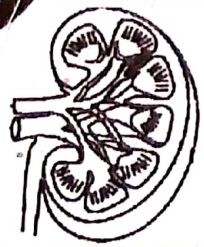
CHAPTER



11

HOMEOSTASIS

Q.No.1 Encircle the correct option from the given multiple choices.

HOMEOSTASIS IN PLANTS

(1) **The maintenance of internal conditions of body at equilibrium, despite changes in external environment is called**

(a) Thermoregulation (b) Homeostasis (c) Osmoregulation (d) All of above

(2) **If thermoregulation is lost in living organisms it can cause_____.**

(a) Sweating (b) Vomiting (c) Loss of Enzyme function (d) Death

(3) **Co_2 is removed from following**

(a) Stomata (b) Young stems (c) Root hairs (d) All of following

(4) **_____ cells remove extra amount of O_2 through stomata.**

(a) Xylum (b) Phloem (c) Epidermal (d) Mesophil

(5) **_____ material is harmless for plants.**

(a) Ca-phasphate (b) Ca-oxalate (c) Ca-nitrate (d) None of above

(6) **Carnivores Plants secrete_____.**

(a) Resins (b) Gums (c) Mocilage (d) latex

(7) **If a plant is present at bank of river it will adept as.**

(a) More stomata on upper surface of broad leave
(b) More salt in vacuoles
(c) Deep routs
(d) All of above

(8) **Juicy Fluid is present in _____.**

(a) Hydroptytes (b) Xerophytes (c) Mesophytes (d) Halophytes

HOMEOSTASIS IN HUMAN (SKIN)

(9) **Pain is felt due to pain receptors in _____.**

(a) Epidermis (b) Dermis (c) Bone (d) Cartilage

(10) **Presence of fat layer and formation of Goosebumps help in_____ environmnet**

(a) Warm (b) Cold (c) Moderate (d) None

(11) **_____ wastes are also removed by sweating.**

(a) Urea (b) Uric acid (c) Some Drugs metabolites (d) All of above

URINARY SYSTEM IN HUMAN

(12) _____ tube is common for excreation of sperms and urine in males.
(a) Ureter (b) Umblical cord (c) Placenta (d) Urethra

(13) Floating ribs (last two Ribs) protect_____.
(a) Heart (b) Lungs (c) Kidney (d) Spleen

(14) Nerves enters in Kidney through_____.
(a) Renal cortex (b) Renal medula (c) Hillus (d) None of these

(15) _____forms the base of ureter.
(a) Renal pyramiels (b) Neptron (c) Renal Pelvis (d) Bladder

(16) Mark the correct sequence.
(a) Aorta→Rental arteriole→Effercut arteriols.
(b) Aorta→Renal artery→Arterioles→Glamerulus→Efferent arteriole→peritubular capp→venules→veins
(c) Efferent arteriole→Renal artery
(d) None

(17) Cup-shaped part of Nephron is called_____ and U-shape part of Nephron is called_____.
(a) PCT, DCT (b) Bowman's capsule, Loop of Henle
(c) CD, PCT (d) All of above

(18) Marks the correct sequence for excretion of Urine
(a) Collecting ducts→ Papillary duct→ Pelvis→Ureter(b) Papillary duct→ Collecting duct (c) Papillary duct→ Collecting duct→ Ureter(d) All above

(19) The first step is urine formation is_____.
(a) Pressure filtration (b) Selective Realosorption(c) Active secretion(d) Filtration

(20) _____% of glomerular filtrate is reabsorbed into blood capillaries.
(a) 90% (b) 99% (c) 100% (d) 5%

(21) Creatinine is added in Urine in which step.
(a) Pressore filtration (b) Selective Reabsorption(c) Tubular Secretion(d) All of above

(22) According to NASA contractor report the amount of Urea in Urine is_____.
(a) 9.0g (b) 9.3g (c) 9.6g (d) 10.0g

(23) During Summer which function usually kidney has to do?
(a) Less filtration (b) Increased Reabsorption(c) Both a & b (d) Less Reabsorption

DISORDER OF KIDNEY

(24) More Uric acid in blood can cause_____.
(a) Kidney failure (b) Heart failure (c) Kidney stone (d) Hypertension

(25) Pain in lower Abdomen, vomiting frequent urination and foul smilling urine with blood and pus are symptoms of _____.
(a) Kidney stone (b) Kidney Failure (c) Hypertension (d) Sugar

(26) _____ **Invented the surgical removal stone from urinary bladder.**

(a) Islam's Greatest Scientist Abu-Al-Qasim Al Zahrawi

(b) Abu-Nasr-al-Farabi

(c) Ibn-Al-Hytham

(d) All above

(27) **Diabetes mellitus, Hypertension and Drug overdose can lead to_____.**

(a) Angina (b) Kidney failure (c) Diarrchoea (d) Constipation

(28) **_____type of dialysis can be done at home but must be done everyday**

(a) Peritoneal dialysis (b) Haemodialysis (c) Electrodialysis (d) None of Above

(29) **If a person go to hospital on Monday, Wednesday and Friday and cleans his blood through dialyzer then it is called_____.**

(a) Peritoneal dialysis (b) Haemodialysis (c) Kidney maturation (d) All above

(30) **Following problems can happen with kidney Transplant.**

(a) Rejection reaction (b) Infection & Bone problem

(c) Ulcers (d) All of above

ANSWER KEY

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1	b	11	d	21	c
2	c	12	d	22	b
3	d	13	c	23	c
4	d	14	b	24	c
5	b	15	c	25	a
6	c	16	b	26	a
7	a	17	b	27	b
8	b	18	a	28	a
9	b	19	a	29	b
10	b	20	b	30	d

Q.No.2 Answer these questions. Answer to each part should not exceed three to four lines.

INTRODUCTION TO HOMEOSTASIS

Q.1 Explain the Philosophy of Homeostasis with examples?

Ans: Homeostasis may be defined as the maintenance of the internal conditions of body at equilibrium, despite changes in the external environment. For example, the core temperature of human body remains at about 37°C despite fluctuations in the surrounding air temperature. Similarly, the blood glucose level remains about 1g per litre despite eating a meal rich in carbohydrates.

Q.2 What are three types Homeostasis discuss?

Ans: **Osmoregulation:** It is maintenance of the amounts of water and salts in body fluids (i.e. blood and tissue fluids). We know that the relative amounts of water and salts in body fluids and inside cells control the processes of diffusion and osmosis, which are essential for the functioning of cells (*Recall "the concept of tonicity" from Grade IX biology*).

Thermoregulation: The maintenance of internal body temperature is called thermoregulation. The enzymes of body work best at particular temperatures (optimum temperature). Any change in body temperature may effect the functioning of enzymes.

Excretion is also a process of homeostasis. In this process the metabolic wastes are eliminated from body to maintain the internal conditions at equilibrium.

| Metabolic waste means any material that is produced during body metabolism and that may harm the body. |

HOMEOSTASIS IN PLANTS

Q.3 How Plant do homeostasis? Regarding extra water?

Ans: We know that plants obtain water from soil and it is also produced in the body during cellular respiration. Plants store large amount of water in their cells for turgidity. Extra water is removed from plant body by **transpiration.**

At night, transpiration usually does not occur because most plants have their stomata closed. If there is a high water content in soil, water enters the roots and is accumulated in xylem vessels. Some plants such as grasses force this water through special pores, present at leaf tips or edges, and form drops. The appearance of drops of water on the tips or edges of leaves is called **guttation.** (Fig 11.1)

| **Recalling:** Transpiration is the loss of water from plant surface in the form of vapours. |

| Guttation is not to be confused with dew, which condenses from the atmosphere onto the plant surface. |

Q.4 Is plants can remove waste products, if yes give example?

