Excretory Products and Their Elimination — Assignment 1

Class 11 Biology · Topic-wise question bank covering every concept of the chapter · Narayan Gurukul Academy

Instructions: (1) Attempt all questions. This worksheet walks through every concept of the chapter, topic by topic.
(2) The interactive MCQ version of these questions (with instant answer reveal) is available on the notes page.
(3) Write answers in your own words; label diagrams wherever asked, and quote NCERT values (GFR, osmolarity, etc.) exactly.

Modes of Excretion — Ammonotelism, Ureotelism and Uricotelism

MCQ Questions (choose the correct option)

1. Which nitrogenous waste is the most toxic and requires the largest volume of water for elimination?
   (A) Ammonia
   (B) Urea
   (C) Uric acid
   (D) Creatinine
2. Bony fishes and aquatic amphibians are typically —
   (A) Uricotelic
   (B) Ammonotelic
   (C) Ureotelic
   (D) Amphibiotic
3. Reptiles and birds excrete nitrogenous wastes mainly as —
   (A) Ammonia
   (B) Urea
   (C) Uric acid
   (D) Hippuric acid
4. Ammonia, being readily soluble, is chiefly excreted by —
   (A) Diffusion across body or gill surfaces
   (B) Kidneys as ammonium ions
   (C) Lungs as gas
   (D) Skin as sweat
5. Which excretory structure is primarily concerned with osmoregulation in flatworms?
   (A) Nephridia
   (B) Malpighian tubules
   (C) Protonephridia (flame cells)
   (D) Green glands

1 Mark Questions

1. Define ammonotelism with one example.
2. Define ureotelism and name the organ where urea is formed.
3. What are malpighian tubules? Name an organism that has them.
4. Name the excretory structure of crustaceans like prawns.
5. What is osmoregulation?

2 Mark Questions

1. Why does ammonia need large volumes of water for elimination while uric acid needs the least?

2. Distinguish between ammonotelism, ureotelism and uricotelism with one example of each.

3. Name the four invertebrate excretory structures and their functions.

3 Mark Questions

1. Terrestrial animals are generally either ureotelic or uricotelic, not ammonotelic. Justify, using the toxicity and solubility of the nitrogenous wastes.

2. Survey the variety of excretory structures in the animal kingdom — flame cells, nephridia, malpighian tubules and green glands — and state the function of each.

Human Excretory System — Organs

MCQ Questions (choose the correct option)

1. The human excretory system consists of —
   (A) A pair of kidneys, a pair of ureters, a urinary bladder and a urethra
   (B) A pair of kidneys and a single urethra
   (C) Lungs, liver and skin only
   (D) A pair of kidneys and a pair of urethras
2. The kidneys are situated between the levels of —
   (A) Last thoracic and third lumbar vertebra
   (B) First and second sacral vertebra
   (C) T4 and T8 vertebra
   (D) Second and fourth lumbar vertebra
3. The average weight of an adult human kidney is —
   (A) 40–60 g
   (B) 200–250 g
   (C) 120–170 g
   (D) 500 g
4. The ureter, blood vessels and nerves enter the kidney through the —
   (A) Renal pelvis
   (B) Calyx
   (C) Medulla
   (D) Hilum
5. The funnel-shaped cavity of the kidney into which the calyces project is the —
   (A) Hilum
   (B) Renal pelvis
   (C) Collecting duct
   (D) Ureter

1 Mark Questions

1. List the organs of the human excretory system.

2. Where are the kidneys located in the body?

3. Give the average weight and dimensions of an adult human kidney.

4. What is the hilum of the kidney?

5. Define calyx and renal pelvis.

2 Mark Questions

1. Explain the roles of the ureters, urinary bladder and urethra in urine transport and storage.
2. Describe the hilum and renal pelvis of the kidney with their significance.
3. Distinguish between the renal cortex and renal medulla.

3 Mark Questions

1. Describe the position, shape, size and weight of the human kidney, mentioning the hilum and renal pelvis.
2. Trace the path of urine from the kidney to the external urethral opening, naming each part involved.

Structure of the Kidney — Cortex, Medulla and Pyramids

MCQ Questions (choose the correct option)

1. In the human kidney, the medulla is divided into a few conical masses called —
   (A) Medullary pyramids
   (B) Columns of Bertini
   (C) Calyces
   (D) Bowman's capsules
2. The cortex extends between the medullary pyramids as —
   (A) Calyces
   (B) Renal columns (Columns of Bertini)
   (C) Pelvis
   (D) Nephrons only
3. The outer layer of the kidney is a —
   (A) Tough capsule
   (B) Row of nephrons
   (C) Layer of urine
   (D) Serous membrane
4. The projections of the renal pelvis into which the medullary pyramids project are the —
   (A) Alveoli
   (B) Hilum
   (C) Calyces
   (D) Columns

1 Mark Questions

1. Name the two zones of the kidney.
2. What are medullary pyramids?
3. Define the Columns of Bertini.
4. What are the projections of the renal pelvis called?

