent urination, foul-smelling urine, blood and pus in urine, nausea, vomiting, bloating.

Causes: Presence of more calcium oxalate, calcium and ammonium phosphates in diet

(green vegetables, fats, dairy products), extra amounts of vitamins C and D in diet, reduced water intake, excess uric acid in blood, urinary tract infections, and alcohol consumption.

Treatment: If kidney stones are small in size, the patient is advised to drink plenty of water so that stones can pass through the urine.

Lithotripsy is another method for the removal of kidney stones. In lithotripsy, non-electric shock waves are fired on kidney from outside. The waves hit the stones and break them into smaller pieces, which pass out through urine.



If stones are large and cannot pass easily, the patient has to undergo surgery for the removal of stones.

Q.8: Write down the symptoms and causes of kidney failure.

Ans. Kidney Failure:

Kidney failure is also known as renal failure. "When one or both kidneys are not able to perform their function (removing waste materials from blood and then passing them out), the condition is called kidney failure."

Symptoms of kidney failure: Increase concentration of wastes in blood, rise in volume of body fluids, weight loss and blood in urine, swelling in legs, feet and face-are the symptoms of kidney failure.

Causes of kidney failure: Long-term diabetes mellitus and hypertension, dehydration, severe kidney infections, overuse of certain medicines (e.g nonsteroidal anti inflammatory drugs-NSAIDs), large kidney stones, physical damage to kidneys heart or liver failure are the causes of kidney failure.

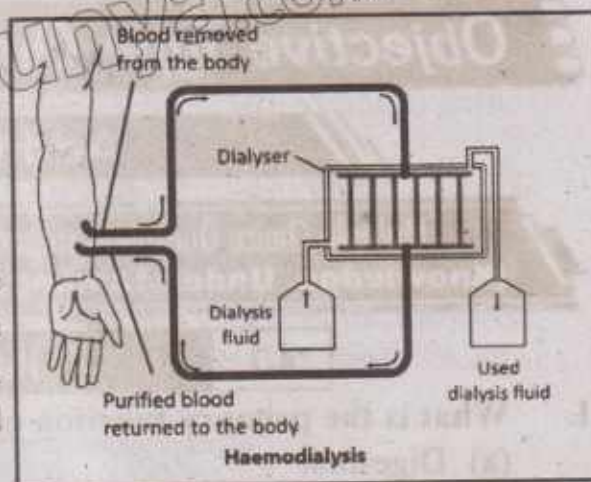
Q.9: Define dialysis and describe the processes of peritoneal dialysis and haemodialysis.

Ans. Dialysis:

Dialysis is a method in which wastes are extracted from blood by using a dialysis fluid. There are two methods of dialysis:

