

# Excretory Products and their Elimination

## Solutions

### SECTION - A

#### Objective Type Questions

1. On an average, how much urea is excreted out per day by an adult human?

- (1) 25–30 g                      (2) 15–20 g                      (3) 35–40 g                      (4) 40–45 g

Sol. Answer (1)

25–30 g of urea is excreted in urine per day. While normal blood urea level is 18–38 mg/100 ml.

2. The most toxic nitrogenous waste excreted by many bony fishes, aquatic amphibians and aquatic insects is

- (1) Ammonia                      (2) Urea                      (3) Uric acid                      (4) Both (2) & (3)

Sol. Answer (1)

The most toxic waste excreted by many bony fishes, aquatic amphibians and aquatic insects is ammonia; the urea is comparatively less toxic and uric acid is least toxic.

3. In crustaceans, the excretory functions are performed by

- (1) Antennal glands                      (2) Green glands                      (3) Both (1) & (2)                      (4) Malpighian tubules

Sol. Answer (3)

In crustaceans, excretory functions are performed by antennary or green gland.

4. Nearly all of the essential nutrients, and 70–80% of electrolytes and water are reabsorbed in the

- (1) PCT                      (2) Henle's loop                      (3) DCT                      (4) Collecting duct

Sol. Answer (1)

PCT : This is known as obligatory reabsorption.

5. Vasa recta is

- (1) L-shaped                      (2) U-shaped                      (3) S-shaped                      (4) V-shaped

Sol. Answer (2)

Vasa recta is U-shaped in which blood flows in opposite direction to the flow of the filtrate in the loop of Henle.

6. Which is the largest digestive gland of our body?

- (1) Liver (2) Lung (3) Brain (4) Stomach

Sol. Answer (1)

Liver is the largest digestive gland of the body.

7. An adult human excretes, on an average \_\_\_\_\_ litres of urine per day.

- (1) 1 to 1.5 (2) 2 to 2.5 (3) 2.5 to 3 (4) 3 to 3.5

Sol. Answer (1)

Urine :

- 1–1.5 L/day on an average
- pH = 6.0
- Yellow coloured, watery
- 25–30 g of urea is excreted out / day

8. Malpighian body or renal corpuscle is

- (1) Glomerulus along with collecting duct (2) Glomerulus along with DCT  
(3) Glomerulus along with Bowman's capsule (4) Glomerulus along with Loop of Henle

Sol. Answer (3)

Malpighian body or Renal corpuscle = Glomerulus + Bowman's capsule

9. The excretory structure of Amphioxus (Cephalochordate) is

- (1) Flame cell/Solenocyte (2) Coxal gland  
(3) Malpighian tubules (4) Green gland

Sol. Answer (1)

- Flame cells/Solenocytes – Amphioxus (Cephalochordates)
- Coxal gland – Crustaceans
- Malpighian tubules – Insects
- Green gland – Crustaceans

10. Least toxic nitrogenous waste among the following is

- (1) Urea (2) Uric acid  
(3) Ammonia (4) More than one option is correct

Sol. Answer (2)

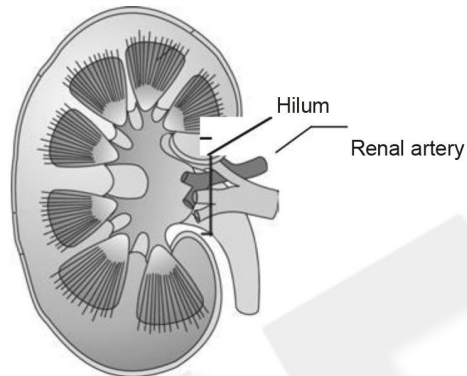
Ammonia > Urea > Uric acid

11. The part through which arteries and veins enter or leave the kidney is called

- (1) Hilus (2) Renal papilla (3) Major calyces (4) Minor calyces

Sol. Answer (1)

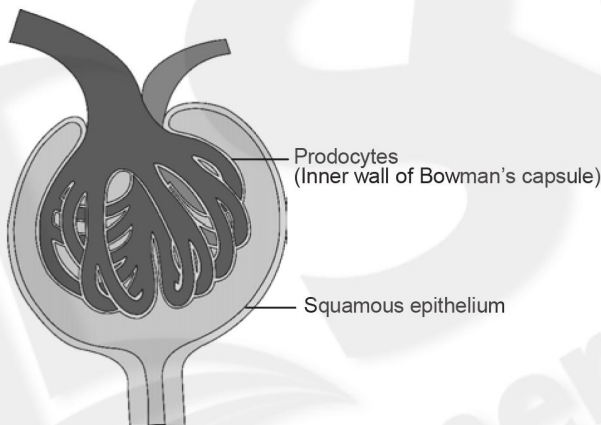
A depression where arteries and veins enter and leave body organ is known as hilum.



12. Podocyte cells occur in

- (1) Glomerular capillaries  
 (2) Neck region of nephron  
 (3) Inner wall of Bowman's capsule  
 (4) Outer wall of Bowman's capsule

Sol. Answer (3)



13. Loop of Henle is found in

- (1) Green gland  
 (2) Malpighian tubule  
 (3) Neuron  
 (4) Nephron

Sol. Answer (4)

Loop of Henle is found in nephron of the kidney of reptiles, birds and mammals.