2 Mark Questions

1. Describe the internal structure of the kidney — capsule, cortex, medulla, pyramids, pelvis and calyces.
2. Distinguish between the cortex and the medullary pyramids of the kidney.
3. How do the collecting ducts of the nephrons open into the renal pelvis?

3 Mark Questions

1. Give a labelled account of the longitudinal section of the human kidney and describe the medullary organisation.
2. Explain the relationship between the medullary pyramids, calyces and renal pelvis in draining urine.

Nephron — Structure and Types

MCQ Questions (choose the correct option)

1. The functional unit of the kidney is the —
   (A) Glomerulus
   (B) Calyx
   (C) Nephron
   (D) Ureter
2. The glomerulus is a tuft of capillaries formed by the —
   (A) Efferent arteriole
   (B) Renal vein
   (C) Afferent arteriole
   (D) Peritubular capillaries
3. The malpighian body (renal corpuscle) is formed of the —
   (A) Glomerulus + Bowman's capsule
   (B) PCT + DCT
   (C) Loop of Henle + collecting duct
   (D) Glomerulus + PCT
4. In which nephrons does the loop of Henle run deep into the medulla?
   (A) Cortical nephrons
   (B) Juxta medullary nephrons
   (C) Both equally
   (D) Neither type
5. The vasa recta is —
   (A) A U-shaped capillary network running parallel to the loop of Henle
   (B) The tuft of capillaries in the glomerulus
   (C) The filtration slits of podocytes
   (D) A renal column

1 Mark Questions

1. Define a nephron and name its two main parts.
2. What is the malpighian body?
3. How is the glomerulus formed?
4. Name the parts of the renal tubule in order.
5. Define vasa recta. In which nephrons is it absent or highly reduced?

2 Mark Questions

1. Distinguish between cortical and juxta medullary nephrons.
2. Describe the structure of the renal tubule starting from Bowman's capsule up to the collecting duct.
3. Trace the fate of the efferent arteriole after it leaves the glomerulus.

3 Mark Questions

1. Describe the structure of a nephron along with its blood supply — glomerulus, Bowman's capsule, PCT, loop of Henle, DCT, collecting duct, peritubular capillaries and vasa recta.

2. Why is the malpighian corpuscle also called the renal corpuscle? Describe its parts and location in the kidney.

Urine Formation — Glomerular Filtration, GFR and JGA

MCQ Questions (choose the correct option)

1. The GFR in a healthy individual is approximately —
   (A) 125 mL/min
   (B) 1.5 L/min
   (C) 125 mL/day
   (D) 300 $mOsmolL^{-1}$
2. A GFR of 125 mL/min corresponds to how much filtrate per day?
   (A) 180 L
   (B) 12.5 L
   (C) 1.5 L
   (D) 125 L
3. Which of the following is NOT one of the three main processes of urine formation?
   (A) Glomerular filtration
   (B) Tubular reabsorption
   (C) Tubular secretion
   (D) Osmoreceptor activation in the cortex
4. Ultrafiltration at the glomerulus passes blood through —
   (A) Endothelium of glomerular vessels, epithelium of Bowman's capsule and basement membrane
   (B) Only the basement membrane
   (C) Only the podocytes
   (D) Endothelium of peritubular capillaries
5. The JGA is formed by cellular modifications in the —
   (A) DCT and the afferent arteriole
   (B) PCT and the efferent arteriole
   (C) Loop of Henle and the vasa recta
   (D) Collecting duct and the ureter

1 Mark Questions

1. Define glomerular filtration.
2. State the value of GFR in a healthy adult.
3. What is ultrafiltration?
4. Name the three processes of urine formation.
5. What are filtration slits?

2 Mark Questions

1. How much blood is filtered per minute and what fraction of the ventricular output is it?
2. Explain the role of the JGA in regulating GFR.
3. Blood is ultrafiltered at the glomerulus — which constituents pass and which are retained?

3 Mark Questions

1. Describe the three layers of the glomerular filtration membrane and explain how ultrafiltration occurs.
2. Explain the autoregulatory mechanism of GFR with the help of the juxta glomerular apparatus.