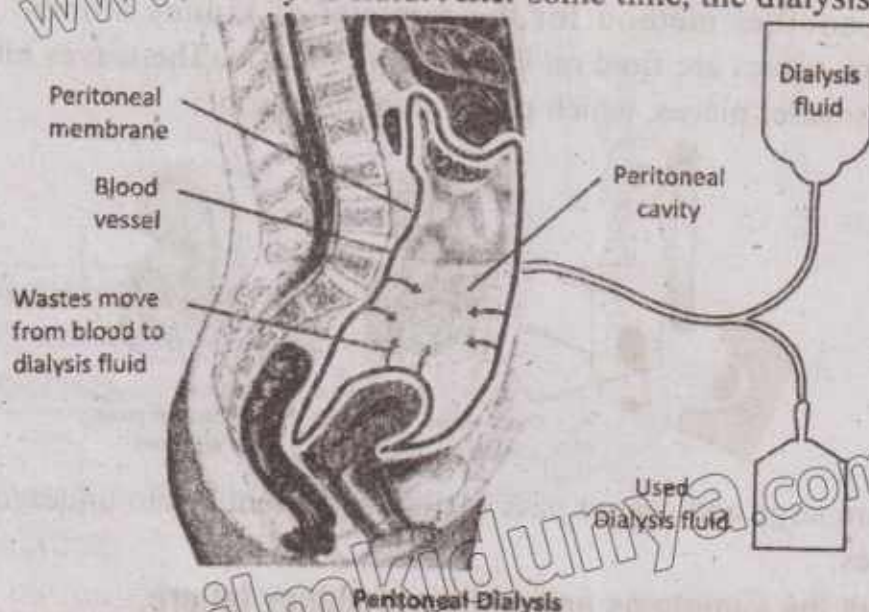
1. Haemodialysis 2. Peritoneal dialysis

1. **Haemodialysis:** In haemodialysis, the patient's blood is pumped through a machine called dialyzer. The dialyzer contains long tubes. Blood flows inside the tubes while dialysis fluid flows outside. Extra water and wastes move from



blood and enter the dialysis fluid. The purified blood is then returned back to the body.

2. Peritoneal Dialysis: In this method, dialysis fluid is pumped into the peritoneal cavity (the space around gut in abdomen). The walls of peritoneal cavity are lined with peritoneal membrane. The wastes pass from the blood present in blood vessels of peritoneal membrane into the dialysis fluid. After some time, the dialysis fluid is drained.



Q. Which organization controlled organ transplantation in Punjab?

Ans. In Punjab, organ transplantation is controlled by Punjab Human Organ Transplant Authority. It ensures that people can have suitable transplantation with safety and quality.

Q.10: How kidney transplant is done?

Ans. Kidney transplantation:

Kidney transplantation is done for advanced treatment of kidney failure.

Procedure: In this treatment, a healthy kidney from some donor is transplanted in patient's body, along with damaged kidney. The donor of kidney may be a deceased person or a living one. Living-donor may or may not be a relative of the patient. In all cases, the donor's kidney is matched with the patient's immune system. When a matching kidney is transplanted, it works normally in patient's body for ten to fifteen years.

Objective Type Questions

Additional MCQ's

Multiple Choice Questions prepared in the light of new Examination Techniques
(Knowledge, Understanding, Application, Analytical & Conceptual)

4.1

Human Urinary System

1. What is the primary function of the urinary system?

(a) Digestion

(b) Regulation of internal environment

- (c) Pumping blood (d) Oxygen transport
- Which organs are responsible for removing extra water and nitrogenous wastes?
(a) Lungs (b) Kidneys (c) Liver (d) Heart
 - The tube that carries urine from the kidney to the bladder is:
(a) Urethra (b) Renal artery (c) Ureter (d) Hilus
 - Where is urine temporarily stored before being excreted?
(a) kidneys (b) Ureter (c) Urinary bladder (d) Renal capsule
 - Typical shape of a human kidney is:
(a) Sphere-shaped (b) Bean-shaped (c) Cube-shaped (d) Cone-shaped
 - Where are the kidneys located in human body?
(a) Thoracic cavity (b) Pelvic cavity
(c) Abdominal cavity (d) Cranial cavity
 - Approximate length of the human kidney is:
(a) 5cm (b) 10cm (c) 4cm (d) 15cm
 - Which vessels supplies the kidneys with blood?
(a) Renal veins (b) Pulmonary arteries
(c) Renal arteries (d) Hepatic portal vein
 - The tough tissue surrounding the kidney is known as:
(a) Renal capsule (b) cortex (c) Hilus (d) Diaphragm
 - The outer region of the kidney is:
(a) Renal medulla (b) Renal cortex (c) Renal pyramid (d) Nephrons
 - The functional units of kidneys are:
(a) Medulla (b) ureter (c) Renal pelvis (d) Nephrons
 - How many nephrons are present in each kidney?
(a) More than thousand (b) More than one million
(c) More than two million (d) More than three million
 - A nephron consist of:
(a) Renal corpuscle (b) Renal tubule (c) Both a and b (d) Collecting duct
 - Renal corpuscle is composed of:
(a) Glomerulus (b) Bowman's capsule
(c) Loop of henle (d) Both a and b

