### CHAPTER - 9

# EXCRETION – ELIMINATION OF BODY WASTES

# P. 122 CHECK YOUR PROGRESS 1

#### A. Answer these questions.

- 1. The removal of waste products formed in the body as a result of metabolism is termed as excretion.
- 2. Various waste products are formed in our body as a result of many metabolic activities taking place inside the body. These waste substances if accumulated would poison cells or slow down metabolism. Hence, the body must get rid of these unwanted substances. The metabolic wastes to be excreted include CO<sub>2</sub>, H<sub>2</sub>O, ammonia, urea, uric acid, etc. and the process is called excretion.
- **3.** The wastes formed as a result of various metabolic activities are:
  - Respiratory waste products are formed as a result of oxidation of glucose (food) (through cellular respiration).
  - Nitrogenous waste products are formed as a result of deamination of unwanted amino acids, body's own proteins and nucleic acids.
  - Other waste materials like salts (NaCl), vitamins and water.

### P. 127 CHECK YOUR PROGRESS 2

### A. Answer these questions.

- 1. Nephron
- 2. Each nephron consists of a Malpighian capsule, a nephric tubule (secretory part of uriniferous tubule) and a collecting tubule.
- **3.** Collecting ducts are larger ducts, each receiving collecting tubules from several nephrons. These drain the urine collected from the nephrons into the pelvis which leads to the ureter.
- 4. Antidiuretic hormone (ADH) released from the posterior lobe of pituitary gland, increases the permeability of the renal tubule to water. When the blood plasma is concentrated, more ADH is secreted and more water is reabsorbed in the urinary tubules. Hence, urine passed out from body is concentrated, for example in summers. When the blood plasma is diluted, less ADH is secreted and less water is reabsorbed in the urinary tubule. In this case, dilute urine is passed out of the body, for example in winters.

Aldosterone, a hormone released from the adrenal cortex, influences reabsorption of sodium and potassium. This hormone regulates

the amount of sodium and potassium that is to be retained in the blood and is to be excreted.

### P. 129 CHECK YOUR PROGRESS 3

### A. Answer these questions.

- 1. Yellow colour of urine is due to a pigment urochrome derived from the breakdown of haemoglobin of worn out RBCs.
- 2. The water and solute content of body fluids is regulated by the kidney. This function of regulation of osmotic concentration of blood by the kidney is called osmoregulation.
- 3. Refer to Sol. 4 Check Your Progress 2.
- **4.** When there is excess of water in body fluids urine is more dilute (hypotonic) than the body fluids. It is achieved by two processes:
  - i. Excess of water increases blood volume which increases the hydrostatic pressure in glomerulus, hence, more nephric or glomerular filtrates are formed.
  - ii. The sensation of excess of water in the body fluid is received by osmoregulator cells in the hypothalamus part of the brain. These cells in turn influence the posterior lobe of the pituitary gland to inhibit or reduce the release of antidiuretic hormone (ADH). Deficiency of this hormone lowers the permeability of cells in the distal convoluted tubule and collecting duct, thereby decreasing the reabsorption of water. More filtration and less reabsorption of water produces excessively dilute urine. This brings down the volume of the body fluids to normal.

### P. 129 EXERCISES

#### I. Multiple-Choice Questions

### A. Choose the most appropriate answer.

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<b>1.</b> c	<b>2.</b> a	<b>3.</b> C	<b>4.</b> C
<b>5.</b> b	<b>6.</b> b	7. d	<b>8.</b> d
<b>9.</b> d	<b>10.</b> a	<b>11.</b> b	<b>12.</b> d

# II. Assertion–Reason Type Questions

A. 1. c 2. a 3. c 4. a

## **III. Very Short Answer Type Questions**

### A. Name the following.

- 1. Hepatic vein2. Liver
- 3. Cortex 4. Ureter
- 5. Kidney 6. Urethra
- 7. Glomerulus 8. Excretion

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B. Match the items in Column A with those in Column B and write down the matching pairs.

1.a 2.b 3.c 4.d 5.e

- C. Arrange and rewrite the terms in each group in the correct order so as to be in a logical sequence beginning with the term that is underlined.
  - 1. <u>Afferent arteriole</u>  $\rightarrow$  glomerulus  $\rightarrow$  efferent arteriole  $\rightarrow$  capillary network  $\rightarrow$  renal vein
  - **2.** <u>Renal artery</u>  $\rightarrow$  kidney  $\rightarrow$  ureter  $\rightarrow$  urinary bladder  $\rightarrow$  urethra
- D. Given below is a set of four terms. Out of four, one set is odd and cannot be grouped in the same category to which other three belong. Identify the odd term and name the category to which remaining three belong.

Odd term - Uterus

Category - Human urinary system

- E. Complete the following statements by choosing the correct alternative from those given in the brackets.
  - 1. renal artery
  - 2. nephrons
  - **3.** 200 450
  - 4. glomerulus
- F. Complete the following paragraph by filling in the blanks (1) to (5) with appropriate words:
  - 1. ADH
  - 2. posterior
  - 3. diabetes insipidus
  - 4. insulin
  - 5. diabetes mellitus

### **IV. Short Answer Type Questions**

### A. Define the following terms.

- 1. The act of discharging urine is called micturition.
- 2. Filtration which occurs under high pressure is called **ultrafiltration** as in case of glomerulus of nephron to filter all the liquid part of the blood.
- **3.** The process of maintaining the osmotic concentration of blood or right amount of water and proper ionic balance in the body is called **osmoregulation**.
- **4. Loop of Henle** is U-shaped loop formed in the middle of the nephric tubule by the thin descending and a thick ascending limb.

