# Excretory Products and Their Elimination

## Case Study Based Questions

**Read the following passages and answer the questions that follow:**

**1.** Master Mahrishi Shukla was born with bilateral refluxing ureters (part of urine goes back to the kidney instead of coming out of natural passage). He was diagnosed as suffering from high blood pressure and kidney failure at 8 years of age. He was started on maintenance haemodialysis under care of a nephrologist. He had difficulty controlling blood pressure, for which he was hospitalised 8 times. Once he needed ventilatory support due to flash pulmonary edema and convulsions needing anaesthetic agents to control convulsion. His father decided to donate a kidney but family finances were not sufficient to pay for a kidney transplant.

**(A) Structure that covers the kidneys is:**

(a) calyx

(b) renal fascia

(c) renal pyramid

(d) hilum

**(B) The given three major hormones are secreted by the kidneys. Match them with their correct functions.**

| Hormone | Function |
|---|---|
| (A) Renin | (i) Helps in the absorption of calcium in the intestines. |
| (B) Calcitriol | (ii) Released in response to hypoxia. |
| (C) Erythropoietin | (iii) Controls blood pressure by regulation of angiotensin and aldosterone. |

**Codes:**

(a) (A)(i), (B) - (ii), (C)(iii)

(b) (A)(iii), (B)-(i), (C) - (ii)

(c) (A)(i), (B) - (iii), (C) - (ii)

(d) (A)(ii), (B)(i), (C)(iii)

**(C) Which of the following is not a function of kidneys?**

(a) Filter blood

(b) Removal of metabolic waste

(c) Reabsorption

(d) None of the above

**(D) What is the kidney's shape?**

(a) The organ is oval in shape.

(b) It's a bean-shaped organ.

(c) It has a rectangular shape.

(d) It does not have a fixed shape.

**(E) When a person is put on dialysis, he suffers from:**

(a) Cardiovascular disease

(b) Kidney disease

(c) Respiratory issue

(d) None of the examples given

**Ans. (A)** (b) renal fascia

**Explanation:** Each kidney is secured in position by connective tissue called renal fascia

and is protected by perirenal fat (thick layer of adipose tissue). Each kidney is surrounded with a thick, fibrous connective tissue renal capsule that provides support for the soft tissues inside.

**(B)** (b) (A)(iii), (B)-(i), (C)-(ii)

**Explanation:** The kidneys secrete three different types of hormones; erythropoietin, renin and calcitriol (1, 25- dihydroxycholecalciferol).

(1) Erythropoietin is the peptide hormone secreted by the juxtaglomerular cells of the kidney. This hormone releases in response to hypoxia (insufficient oxygen supply to the tissues). It stimulates the formation of RBCs from the hematopoietic stem cells in the bone marrow.

(2) Renin is also a peptide hormone and it is secreted by the juxtaglomerular cells of the kidney. This hormone has enzymatic activity and it controls blood pressure by regulatng of angiotensin and aldosterone.

(3) Calcitriol is a steroid hormone synthesized by the cells of the proximal tubules of the nephrons. This hormone is the active form of vitamin D. It helps in the formation of calcium- binding protein thereby increasing the intestinal absorption of calcium. Thus, it plays an important role in the bone formation.

**(C)** (d) None of the above

**Explanation:** The functions of kidneys are described as follows:

(1) The major function performed by the kidneys is to filter the blood for urine formation.

(2) It removes the metabolic wastes like urea and uric acid from the blood and helps in their excretion through the urine.

(3) By reabsorbing bicarbonate from urine and releasing hydrogen ions and acid ions into the urine, it keeps the body's acid-base balance in check.

(4) By collaborating with the pituitary gland, it also regulates the body's levels of salt and water stablility.

**(D)** (b) It's a bean-shaped organ.

**Explanation:** Kidneys are reddish-brown bean-shaped structures located near the dorsal inner wall of the abdominal cavity between the levels of the last thoracic and third lumbar vertebra. Human kidney is metanephric

**(E)** (b) Kidney disease

**Explanation:** Dialysis is employed for individuals with a critical kidney disorder such as

grave kidney damage, previously severe renal failure, etc. Dialysis is an artificial process for removing extra fluid and waste from the body. This technique is accomplished with the aid of a dialyzer or artificial kidney.

**2.** A man has symptoms like pain while passing urine through the urinary tract and pain in the lower back. Later he was diagnosed with kidney stones. A kidney stone affects one out of every 10 people at some point in their lives. These stones are mineral and acid salt deposits that clump together in concentrated urine but they rarely cause long-term damage. Severe pain, usually in the side of the abdomen, is the most prevalent symptom, which is frequently accompanied by nausea.

(A) Mention the causes of kidney stones.
(B) Write any four symptoms of kidney stones are observed in starting?
(C) Write the names of the diagnostic approaches for kidney stones. Mention any four.

**Ans. (A)** Majority of stones are formed as a result of a mix of genetics and environmental influences. High calcium levels in the urine, obesity, some meals, certain drugs, calcium supplements, gout, hyperparathyroidism and not drinking enough water are all risk factors. When the concentration of minerals in urine is too high, stones form in the kidney.
**(B)** Symptoms of kidney stones observed in starting are:
(1) Back, belly, or side pain is common.
(2) During urinating, patients may experience pain or a burning sensation.
(3) Urine with blood in it.
(4) Urine that is cloudy or stinky.
(5) Nausea and vomiting are common side effects. (Any four)
**(C)** Kidney stones are diagnosed by the doctor through various diagnostic approaches such as:

(1) Imaging Tests
(2) Kidney Stone Analysis
(3) Urinalysis
(4) Blood Chemistry Screen
(5) Kidney Ultrasound (Any four)