SHORT QUESTIONS

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

Ans: Homeostasis in humans:

Like other complex animals, humans have highly developed systems for homeostasis. The following are the main organs which work for homeostasis.

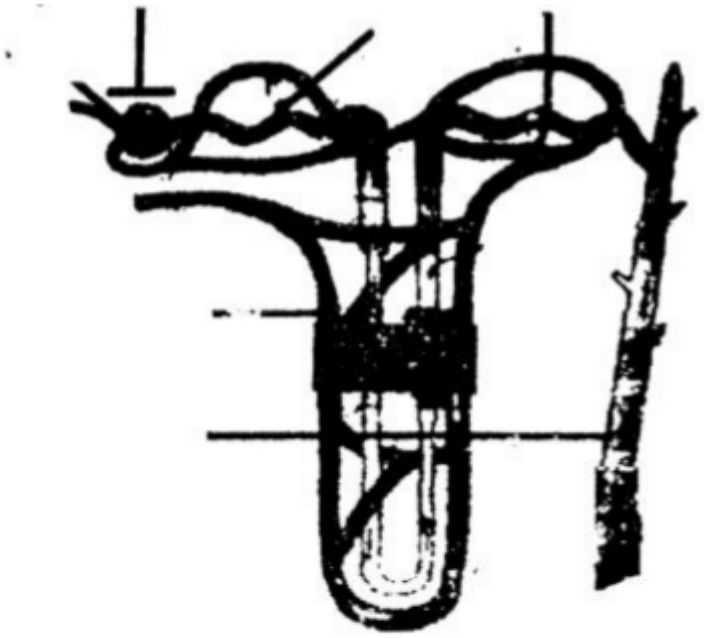
Major organs involved in homeostasis in human body:

i. **Lungs:**
Lungs remove excess carbon dioxide and keep it in balance.

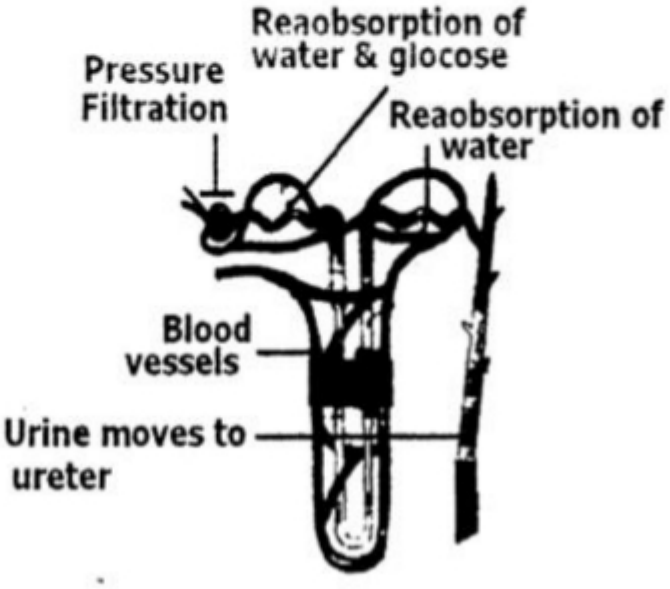
ii. **Skin:**
Skin performs role in the maintenance of body temperature and also removes excess water and salts.

iii. **Kidney:**
The kidney filters excess water, salt, uric acid etc. from the blood forms urine.

2. **Identify and label the following: diagram.**



Ans.


Reaobsorption of water & glocose
Pressure Filtration
Reaobsorption of water
Blood vessels
Urine moves to ureter

UNDERSTANDING THE CONCEPT

1. **Describe the process of selective re-absorption in the kidneys.**

   Ans: 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 reabsorption of water into the blood.

2. **How do the plants excrete extra water and salts from their bodies?**

   Ans: 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.

   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.

Guttation:

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

Guttation in Different plants

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

Removal of Salts:

i. **Removal of Calcium oxalate:**

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

Caclium oxalate needles in a leaf cell

ii. **Removal of Metabolic waste by leaf fall:**

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

iii. **Removal of Risns:**

Other waste materials that are removed by some plants are resins coniferous trees).

iv. **Removal of Gums:**

Gums (by keekar)

v. **Removal of Latex:**

Latex (by rubber plant).

vi. **Removal of Mucilage:**

Mucilage (by carnivorous plants and ladyfinger).