Function of the Tubules — PCT, Loop of Henle, DCT, Collecting Duct

MCQ Questions (choose the correct option)

1. Nearly all essential nutrients and 70–80% of electrolytes and water are reabsorbed by the —
   (A) PCT
   (B) Thin ascending limb
   (C) Collecting duct
   (D) DCT
2. Which part of the loop of Henle is permeable to water but almost impermeable to electrolytes?
   (A) Ascending limb
   (B) Descending limb
   (C) Both limbs
   (D) Neither limb
3. Which segment is impermeable to water but allows active or passive transport of electrolytes?
   (A) PCT
   (B) Descending limb of the loop of Henle
   (C) Ascending limb of the loop of Henle
   (D) Collecting duct
4. Small amounts of urea pass into the medullary interstitium to maintain osmolarity through the —
   (A) Collecting duct
   (B) PCT
   (C) Glomerulus
   (D) DCT
5. Which segment performs conditional reabsorption of Na^+ and water and secretes H^+, K^+ and NH_3?
   (A) PCT
   (B) Loop of Henle
   (C) DCT
   (D) Collecting duct

1 Mark Questions

1. What is the function of the brush border in the PCT?
2. Which segment of the nephron reabsorbs the maximum electrolytes and water?
3. State the permeability properties of the descending and ascending limbs of the loop of Henle.
4. Which part of the nephron allows small amounts of urea into the medullary interstitium?
5. What does tubular secretion help the body to maintain?

2 Mark Questions

1. Why is the ascending limb of the loop of Henle impermeable to water, and what role does this play in the medullary osmolarity?
2. List the functions of the PCT.
3. Explain how the DCT maintains the pH and sodium–potassium balance of the blood.

3 Mark Questions

1. Describe the functions of the PCT, loop of Henle, DCT and collecting duct with reference to reabsorption and secretion.

2. Discuss which substances are reabsorbed actively and which passively in different nephron segments, and how tubular secretion maintains the pH of body fluids.

Countercurrent Mechanism — Concentration of the Filtrate

MCQ Questions (choose the correct option)

1. The osmolarity of the inner medullary interstitium is approximately —
   (A) 1200 mOsmolL^{-1}
   (B) 300 mOsmolL^{-1}
   (C) 600 mOsmolL^{-1}
   (D) 1500 mOsmolL^{-1}
2. The osmolarity gradient in the kidney goes from about —
   (A) 1200 to 300 mOsmolL^{-1} (cortex to medulla)
   (B) 300 to 1200 mOsmolL^{-1} (cortex to medulla)
   (C) 300 to 600 mOsmolL^{-1} (medulla to cortex)
   (D) 600 to 1200 mOsmolL^{-1} (cortex to medulla)
3. The medullary interstitial gradient is caused mainly by —
   (A) NaCl and urea
   (B) Glucose and amino acids
   (C) K^+ and Ca^{2+}
   (D) Plasma proteins
4. The counter current in the kidney involves the —
   (A) Loop of Henle and the vasa recta
   (B) PCT and the DCT
   (C) Glomerulus and Bowman's capsule
   (D) Ureter and the bladder
5. Human kidneys can produce urine that is concentrated about —
   (A) Four times the initial filtrate
   (B) Two times
   (C) Ten times
   (D) Equal to the filtrate

1 Mark Questions

1. Define the counter current mechanism.
2. Give the osmolarity values of the kidney cortex and inner medulla.
3. Which two substances mainly build the medullary osmotic gradient?
4. How much more concentrated than the initial filtrate can human urine be?

2 Mark Questions

1. Explain the role of the vasa recta as a counter current exchanger.
2. How does the ascending limb of the loop of Henle contribute to building the medullary gradient?

3. How does urea enter the medullary interstitium and why does this matter?

3 Mark Questions

1. Give a brief account of the counter current mechanism and the role of the loop of Henle and vasa recta in concentrating urine.

2. Explain why the special arrangement of the loop of Henle and the vasa recta is called a counter current mechanism, and how the interstitial gradient it builds helps concentrate the filtrate.