4.2

Functioning of Kidney

- Which particles are not filtered through the glomerular capillaries?
(a) Proteins (b) Blood cells (c) Lipids (d) A and B both
- Each arteriole divides into the:
(a) Arteries (b) tubules (c) Capillaries (d) Veins
- Which blood vessel is responsible for bringing blood into the kidney for filtration?
(a) Renal vein (b) Renal artery (c) Hepatic artery (d) Pulmonary vein
- During the reabsorption process, where do the useful materials move to after leaving the renal tubule?
(a) Glomerular capillaries (b) Bowman's capsule
(c) The bladder (d) Blood capillaries

19. The primary substance reabsorbed in the descending limb of the loop of Henle:
 - (a) Proteins
 - (b) Urea
 - (c) Some water
 - (d) Salts
20. In which part of loop of Henle are large amount of salts reabsorbed?
 - (a) Descending limb
 - (b) Ascending limb
 - (c) Glomerulus
 - (d) Renal pelvis
21. Tubular secretion is an:
 - (a) Passive transport process
 - (b) Active transport process
 - (c) Osmosis process
 - (d) None of these
22. After reabsorption and tubular secretion, the filtrate in the renal tubule is known as:
 - (a) Blood
 - (b) Urine
 - (c) Faeces
 - (d) Glomerular filtrate
23. Osmoregulation refers to the control of:
 - (a) Glucose
 - (b) Salts
 - (c) Water
 - (d) Urea
24. Main organ which work for osmoregulation:
 - (a) Liver
 - (b) Kidney
 - (c) Heart
 - (d) Stomach
25. If you drink a lot of water, your kidneys will produce:
 - (a) Concentrated urine
 - (b) Diluted urine
 - (c) No urine
 - (d) Salty urine
26. Concentrated urine means there is:
 - (a) More water and less waste
 - (b) Less water and more waste
 - (c) No waste at all
 - (d) Only pure water
27. Why does the kidney produce concentrated urine?
 - (a) to get rid of extra water
 - (b) To save water for the body
 - (c) To make the bladder full faster
 - (d) To clean the renal artery

4.3

Disorders of Kidney

28. What are kidney stones made of?
 - (a) Sugar and proteins
 - (b) Deposits of minerals and salts
 - (c) Only excess water
 - (d) Blood cells
29. Which of the following salts is a common cause of kidney stones?
 - (a) sodium chloride
 - (b) Calcium oxalate
 - (c) Potassium
 - (d) Magnesium sulfate
30. Which symptom is associated with kidney stones?
 - (a) Severe pain in lower abdomen
 - (b) Difficulty in breathing
 - (c) Memory loss
 - (d) High hair growth
31. What is the major dietary cause of kidney stones?
 - (a) Eating too much fruit
 - (b) Eating green vegetables and dairy products
 - (c) Drinking too much water
 - (d) Lack of salt in food
32. Extra amount of which vitamins can contribute to stone formation.
 - (a) Vitamin A and B
 - (b) Vitamin C and D
 - (c) Vitamin K and A
 - (d) Vitamin E and B
33. In which technique non-electric shock waves are fired on kidney from outside.
 - (a) Surgery
 - (b) Laser
 - (c) Lithotripsy
 - (d) Dialysis

34. When one or both kidneys are not able to perform their function, the condition is called:
 (a) Kidney stone (b) Lithotripsy (c) Dialysis (d) Kidney failure
35. All are the causes of kidney failure except:
 (a) Blood in urine (b) Swelling in legs (c) Weight loss (d) Headache
36. A treatment in which wastes are extracted from blood is known as:
 (a) Kidney transplant (b) dialysis
 (c) Lithotripsy (d) None of these
37. What is the name of the machine used to clean blood during Haemodialysis?
 (a) Lithotripter (b) Peritoneal cavity (c) Dialyzer (d) Nephroscope
38. In Punjab, which authority controls organ transplantation to ensure safety and quality?
 (a) Punjab Medical Board
 (b) Punjab Human organ Transplant Authority
 (c) Kidney stones Relief centre (d) Dialysis Control Bureau
39. Which of the following method is done for advanced treatment of kidney failure?
 (a) Haemodialysis (b) Peritoneal Dialysis
 (c) Lithotripsy (d) Kidney Transplantation
40. For how many years a transplanted kidney works normally?
 (a) Five to ten years (b) Ten to fifteen years
 (c) Three to four years (d) Five to eight years

