ICSE 2027 PRACTICE QUESTION BANK

BIOLOGY (SCIENCE PAPER 3) — EXCRETORY SYSTEM

Class X Syllabus 3(ii): Excretory organs, urinary system, kidney structure and blood vessels, nephron, ultrafiltration, selective reabsorption, tubular secretion, composition of urine

How to use this bank. All questions are taken from the T23, T24, T25 and T26 board papers, the T24 and T26 specimen papers and the T27 specimen paper, arranged in the format of the T27 specimen paper. Each question carries its source tag in grey. Attempt each part cold, then check the answer key at the end (answers only).

Answer reliability. Only the T27 specimen items come from a CISCE draft marking scheme; the T26 and T24 specimen papers in your files have no excretory marking scheme in this set. All other answers are written by me from the Class X syllabus — verify any you doubt. The T27 nephron question used a numbered diagram that I could not reproduce, so it is reworded. The kidney and Malpighian capsule diagrams are redrawn.

Diagrams to practise from memory: urinary system, kidney (L.S.), nephron with blood supply, Malpighian capsule.

EXCRETORY SYSTEM

Question 1 **[8]**

Choose the correct answers to the questions from the given options. (Do not copy the question, write the correct answers only.)

(i) Which of the following correctly describes the level of urea in the two blood vessels after a meal containing protein? [1]

(a) Renal artery – High; Renal vein – High
(b) Renal artery – High; Renal vein – Low
(c) Renal artery – Low; Renal vein – Low
(d) Renal artery – Low; Renal vein – High

Source: T27 Specimen Q1(iv)

(ii) A patient suffering with severe cholera: [1]

(a) passes very little urine due to severe dehydration.
(b) passes excessive urine due to kidney overactivity.
(c) has blood in the urine as the first symptom.
(d) produces normal amounts of urine despite severe fluid loss.

Source: T27 Specimen Q1(v)

(iii) Which parts of the nephron are present in the renal cortex and which in the renal medulla? [1]

(a) Cortex: Malpighian capsule, PCT, DCT; Medulla: Loop of Henle, collecting duct
(b) Cortex: Loop of Henle, collecting duct; Medulla: Malpighian capsule, PCT, DCT
(c) Cortex: Malpighian capsule, Loop of Henle; Medulla: PCT, DCT, collecting duct
(d) Cortex: PCT, collecting duct; Medulla: Malpighian capsule, DCT, Loop of Henle

Source: T27 Specimen Q1(viii) (original used a numbered nephron diagram; reworded in words)

(iv) A person suffering from kidney failure has proteins in the urine. What is this condition called? [1]

(a) Haematuria
(b) Glycosuria
(c) Albuminuria
(d) Anaemia

Source: T26 Q1(xii)

(v) Assertion (A): Deficiency of antidiuretic hormone causes an increase in urination. [1]

Reason (R): Antidiuretic hormone acts on the kidney to reabsorb water from the kidney tubules.

(a) (A) is true and (R) is false.

(b) (A) is false and (R) is true.

(c) Both (A) and (R) are true.

(d) Both (A) and (R) are false.

Source: T25 Q1(ix)

(vi) The hormone that affects urination is: [1]

(a) Adrenaline

(b) Vasopressin

(c) Oestrogen

(d) Thyroxine

Source: T24 Q1(iv)

(vii) Assertion (A): There is frequent urination in summer than in winter. [1]

Reason (R): In summer we lose a lot of water as sweat, so the kidneys reabsorb more water. Hence, urine formed is less in summer than in winter.

(a) Both A and R are true

(b) Both A and R are false

(c) A is true and R is false

(d) A is false and R is true

Source: T24 Specimen Q1(vi)

(viii) The pale yellow colour of normal human urine is due to the pigment: [1]

(a) Melanin

(b) Anthocyanin

(c) Urochrome

(d) Haemoglobin

Source: T23 Q1(ix)

Question 2 [13]

(i) Give the biological / technical terms for the following: [2]

(a) The duct which carries urine from the urinary bladder to the outside of the body.

(b) The main nitrogenous waste formed in the body.

Source: T24 Specimen Q2(i)(d); T24 Q2(i)(d)

(ii) Arrange the terms in the correct logical sequence (path of the filtrate): Loop of Henle, Distal convoluted tubule, Bowman's capsule, Proximal convoluted tubule. [1]

Source: T24 Q2(ii)(d)

(iii) Choose the odd one out from each set and name the category to which the remaining three belong: [5]

(a) Urochrome, Urea, Uric acid, Nucleic acid

(b) Uterus, Urethra, Urinary bladder, Ureter

(c) Urochrome, Urea, Keratin, Uric acid

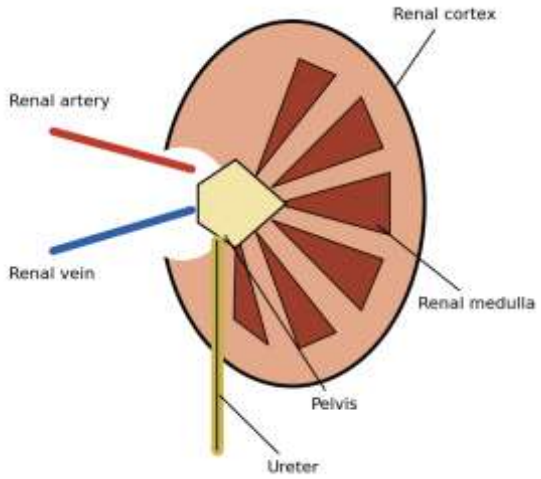
(d) Ureter, Urethra, Uterus, Renal pelvis

(e) Renal pelvis, Renal artery, Renal cortex, Renal medulla

Source: T26 Q2(iii)(c); T23 Q2(iv)(c); T24 Specimen Q2(iv)(c); T26 Specimen Q2(iii)(d); T24 Specimen Q2(iv)(b)

(iv) Study the diagram given below and name the structure that matches each function. [5]

Example: Receives urine which flows into the ureter – Pelvis.



