KATTAR NEET 2026

Zoology By Samapti Sinha Ma'am

Excretory Products & their Elimination

Q1 Regarding different excretory structures, identify the correct and incorrect statements:
I. Protonephridia are the primary excretory structures in Platyhelminthes and are mainly concerned with ionic and fluid volume regulation.
II. Nephridia in earthworms help in removing nitrogenous wastes and maintaining a fluid and ionic balance.
III. Malpighian tubules are the excretory structures of most insects and primarily help in osmoregulation.
IV. Antennal glands in crustaceans perform an excretory function.
Choose the option with the **correct** assessment of statements:
(A) I - Correct, II - Correct, III - Incorrect, IV - Correct
(B) I - Correct, II - Correct, III - Correct, IV - Correct
(C) I - Incorrect, II - Correct, III - Incorrect, IV - Correct
(D) I - Correct, II - Incorrect, III - Correct, IV - Incorrect

Q2 Which of the following **correctly** traces the path of filtrate from the glomerulus to the collecting duct in a nephron?
(A) Glomerulus → PCT → Descending limb of Henle's loop → Ascending limb of Henle's loop → DCT → Collecting duct
(B) Glomerulus → DCT → PCT → Henle's loop → Collecting duct
(C) Glomerulus → PCT → Henle's loop → Collecting duct → DCT
(D) Glomerulus → Descending limb of Henle's loop → PCT → Ascending limb of Henle's loop → DCT → Collecting duct

Q3 Identify the part of the nephron that is primarily located in the medulla region of kidney. It dips down from cortex to medulla, and is surrounded by peritubular capillaries.
(A) Glomerulus
(B) Proximal Convoluted Tubule (PCT)
(C) Loop of Henle
(D) Collecting Duct

Q4 Analyze the following statements regarding the human kidney and choose the **correct** option:
I. The renal cortex is the outer light-colored zone, while the medulla is the inner darker zone, divided into medullary pyramids.
II. The hilum, a notch on the outer convex surface of the kidney, is the entry point for the renal artery and nerves, and the exit point for the renal vein and ureter.
III. The renal pelvis is a broad, funnel-shaped space continuous with the ureter, and it receives urine from the major calyces.
IV. The Columns of Bertini are extensions of the renal medulla into the renal cortex.
(A) Only I and III are correct.
(B) Only I, II, and III are correct.
(C) Only I and IV are correct.
(D) Only III is correct.

Q5 If a substance is filtered from the glomerulus and then completely reabsorbed in the proximal convoluted tubule (PCT), where would its concentration be effectively zero if all subsequent parts of the nephron are functioning normally?
(A) In the fluid within the loop of Henle.
(B) In the fluid within the glomerulus.

(C) In the blood within the efferent arteriole.
(D) In the filtrate entering the Bowman's capsule.

Q6 If a substance is found to be actively secreted only in the region lined by cuboidal epithelial cells with very few microvilli and mitochondria, and this region is also permeable to water under hormonal influence, which region is it?
(A) Proximal convoluted tubule
(B) Ascending limb of Henle's loop
(C) Distal convoluted tubule
(D) Bowman's capsule

Q7 Match the **List-I** with **List-II.**

	List-I		**List-II**
(A)	GFR	(I)	A specialized sensitive region formed by cellular modifications in the DCT and afferent arteriole.
(B)	Podocytes	(II)	The amount of filtrate formed by the kidneys per minute.
(C)	JGA	(III)	Process by which substances are transported from blood into the renal tubules.
(D)	Tubular secretion	(IV)	Epithelium cells of Bowman's capsule arranged in an intricate manner leaving filtration slits.

Choose the **correct** answer from the options given below:
(A) A-I,B-II,C-III,D-IV
(B) A-IV,B-III,C-I,D-II
(C) A-III,B-I,C-II,D-IV
(D) A-II,B-IV,C-I,D-III

Q8 If the ascending limb of Henle's loop were to become permeable to water, what would be the immediate consequence on the urine concentration?
(A) The urine would become more concentrated.
(B) The urine would become more dilute.
(C) There would be no significant change in urine concentration.
(D) The counter current mechanism would become more efficient.

Q9 Which of the following statements **correctly** describe the roles of different parts of the nephron and vasa recta in the counter current mechanism?
I. The thin segment of the ascending limb allows passive diffusion of NaCl out into the interstitium.
II. The descending limb of the vasa recta reabsorbs water from the medullary interstitium.
III. The collecting duct is permeable to water in the presence of ADH, leading to water reabsorption.
IV. The ascending limb of Henle's loop contributes to the increasing osmolarity of the medulla by removing water.
(A) I and III only
(B) II and IV only
(C) I, II, and III only
(D) I, III, and IV only

Q10 Which of the following processes in urine formation is most responsible for regulating blood pH by removing excess H^+ ions or conserving HCO_3^- ions?
(A) Glomerular filtration
(B) Tubular reabsorption in PCT
(C) Tubular secretion in PCT and DCT
(D) Water reabsorption in the collecting duct

Q11 Consider the following statements regarding the regulation of kidney function:
Statement I: Angiotensin II directly stimulates the release of Aldosterone, which acts on the renal tubules to increase sodium reabsorption.

Statement II: An increase in GFR due to an increase in blood pressure directly leads to an increase in ANF release, which then acts as a vasodilator.

In the light of the above statements, choose the *most appropriate* answer from the options given below:

(A) Statement I is correct but Statement II is incorrect.

(B) Statement I is incorrect but Statement II is correct.

(C) Both Statement I and Statement II are correct.

(D) Both Statement I and Statement II are incorrect.

Q12 Match the **List-I** with **List-II.**

	List-I		**List-II**
(A)	Micturition	(I)	Eliminate sterols
(B)	Diabetes mellitus	(II)	Nervous system control
(C)	Kidney failure	(III)	Glucose in urine
(D)	Sebaceous glands	(IV)	Hemodialysis

Choose the **correct** answer from the options given below:

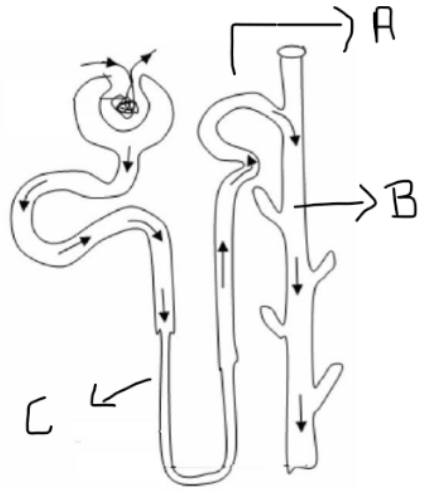
(A) A-I, B-II, C-III, D-IV

(B) A-IV, B-III, C-I, D-II

(C) A-III, B-I, C-II, D-IV

(D) A-II, B-III, C-IV, D-I

Q13



A patient is diagnosed with a condition that primarily affects the reabsorption of water in the nephron, leading to excessive urination (polyuria) and dehydration. Based on the provided diagram, which part of the nephron, if dysfunctional, would most directly and significantly contribute to these symptoms?

(A) A: Distal convoluted tubule

(B) B: Collecting Duct

(C) C: Thin segment of descending limb

(D) Both A and B

Q14 Consider a scenario where the vasa recta blood flow is significantly increased beyond physiological limits. How would this affect the countercurrent mechanism and urine concentration?

(A) Urine would become more concentrated due to enhanced nutrient supply to medullary cells.

(B) The osmotic gradient in the medulla would be "washed out," leading to more dilute urine.

(C) Water reabsorption in the descending limb would increase, but collecting duct reabsorption would decrease.