Ans: plants can also remove their wastes as plants deposit many metabolic wastes in their bodies as **harmless insoluble materials**. For example, calcium oxalate is deposited in the form of crystals in the leaves and stems of many plants e.g. in tomato

In trees which **shed their leaves** yearly, the excretory products are removed from body during leaf fall.

Other waste materials that are removed by some plants are resins (by coniferous trees). Gums (by keekar). Latex (by rubber plant) and mucilage (by carnivorous plants and ladyfinger) etc.

| The removal of excretory product is a secondary function of leaf fall. If the leaves are not shed, the calcium oxalate just remains as harmless crystals in the leaves. |

Q.5 What are Hydrophytes? Give then adaptation?

Ans: **Hydrophytes** are the plants which live completely or partially submerged in freshwater. Such plants do not face the problem of water shortage. They have developed mechanisms for the removal of extra water from their cells. Hydrophytes have broad leaves with a large number of stomata on their upper surface. This characteristic helps them to remove the extra amount of water.

Example: The most common example of such plants is water lily.

Q.6 Write any three changes in Cactus after facing scarce condition:

Ans: **(i)** They possess thick, waxy cuticle over their epidermis to reduce water loss from internal tissues.

(ii) They have less number of stomata to reduce the rate of transpiration. Such plants have deep roots to absorb maximum water from soil.

(iii) Some xerophytes have special parenchyma cells in stems or roots in which they store large quantities of water. This makes their stems or roots wet and juicy, called **succulent organs.** Cacti (Singular: Cactus) are the common examples of such plants.

Q.7 Why sea grasses have more salts in their vacules.

Ans: Salts enter in the bodies of such plants due to their higher concentration in sea water. On the other hand, water tends to move out of their cells into the hypertonic sea water. When salts enter into cells, plants carry out active transport to move and hold large amount of salts in vacuoles. Salts are not allowed to move out through the semi-permeable membranes of vacuoles. So the sap of vacuoles remains even more hypertonic than sea water. In this way, water does not move out of cells.

HOMEOSTASIS IN HUMAN (SKIN)

Q.8 How skin play a role during winter and summer season.

Ans: **During winter**: Skin performs important role in the regulation of body temperature. The thin layer of fat cells in the dermis insulates the body. Contraction of small muscles attached to hairs forms 'Goosebumps'. It creates an insulating blanket of warm air (Fig. 11.5).

During summer: Similarly, skin helps in providing cooling effect when sweat is produced by sweat glands and excess body heat escapes through evaporation.

URINARY SYSTEM IN HUMAN

Q.9 Discuss the route of urine formation with diagram?

Ans: Kidneys filter blood to produce urine and the ureters carry urine from kidneys to urinary bladder. The bladder temporarily stores urine until it is released from body. Urethra is the tube that carries urine from urinary bladder to the outside of body.

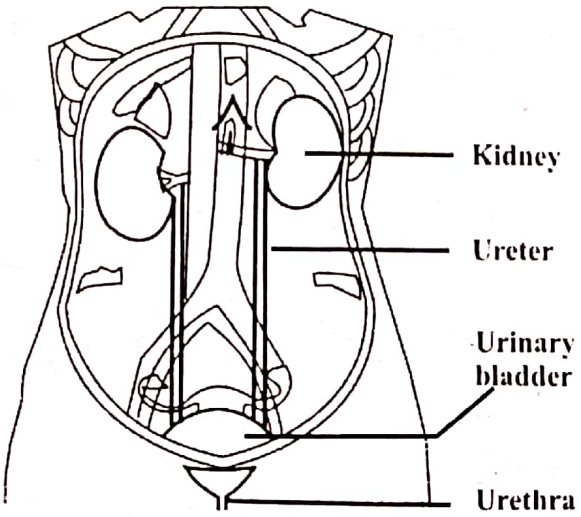


Figure 11.6: The urinary system of humans

Q.10 Draw the label structure of kidney:

Ans:

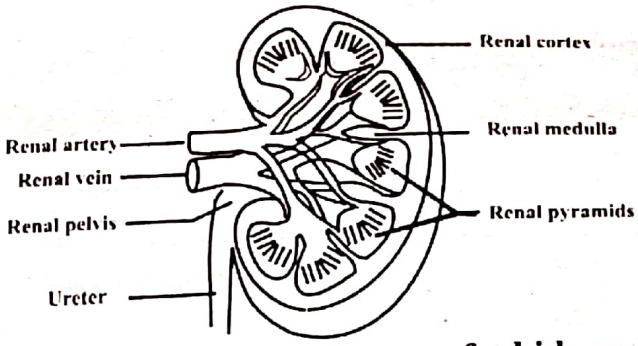


Figure 11.7: The anatomy of a kidney

Q.11 Compare the outer and innerportion of Kidney.

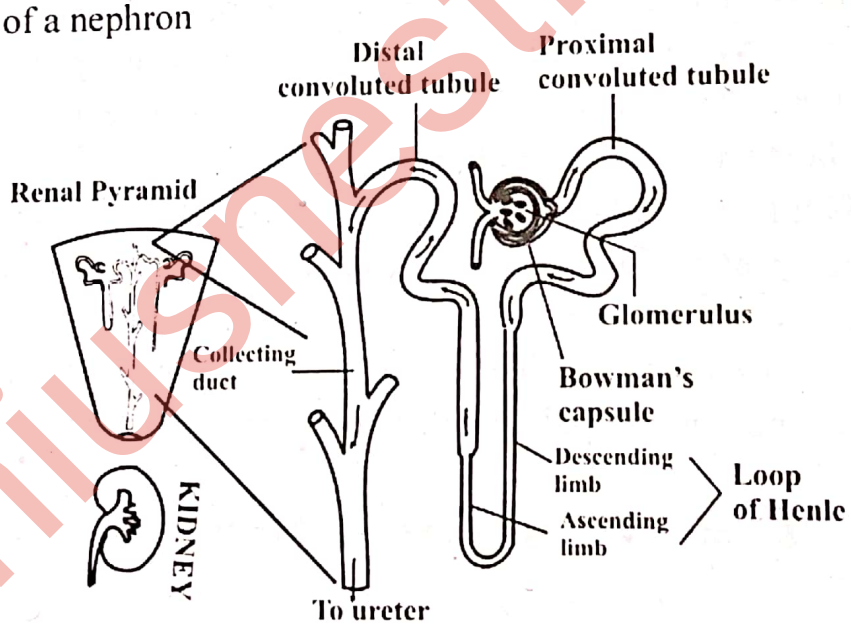
Ans: The longitudinal section of the kidney shows two regions (Fig 11.7). Renal **cortex** is the outer part of kidney and it is dark red in colour. Renal **medulla** is the inner part of kidney and is pale red in colour. Renal medulla consists of several cone shaped areas called renal **pyramids.** Renal pyramids project into a funnel-shaped cavity called renal **pelvis**, which is the base of ureter.

Q.12 Name the parts of Nephron?