Answers

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|---------|---------|---------|---------|---------|---------|
| 1. (b) | 2. (b) | 3. (c) | 4. (c) | 5. (b) | 6. (c) |
| 7. (b) | 8. (c) | 9. (a) | 10. (b) | 11. (d) | 12. (b) |
| 13. (c) | 14. (d) | 15. (d) | 16. (c) | 17. (b) | 18. (d) |
| 19. (c) | 20. (b) | 21. (b) | 22. (b) | 23. (c) | 24. (b) |
| 25. (b) | 26. (b) | 27. (b) | 28. (b) | 29. (b) | 30. (a) |
| 31. (b) | 32. (b) | 33. (c) | 34. (d) | 35. (d) | 36. (d) |
| 37. (c) | 38. (b) | 39. (d) | 40. (b) | | |

Additional Short Questions

Short Answer Questions prepared in the light of new Examination Techniques
 (Knowledge, Understanding, Application, Analytical & Conceptual)

4.1

Human urinary system

1. Write down the role of human urinary system.

Ans. The human urinary system regulates the internal environment of body. It ensures that waste products and excess substances are removed from body.

2. Enlist the main parts of human urinary system.

Ans. The human urinary system consists of a pair of kidneys, a pair of ureters, a urinary bladder and a urethra.

3. Differentiate between ureter and urethra.

Ans. Ureter: Ureter carries urine from the kidneys to the urinary bladder.

Urethra: Urethra is the tube that carries urine from the urinary bladder to the outside.

4. State two functions of the kidneys.

Ans. (i) Kidneys filter metabolic wastes from blood and remove extra water and salts.

(ii) They maintain the body's internal fluid balance.

5. Why is the left kidney slightly higher than the right kidney?

Ans. The left kidney is slightly higher because the right kidney is pushed down a little by the large size of liver.

6. Describe the shape and size of a human kidney.

Ans. Kidneys are bean-shaped organs having a concave and convex side.

Each kidney is about 10cm long, 5cm wide and 4cm thick.

7. What is the hilus? Write its importance.

Ans. Hilus: On the concave side of kidney, there is a depression called hilus.

It is the point from where renal artery enters in kidney and renal vein and ureter leave kidney.

8. Differentiate between renal cortex and renal medulla.

Ans. Renal cortex: Renal cortex is the outer region of the kidney.

Renal medulla: Renal medulla is the inner region of the kidney containing renal pyramids.

9. Why nephron is called the functional unit of kidney?

Ans. The functional units of kidneys are called nephrons. They filter blood and form urine, so the kidney's function depends on nephron.

10. Name the major parts of the nephron.

Ans. A nephron consists of two major parts:

(i) Renal corpuscle

(ii) Renal tubule

11. Differentiate between renal corpuscle and renal tubule.

Ans. Renal corpuscle: It is the first part of the nephron where filtration of blood takes place.

● It consists of Bowman's capsule and glomerulus.

Renal tubule: It is the second part of the nephron where reabsorption and secretion occur.

● It consists of proximal convoluted tubule, Loop of henle and distal convoluted tubule.

12. What is glomerulus and Bowman's capsule?

Ans. The glomerulus is a network of capillaries while the Bowman's capsule is a cup-shaped structure around the glomerulus.

4.2

Functioning of the kidney

13. What do you know about glomerular filtrate?

Ans. Glomerular filtrate: It is the fluid that is filtered from the blood into the Bowman's capsule. It contains water, salts, glucose and urea etc.

14. How reabsorption takes place in kidney?

Ans. ● Large amount of water, nearly 100% of glucose and amino acids and most of

the salts are reabsorbed from proximal convoluted tube.