(D) There would be no significant effect, as the vasa recta primarily function in oxygen supply.

Q15 Evaluate the following assertions concerning nitrogenous waste excretion:

1. Ammonotelism is common in bony fishes and aquatic insects due to the ready availability of water for dilution and excretion of ammonia via diffusion.
2. Ureotelism involves the conversion of ammonia into urea in the liver of animals like mammals and terrestrial amphibians to conserve water.
3. Uricotelism, observed in reptiles, birds, land snails, and insects, is an adaptation for minimal water loss, where uric acid is excreted.
4. Some amount of urea may be retained in the kidney matrix of some ureotelic animals to

maintain desired osmolarity.

Select the option that accurately reflects the validity of these statements:
(A) Only I and III are true.
(B) I, II, and III are true.
(C) I, II, III, and IV are true.
(D) Only II and IV are true.

Q16 Consider the adrenal gland shown superior to the kidney. While not directly part of the urinary system's excretory function, it produces hormones that significantly influence kidney function. Which of the following hormones produced by the adrenal gland directly impacts the reabsorption of sodium and water in the kidney tubules, ultimately affecting blood volume and pressure?
(A) Adrenaline (Epinephrine)
(B) Noradrenaline (Norepinephrine)
(C) Aldosterone
(D) Cortisol

Q17 A person is diagnosed with a condition where the efferent arteriole of the glomerulus is significantly constricted, while the afferent arteriole remains normal. Analyze the potential consequences:
I. Glomerular Filtration Rate (GFR) would likely increase.
II. Hydrostatic pressure within the glomerulus would increase.
III. Peritubular capillary blood flow would decrease.
IV. Formation of concentrated urine would be inhibited due to reduced medullary osmotic gradient.
Which of the above statements are likely to be **correct**?
(A) I, II, and III only
(B) I, II, and IV only
(C) II, III, and IV only
(D) I, II, III, and IV

Q18 Considering the blood supply within the nephron, which statement accurately describes a key characteristic of the efferent arteriole in a juxtamedullary nephron compared to a cortical nephron?
(A) In juxtamedullary nephrons, the efferent arteriole directly forms the peritubular capillaries around the PCT and DCT only.
(B) In juxtamedullary nephrons, the efferent arteriole gives rise to the vasa recta which runs parallel to the loop of Henle, a feature less prominent or absent in cortical nephrons.
(C) The efferent arteriole in juxtamedullary nephrons has a significantly wider diameter than the afferent arteriole to facilitate rapid blood flow to the medulla.
(D) Efferent arterioles of juxtamedullary nephrons primarily supply blood to the renal pelvis before forming any capillary network.

Q19 Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:
Assertion (A): A person with uncontrolled diabetes mellitus often produces large volumes of urine.
Reason (R): In diabetes mellitus, excess glucose in the filtrate acts as an osmotic diuretic, reducing water reabsorption.
In the light of the above statements, choose the **correct** answer from the options given below:
(A) A is true but R is false.
(B) A is false but R is true.
(C) Both A and R are true and R is the correct explanation of A.
(D) Both A and R are true but R is NOT the correct explanation of A.

Q20 Given below are two statements:
Statement I: Hemodialysis is a procedure used to remove urea and other wastes from the blood when kidneys fail.
Statement II: Reduced blood flow to the kidneys triggers the release of renin.

In the light of the above statements, choose the *most appropriate* answer from the options given below:
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

Q21 A patient suffering from chronic renal failure is undergoing hemodialysis. Which of the following substances would not be expected to be present in the dialyzing fluid in significant concentrations?
(A) Glucose
(B) Electrolytes (e.g., Na^+, K^+)
(C) Urea
(D) Amino acids

Q22 Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:
Assertion (A): The efferent arteriole has a narrower diameter than the afferent arteriole.
Reason (R): This difference in diameter creates a high hydrostatic pressure in the glomerulus, facilitating ultrafiltration.
In the light of the above statements, choose the **correct** answer from the options given below:
(A) A is true but R is false.
(B) A is false but R is true.
(C) Both A and R are true and R is the correct explanation of A.
(D) Both A and R are true but R is NOT the correct explanation of A.

Q23 A substance 'X' is freely filtered at the glomerulus, undergoes complete reabsorption in the PCT, and is then secreted into the DCT. Which of the following best describes substance 'X'?
(A) Glucose
(B) Urea
(C) Creatinine
(D) Hydrogen ions (H^+)

Q24 Analyze the statements related to the toxicity and water requirement for the excretion of nitrogenous wastes:
I. Uric acid is less toxic than urea and requires less water for elimination.
II. Ammonia is the least toxic form and can be eliminated with a minimal loss of water.
III. Urea requires more water for excretion compared to uric acid but less than ammonia.
IV. The process of excreting urea is termed uricotelism.
Identify the **incorrect** statements:
(A) I and III
(B) II and IV
(C) I, III, and IV
(D) Only I

Q25 Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:
Assertion (A): People living in desert areas tend to have longer loops of Henle and more juxtamedullary nephrons compared to those living in areas with abundant water.
Reason (R): Longer loops of Henle facilitate greater water reabsorption, enabling the production of highly dilute urine.
In the light of the above statements, choose the **correct** answer from the options given below:
(A) A is true but R is false.
(B) A is false but R is true.
(C) Both A and R are true and R is the correct explanation of A.
(D) Both A and R are true but R is NOT the correct explanation of A.

Q26 A patient presents with severe dehydration and low blood pressure. Which of the following compensatory mechanisms would be *least* effective in restoring normal blood volume and pressure ?
(A) Increased ADH secretion
(B) Increased renin release

(C) Increased Atrial Natriuretic Factor (ANF) release
(D) Increased aldosterone secretion

Q27 The counter-current mechanism is crucial for the formation of concentrated urine. If the vasa recta were to completely run parallel to the loop of Henle, instead of in a counter-current fashion, what would be the most likely impact on urine concentration?
(A) Urine would become more concentrated due to enhanced reabsorption.
(B) Urine would become more dilute as the medullary interstitial gradient would be diminished.
(C) There would be no significant change in urine concentration.
(D) The kidney would fail due to complete loss of water.

Q28 An individual's urine test shows the presence of glucose and amino acids, despite normal blood glucose levels. This finding most strongly suggests a defect in which part of the nephron?
(A) Glomerulus
(B) Proximal Convoluted Tubule (PCT)
(C) Loop of Henle
(D) Distal Convoluted Tubule (DCT)

Q29 Read the following statements and choose the **correct** option
I. Micturition involves the voluntary relaxation of the urethral sphincter, allowing urine to pass out.
II. Urine analysis can provide diagnostic information about kidney malfunctions and metabolic disorders.
III. Besides kidneys, the liver plays a significant role in excretion by releasing bile containing excretory products.
IV. The process of hemodialysis is typically used as a short-term measure to manage acute renal failures.
(A) I, II, and III are correct
(B) II, III, and IV are correct
(C) I, II, and IV are correct
(D) I, II, III and IV are correct

Q30 Read the following statements and choose the **correct** option.
I. Lungs primarily remove large amounts of CO_2 (approximately 200 mL/minute) and also significant quantities of water.
II. Liver facilitates the excretion of substances like bilirubin, biliverdin, cholesterol, degraded steroid hormones, vitamins, and drugs through bile.
III. Sweat glands remove small amounts of urea, lactic acid, and chlorides, while sebaceous glands eliminate substances like sterols and hydrocarbons through sebum.
IV. The presence of even trace amounts of urea in sweat indicates kidney malfunction.
(A) I, II, and III are correct
(B) I, II, and IV are correct
(C) II, III, and IV are correct
(D) I, II, III and IV are correct

Q31 A person suffering from chronic kidney disease shows a high concentration of urea in blood (uremia) but normal levels of glucose and proteins.
Which part of the nephron is still functioning effectively, and which is impaired?
(A) PCT is functional; Glomerulus is impaired
(B) Glomerulus is functional; Tubular reabsorption is impaired
(C) Loop of Henle is impaired; DCT is functional
(D) Both glomerulus and PCT are impaired

Q32 Select the in**correct** match.
(A) Juxtamedullary nephrons - possess loops of Henle that penetrate deep into the medulla and help generate a steep osmotic gradient
(B) ANF - cause vasodilation and thereby decrease the blood pressure
(C) JGA - formed by cellular modification of PCT and afferent arteriole at the point of their contact
(D) Cortical nephrons – more numerous than juxtamedullary nephrons

Q33 Given below are few statements. Select the **incorrect** one.