3. **What is the functional unit of the kidney? Describe its structure and draw labeled diagram.**

Ans: Nephron;

The functional unit of the kidneys is called nephron. There are over ono million nephrons in each kidney.

Parts of nephron:

There are two parts of a nephron i.e. renal corpuscle and renal tubule

i. **renal corpuscle:**

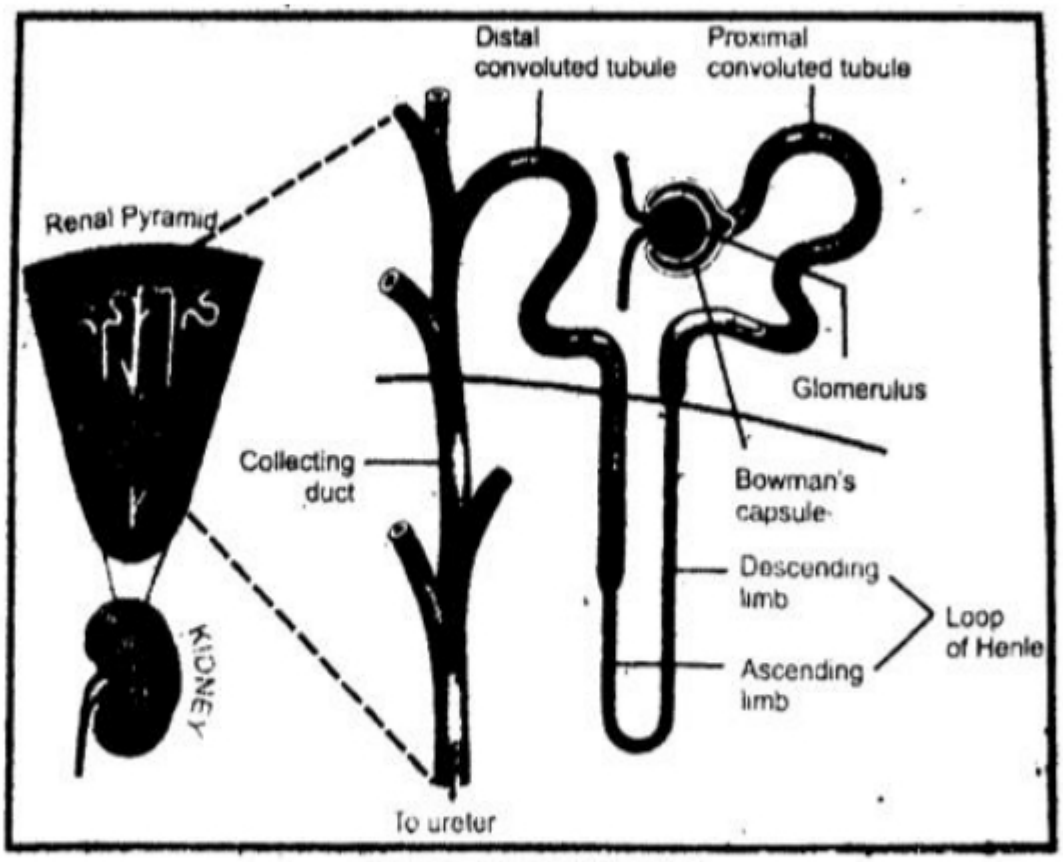
The renal corpuscle is not tubular and has two parts i.e. glomerulus and capsule. Glomerulus is a network of capillaries while Bowman's capsule is a cup-shaped structure that encloses glomerulus.

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

ii. **Renal tubule:**

The renal tubule is the part of nephron which starts after Bowman's capsule its first portion is called the proximal convoluted tubule. Next portion is U-shaped and is called the Loop of Henle. The last portion of renal tubule is the **distal convoluted tubule.**

The distal convoluted tubules of many nephrons open in a single collecting duct. Many collecting ducts join together to form several hundred papillary ducts which drain into renal pelvis.