Ans: **(i)** Glomerulus **(ii)** Bowman's capsule **(iii)** Renal tubule **(iv)** Proximal convoluted tubule. **(v)** Loop of Henle **(vi)** Distal convoluted **(vii)** Collecting duct **(viii)** papillary ducts

Q.13 Draw the labelled diagram of Nephron?

Ans: The structure of a nephron



Q.14 Most of plasma is preserved while passing from Nephron? Discuss?

Ans: **Selective re-absorption.** In this step about 99% of the glomerular filtrate is reabsorbed into the blood capillaries surrounding renal tubule. It occurs through osmosis, diffusion and active transport. Some water and most of the glucose is reabsorbed from the proximal convoluted tubule. Here, salts are reabsorbed by active transport and then water follows by osmosis. The descending limb of loop of Henle allows the reabsorption of water while the ascending limb of Loop of Henle allows the reabsorption of salts. The distal convoluted tubule again allows the reabosrption of water into the blood.

Q.15 Write composition of Urine?

Ans:

Table 11.1 Normal chemical composition of urine (Source: NASA Contractor Report)	
Water	95%
Urea	9.3g/l
Chloride ions	1.87g/l
Sodium ions	1.17g/l
Potassium ions	0.750g/l
Other ions and compounds	Variable amounts

Q.16 If a child drink 10 glass of water in day, he is not died? Discuss why.

Ans: When there is excess water in body fluids, kidneys form dilute **(hypotonic)** urine. For this purpose, kidneys filter more water from glomerular capillaries into Bowman's capsule. Similarly less water is reabsorbed and abundant dilute urine is produced. It brings down the volume of body fluids to normal. So that's why child is no died.

DISORDERS OF KIDNEY

Q.17 What are causes and symptoms of stone formation in kidney?

Ans: The major **causes** of kidney stones are age, diet(containing more green vegetables, salts, vitamins C and D), recurring urinary tract infections, less intake of water, and alcohol consumption. The **symptoms** of kidney stones include severe pain in kidney or in lower abdomen, vomiting, frequent urination and foul-smelling urine with blood and pus.

Q.18 Discuss three best ways to treat kidney stones?

Ans: About 90% of all kidney stones can pass through the urinary system **by drinking plenty of water.** In **surgical treatment,** the affected area is opened and stone(s) are removed. **Lithotripsy** is another method for the removal of kidney stones. In this method, non-electrical shock waves from outside are bombarded on the stones in the urinary system. Waves hit the dense stones and break them. Stones become sand-like and are passed through urine.

Q.19 Discuss the role of Ever remembered Muslim Surgeon and one Muslim nephrologists?

Ans: Nephrologist:

Abu Nasr al-Farabi (872-951) was a prominent scientist who wrote many books that contained information about kidney diseases.

Surgeon:

The genius Abu al-Qasim Al-Zahrawi (known as Albucasis: 936-1013), is considered to be Islam's greatest surgeon who invented many surgical procedures including the surgical removal of stones from the urinary bladder. His encyclopedia, Al-Tasrif ("The Method"), contained over 200 surgical medical instruments he personally designed.

Q.20 What are causes and Symptoms of Kidney failure?

Ans: **Diabetes mellitus** and **hypertension** are the leading causes of kidney failure. In certain cases, sudden interruption in the blood supply to kidney and drug overdoses may also result in kidney failure.

The main symptom of kidney failure is the high level of urea and other wastes in blood, which can result in vomiting, nausea, weight loss, frequent urination and blood in urine. Excess fluids in body may also cause swelling of legs, feet and face and shortness of breath.

Q.21 What is Home-carrying dialysis?

Ans: **Peritoneal Dialysis**

In this type of dialysis, the dialysis fluid is pumped for a time into the peritoneal cavity which is the space around gut (Fig. 11.11). This cavity is lined by peritoneum. Peritoneum contains blood vessels. When we place dialysis fluid in peritoneal cavity, waste materials from peritoneal blood vessels diffuse into the dialysis fluid, which is then drained out. This type of dialysis can be performed at home, but must be done every day.

Q.22 What is dialyzer ?Write its principles

Ans: **Dialyzer.**

The dialyzer contains long tubes, the walls of which act as semi-permeable membranes (Fih.11.12.) Blood flows through the tubes while the dialysis fluid flows around the tubes. Extra water and wastes move from blood into the dialysis fluid. The cleansed blood is then returned back to body.

Q.1 What is metabolic waste?

Ans: **Metabolic waste:** Any material that is produces during body metabolism and that may harm the body is called metabolic waste

Q.2 Define transpiration.

Ans: **Transpiration:** The loss of water from plant surface in the form of vapours is called transpiration.

Q.3 What is difference between transpiration and guttation?

Ans:

DIFFERENCE BETWEEN TRANSPIRATION AND GUTTATION

Transpiration	Guttation
Definition: The loss of water from plant surface in the form of vapours is called transpiration. ***Time:*** It takes place in day time. ***Types:*** It has three types: • Stomatal transpiration • Cuticular transpiration • Lenticular transpiration ***Examples:*** All plants	***Definition:*** The appearance of drops of water on the tips or edges of leaves is called guttation. ***Time:*** It takes place at night time. ***Types:*** It has no other type. ***Examples:*** Some grasses

Q.4 Why guttation should not be confused with due?

Ans:

CONFUSION BETWEEN GUTTATION AND DUE

Guttation is not to be confused with due, which condenses from the atmosphere onto the plant surface.

Q.5 Write names of excretory products in plants:

Ans:

EXCRETORY PRODUCTS IN PLANTS

The following are the excretory products in plants:

- Oxygen
- Carbon dioxide
- Water
- Calcium oxalate
- Latex
- Resins
- Gums
- Mucilage

Q.6 Which organs work for homeostasis in humans?

Ans:

ORGANS FOR HOMEOSTASIS IN HUMANS

The following organs work for homeostasis in humans:

Lungs:

Lungs remove excess carbon dioxide and keep it in balance.

Skin:

Skin performs role in the:

- Maintenance of body temperature
- Removal of excess water and salts

Kidneys:

The kidneys filter the following from the blood and form urine:

- Excess water
- Salts
- Urea
- Uric acid

Q.7 What are 'Goosebumps'?

Ans:

GOOSEBUMPS

Formation:

Contraction of small muscles attached to hairs forms 'Goosebumps'.

Function:

It creates an insulation blanket of warm air.

Q.8 Explain role of lungs in excretion of carbon dioxide.

Ans:

ROLE OF LUNGS IN EXCRETION OF CARBON DIOXIDE

Lungs maintain the concentration of carbon dioxide in the blood. Our cells produce carbon dioxide when they perform cellular respiration. From cells, carbon dioxide diffuses into tissue fluid and from here into blood. Blood carries carbon dioxide to lungs from where it is removed in air.

Q.9 Which materials do not filter through the glomerular capillaries and why?

Ans: The following materials are not filtered through the glomerular capillaries:

- Blood cells
- Proteins

Reason:

They are relatively larger in size.

Q.10 What is the percentage of originally filtered volume of glomerular filtrate that forms urine?

Ans: At the final stage, urine is only 1% of the originally filtered volume.

Q.11 What volume of urine is produced by an average human adult per day?

Ans: The typical volume of urine produced by an average adult is around 1.4 liters per day.

Q.12 What is the composition of the kidney stones?

Ans:

COMPOSITION OF KIDNEY STONES

The kidney stones are composed of the crystals of the following salts:

- Calcium oxalate
- Calcium phosphate
- Ammonium phosphate
- Uric acid

Q.13 What causes the materials to move from glomerular capillaries to Bowman's capsule?