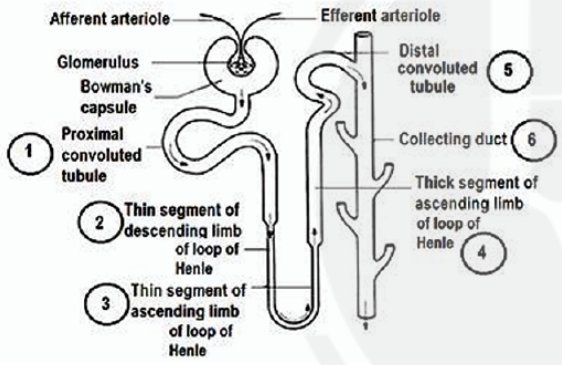
(A) Terrestrial animals are generally either ureotelic or uricotelic, not ammonotelic.

(B) Glycosuria and ketonuria are indicative of diabetes insipidus.

(C) A person that tests negative for glycosuria is certainly not a patient of diabetes mellitus.

(D) Protein-free fluid is filtered from blood plasma into the Bowman's capsule.

Q34 Urine concentration is influenced by water reabsorption and solute handling in various segments of the nephron. Antidiuretic hormone (ADH) increases water permeability in specific regions of the nephron to reduce water loss. Which of the numbered parts (1–6) are directly affected by ADH to regulate water reabsorption?



Select the **correct** option:

(A) 1 and 5 (B) 2 and 4

(C) 5 and 6 (D) 3 and 4

Q35 Match **List-I** with **List-II.**

	List-I		List-II
(A)	Uremia	(I)	Presence of blood in urine
(B)	Hematuria	(II)	Presence of excess urea in blood
(C)	Pyuria	(III)	Presence of glucose in urine
(D)	Glycosuria	(IV)	The presence of pus in the Urine

Choose the **correct** answer from the options given below:

(A) A-III, B-I, C-IV, D-II

(B) A-II, B-I, C-IV, D-III

(C) A-III, B-IV, C-II, D-I

(D) A-IV, B-II, C-I, D-III

Q36 Which of the following changes are observed in a person suffering from chronic kidney failure?

(A) decreased urea and creatinine levels in blood

(B) Increased erythropoietin production

(C) Water retention and edema

(D) Metabolic alkalosis

Q37 In the process of urine concentration, which of the following conditions does **not** favour the maximum water reabsorption in the renal medulla of a nephron?

(A) Active Na^+ transport in the thick ascending limb of Henle

(B) High osmolarity in the medullary interstitium

(C) Low ADH secretion from posterior pituitary

(D) Presence of aquaporins in the collecting duct cells

Q38 Choose **incorrect** option regarding the following non- renal organs involved in excretion and the products they eliminate.

(A) Lungs – Carbon dioxide and water vapor

(B) Skin – Salts, urea, and water via sweat

(C) Liver – Urea formation and cholesterol degradation

(D) Pancreas – Ammonia and bile pigments

Q39 Which of the following **correctly** explain why the medullary interstitium becomes hyperosmotic during urine formation?

(i) Active transport of NaCl from ascending limb of Henle's loop into medullary interstitium.

(ii) High permeability of descending limb to salts but not to water.

(iii) Counter-current flow between Henle's loop and vasa recta maintaining gradient.

(iv) Urea recycling from collecting ducts into medulla contributes to osmolarity.

(A) (i) and (ii)

(B) (iii) and (iv) only

(C) (i), (iii) and (iv)
(D) (ii), (iii) and (iv)

Q40 Which of the following conditions would most likely result from the failure of aldosterone secretion in a healthy adult?
(A) Increased sodium reabsorption and water retention
(B) Increased potassium secretion and blood volume
(C) Decreased sodium reabsorption and low blood pressure
(D) Increased water reabsorption in collecting ducts

Q41 A patient shows the presence of proteins and erythrocytes in the urine. Which renal condition is most likely responsible?
(A) Renal calculi obstructing the ureter
(B) Damage to the glomerular filtration membrane
(C) Excess ADH secretion leading to water retention
(D) Tubular reabsorption failure in the loop of Henle

Q42 Each nephron actively filters plasma through glomeruli and reabsorbs essential substances along its tubular path. However, dysfunction of renal tissue can lead to life-threatening conditions.Which of the following disorders is directly caused by long-term damage to nephrons resulting in the progressive accumulation of nitrogenous waste in the body?
(A) Kidney stone (renal calculi)
(B) Acute glomerulonephritis
(C) Renal failure (uremia)
(D) Diabetes insipidus

Q43 Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:
Assertion A: Kidney is one of the organs to show autoregulation like heart and brain.
Reason R: A fall in GFR activates JG cells to release renin that restores GFR to normal level.
In the light of the above statements, choose the **correct** answer from the options given below:
(A) A is true but R is false.
(B) A is false but R is true.
(C) Both A and R are true and R is the correct explanation of A.
(D) Both A and R are true but R is NOT the correct explanation of A.

Q44 Given below are two statements:
Statement (I): Flame cells are not found in chordates. They are characteristic of certain **invertebrates**, particularly Platyhelminthes**.**
Statement (II): The excretory organs in *Amphioxus* are protonephridia or flame cells.
In the light of the above statements, choose the most appropriate answer from the options given below:
(A) Statement I is correct but Statement II is incorrect.
(B) Statement I is incorrect but Statement II is correct.
(C) Both Statement I and Statement II are correct.
(D) Both Statement I and Statement II are incorrect.

Q45 Which of the following factors would result in an increase in the rate of glomerular filtration in the kidneys?
(A) A rise in plasma protein concentration.
(B) An increase in the fluid pressure in Bowman's space.
(C) An increase in the glomerular capillary blood pressure.
(D) A drop in glomerular capillary blood pressure.

Q46 Choose the **correct** statement.
(A) An increase in the kidney size observed with aging is due to both the increase in number and size of nephrons.
(B) An excessive loss of fluid from the body can activate osmoreceptors which inhibits the hypothalamus.

(C) Blood is filtered so finely in renal capsules that except blood cells all constituents of plasma pass into lumen of Bowman's capsule.
(D) The thick part of ascending limb of loop of Henle is lined with simple cuboidal epithelium whereas thin ascending limb is lined with simple squamous epithelium.