- Some water is reabsorbed from ascending limb of loop of Henle.
- Large amount of salts are reabsorbed from ascending limb of the loop of Henle.
- Same water is also reabsorbed from distal convoluted tubule and collecting duct.

15. What do you know about the process of tubular secretion?

Ans. Tubular secretion: When useful materials are reabsorbed into blood, some of the remaining wastes present in blood are secreted from blood capillaries to renal tubule. It is an active transport process and is called tubular secretion.

16. Define Osmoregulation.

Ans. Osmoregulation: Osmoregulation is the control of water and salts balance in the body.

- It is mainly performed by the kidney's.

17. How excess water in the blood is controlled?

Ans. If there is excess water in blood, more water is filtered from the glomerulus to Bowman's capsule. There is less reabsorption of water from renal tubule to capillaries. In this way, abundant dilute urine is produced and the amount of water in blood is brought to normal.

18. How less amount of water in blood is brought to normal?

Ans. If the amount of water in blood is less than normal, less water is filtered from the glomerulus to Bowman's capsule. There is more reabsorption of water from renal tubule to capillaries. In this way, concentrated urine is produced and the water is preserved in blood.

4.3

Disorders of Kidney

19. How kidney stones are formed?

Ans. Sometimes, the filtered minerals and salts e.g. calcium oxalate, calcium and ammonium phosphate and uric acid etc.) gather on kidneys and make hard, crystalline deposits. Such deposits cannot pass in urine and are called kidney stones.

20. Write down some symptoms of kidney stones.

Ans. Severe pain in kidney or lower abdomen, burning in urethra, frequent urination, foul-smelling urine, blood and pus in urine are the symptoms of kidney stones.

21. Write down any two symptoms and causes of kidney failure.

Ans. Symptoms: Increases concentration of wastes in blood rise in volume of body fluid and blood in urine are the symptoms.

Causes: Long-term diabetes mellitus and severe kidney infections are the major causes of kidney failure.

22. Define dialysis write down the names of its two methods.

Ans. Dialysis: Dialysis is a treatment in which wastes are extracted from blood by using a dialysis fluid.

Methods of dialysis:

- (i) Haemodialysis
- (ii) Peritoneal Dialysis

23. How kidney transplantation takes place?

Ans. Kidney transplantation is done for advanced treatment of kidney failure. In this

treatment, a healthy kidney from some donor is transplanted in patient's body, along with damaged kidney. The donor's kidney should be matched with the patient's immune system. When a matching kidney is transplanted, it works normally in patient's body for then to fifteen years.

Exercise Questions (Solved)



A. Select the correct answers for the following questions.

- The process of regulating the amount of water in body fluid is called;**
(a) Filtration (b) Reabsorption
(c) Tubular secretion (d) Osmoregulation
- What happens in the proximal convoluted tubule of nephron?**
(a) Blood is filtered by glomerulus
(b) Reabsorption of water and nutrients occurs
(c) Urine is stored
(d) Water is secreted into the bloodstream
- Which structure is responsible for filtering blood to produce urine?**
(a) Nephron (b) Renal Pelvis (c) Ureter (d) Renal capsule
- Which structure in nephron is responsible for filtering blood?**
(a) Loop of Henle (b) Glomerulus
(c) Proximal convoluted tubule (d) Distal convoluted tubule
- In which part of nephron, the reabsorption of nutrients occurs?**
(a) Glomerulus (b) Proximal convoluted tubule
(c) Loop of Henle (d) Distal convoluted tubule
- Which process in nephron involves the active transport of materials from blood into nephron?**
(a) Filtration (b) Reabsorption (c) Secretion (d) Excretion
- Which is NOT present in the filtrate entering the Bowman's capsule of nephron?**
(a) Water (b) Calcium ions (c) Blood cells (d) Urea
- In which procedure a machine is used to filter blood outside the body?**
(a) Peritoneal dialysis (b) Haemodialysis (c) Lithotripsy (d) Renal surgery
- What is the primary purpose of haemodialysis?**
(a) To rehydrate the body (b) To replace lost nutrients
(c) To filter waste products from blood (d) To regulate blood pressure
- In peritoneal dialysis, what acts as the filtering membrane?**
(a) Dialysis machine (b) Renal cortex
(c) Peritoneal membrane (d) Renal tubules