Ans: Blood pressure causes the materials to move from glomerular capillaries to Bowman's capsule

Q.14 What is the contribution of Abu Nasr al-Farabi?

Ans:

CONTRIBUTION OF ABU NASR AL-FARABI

Period: 872-951

Contribution:

He was a prominent scientist who wrote many books that contained information about kidney disease.

Q.15 What is the contribution of Abu al-Qasim al-Zahrawi?

Ans:

CONTRIBUTION OF ABU AL-QASIM AL-ZAHRAWI

He is also known as Albucasis.

Period: 936-1013

Contribution:

He is considered to be Islam's greatest surgeon who invented many surgical procedures including the surgical removal of stones from the urinary bladder.

Publication:

His encyclopedia, Al-Tasrif ("The Mehthod"), contained over 200 surgical medical instruments he personally designed.

Q.16 Define kidney failure.

Ans:

KIDNEY FAILURE

The complete or partial failure of kidney to function is called kidney failure.

Q.17 What are the leading causes of kidney failure?

Ans:

LEADING CAUSES OF KIDNEY FAILURE

The following are the leading causes of kidney failure:

- Diabetes mellitus
- Hypertension

Q.18 Enlist the cause of kidney failure.

Ans:

CAUSES OF KIDNEY FAILURE

The following are the causes of kidney failure:

- Diabetes mellitus
- Hypertension
- Sudden interruption in the blood supply of kidney
- Drug overdosage

Q.19 What are the symptoms of kidney failure?

Ans:

SYMPTOMS OF KIDNEY FAILURE

The following are the symptoms of kidney failure:

- High level of urea in blood
- High level of waste materials in blood
- Vomiting
- Nausea
- Weight loss
- Frequent urination
- Blood in urine
- Swelling of legs, feet and face
- Shortness of breath

Q.20 How is kidney failure treated?

Ans:

TREATMENT OF KIDNEY FAILURE

The kidney failure is treated with:

- Dialysis
- Kidney transplant

Q.21 What problems may arise after kidney transplant.

Ans:

PROBLEMS AFTER TRANSPLANT

Problems after a transplant may include:

- Transplant rejection
- Infections
- Imbalances in body salts
- Bone problems
- Ulcers

LONG QUESTIONS LONG QUESTIONS

Q.No.1 What is homeostasis? Explain with examples.

HOMEOSTASIS

Definition:

The maintenance of the internal conditions of the body at equilibrium, despite changes in the external environment is called homeostasis.

Examples:

Body Temperature:

The core temperature of human body remains at about 37°C despite fluctuations in the surrounding air temperature.

Blood Glucose Level:

The blood glucose level remains about 1g per litre despite eating a meal rich in carbohydrates.

Importance of Homeostasis:

Body cells need the internal environment in which conditions do not change much. Stable internal conditions are important for the efficient functioning of enzymes.

Types of homeostasis

The following are some types of homeostasis:

(i) Osmoregulation
(ii) Thermoregulation
(iii) Excretion

(i) Osmoregulation:

Definition:

The maintenance of the amounts of water and salts in body fluids (i.e. blood and tissue fluids) is called homeostasis.

Importance:

The relative amounts of water and salts in body fluids and inside cells control the processes of diffusion and osmosis, which are essential for the functioning of cells.

(ii) Thermoregulation:

Definition:

The maintenance of internal body temperature is called thermoregulation.

Example:

The enzymes of body work best at particular temperatures (optimum temperature). Any change in body temperature may affect the functioning of enzymes.

(iii) Excretion:

The elimination of metabolic wastes from body to maintain the internal conditions at equilibrium is called excretion.

Q.No.2 How extra carbon dioxide and oxygen is removed by plants?

REMOVAL OF EXTRA CARBON DIOXIDE

During Day Time:

In daytime, the carbon dioxide produced during cellular respiration is utilized in photosynthesis and hence it is not a waste product.

During Night Time:

At night, it is surplus because there is no utilization of carbon dioxide. It is removed from the tissue cells by diffusion.

Leaves and Stems:

In leaves and young stems, carbon dioxide escapes out through stomata.

Roots:

In young roots, carbon dioxide diffuses through the general root surface, especially through root hairs.

Removal of Oxygen

Oxygen is produced in mesophyll cells only during daytime, as a by-product of photosynthesis. After its utilization in cellular respiration, the mesophyll cells remove the extra amount of oxygen through stomata.

Q.No.3 How do plants get rid of extra water?

REMOVAL OF EXTRA WATER

Plants obtain water from soil and it is also produced in the body during cellular respiration. Plants store large amount of water in their cells for turgidity.

Extra water is removed from plant body by transpiration.

Transpiration:

The loss of water from plant surface in the form of vapours is called transpiration.

During Night Time:

At night, transpiration usually does not occur because most plants have their stomata closed.

Guttation:

The appearance of drops of water on the tips or edges of leaves is called guttation.

Explanation:

If there is high water content is soil, water enters the roots and is accumulated in xylem vessels. Some plants force this water through special pores, present at leaf tips or edges, and form drops.

Example:

Some grasses

Guttation versus Dew:

Guttation is not to be confused with dew, which condenses from the atmosphere onto the plant surface.

Q.No.4 Explain the removal of metabolic waste products in plants.

REMOVAL OF METABOLIC WASTES

Metabolic waste:

Any material that is produced during body metabolism and that may harm the body is called metabolic waste.

Plants deposit many metabolic wastes in their bodies as harmless insoluble materials.

Calcium Oxalate:

Calcium oxalate is deposited in the form of crystals in the leaves and steams of many plants.

Tomato

Resins:

Coniferous trees

Gums:

Keekar

Latex:

Rubber plant

Mucilage:

- Carnivorous plants
- Ladyfinger

Leaf Fall:

In trees which shed their leaves yearly, the excretory products are removed from body during leaf fall.

Q.No.5 Explain osmotic adjustments in plants.

OSMOTIC ADJUSTMENTS IN PLANTS

On the basis of the available amount of water and salts, plants are divided into three groups.

(i) Hydrophytes
(ii) Xerophytes
(iii) Halophytes

(i) Hydrophytes:

Occurrence:

Hydrophytes are the plants which live completely or partially submerged in freshwater. Such plants do not face the problem of water shortage.

Mechanism:

They have developed mechanisms for the removal of extra water from their cells. Hydrophytes have broad leaves with a large number of stomata on their upper surface. This characteristic helps them to remove the extra amount of water.

Example:

Water lily

(ii) Xerophytes:

Occurrence:

Xerophytes live in dry environments.

Cuticle:

They possess thick and waxy cuticle over their epidermis, to reduce water loss from internal tissues.

Number of Stomata:

They have less number of stomata to reduce the rate of transpiration.

Deep Roots:

Such plants have deep roots to absorb maximum water from soil.

Succulent Stems:

Some xerophytes have special parenchyma cells in stems or roots in which they store large quantities of water. This makes their stems or roots wet and juicy, called succulent organs.

Example:

Cacti (singular cactus)

(iii) Halophytes:

Occurrence:

Halophytes live in sea waters and are adapted to salty environments.

Entry of Salts:

Salts enter in the bodies of such plants due to their higher concentration in sea water.

Removal of Water:

Water tends to move out of their cells into the hypertonic sea water.