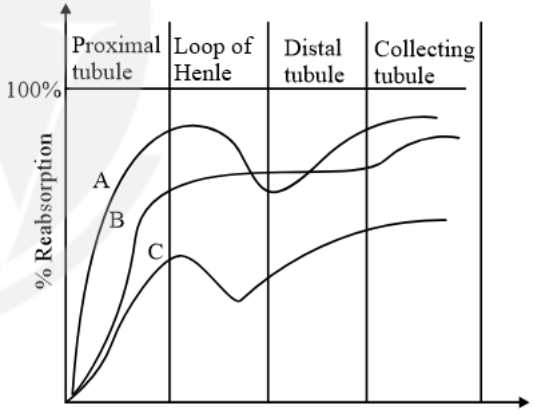
Q47 Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:
Assertion A: Micturition in humans is controlled by both parasympathetic and sympathetic nervous system.
Reason R: Parasympathetic nervous system promote bladder emptying by stimulating contraction of urinary bladder's smooth muscles and sympathetic nervous system promote filling of bladder by relaxation of smooth muscles of bladder wall.
In the light of the above statements, choose the **correct** answer from the options given below:
(A) A is true but R is false.
(B) A is false but R is true.
(C) Both A and R are true and R is the correct explanation of A.
(D) Both A and R are true but R is NOT the correct explanation of A.

Q48 If a healthy man drinks one litre of water on A occasion and one litre of 0.9% saline on occasion B, what shall we expect in two hours?

	Occasion A		Occasion B	
	Volume of urine	Concentration of Na^+ in urine	Volume of urine	Concentration of Na^+ in urine
A.	+++	+	+	+++
B.	+++	+	+	+
C.	++	++	++	+++
D.	+++	++	+++	+++

Q49 Consider the following statements.
I. The first step in urine formation is filtration of blood which is carried out by Malpighian tubules.
II. Roughly 16-17 times of stroke volume is filtered by the kidneys per minute.
III. The glomerular capillary blood pressure causes filtration of blood through three cellular layers.
IV. Capillary pores present in glomerulus are actually responsible for the ultrafiltration and is called filtration slits or slit pores.
V. Nephridia are the excretory structure that helps in ionic and fluid regulation (osmoregulation) in rotifers, some annelids and cephalochordates.
Which of the above statement is/are **correct**?
(A) I, II and V only
(B) II, III and IV only
(C) II and V only
(D) II only

Q50 The accompanying figure shows reabsorption of some constituents of glomerular filtrate in different parts of mammalian nephron. What can these constituents be?



(A) A-Na+, B-Water, C-Urea
(B) A-Urea, B-Na+, C-Water
(C) A-Water, B-Na+, C-Urea
(D) A-Na+, B-Urea, C-Water

Q51 Match **List-I** with **List-II**.

	List-I		List-II
(A)	Structure not present in renal pyramids	(I)	Angiotensin II

(B)	Collecting duct	(II)	Convoluted tubules
(C)	*Aptenodytes* and *Chameleon*	(III)	Not a part of renal tubules
(D)	Stimulate adrenal cortex directly to release aldosterone	(IV)	Uricotelic

Choose the **correct** answer from the options given below:

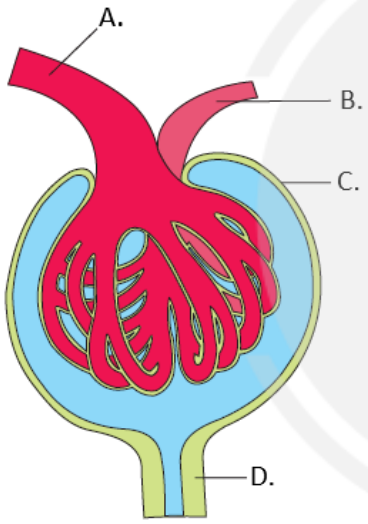
(A) A-III, B-II, C-I, D-IV

(B) A-II, B-III, C-I, D-IV

(C) A-II, B-III, C-IV, D-I

(D) A-III, B-II, C-IV, D-I

Q52 Recognise the given figure and find out the **correct** labels.



(i) 'A' is the fine branch of renal vein.

(ii) 'B' carries blood towards the glomerulus.

(iii) 'C' is the tuft of capillaries formed by the 'A'.

(iv) 'D' is the highly coiled network of renal tubule.

Which of the above statement is **correct**?

(A) (i) and (ii) (B) (ii) and (iii)

(C) (iii) and (iv) (D) (iv) only

Q53 Select the group containing ammonotelic animals only.

(A) Earthworm, frog, turtle, pigeon

(B) Prawn, earthworm, leech, bony fish

(C) Cockroach, land snail, prawn, toad

(D) Tapeworm, lizard, shark, leech

Q54 Identify the following statements as **true(T)** or **false(F)**.

A. The number of nephrons in a kidney is equal to the number of Bowman's capsules.

B. Glucose and amino acids are reabsorbed by active transport in PCT whereas water is reabsorbed by osmosis. Reabsorption is maximum in PCT segment.

C. Drugs called diuretics increase the production of dilute urine and prevent excessive water retention and tissue swelling.

D. Due to the deficiency of ADH, a disease called diabetes Type 2 (Insulin independent diabetes mellitus), is caused in which the output of urine may reach up to 2-3 times the average output.

(A) **A**-F; B-T; C-T; D-F

(B) **A**-F; B-F; C-T; D-F

(C) **A**-F; B-T; C-F; D-T

(D) **A**-T; B-T; C-T; D-F

Q55 Researchers analyzed nitrogenous waste excretion in three animal groups — freshwater fish (Group A), desert lizard (Group B), and amphibians (Group C). Each group was studied for:

- Type of nitrogenous waste (X, Y, Z)
- Nitrogen excreted per gram of protein
- Water required per gram of nitrogen excreted

Experimental Data:

Animal Group	Type of waste	Nitrogen Excreted (g) per g protein	Water required (mL) per g N
A (Fish)	X	0.28	500
B (Lizard)	Y	0.16	10
C (Amphibian)	Z	0.23	50

Based on the data above, which of the following combinations correctly identifies X, Y, and Z, and

explains the evolutionary advantage of the nitrogenous waste type in Group B?

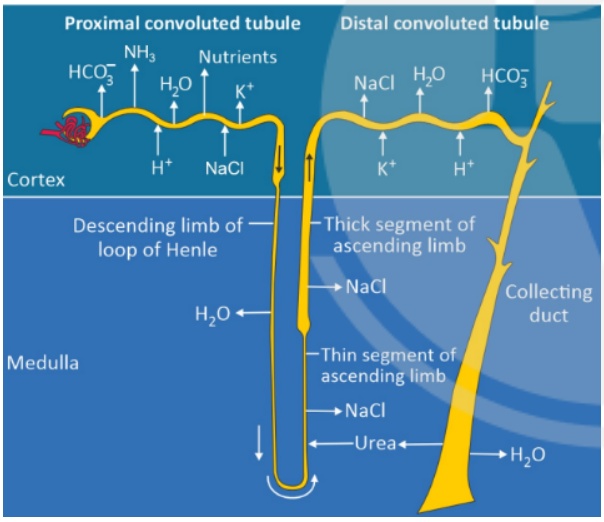
(A) X – Ammonia, Y – Uric acid, Z – Urea; Uric acid in Group B allows maximum nitrogen excretion per protein gram and is preferred for aquatic environments.

(B) X – Urea, Y – Ammonia, Z – Uric acid; Ammonia in Group B reduces energy cost and is ideal for desert survival.

(C) X – Ammonia, Y – Uric acid, Z – Urea; Uric acid in Group B reduces water loss, helping survival in arid environments.

(D) X – Uric acid, Y – Ammonia, Z – Urea; Uric acid is most energy-efficient and therefore preferred by all land animals

Q56 The given figure shows reabsorption and secretion of major substances at different parts of the nephron. The movement of which of the following substances is **wrongly** depicted?



(A) NaCl and K+ at DCT

(B) NaCl and NH_3 at PCT

(C) NaCl at ascending limb of loop of Henle

(D) H_2O at descending limb of loop of Henle

Q57 Read the following given statements w.r.t excretion in humans.