Answers

- | | | | | |
|--------|--------|--------|--------|---------|
| 1. (d) | 2. (b) | 3. (a) | 4. (b) | 5. (b) |
| 6. (c) | 7. (c) | 8. (b) | 9. (c) | 10. (c) |

B. Write short answers.

1. Enlist the main parts of the human urinary system.

Ans. The human urinary system consists of a pair of kidneys, a pair of ureters, a urinary bladder and a urethra.

2. Briefly describe how kidneys control the composition of blood.

Ans. Kidneys control the composition of blood by the following processes:

(i) Pressure filtration (ii) Reabsorption (iii) Tubular Secretion

Kidneys control blood composition by first filtering water, salts and wastes from blood in the glomerulus. Then the tubules reabsorb useful substances like glucose, amino acids, water and needed salts back into the blood. Finally, they remove extra wastes and ions through secretion and form urine.

3. Name the major parts of a nephron.

Ans. A nephron consists of two major parts:

(i) Renal corpuscle (ii) Renal tubule

4. What materials in diet can cause kidney stones?

Ans. Presence of more calcium oxalate, calcium and ammonium phosphate in diet (green vegetables, fats, dairy products) and extra amount of vitamin C and D in diet can cause kidney stones.

5. What do you mean by lithotripsy?

Ans. Lithotripsy: Lithotripsy is the method for removal of kidney stones. In lithotripsy, non-electric shock waves are fired on kidney from outside. The waves hit the stone and break them into smaller pieces, which pass out through urine.

6. Define kidney failure. Name the treatments for kidney failure.

Ans. Kidney failure: When one or both kidneys are not able to perform their function (removing waste materials from blood and then passing them out), the condition is called kidney failure.

Treatments for kidney failure:

Treatments for kidney failure are:

- (i) Dialysis which may be Haemodialysis and Peritoneal dialysis.
- (ii) Kidney Transplant.

7. Differentiate between:

- i. Excretion and osmoregulation
- ii. Renal cortex and renal medulla
- iii. Renal corpuscle and renal tubule
- iv. Pressure filtration and tubular secretion
- v. Haemodialysis and peritoneal dialysis

i. Excretion and osmoregulation.

Ans. Excretion: Excretion is the removal of metabolic wastes such as urea, CO_2 and extra salts from the body.

- Its main organs are kidneys, lungs and skin.

Osmoregulation: Osmoregulation is the control of water and salts balance in the body.

- It is mainly performed by the kidneys.

ii. **Renal cortex and renal medulla.**

Ans. Renal cortex: Renal cortex is the outer region of the kidney.

Renal medulla: Renal medulla is the inner region of the kidney containing renal pyramids.

iii. **Renal corpuscle and renal tubule.**

Ans. Renal corpuscle: It is the first part of the nephron where filtration of blood takes place.

- It consists of Bowman's capsule and glomerulus.

Renal tubule: It is the second part of the nephron where reabsorption and secretion occur.

- It consists of proximal convoluted tubule, Loop of henle and distal convoluted tubule.

iv. **Pressure filtration and tubular secretion.**

Ans. Pressure filtration: Pressure filtration occurs in glomerulus. Blood is filtered under pressure into Bowman's capsule forming glomerular filtrate. It mainly removes wastes, excess water and salts from blood.