Mechanism:

When salts enter into cells, plants carry out active transport to move and hold large amount of salt in vacuoles. Salts are not allowed to move out through the semi-permeable membranes of vacuoles. So the sap of vacuoles remains even more hypertonic than sea water. In this way, water does not move out of cells.

Example:

Many sea grasses

Q.No.6 Explain role of skin in homeostasis.

ROLE OF SKIN IN HOMEOSTASIS

Skin performs role in:

- The maintenance of body temperature
- Removal of excess water and salts

Structure of Skin:

Our skin consists of two layers:

(i) Epidermis

(ii) Dermis

(i) Epidermis:

The outer protective layer without blood vessels is called epidermis.

(ii) Dermis:

The inner layer of skin which consists of:

- Blood vessels
- Sensory nerve endings
- Sweat glands
- Oil glands
- Hairs
- Fat cells

FUNCTIONS

Role in Insulation:

Function of Fat Cells:

The thin layer of fat cells in the dermis insulates the body.

Function of Hairs:

Contraction of small muscles attached to hairs forms 'Goosebumps'. It creates an insulation blanket of warm air.

Role in Cooling:

Skin helps in providing cooling effect when sweat is produced by sweat glands and excess body heat escapes through evaporation.

Removal of Metabolic Wastes:

The following metabolic wastes are also removed in sweat:

- Excess water
- Salts
- Urea
- Uric acid

Q.No.7 Describe the human urinary system.

HUMAN URINARY SYSTEM

The human urinary system consists of the following:

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

(i) **A Pair of Kidneys:**

A pair of kidneys is present against the back wall of abdominal cavity just below diaphragm, one on either side of the vertebral column. The kidneys filter blood to produce urine.

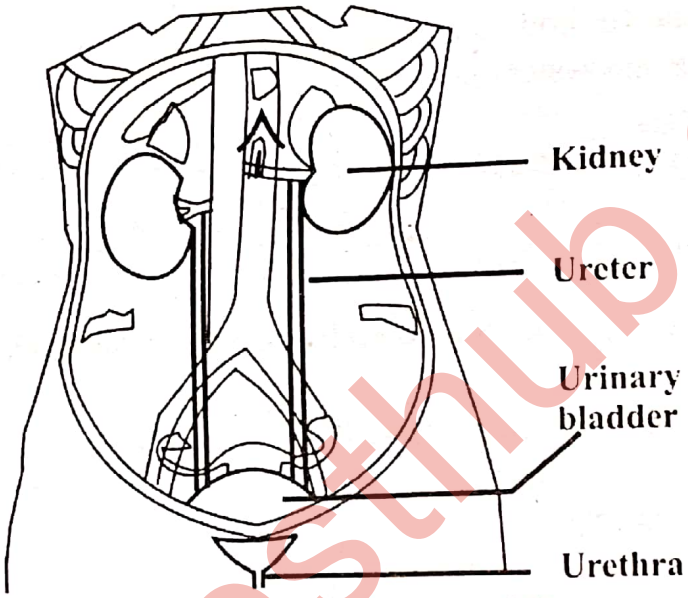


Figure: The Urinary System of Humans

(ii) **A Pair of Ureters:**

The ureters carry urine from kidneys to the urinary bladder.

(iii) **A Urinary Bladder:**

The urinary temporarily stores urine until it is released from the body.

(iv) **Urethra:**

Urethra is the tube that carries urine from urinary bladder to the out side of the body.

Q.No.8 Describe the structure of kidney.

HUMAN KIDNEY

Colour:

The kidneys are dark-red in colour.

Shape:

The kidneys are bean shaped.

Dimensions:

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

Weight:

Each kidney weighs about 27 grams.

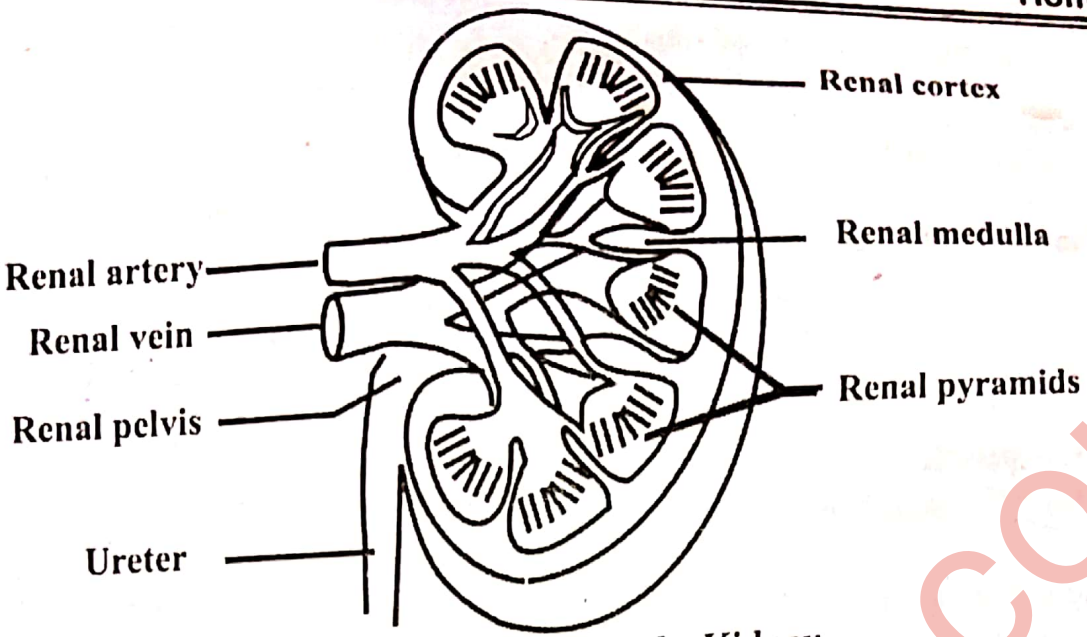


Figure: The Anatomy of a Kidney

Location:

The kidneys are placed against the back wall of abdominal cavity just below diaphragm, one on either side of vertebral column. The left kidney is a little higher than the right. The concave side of the kidney faces vertebral column.

Protection:

The kidneys are protected by the last two ribs.

STRUCTURE OF KIDNEY

Each kidney consists of the following structures:

(i) Hilus
(ii) Renal Cortex
(iii) Renal Medulla
(iv) Renal Pyramids
(v) Renal Pelvis

(i) **Hilus:**
There is a depression near the centre of the concave area of the kidney called hilus. This is the area of kidney through which ureter leaves kidney and the following structures enter and leave kidney:

- Blood vessels
- Lymphatic vessels
- Nerves

(ii) **Renal Cortex:**
Renal cortex is the outer part of kidney. It is dark red in colour.

(iii) **Renal Medulla:**
Renal medulla is the inner part of the kidney. It is pale red in colour.

(iv) **Renal Pyramids:**
Renal medulla consists of several cone shaped areas called renal pyramids.

(v) **Renal Pelvis:**
Renal pyramids project into a funnel-shaped cavity called renal pelvis, which is the base of ureter.

Q.No.9 Describe the structure of nephron.

NEPHRON

Definition:

The functional unit of the kidneys is called nephron.

Number:

There are over one million nephrons in each kidney.

STRUCTURE OF NEPHRON

There are two parts of a nephron

(i) Renal Corpuscle

(ii) Renal Tubule

(i) Renal Corpuscle:

The renal corpuscle is not tubular. It consists of two parts:

Glomerulus:

It is the network of capillaries. The capillaries of the glomerulus arise from the afferent arteriole and join to form the efferent arteriole.