1. Removal of PCT will result in no urine formation.
2. Effective filtration pressure in glomerulus is caused due to the diameter difference of afferent and efferent arteriole.
3. Decrease in volume of body fluids results in increased permeability of DCT and collecting tubule under the action of ADH.
4. Alcohol and caffeine intake increase loss of water in urine.
5. Erythropoietin hormone which stimulates WBC formation is produced by JG cells of kidney.
6. ADH and angiotensin II differs in all, except vasoconstriction.

How many of the above statements are **correct**.

(A) One (B) Three

(C) Two (D) Four

Q58 Which of the following sequences is **correct** regarding regulation of kidney function?

(A) An excess loss of water from body → Hypothalamus → Osmoreceptors → Neurohypophysis → ADH → Increases water permeability of DCT and CT → Prevention of diuresis

(B) An excess loss of fluid from body → Osmoreceptors → Hypothalamus → Neurohypophysis → ADH → Increases water permeability of DCT and CT → Prevention of diuresis

(C) An excess loss of fluid from body → Osmoreceptors → Hypothalamus → Neurohypophysis → Aldosterone → Water permeability of DCT and CT increases →→ Prevention of diuresis

(D) An excess loss of fluid from body → Osmoreceptor → Hypothalamus → Adenohypophysis → ADH → Increases water permeability of DCT and CT → Prevention of diuresis

Q59 Dialysis is of two types: haemodialysis and peritoneal dialysis. Peritoneal dialysis uses peritoneal membrane present inside the body, i.e., to remove wastes and extra fluid from the body. The dialysis fluid fills the belly and pulls out wastes and extra fluid from the body

Based on the above given information choose the **correct** option.

(A) In peritoneal dialysis the blood is removed from the body and a natural filter is used.

(B) In peritoneal dialysis the blood is not removed from the body and a natural filter is used.

(C) In peritoneal dialysis the blood is not removed from the body and an artificial filter is used.

(D) In peritoneal dialysis the blood is removed from the body and an artificial filter is used.

Q60 How many of the following are **correct** statements as per the situation.

(1) If one of the kidneys is removed from the body of a human being, he will have uremia and ultimately death.

(2) Tumor in renal pelvis is the condition of renal calculi.

(3) A person who has undergone prolonged fasting will have ketone bodies in his urine.

(4) A person who is not taking food or beverages will have less urea in urine.

(5) If a person goes to antarctica like cold place, ADH level increases.

(A) One (B) Two

(C) Three (D) Four

Answer Key

Q1	(B)	Q31	(B)
Q2	(A)	Q32	(C)
Q3	(C)	Q33	(B)
Q4	(A)	Q34	(C)
Q5	(A)	Q35	(B)
Q6	(C)	Q36	(C)
Q7	(D)	Q37	(C)
Q8	(B)	Q38	(D)
Q9	(A)	Q39	(C)
Q10	(C)	Q40	(C)
Q11	(C)	Q41	(B)
Q12	(D)	Q42	(C)
Q13	(D)	Q43	(C)
Q14	(B)	Q44	(B)
Q15	(C)	Q45	(C)
Q16	(C)	Q46	(D)
Q17	(A)	Q47	(C)
Q18	(B)	Q48	(B)
Q19	(C)	Q49	(D)
Q20	(C)	Q50	(A)
Q21	(C)	Q51	(C)
Q22	(C)	Q52	(D)
Q23	(D)	Q53	(B)
Q24	(B)	Q54	(D)
Q25	(A)	Q55	(C)
Q26	(C)	Q56	(B)
Q27	(B)	Q57	(D)
Q28	(B)	Q58	(B)
Q29	(D)	Q59	(B)
Q30	(A)	Q60	(B)

Hints & Solutions

Q1 Text Solution:

- Protonephridia are the primary excretory structures in Platyhelminthes and are mainly concerned with ionic and fluid volume regulation.
- Nephridia in earthworms help in removing nitrogenous wastes and maintaining a fluid and ionic balance.
- Malpighian tubules are the excretory structures of most insects and primarily help in osmoregulation.
- Antennal glands in crustaceans perform an excretory function.

Q2 Text Solution:

The path of filtrate from the glomerulus to the collecting duct in a nephron

Glomerulus → PCT → Descending limb of Henle's loop → Ascending limb of Henle's loop → DCT → Collecting duct

Q3 Text Solution:

Loop of Henle primarily located in the medulla region of the kidney. It dips down from cortex to medulla and is surrounded by peritubular capillaries.

Q4 Text Solution:

- Statement I is correct as described in the text regarding the zones of the kidney.
- Statement II is incorrect. The hilum is on the **inner concave surface** of the kidney, not the outer convex surface.
- Statement III is correct as the renal pelvis is described as a funnel-shaped space leading to the ureter and receiving urine from calyces.
- Statement IV is incorrect. The Columns of Bertini are extensions of the **renal cortex** in between the medullary pyramids.

Q5 Text Solution:

If completely reabsorbed in the PCT, it wouldn't be present in the subsequent parts of the tubule (loop of Henle, DCT, collecting duct) and therefore not in the final urine. While it would be returned to the blood via peritubular capillaries (fed by the efferent arteriole), the question asks where its concentration in the filtrate/urine path would be zero. It's still present in the filtrate entering Bowman's capsule before reabsorption.

Q6 Text Solution:

- Actively secreted": DCT and collecting duct are involved in active secretion (e.g., K+, H+). PCT also does secretion.
- "Cuboidal epithelial cells with very few microvilli and mitochondria": This distinguishes it from the PCT, which has prominent microvilli (brush border) and many mitochondria for its extensive reabsorptive functions. The DCT has cuboidal cells but fewer microvilli and mitochondria than PCT. The collecting duct also has cuboidal cells.
- "Permeable to water under hormonal influence": This primarily points to the DCT and collecting duct (influence of ADH). The ascending limb is impermeable to water.
- The combination of "active secretion," "few microvilli/mitochondria compared to PCT," and "conditional water permeability" best fits the **Distal Convoluted Tubule (DCT)**. The collecting duct fits some criteria, but the description of cellular machinery (fewer mitochondria than PCT) is often used to differentiate DCT from PCT. The question implies a single region. The text for DCT mentions "conditional reabsorption of Na+ and water" and "selective secretion of hydrogen and potassium ions."

Q7 Text Solution:

- GFR: The amount of filtrate formed by the kidneys per minute.
- Podocytes: Epithelium cells of Bowman's capsule arranged in an intricate manner leaving filtration slits.
- JGA : A specialized sensitive region formed by cellular modifications in the DCT and afferent arteriole.
- Tubular secretion: Process by which substances are transported from blood into the renal tubules.

Q8 Text Solution:

If the ascending limb were permeable to water, water would leave along with NaCl, reducing the gradient and thus less water would be reabsorbed from the collecting duct, leading to dilute urine.

Q9 Text Solution:

The ascending limb of Henle's loop removes NaCl (solute) from the filtrate, not water, and this removal of solute creates the gradient, it doesn't remove water to increase osmolarity.

Q10 Text Solution:

Tubular secretion is a key process where H^+ ions, K^+ ions, and ammonia are actively secreted into the filtrate, and HCO_3^- can be reabsorbed, playing a crucial role in maintaining the acid-base balance of the blood. This occurs in both PCT and DCT/collecting ducts.

Q11 Text Solution:

- "Angiotensin II also activates the adrenal cortex to release aldosterone." It also mentions aldosterone's role in increasing "salt reabsorption."
- An increase in blood pressure leads to an increase in GFR, which then stimulates the heart to release ANF. It further states that ANF acts as a vasodilator.