Tubular secretion: It occurs in renal tubule. Extra ions are actively secreted from blood into tubules.

v. **Haemodialysis and peritoneal dialysis.**

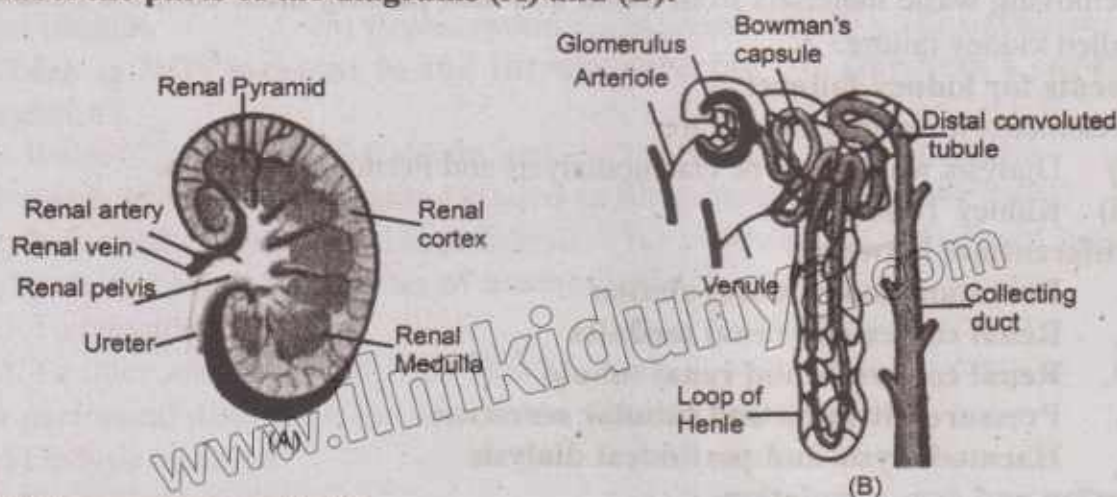
Ans. ● Haemodialysis: In haemodialysis, the patients blood is pumped through a machine called dialyzer.

- Usually done 3-4 times a week.

● **Peritoneal dialysis:** In peritoneal dialysis, blood is filtered inside the body through the peritoneal membrane

- Can be done continuously at home.

8. **Label the parts of the diagrams (A) and (B):**



D. **Write answers in detail.**

1. **Write a note on the structure of kidney.**

Ans. For answer see Q's 2

2. **Describe the structure of a nephron and draw a labelled diagram.**

Ans. For answer see Q's 3

3. Describe the process of pressure filtration and re-absorption in kidneys.

Ans. For answer see Q's 4

4. What is tubular secretion? How it helps in the removing wastes from blood?

Ans. For answer see Q's 5

5. Write a comprehensive note on kidney stones describing the causes, symptoms and treatments.

Ans. For answer see Q's 7

6. Write down the symptoms and causes of kidney failure.

Ans. For answer see Q's 8

7. Define dialysis and describe the processes of peritoneal dialysis and haemodialysis.

Ans. For answer see Q's 9

D. Write answers in detail.

1. "Along with excretion, kidneys also play role in osmoregulation." Comment on this statement.

Ans. This statement is correct because kidneys not only remove wastes like urea and excess salts (excretion) but also maintain water and salt balance (osmoregulation) in the body.

Osmoregulation is the maintenance of the balance of water and salts in body fluids. Kidneys produce dilute urine when water is excess and concentrated urine when water is low, keeping the blood composition and internal environment stable.

2. How does the nephron ensure that essential nutrients are not lost in urine?

Ans. The nephron uses a process called selective reabsorption. As the filtrate travels through proximal convoluted tubule, nearly all glucose, amino acids and essential salts are actively transported back into the surrounding peritubular capillaries thus nephron ensures that essential nutrients stay in blood while wastes are excreted.

3. Why is long loop of Henle important in the balance of water and salts in body?

Ans. The long loop of henle creates a concentration gradient in the kidney medulla, which allow the nephron to reabsorb more water and salts. This helps to produce concentrated urine when the body needs to conserve water, maintaining the water and salt balance in the body.

4. How can chronic diseases like diabetes lead to kidney failure?

Ans. Chronic diseases like diabetes can damage the blood vessels in the kidneys, reducing their ability to filter blood properly. Over time, this can lead to accumulation of wastes, loss of kidney function and eventually kidney failure.