Regulation of Kidney Function — ADH, Renin-Angiotensin and ANF

MCQ Questions (choose the correct option)

1. ADH is released from the —
   (A) Neurohypophysis
   (B) Adenohypophysis
   (C) Adrenal medulla
   (D) Juxta glomerular cells
2. Which hormone's release prevents diuresis by facilitating water reabsorption from the latter parts of the tubule?
   (A) Aldosterone
   (B) ADH (vasopressin)
   (C) ANF
   (D) Renin
3. Angiotensin II is a powerful —
   (A) Vasoconstrictor
   (B) Vasodilator
   (C) Diuretic
   (D) Anti-coagulant
4. Aldosterone, which causes reabsorption of Na^+ and water, is secreted by the —
   (A) Adrenal medulla
   (B) Adrenal cortex
   (C) Anterior pituitary
   (D) Liver
5. ANF, which acts as a check on the renin-angiotensin mechanism, is released by —
   (A) The atrial wall of the heart
   (B) Juxta glomerular cells
   (C) Lungs
   (D) Hypothalamus

1 Mark Questions

1. What is ADH and from where is it released?

2. What is vasopressin?

3. Name the two hormones and one factor that regulate kidney function.

4. What is the effect of ANF on blood pressure?

2 Mark Questions

1. Explain the role of osmoreceptors and ADH in regulating the water balance of the body.

2. Outline the renin-angiotensin mechanism from renin release to aldosterone action.

3. How does ANF act as a check on the renin-angiotensin mechanism?

3 Mark Questions

1. Describe the hormonal feedback regulation of kidney function involving the hypothalamus, the JGA and the heart.

2. Explain how an excessive loss of fluid from the body is corrected by the ADH mechanism, and how an increase in body fluid volume completes the feedback.

Micturition and Accessory Excretory Organs

MCQ Questions (choose the correct option)

1. The process of release of urine from the body is called —
   (A) Micturition
   (B) Diuresis
   (C) Ultrafiltration
   (D) Osmoregulation
2. The micturition reflex is initiated by the stretching of the —
   (A) Urinary bladder
   (B) Renal pelvis
   (C) Urethra
   (D) Ureter
3. A healthy adult human excretes on average how much urine per day?
   (A) 1–1.5 L
   (B) 5 L
   (C) 200 mL
   (D) 10 L
4. Normal human urine is slightly acidic, with a pH of about —
   (A) 7.4
   (B) 6.0
   (C) 8.0
   (D) 5.0
5. Glycosuria and ketonuria together are indicative of —
   (A) Diabetes mellitus
   (B) Glomerulonephritis
   (C) Liver failure
   (D) Anaemia
6. The lungs remove approximately how much CO_2 per minute?
   (A) 200 mL
   (B) 20 mL
   (C) 2 L
   (D) 2000 mL

1 Mark Questions

1. Define micturition and the micturition reflex.

2. Give the average daily urine output and the average urea excretion of an adult human.

3. Name the excretory products of the sweat glands.
4. Which organ secretes bile containing bilirubin and biliverdin?
5. What do glycosuria and ketonuria indicate?

2 Mark Questions

1. Explain the neural mechanism of micturition.
2. Describe the role of the liver and skin in excretion.
3. Mention the characteristics of normal urine and what their analysis reveals.

3 Mark Questions

1. Describe the role of the lungs, liver and skin in the elimination of excretory wastes.
2. Explain micturition — how urine is stored and released through the micturition reflex.

Disorders of the Excretory System — Uremia, Hemodialysis, Renal Calculi

MCQ Questions (choose the correct option)

1. Accumulation of urea in the blood is called —
   (A) Uremia
   (B) Glycosuria
   (C) Ketonuria
   (D) Oliguria
2. During hemodialysis, an anticoagulant added to the blood drained from the artery is —
   (A) Heparin
   (B) Anti-heparin
   (C) Insulin
   (D) Renin
3. The dialysing fluid has the same composition as plasma except for —
   (A) Nitrogenous wastes
   (B) Glucose
   (C) Amino acids
   (D) Water
4. A stone or insoluble mass of crystallised salts formed within the kidney is called —
   (A) Renal calculus
   (B) Glomerulonephritis
   (C) Uremia
   (D) Nephron loss
5. Inflammation of the glomeruli of the kidney is —
   (A) Glomerulonephritis
   (B) Renal calculi
   (C) Uremia
   (D) Pyelonephritis

1 Mark Questions

1. What is uremia?
2. Define renal calculi.

3. What is glomerulonephritis?

4. Why is heparin added to blood during hemodialysis?

2 Mark Questions

1. Describe how hemodialysis removes nitrogenous wastes using the artificial kidney.

2. Why is a functioning kidney for transplantation preferred from a close relative?

3. Distinguish between renal calculi and glomerulonephritis.

3 Mark Questions

1. Explain the principle and working of hemodialysis, from blood drainage to return of cleared blood.

2. Describe the main disorders of the excretory system — uremia, renal calculi, glomerulonephritis, and the corrective methods of hemodialysis and kidney transplantation.