Q12 Text Solution:

- Micturition : Controlled by nervous system
- Diabetes mellitus: Glucose in urine
- Kidney failure: often necessitates Hemodialysis
- Sebaceous glands: Eliminate sterols

Q13 Text Solution:

A) Distal convoluted tubule:

B) Descending Limb of Loop of Henle: This limb is permeable to water, and water reabsorption does occur here. However, the *fine-tuning* of water reabsorption, especially under hormonal control (ADH), occurs in the DCT and collecting duct.

C) Thin segment of descending limb:

D) DCT and Collecting Duct: These are the primary sites for facultative (regulated) water reabsorption under the influence of ADH. If these segments are dysfunctional and cannot reabsorb adequate water, even if the earlier parts are working, the patient will experience significant polyuria and dehydration. Conditions like Diabetes Insipidus specifically affect ADH production or receptor function in these areas.

Q14 Text Solution:

The vasa recta act as countercurrent exchangers, maintaining the medullary osmotic gradient by minimizing the loss of solutes from the interstitium. If blood flow through the vasa recta increases significantly, the solutes (NaCl and urea) that are pumped into the interstitium by the loop of Henle and collecting duct would be carried away more rapidly. This "washes out" the osmotic gradient, making it difficult for the collecting duct to reabsorb water and produce concentrated urine.

Q15 Text Solution:

- Ammonotelism is common in bony fishes and aquatic insects due to the ready availability of water for dilution and excretion of ammonia via diffusion.
- Ureotelism involves the conversion of ammonia into urea in the liver of animals like mammals and terrestrial amphibians to conserve water.

- Uricotelism, observed in reptiles, birds, land snails, and insects, is an adaptation for minimal water loss, where uric acid is excreted.
- Some amount of urea may be retained in the kidney matrix of some ureotelic animals to maintain desired osmolarity.

Q16 Text Solution:

Aldosterone, a mineralocorticoid produced by the adrenal cortex, acts on the renal tubules (primarily the distal convoluted tubule and collecting duct) to increase the reabsorption of sodium ions (Na+) and water, and simultaneously promote the excretion of potassium ions (K+). This action plays a crucial role in regulating blood volume and blood pressure. Adrenaline and Noradrenaline are catecholamines involved in "fight or flight" responses, and Cortisol is a glucocorticoid involved in metabolism and stress response, with indirect effects on fluid balance.

Q17 Text Solution:

Constriction of the efferent arteriole backs up blood in the glomerulus, increasing the glomerular hydrostatic pressure, which in turn increases GFR.

As blood flow out of the glomerulus is restricted, pressure builds up within the glomerular capillaries, leading to increased hydrostatic pressure.

Since less blood is exiting the glomerulus via the efferent arteriole, the blood flow to the peritubular capillaries (which arise from the efferent arteriole) would decrease.

Reduced blood flow to the vasa recta (part of the peritubular capillary network) would lead to *increased* maintenance of the medullary osmotic gradient, as less solute would be "washed away" from the medulla. This would potentially *enhance*, not inhibit, the ability to form concentrated urine, assuming ADH is present.

Q18 Text Solution:

"Efferent arteriole emerging from the glomerulus forms a fine capillary network around the renal tubule called the peritubular capillaries. A minute vessel of this network runs parallel to the Henle's loop forming a 'U' shaped vasa recta. Vasa recta is absent or highly reduced in cortical nephrons." This implies its significance in nephrons with longer loops of Henle that extend deep into the medulla (juxtamedullary nephrons).

Q19 Text Solution:

In diabetes mellitus, high blood glucose leads to glucose in the filtrate, which then acts as an osmotic diuretic, drawing water with it and leading to polyuria (large urine volume).

Q20 Text Solution:

- Hemodialysis effectively removes waste products and excess fluid but cannot replicate all functions of the kidney, such as hormone production (e.g., erythropoietin, vitamin D activation).
- Renal artery stenosis reduces blood flow to the kidney, which the kidney interprets as low systemic blood pressure. This triggers the release of renin, initiating the RAAS, leading to vasoconstriction and increased blood pressure (hypertension).

Q21 Text Solution:

The dialyzing fluid is designed to have a composition similar to normal plasma for essential substances like glucose, electrolytes, and amino acids, but *lacks* nitrogenous wastes like urea to allow for their diffusion out of the blood.

Q22 Text Solution:

- The afferent arteriole, which brings blood to the glomerulus, has a wider lumen than the efferent arteriole, which carries blood away.
- The narrower efferent arteriole acts as a resistance to blood flow out of the glomerulus. This resistance causes blood to "pile up" in the glomerular capillaries, significantly increasing the glomerular hydrostatic pressure. This high pressure is the primary driving force for ultrafiltration,

pushing fluid and small solutes out of the blood and into Bowman's capsule.

Q23 Text Solution:

Freely filtered: Small molecules like ions, glucose, urea, creatinine are freely filtered.

Complete reabsorption in PCT: Glucose and amino acids are normally completely reabsorbed in the PCT (unless their concentration exceeds the transport maximum, as in diabetes mellitus for glucose). However, the question states it's then secreted into the DCT.

Secreted into DCT: Hydrogen ions (H+) are actively secreted into the PCT and DCT, and collecting ducts to regulate pH. While some H^+ may be reabsorbed as bicarbonate, the net movement is secretion to eliminate excess acid.

Q24 Text Solution:

- Due to its high toxicity, ammonia requires a large amount of water for its dilution and elimination.
- The process of excreting urea is termed **ureotelism**. Uricotelism refers to the excretion of uric acid

Q25 Text Solution:

Longer loops of Henle facilitate greater water reabsorption to produce highly concentrated urine, not dilute urine. The entire purpose of these adaptations in desert animals is to minimize water loss by excreting a very concentrated urine.

Q26 Text Solution:

Dehydration implies low blood volume and pressure. ADH, renin, and aldosterone all work to conserve water and sodium, thereby increasing blood volume and pressure. ANF, however, promotes sodium and water excretion, which would further lower blood volume and pressure, making it counterproductive in this scenario.

Q27 Text Solution:

The counter-current arrangement of the vasa recta with the Loop of Henle is essential for maintaining the medullary osmotic gradient. If they ran parallel, the reabsorbed solutes and water from the loop would be rapidly carried away, effectively "washing out" the gradient, thus preventing the formation of concentrated urine.

Q28 Text Solution:

In a healthy individual, glucose and amino acids are freely filtered at the glomerulus and are almost entirely reabsorbed in the Proximal Convoluted Tubule (PCT) via active transport mechanisms. If these substances are found in the urine despite normal blood levels, it indicates a defect in the reabsorptive capacity of the PCT, where their transport maximum (Tm) might be impaired or exceeded.

Q29 Text Solution:

Micturition is the process of urination, involving both involuntary (reflex) and voluntary control — the external urethral sphincter is voluntarily relaxed.

Urinalysis is widely used in medical diagnostics to detect kidney issues, diabetes, infections, etc.

Liver eliminates bilirubin, biliverdin, drugs, and other waste substances via bile.

Hemodialysis is used as a temporary support in acute renal failure, or as a long-term support in chronic kidney disease.

Q30 Text Solution:

"Sweat glands remove small amounts of urea, lactic acid, and chlorides..." It does not state that the presence of even trace amounts of urea in sweat indicates kidney malfunction. In fact, removing "small amounts of urea" is a normal function of sweat glands, implying that its trace presence is normal.

Q31 Text Solution:

In chronic kidney disease, when a person shows high levels of urea in the blood (a condition called uremia) but has normal levels of glucose and proteins, it indicates a selective malfunction in certain parts of the nephron.

The glomerulus, which is responsible for the initial filtration of blood, seems to be functioning normally since glucose and proteins are not being lost into the urine. This is because a healthy glomerulus prevents large molecules like proteins from being filtered out, and glucose is normally filtered but reabsorbed later. However, the presence of high urea in blood suggests that tubular reabsorption or secretion processes are impaired.