(a) Has Malpighian capsules

(b) Carries oxygenated blood

(c) Transports urine to the urinary bladder

(d) Has Henle's loops

(e) Carries deoxygenated blood

Source: T26 Q2(v) (diagram redrawn); T24 Q2(v)

Question 3 [13]

Answer the following questions.

(i) What is excretion? [1]

Source: T26 Specimen Q4(i); T25 Q8(i)

(ii) Define the term ultrafiltration. [1]

Source: T24 Q8(i)

(iii) What is micturition? Explain. [1]

Source: T25 Q5(i)

(iv) Differentiate between the afferent arteriole and the efferent arteriole on the basis of diameter. [2]

Source: T24 Q3(iii)

(v) Mention the regions of the kidney where we can find the glomerulus and the Henle's loop. [2]

Source: T26 Specimen Q7(iv)

(vi) The renal cortex has a dotted appearance and the renal medulla has a striped appearance. Explain. [2]

Source: T23 Q7(ii)

(vii) Differentiate between the functions of the urethra and the uterus. [2]

Source: T25 Q5(iii)

(viii) State the difference between a nephron and a neuron. [2]

Source: T25 Q8(ii)

Question 4 **[3]**

Application / case-based question.

(i) Akshay's father had a tumour in his prostate gland. His doctor advised him to get it removed surgically. One side effect of the surgery was incontinence of urine, i.e. leakage of urine from the urinary bladder. [3]

(a) Where is the prostate gland located?

(b) Why does the prostate gland produce an alkaline secretion?

(c) Name the structure that regulates the flow of urine from the urinary bladder into the urethra.

Source: T26 Q4(v)

Question 5 **[3]**

Diagram-based question.

(i) Draw a neat, labelled diagram of a Malpighian capsule. [3]

Source: T23 Q6(v)

ANSWER KEY

Question 1

(i) (b) Renal artery – High; Renal vein – Low

(ii) (a) passes very little urine due to severe dehydration.

(iii) (a) Cortex: Malpighian capsule, PCT, DCT; Medulla: Loop of Henle, collecting duct

(iv) (c) Albuminuria

(v) (c) Both (A) and (R) are true.

(vi) (b) Vasopressin

(vii) (d) A is false and R is true

(viii) (c) Urochrome

Question 2

(i)

- **(a)** Urethra
- **(b)** Urea

(ii) Bowman's capsule → Proximal convoluted tubule → Loop of Henle → Distal convoluted tubule

(iii)

- **(a)** Odd: Nucleic acid. Others: constituents of urine.
- **(b)** Odd: Uterus. Others: parts of the urinary system.
- **(c)** Odd: Keratin. Others: constituents of urine.
- **(d)** Odd: Uterus. Others: parts of the urinary system.
- **(e)** Odd: Renal artery. Others: parts of the kidney.

(iv)

- **(a)** Renal cortex
- **(b)** Renal artery
- **(c)** Ureter
- **(d)** Renal medulla
- **(e)** Renal vein

Question 3

(i) The removal of harmful nitrogenous waste products (metabolic wastes) from the body.

(ii) The filtration of blood under high pressure in the Malpighian capsule, in which water, urea, glucose and salts pass from the glomerulus into Bowman's capsule, while blood cells and large protein molecules are held back.

(iii) The process of passing out urine. Urine stored in the bladder is released through the urethra when the bladder wall contracts and the sphincter relaxes.

(iv) The afferent arteriole (brings blood to the glomerulus) is wider; the efferent arteriole (takes blood away from the glomerulus) is narrower, which maintains high pressure in the glomerulus.

(v) Glomerulus – renal cortex. Henle's loop – renal medulla.

(vi) The cortex contains Malpighian capsules and convoluted tubules, which appear as dots. The medulla contains loops of Henle and collecting ducts running in parallel, which appear as stripes.

(vii) Urethra: passage that carries urine from the bladder to the outside. Uterus: site of implantation and development of the embryo and foetus.

(viii) Nephron: structural and functional unit of the kidney (filters blood and forms urine). Neuron: structural and functional unit of the nervous system (conducts nerve impulses).

Question 4

(i) *Akshay's father had a tumour in his prostate gland. His doctor advised him to get it removed surgically. One side effect of the surgery was incontinence of urine, i.e. leakage of urine from the urinary bladder.*

(a) Just below the urinary bladder, surrounding the beginning of the urethra.

(b) To neutralise the acidity of the urine in the urethra and the vagina, which helps sperm survive and move.

(c) Sphincter muscle

Question 5

(i) Label: afferent arteriole, efferent arteriole, glomerulus, Bowman's capsule, capsular space, proximal convoluted tubule.