Bowman's Capsule:

Bowman's capsule is a cup-shaped structure that encloses glomerulus.

(ii) Renal Tubule:

The renal tubule is the part of the nephron which starts after Bowman's capsule. It consists of three parts:

Proximal Convoluted Tubule:

The first portion of the renal tubule is called proximal convoluted tubule.

Loop of Henle:

Next portion of renal tubule is U-shaped and is called the Loop of Henle.

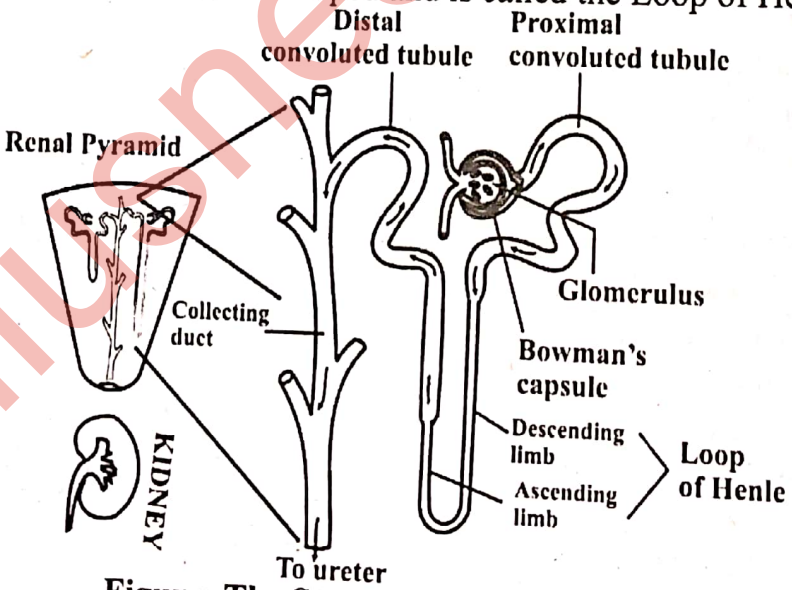


Figure: The Structure of a Nephron

Distal Convoluted Tubule:

The last portion of the renal tubule is the distal convoluted tubule.

Collecting Duct:

The distal convoluted tubules of many nephrons open in a single collecting duct.

Papillary Ducts:

Many collecting ducts join together to form several hundred papillary ducts which drain into renal pelvis.

Q.No.10 Describe the functioning of kidney.

FUNCTIONING OF KIDNEY

The main function of kidney is urine formation, which takes place in the following three steps:

(i) Pressure Filtration
(ii) Selective Re-absorption
(iii) Tubular Secretion

(i) **Pressure Filtration:**

This is the first step. When blood enters the kidney via the renal artery, it goes to many arterioles, and then to the glomerulus. The pressure of blood is very high and so most of the water, salts, glucose and urea of blood is forced out of glomerular capillaries.

Glomerular Filtrate:

The material that passes into the Bowman's capsule from the glomerulus after pressure filtration is called glomerular filtrate.

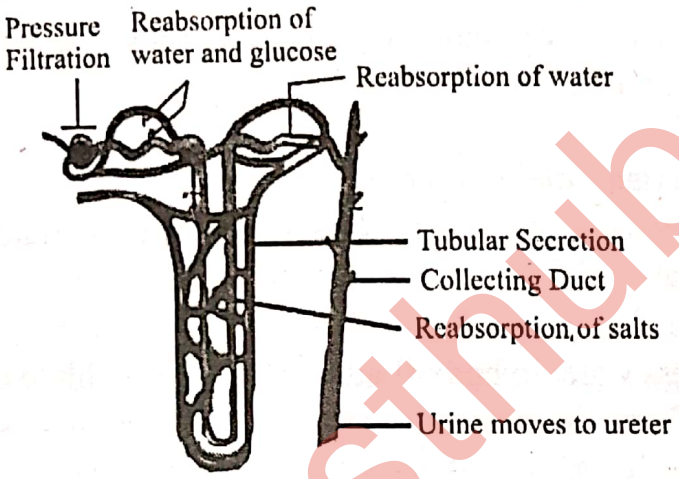


Figure: Functioning of Kidney (Nephron)

(ii) **Selective Re-absorption:**

The second step is the selective re-absorption. In this step about 99% of the glomerular filtrate is reabsorbed into the blood capillaries surrounding renal tubule. The selective re-absorption occurs through:

- Osmosis
- Diffusion
- Active transport

Proximal Convoluted Tubule:

Some water and most of the glucose is reabsorbed form the proximal convoluted tubule. Here, salts are reabsorbed by active transport and then water follows by osmosis.

Loop of Henle:

The descending limb of Loop of Henle allows the re-absorption of water while the ascending limb of Loop of Henle allows the re-absorption of salts.

Distal Convoluted Tubule:

The distal convoluted tubule again allows the re-absorption of water into the blood.

(iii) **Tubular Secretion:**

The third step is the tubular secretion. Different ions, creatinine, urea etc. are secreted from blood into the filtrate in renal tubule. This is done to maintain blood at a normal pH (7.35 to 7.45).

Urine:

After all these mentioned steps, the filtrate present in renal tubules is known as urine. It moves into collecting ducts and then into pelvis.

Q.No.11 Describe the normal chemical composition of urine.

NORMAL CHEMICAL COMPOSITION OF URINE

Ingredients	Quantity
Water	95%
Urea	9.3 g/l
Chloride ions	1.87 g/l
Sodium ions	1.17 g/l
Potassium ions	0.750 g/l
Other ions and compounds	Variable amounts

Q.No.12 Describe the osmoregulatory function of kidney.

OSMOREGULATORY FUNCTION OF KIDNEY

Osmoregulation:

The regulation of the concentration of water and salts in blood and other body fluids is called osmoregulation.

Importance:

Kidneys play important role in osmoregulation by regulating the water contents of blood. It is an important process as excessive loss of water concentrates the body fluids whereas excess intake of water dilutes them.

Greater Water Potential:

When there is excess water in body fluids, kidneys form dilute (hypotonic) urine. For this purpose, kidneys filter more water from glomerular capillaries into Bowman's capsule. Similarly less water is reabsorbed and abundant dilute urine is produced. It brings down the volume of body fluids to normal.

Lesser Water Potential:

When there is shortage of water in body fluids, kidneys filter less water from glomerular capillaries and the rate of reabsorption of water is increased. Less filtration and more reabsorption produce small amount of concentrated (hypertonic) urine. It increases the volume of body fluids to normal.

Hormonal Control:

This whole osmoregulatory process of kidney is under hormone control.

Q.No.13 Write a note on kidney stones.

KIDNEY STONES

Formation:

When urine becomes concentrated crystals of the following salts are formed:

- Calcium oxalate
- Calcium phosphate
- Ammonium phosphate
- Uric acid

Such large crystals can not pass in urine and form hard deposits called kidney stones.

Other Organs:

Most stones start in kidney, some may travel to ureter or urinary bladder.

Causes:

The major causes of kidney stones are:

- Age
- Diet (containing more green vegetables, salts, vitamins C and D)
- Recurring urinary tract infections
- Less intake of water
- Alcohol consumption

Symptoms:

The symptoms of kidney stones include:

- Severe pain in kidney or in lower abdomen
- Vomiting
- Frequent urination
- Foul-smelling urine
- Urine with blood and pus

Treatment:

The treatment of kidney stones includes:

Excessive Water Intake:

About 90% of all kidney stones can pass through the urinary system by drinking plenty of water.