Urea is usually filtered and partly reabsorbed, but its final concentration in blood is regulated by the tubules. If these tubular structures are not functioning properly, they fail to remove enough urea from the body, causing its accumulation in the blood.

Q32 Text Solution:

It is **not the proximal convoluted tubule (PCT)**, but the **distal convoluted tubule (DCT)** that makes contact with the **afferent arteriole** at the JGA.

Q33 Text Solution:

Ammonotelic animals excrete ammonia, which is highly toxic and requires a lot of water to eliminate — common in **aquatic animals**.

Terrestrial animals conserve water and therefore are generally:

Ureotelic (e.g., humans, amphibians) – excrete urea. **Uricotelic** (e.g., birds, reptiles) – excrete uric

Diabetes insipidus involves **deficiency of ADH** (antidiuretic hormone), leading to **excessive water loss but no glucose or ketone bodies in urine**. **Glycosuria** (glucose in urine) and **ketonuria** (ketones in urine) are typical of **diabetes mellitus**, particularly uncontrolled cases.

Glycosuria occurs **only when blood glucose > renal threshold (~180 mg/dL)**. A diabetic with **controlled glucose** may test **negative** for glycosuria. Hence, **not detecting glycosuria does NOT rule out diabetes mellitus**.

The glomerular membrane allows passage of **water, ions, glucose, urea**, etc., but **retains proteins** due to size and charge. So, the filtrate in Bowman's capsule is **protein-free**.

Q34 Text Solution:

ADH (antidiuretic hormone) acts primarily on the distal convoluted tubule (5) and collecting duct (6) to increase their permeability to water, enabling reabsorption and producing concentrated urine. Proximal convoluted tubule (1) and loop of Henle segments (2, 3, 4) are involved in obligatory water reabsorption and counter-current mechanisms but are not directly regulated by ADH. ADH does not act on the thin or thick segments of the loop of Henle (like 2, 3, or 4).

Q35 Text Solution:

Uremia	Presence of excess urea in blood
Hematuria	Presence of blood in urine
Pyuria	The presence of pus in the Urine
Glycosuria	Presence of glucose in urine

Q36 Text Solution:

In a person suffering from chronic kidney failure, several key changes occur due to the kidneys' inability to properly filter waste and regulate homeostasis. Elevated urea and creatinine levels in blood (a) are observed because the kidneys fail to excrete these nitrogenous waste products efficiently. Water retention and edema (c) develop due to impaired fluid balance and sodium retention. Contrary to (b), erythropoietin production decreases (rather than increases), leading to anemia. Additionally, metabolic acidosis (not alkalosis, as in d) occurs because the kidneys cannot adequately excrete hydrogen ions or regenerate bicarbonate.

Q37 Text Solution:

Low ADH secretion from posterior pituitary does not favor water reabsorption. Antidiuretic hormone

(ADH) increases the permeability of the collecting duct to water by inserting aquaporins. Low ADH
means less water reabsorption, leading to dilute urine. All other options represent the conditions which favours maximum water reabsorption in the renal medulla.

Q38 Text Solution:
The pancreas is primarily an endocrine (insulin, glucagon) and exocrine (digestive enzymes) gland,
but it does not directly excrete waste products like ammonia or bile pigments. Ammonia is detoxified in the liver (converted to urea), and bile pigments are produced and excreted by the liver, not the pancreas.

Q39 Text Solution:
The medullary interstitium becomes hyperosmotic due to several key mechanisms. Active transport of NaCl from the ascending limb of Henle's loop into the interstitium increases solute concentration. Counter-current flow between Henle's loop and vasa recta maintains the osmotic gradient, while urea recycling from the collecting ducts further contributes to medullary osmolarity.
However, the descending limb is highly permeable to water, not salts, which allows water reabsorption but does not directly increase interstitial solute concentration.
Thus, the hyperosmotic environment results from NaCl transport, counter-current mechanisms, and urea recycling.

Q40 Text Solution:
Aldosterone, produced by the adrenal cortex, enhances sodium reabsorption and potassium secretion in the distal nephron. Without it, sodium excretion increases, leading to reduced water retention and a drop in blood volume, ultimately causing hypotension. Additionally, potassium retention may occur due to diminished secretion. This contrasts with options (a), (b), and (d), which incorrectly suggest increased sodium/water retention or potassium excretion, as these depend on aldosterone's action.

Q41 Text Solution:
The most likely renal condition responsible for the presence of proteins and erythrocytes in the urine
is (B) Damage to the glomerular filtration membrane. This membrane normally prevents large molecules like proteins and blood cells from passing into the filtrate, but when damaged (as in glomerulonephritis or other glomerular disorders), it allows these substances to leak into the urine, resulting in proteinuria and haematuria. Obstruction by renal calculi (A) typically causes haematuria but not proteinuria, while excess ADH secretion (C) leads to water retention without affecting protein or erythrocyte levels. Tubular reabsorption failure (D) might impair solute or water balance but would not explain the presence of proteins or blood cells in the urine.

Q42 Text Solution:
Renal failure (especially chronic) leads to uremia: build-up of urea and other nitrogenous wastes due to loss of nephron function. Kidney stones are crystal aggregations, not primarily nephron failure. Glomerulonephritis is inflammatory but may not cause progressive nitrogenous waste build-up unless chronic. Diabetes insipidus is related to ADH dysfunction, leading to water loss — not nitrogenous waste accumulation

Q43 Text Solution:
The **kidney** exhibits **autoregulatory mechanisms** to maintain a **constant glomerular filtration rate (GFR)** despite fluctuations in systemic blood pressure (within a certain range).
This is similar to the **heart and brain**, which also autoregulate blood flow to ensure stable perfusion.
A **decrease in GFR** (due to reduced blood pressure or blood volume) is sensed by the **macula densa cells** in the **distal convoluted tubule**.

This stimulates the **juxtaglomerular (JG) cells** in the **afferent arteriole** to release **renin**.
Renin activates the **renin-angiotensin-aldosterone system (RAAS)**:

- Causes **vasoconstriction** (especially of the efferent arteriole)
- Promotes **sodium and water retention**
- Collectively, these actions help **restore blood pressure and GFR**.

Q44 **Text Solution:**
Flame cells are characteristic of certain invertebrates, particularly Platyhelminthes. The excretory organs in *Amphioxus*, a chordate, are protonephridia or flame cells.

Q45 **Text Solution:**
The main driving force favouring fluid filtration from the glomerular capillary to Bowman's space is glomerular capillary blood pressure.

Q46 **Text Solution:**
Nephron number is almost fixed at birth and does not increase. In fact, nephron number declines with age due to natural wear and tear, fibrosis, and glomerulosclerosis. Kidney size also typically shrinks rather than increases in elderly individuals. Some hypertrophy (increase in size) of remaining nephrons may occur as a compensatory mechanism, but this is typically a response to nephron loss, not a general increase with age.
Osmoreceptors detect increased blood osmolarity due to fluid loss and stimulate (not inhibit) the hypothalamus. This leads to ADH (vasopressin) release, promoting water reabsorption and thirst response.
The filtration membrane in the glomerulus allows passage of water and small solutes (like ions, glucose, urea, amino acids). Blood cells and large proteins (like albumin) are normally too large to pass through.
The thin segment of the descending and ascending limbs is lined by simple squamous epithelium.
The thick ascending limb is lined by simple cuboidal or low columnar epithelium.