**5.** Tubular secretion is the reverse process of tubular reabsorption. The cells of the renal tubule remove wastes from blood and pass into the filtrate by secretion. Removes  $NH_3$ , urea, uric acid, creatinine, hippuric acid from the blood and adds into the filtrate.

# B. Answer these questions.

- 1. Urea, uric acid
- 2. Ascending limb of loop of Henle
- **3.** Proximal convoluted tubule is the part of nephron present between Bowman's capsule and the loop of Henle. The Loop of Henle is a long, straight, tubular segment connecting the proximal tubule to the distal convoluted tubule and lies parallel to the collecting ducts.
- 4. Ascending limb (of the loop of Henle).
- **5.** When enough urine gets accumulated, the conc. of urine is maximum in descending limb and in collecting tubule.
- **6.** Ureter transports urine from the kidneys to the urinary bladder whereas urethra carries urine from urinary bladder to the exterior.

# V. Long Answer Type Questions

### A. Answer these questions.

- 1. a. Refer to figure 9.1 from page 123 of ICSE BOOK 10.
  - b. Nitrogenous organic compounds urea 2.3 g, uric acid – 0.7 g, creatinine – 1.5 g, hippuric acid–negligible

Inorganic substances –  $NH_3$  – 0.6 g/L, Na, K, Ca, Mg Salts.

Non-nitrogenous organic compounds – Vitamin C, oxalic acid, phenolic substances, water – 95%.

- c. Renal artery and renal vein
- 2. a. Refer to figure 9.2c page 124 of the textbook.
  - **b.** Walls of glomerular capillaries and Bowman's capsule are very thin and semipermeable in nature. Hence they act as 'ultrafilters'. The glomerular hydrostatic pressure or capillary pressure is the main driving force that tends to move fluid out of the glomeruli. Due to high filtration pressure in the blood of glomerulus, a part of water and dissolved constituents are filtered out in the Bowman's capsule. This is termed as ultrafiltration.

- 3. When enough urine gets accumulated in the bladder to raise its pressure sufficiently, a spontaneous activity is initiated. As the ureters pass obliquely through the bladder wall, their openings get shut due to compression by the contracting bladder muscles and backward flow of urine is prevented.
- 4. The function of regulation of osmotic pressure of blood by the kidney is called osmoregulation. During large amount of water intake, the urine passed out of the body is hypotonic. The glomerular filtrate contains some solutes that are reabsorbed by the renal tubules. Hence urine passed out is hypotonic. Keeps osmotic pressure of blood normal. Under scarce water conditions an isotonic glomerular filtrate is formed in the Bowman's capsule. Large quantity of water is reabsorbed in the nephric tubule. Thus urine passed out is hypertonic. The flexibility in the working of human kidney and renal tubules is brought about by the movement of H<sub>2</sub>O and Na in and out of the nephron, under the influence of hormones, thus osmolarity is regulated.

### VI. Structured/ Application/ Skill Type Question

- A. 1. Excretion is defined as the process of removal of mainly nitrogenous waste products formed in the body as a result of metabolism.
  - 2. Nephrons are the units of kidney.
  - **3.** Part iv is renul medulla. The medulla is subdivided into 15 to 16 conical masses, the renal pyramids. Due to the presence of renal pyramids, the medulla has a stripped appearance.
  - 4. i. Nitrogenous waste, salts are excreted by kidney.
    - ii. The excess water is removed through kidneys. It helps in osmoregulation.
  - 5. i.  $\rightarrow$  Renal artery.
    - ii.  $\rightarrow$  Renal vein.

Renal artery	Renal vein	
It supplies	It carries	
oxygenated blood	deoxygenated blood	
from heart to the	from kidney to the	
kidneys	infenior vena cava	
Contains more urea	Contains less urea	

- B. 1. Excretory system and skeletal system
  - 2. i. Kidneys
    - ii. Posterior vena cava
    - iii. Ureter
    - iv. Urinary bladder
    - v. Urethra
    - vi. Renal vein
    - vii. Renal artery
  - **3.** Nephron is the structural and functional unit of part marked **i**.
  - 4. Urea and uric acid
  - 5. Ultrafiltration and tubular reabsorption
  - 6. Adrenal glands on the top of each kidney
- C. 1. i. Collecting tubule
  - ii. Distal convoluted tubule with arteries
  - iii. U-shaped loop of Henle
  - iv. Proximal convoluted tubule with blood capillaries
  - v. Bowman's capsule
  - vi. Afferent arteriole from renal artery
  - vii. Glomerulus
  - viii. Venule to renal vein
  - 2. Glomerulus, Bowman's capsule
  - Highest concentration of urea Renal artery Lowest concentration of urea – Renal vein
  - 4. Collecting tubule
  - 5. Proximal convoluted tubule
  - 6. Ultrafiltration and tubular reabsorption
  - 7. Loop of Henle
  - 8. The afferent arteriole entering the Bowman's capsule is wider than the efferent arteriole which leave it. So more blood entering and less blood is moving out of the glomerulus.