Surgical Treatment:

In surgical treatment, the affected area is opened and stone(s) are removed.

Lithotripsy:

Lithotripsy is another method for the removal of kidney stones. In this method, non-electrical shock waves from outside are bombarded on the stones in the urinary system. Waves hit the dense stones and break them. Stones become sand-like and are passed through urine.

Q.No.14 Write a note on dialysis.

DIALYSIS

Definition:

The cleaning of blood by artificial ways is called dialysis.

METHODS OF DIALYSIS

There are two methods of dialysis

(i) Peritoneal Dialysis

(ii) Haemodialysis

(i) Peritoneal Dialysis:

Peritoneum:

In this type of dialysis, the dialysis fluid is pumped for a time into the peritoneal cavity which is the space around gut. This cavity is lined by peritoneum. Peritoneum contains blood vessels.

Extraction of Waste Materials:

When we place dialysis fluid is peritoneal cavity, waste materials from peritoneal blood vessels diffuse into the dialysis fluid, which is then drained out.

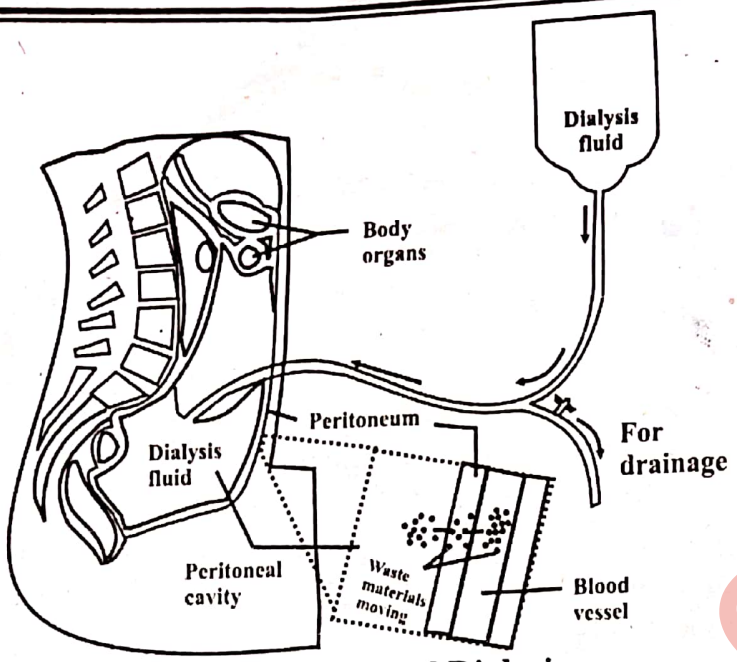


Figure: Peritoneal Dialysis

Duration:

This type of dialysis can be performed at home, but must be done every day.

(ii) Haemodialysis:

Dialyzer:

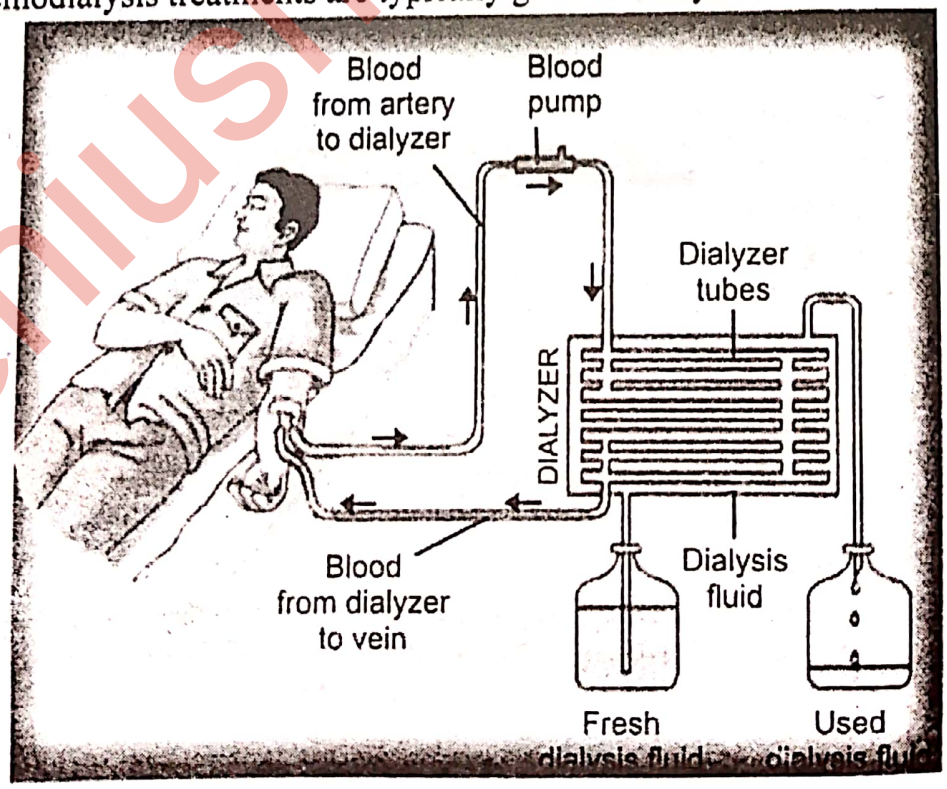
In haemodialysis, patient's blood is pumped through an apparatus called dialyzer. The dialyzer contains long tubes, the walls of which act as semi-permeable membranes.

Extraction of Waste Materials:

Blood flows through the tubes while the dialysis fluid flows around the tubes. Extra water and wastes move from blood into the dialysis fluid. The cleansed blood is then returned back to body.

Duration:

The haemodialysis treatments are typically given in dialysis centres three times per week.



Q.No.15 Write a note on kidney transplant.

KIDNEY TRANSPLANT

Problem with Dialysis:

Dialysis needs to be repeated after every few days and is unpleasant for patients and attendants.

End Stage Treatment:

Another treatment for the end-stage kidney failure is kidney transplantation.

Definition:

The replacement of patient's damaged kidney with a donor healthy kidney is called kidney transplant.

Donors:

Kidney may be donated by a deceased donor or living donor. The donor may or may not be a relative of the patient.

Matching:

Before transplant, the tissue proteins of donor and patient are matched.

Transplantation:

The donor's kidney is transplanted in patient's body and is connected to the patient's blood and urinary system.

Average Life Time:

The average lifetime for a donated kidney is ten to fifteen years.

Failure of Transplant:

When a transplant fails, the patient may be given a second kidney transplant. In this situation, the patient is treated through dialysis for some intermediary time.