Q47 **Text Solution:**
Micturition (urination) involves complex coordination between the autonomic nervous system (parasympathetic and sympathetic) and voluntary control.
Parasympathetic stimulation (via pelvic nerves) causes Detrusor muscle contraction → facilitates bladder emptying. Sympathetic stimulation (via hypogastric nerves) causes: Relaxation of detrusor muscle and contraction of internal sphincter → promotes urine storage.

Q48 **Text Solution:**
When a healthy man drinks one litre of water on occasion A it releases normal volume of urine and Na^{+} concentration. But when he drinks one litre of 0.9% saline which is solution of NaCl, sodium concentration in blood increases and water follows it by osmosis. so, because of increase in absorption of water, volume of urine decreases and there will be no effect on Na^{+} concentration in volume of urine.

Q49 **Text Solution:**
Malpighian tubules are excretory structures in insects, not humans. In humans, the first step of urine formation (filtration) occurs in Bowman's capsule of nephrons.
On an average, 1100-1200 ml of blood is filtered by the kidneys per minute which constitute roughly 1/5th of the blood pumped out by each ventricle of the heart in a minute.
Stroke volume = 70 mL, 16*70 = 1120 mL
The filtration barrier consists of:

1. Fenestrated endothelium of glomerular capillaries
2. Basement membrane (non-cellular)
3. Filtration slits between podocyte foot processes

Capillary pores (fenestrations) are present in the endothelium. Filtration slits are formed by podocytes, not the same as capillary pores.

Nephridia are found in annelids, but not in rotifers or cephalochordates.

- Rotifers have protonephridia.
- Cephalochordates (like amphioxus) have structures that are not homologous to true nephridia.

Q50 Text Solution:

A shows rapid and high reabsorption in the proximal tubule, reaching near 100%, and remains high throughout → indicates a substance that is actively and extensively reabsorbed early.
A = Na^+ (Sodium ions)

- ~65–70% reabsorbed in proximal tubule, more in distal and collecting parts.
- Actively transported → explains the early and sustained high reabsorption.

B shows gradual reabsorption, notably increasing in the Loop of Henle, distal tubule, and collecting duct → matches the pattern of water, which is under hormonal control (e.g., ADH).
B = Water

- Follows osmotic gradients set up by sodium.
- Reabsorbed in proximal tubule, descending limb of Loop of Henle, and under ADH influence in collecting duct.

C shows minimal reabsorption, with a slight increase in later segments → typical of urea, which is partially reabsorbed passively, especially in the medullary collecting duct.
C = Urea

- Not fully reabsorbed; some passive reabsorption in collecting duct due to medullary gradient.
- Graph matches low but present reabsorption pattern.

Q51 Text Solution:

Renal pyramids contain straight tubules, loops of Henle, and collecting ducts, but not convoluted tubules (which lie in the renal cortex).
The renal tubule includes the proximal convoluted tubule, loop of Henle, and distal convoluted tubule. The collecting duct is embryologically and functionally separate from the nephron proper.
Aptenodytes (a genus of penguins) and *Chameleon* are uricotelic, i.e., they excrete nitrogen as uric acid, conserving water.
Angiotensin II acts on the adrenal cortex to stimulate the release of aldosterone, which promotes Na^+ and water reabsorption.

Q52 Text Solution:

A is the fine branch of renal artery.
B carries blood away from the glomerulus.
C is the double walled cup like structure.
D is a highly coiled network of renal tubule.

Q53 Text Solution:

Earthworm – Ammonotelic, Frog – Ammonotelic (in water; partly ureotelic on land), Turtle – Uricotelic, Pigeon – Uricotelic
Prawn – (aquatic → ammonotelic), Earthworm – ammonotelic, Leech – ammonotelic Bony fish – ammonotelic
Cockroach – Uricotelic, Land snail – Uricotelic, Prawn – (aquatic → ammonotelic), Toad – (partially ammonotelic)
Tapeworm – (ammonotelic — simple diffusion), Lizard – Uricotelic, Shark – Ureotelic, Leech – ammonotelic

Q54 Text Solution:

Glomerular filtration depends on adequate glomerular hydrostatic pressure (typically around 55 mmHg). If blood pressure drops too low, filtration ceases because net filtration pressure becomes zero or negative. In such rare conditions, tubular secretion may still occur, though it's limited, and minimal urine formation may continue — mostly consisting of secreted substances like K^+, H^+, drugs, etc. So, urine formation can continue in severely reduced form via tubular secretion, even when filtration stops.

Glucose and amino acids are actively reabsorbed in proximal convoluted tubule (PCT). Water follows via osmosis. PCT does maximum reabsorption of filtrate (~65–70%).
Diuretics increase urine volume by reducing water and sodium reabsorption. They help in reducing edema (swelling) and water retention. Resulting urine is typically more dilute.

Q55 Text Solution:
Group A (Fish) excretes ammonia (X): high water loss, typical for aquatic organisms.
Group B (Lizard) excretes uric acid (Y): conserves water, crucial for desert environments.
Group C (Amphibians) excrete urea (Z): a compromise between toxicity and water use.
Uric acid is low in toxicity and water solubility, excreted as paste → ideal for arid habitats like deserts.

Q56 Text Solution:
NH_3 is secreted while Nacl is reabsorbed in PCT.

Q57 Text Solution:
Urine formation begins in the glomerulus and continues throughout the nephron. Removal of PCT impairs reabsorption but does not stop urine formation. Urine would still form, albeit with serious imbalances.
The afferent arteriole is wider than the efferent arteriole. This creates higher hydrostatic pressure in glomerulus → drives filtration.
ADH is released when body fluid volume is low. It increases water permeability of DCT and collecting duct, enhancing water reabsorption.
Alcohol inhibits ADH secretion, reducing water reabsorption. Caffeine acts as a mild diuretic, promoting fluid loss.
Erythropoietin is produced by interstitial fibroblasts in the kidney, not JG cells. It stimulates RBC formation, not WBCs.
Both ADH and angiotensin II cause vasoconstriction. They differ in:

- Origin (ADH from hypothalamus/posterior pituitary; Ang II from RAAS)
- Mechanism of action
- Effect on electrolyte balance

Q58 Text Solution:
When the body loses excess water (e.g., due to dehydration):

1. Osmoreceptors in the hypothalamus detect increased blood osmolarity.
2. The hypothalamus signals the neurohypophysis (posterior pituitary).
3. Neurohypophysis releases ADH (antidiuretic hormone).
4. ADH acts on the distal convoluted tubule (DCT) and collecting tubule (CT).
5. It increases their water permeability, allowing more water reabsorption.

This leads to reduced urine output → prevention of diuresis (water loss).

Q59 Text Solution:
Peritoneal dialysis uses the peritoneal membrane (lining of the abdominal cavity) as a natural semi-permeable filter. In this a special dialysis fluid is infused into the peritoneal cavity, where waste products and excess fluids from the blood pass across the peritoneal membrane into the fluid. The blood stays inside the body during the process — no external circulation of blood is involved. After a dwell time, the fluid (now containing wastes) is drained out and replaced.

Q60 Text Solution:
Humans can survive with one functional kidney. Uremia (build-up of urea in blood) only occurs if both kidneys fail. One kidney compensates effectively → No uremia or death.
Renal calculi = Kidney stones, formed by crystallization of salts in urine. Tumor in renal pelvis = Renal carcinoma or malignancy, not stones.
During prolonged fasting, fat is broken down for energy. This produces ketone bodies. Ketones appear in urine — a condition called ketonuria.
Urea is a product of protein metabolism. If no food is taken → less protein intake → less amino

acid breakdown → less urea produced and excreted. Also, dehydration can reduce urine volume.

In cold environments, sweating reduces, and fluid loss is minimal. This suppresses ADH release → more dilute urine. Therefore, ADH decreases, not increases.