Structure of a nephron

4. What steps are involved in the formation of urine in the kidneys?

Ans: Functioning of Kidney:

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

Formation of urine:

i. **Pressure filtration:**

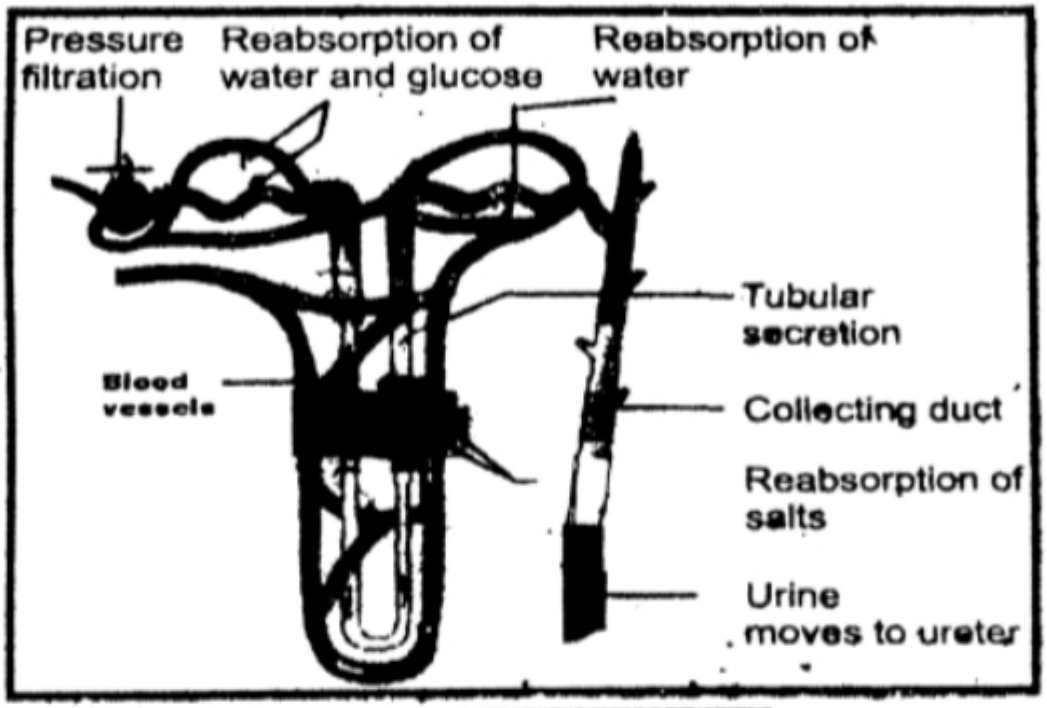
The first step is pressure filtration. When blood enters the kidney via the renal artery, it goes to many arterioles, and then to the glomerulus. The pressure of blood is very high and so most of the water, salts, glucose and urea of blood is forced out of glomerular capillaries. This material passes into the Bowman's capsule and is now called glomerular filtrate.

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. 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 reabsorption 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).



Functioning of Kidney (nephron)

Urine:

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

Normal chemical composition of urine (Source: NASA contractor Report)	
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

5. "Along with excretion, kidneys also play role in Osmoregulation."

Comment on this statement.

Ans: Osmoregulatory:

Osmoregulation is defined as the regulation of the concentration of water and salts in blood and other body fluids.

Osmoregulatory Function of Kidney:

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

Dilute (hypotonic) urine:

When there is excess water in body fluids, kidneys form dilutes (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.

Concentrated (hypertonic) urine:

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. This whole process is under hormonal control.

OR (Second answer)

Osmoregulation is the process which regulates the concentration and osmotic pressure of blood by regulating the water contents of blood plasma. It is an important process as excessive loss of water may cause dehydration whereas excess of water intake may dilute the body fluids.

The vertebrate kidney is extremely flexible in its working it excretes large amount of hypotonic urine when water intake is very high, while it excretes small amount of hypertonic urine when water is deficient and needs to be conserved.

ClassNotes