Problems after Transplant:

Problems after a transplant may include:

- Transplant rejection
- Infections
- Imbalances in body salts
- Bone problems
- Ulcers

EXERCISE MULTIPLE CHOICE QUESTIONS

❋ **Each question has four possible answers. Circle the correct answer.**

(i) The human urinary system consists of:
(a) Rectum, lungs, kidneys, ureters
(b) Kidneys, ureters, urinary bladder
(c) Skin, liver, lungs, kidneys
(d) Kidneys, ureters, urinary bladder, urethra

(ii) Which organ is responsible for filtering the blood?
(a) Intestine (b) Brain (c) Stomach (d) Kidney

(iii) The tube between kidney and urinary bladder is the:
(a) Ureter (b) Urethra (c) Renal tubule (d) Nephron

(iv) 'Body balance' of water, salts, temperature and glucose is termed as:
(a) Excretion (b) Tubular secretion (c) Homeostasis (d) Re-absorption

(v) Which is the correct order for the path taken by urine after it leaves the kidneys?
(a) Urethra, bladder, ureters (b) Bladder, ureters, urethra
(c) Ureters, bladder, urethra (d) Bladder, urethra, ureters

(vi) What is the function of the ureter?
(a) To store urine
(b) To carry urine from the kidney to the bladder
(c) To carry urine out of the body
(d) To remove waste from the blood

(vii) What waste products are excreted by kidneys?
(a) Urea, water & salts
(b) Salts, water and carbon dioxide
(c) Urea & water
(d) Urea & salts

(viii) The two main functions of sweat are:
(a) To keep the body cool and to remove excess proteins
(b) To keep the body warm and to filter the blood
(c) To filter the blood and to remove waste products
(d) To remove waste products and to cool the body

(ix) Which would NOT be present in the filtrate entering the Bowman's capsule of nephron?
(a) Water (b) Calcium ions (c) Blood cells (d) Urea

(x) During peritoneal dialysis, the waste materials move from:
(a) The abdomen to the dialysis fluid
(b) The dialysis fluid to the peritoneum blood vessels
(c) The peritoneum blood vessels to the dialysis fluid
(d) The dialysis fluid to the abdomen

ANSWER KEY

Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.	Q.No.	Ans.
1	d	2	d	3	a	4	c	5	c
6	b	7	a	8	d	9	c	10	c

SHORT QUESTIONS
From Text Book Exercise

Q.1 What are the major organs involved in homeostasis in human body? State the roles of each of these organs.

- **Skin:** It play a role for homeostasis of temperature, water, salts and little amount of waste products.
- **Kidney:** It removes the waste products especially nitrogenous wastes.
- **Lungs:** It is involved in homeostasis of gaseous.

Q.2 Identify and label the following: diagram

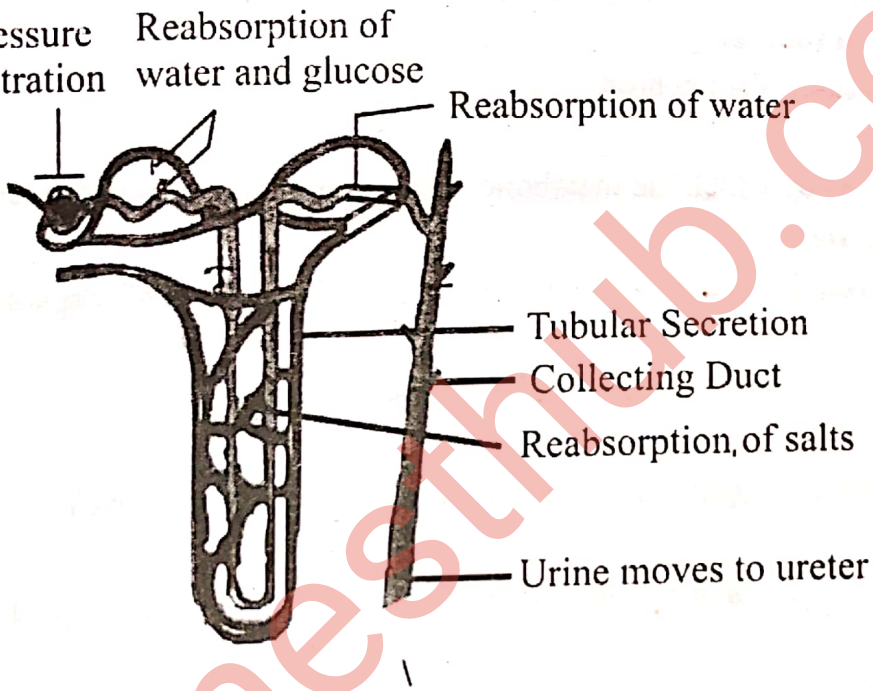


Figure: Functioning of Kidney

UNDERSTANDING THE CONCEPT

(i) Describe the process of selective re-absorption in the kidneys.

Consult Long Question No. 10

(ii) How do the plants excrete extra water and salts from their bodies?

Consult Long Question No. 3 and 4

(iii) What is the functional unit of the kidney? Describe its structure and draw labeled diagram.

Consult Long Question No. 9

(iv) What steps are involved in the formation of urine in the kidneys?

Consult Long Question No. 10

(v) "Along with excretion, kidneys also play role in Osmoregulation, "Comment on this statement.

Consult Long Question No. 12

THE TERMS TO KNOW

Bowman's capsule:
Part of nephron; cup-shaped structure enclosing the glomerulus

Collecting duct:
The tube into which the renal tubule of nephron opens

Dialysis:
The cleaning of blood (removing nitrogenous wastes and extra water) by artificial ways

Dialyzer:
The apparatus used for haemodialysis

Distal convoluted tubule:
The last part of the nephron

Excretion:
The process by which the metabolic wastes are removed from the body

Glomerular filtrate:
The material that passes from glomerulus into the Bowman's capsule

Glomerulus:
The network of capillaries in the nephron of the kidney

Guttation:
Appearance of drops of xylem sap on the tips or edges of leaves

Haemodialysis:
The dialysis in which patient's blood is pumped through the apparatus called dialyzer for cleaning

Hilus:
A depression near the centre of the concave area of the kidney; the area through which the ureter, blood and lymphatic vessels and nerves enter/leave the kidney

Homeostasis:
The maintenance of a constant internal environment in response to environmental changes

Lithotripsy:
Treatment for removing kidney stones; non-electrical shock waves are bombarded on the stones to break them

Loop of Henle:
The U-shaped portion of the renal tubule of nephron

Nephron:
The functional unit of kidneys

Osmoregulation:
The regulation of water content in body fluids

Papillary ducts:
The ducts formed by the joining of many collecting ducts; open into renal pelvis

Peritoneal dialysis:
The dialysis in which the dialysis fluid is pumped into the abdominal peritoneal cavity; the wastes from the blood vessels of the peritoneum diffuse into the dialysis fluid which is then drained out

Pressure filtration:
The first step in urine formation; the process in which most of the water, salts, glucose and urea of the blood is forced out of the glomerulus and passes into Bowman's capsule

Proximal convoluted tubule:
The part of the nephron between Bowman's capsule and the Loop of Henle

Renal corpuscle:
The collective name of the glomerulus and Bowman's capsule of the nephron

Renal pelvis:
The funnel-shaped cavity into which the renal pyramids of kidney project

Renal pyramid:
Cone-shaped areas in the renal medulla

Renal tubule:
The part of the nephron after Bowman's capsule; consists of proximal convoluted tubule, Loop of Henle and distal convoluted tubule

Selective reabsorption:
The second step in urine formation, in it about 99% of the glomerular filtrate is reabsorbed into the blood capillaries surrounding the renal tubule

Tubular secretion:
The third step in urine formation; different ions, creatinine, urea etc. are secreted from the blood into the filtrate in the renal tubule

Ureter:
A tube that carries urine from a kidney to the urinary bladder

Urethra:
The tube that carries urine from urinary bladder to the outside of the body

Urinary baldder:
A sac-like organ where urine is stored before being excreted

Urinary system:
The system responsible for the production and excretion of urine; includes kidneys, ureters, urinary bladder and urethra.