14. Nitrogenous metabolic wastes in our body are the products of

- (1) Carbohydrates  
 (2) Proteins  
 (3) Lipids  
 (4) Vitamins

Sol. Answer (2)

Nitrogenous wastes are the products of protein metabolism.

15. Which of the following is also known as antidiuretic hormone?

- (1) Oxytocin  
 (2) Vasopressin  
 (3) Adrenaline  
 (4) Aldosterone

Sol. Answer (2)

Vasopressin is also known as ADH (antidiuretic hormone)

16. Human beings are

- (1) Uricotelic                      (2) Ureotelic                      (3) Ammonotelic                      (4) Both (2) & (3)

Sol. Answer (2)

Ureotelic – Human beings

Uricotelic – Insects, birds

Ammonotelic – Tadpole

17. We can produce a concentrated urine. This is facilitated by a special mechanism. Identify the mechanism.

- (1) Reabsorption from PCT  
(2) Reabsorption from collecting duct  
(3) Reabsorption/secretion in DCT  
(4) Counter current mechanism in Henle's loop/vasa recta

Sol. Answer (4)

Countercurrent mechanism : The arrangement of loop of Henle and the vasa recta in which opposite direction of flow of the filtrate and blood respectively facilitates increasing osmolarity towards the inner medullary interstitium from  $300 \text{ mOsmL}^{-1}$  in the cortex to about  $1200 \text{ mOsmL}^{-1}$  in the inner medulla.

18. Uric acid is an excretory product of

- (a) Cockroach                      (b) Sparrow                      (c) Terrestrial reptiles                      (d) Man  
(1) (a) & (d)                      (2) (b) & (d)                      (3) (a), (b) & (c)                      (4) (a), (c) & (d)

Sol. Answer (3)

Uric acid : Insects, birds and terrestrial reptiles.

19. All are performed in a nephron, except

- (1) Filtration                      (2) Secretion                      (3) Urea synthesis                      (4) Reabsorption

Sol. Answer (3)

Urea synthesis occurs in the hepatocytes of liver via Ornithine cycle.

20. Which is the first step of urine formation?

- (1) Ultrafiltration                      (2) Tubular secretion                      (3) Selective secretion                      (4) Tubular reabsorption

Sol. Answer (1)

Ultrafiltration is the first step of the urine formation. The blood is filtered inside the glomerular capsule.

Filtrate = Blood – [Formed elements + Proteins]

Filtrate = Plasma – Blood protein

21. Kidneys are reddish brown, bean-shaped structures situated between the levels of \_\_\_\_\_ thoracic and \_\_\_\_\_ lumbar vertebrae.

- (1) 11<sup>th</sup>; 1<sup>st</sup>                      (2) 12<sup>th</sup>; 3<sup>rd</sup>                      (3) 10<sup>th</sup>; 2<sup>nd</sup>                      (4) 12<sup>th</sup>; 5<sup>th</sup>



Sol. Answer (2)

Kidneys are located between 12<sup>th</sup> thoracic and 3<sup>rd</sup> lumbar vertebra and is covered by peritoneum only on the front i.e. fused with the body wall. This arrangement is known as retroperitoneal arrangement.

22. As compared to plasma, all are the constituents of dialysis fluid, except

- (1) NaCl                      (2) Glucose                      (3) Amino acid                      (4) Urea

Sol. Answer (4)

Urea is absent in the dialysing fluid because urea needs to be excreted out of the blood while other constituents are present in the dialysing fluid viz the solutes and electrolytes.

23. Which one is the vasoconstrictor?

- (1) ANF                      (2) Renin                      (3) Angiotensin-II                      (4) Histamine

Sol. Answer (3)

Vasoconstrictors : Angiotensin II

Vasodilators : ANF, histamine

Renin is also known as angiotensinogenase which catalyses the conversion of inactive angiotensinogen to angiotensin-II ultimately.

24. The condition of accumulation of urea in blood is termed as

- (1) Uremia                      (2) Diuresis                      (3) Glycosuria                      (4) Haematuria

Sol. Answer (1)

Uremia : Condition of accumulation of urea in the blood.

Diuresis : Increased excretion of urine.

Glycosuria : Excretion of glucose in the urine.

Haematuria : Presence of blood in the urine.

25. Glucose and amino acids in the filtrate are reabsorbed by tubular epithelial cells through

- (1) Active transport                      (2) Passive transport                      (3) Both (1) & (2)                      (4) Osmosis

Sol. Answer (1)

Glucose and amino acids in the filtrate are reabsorbed in the proximal convoluted tubule via active transport.

26. Which of the following component of blood does not enter into the nephron?

- (1) Water                      (2) Glucose                      (3) Urea                      (4) Plasma proteins

Sol. Answer (4)

Plasma proteins are not filtered out during ultrafiltration in the glomerular capsule.

Filtrate = Plasma – Plasma proteins.

27. The cause of glomerular filtration is

- (1) Osmosis                      (2) GHP                      (3) Hemodialysis                      (4) Acidic pH

Sol. Answer (2)

Glomerular filtration pressure (GFP) which is 100 mmHg

$$\text{GFP} = \text{GHP} - (\text{BCOP} + \text{CHP})$$

$$= 60 - (30 + 20)$$

$$= 10 \text{ mmHg}$$

28. The main function of loop of Henle is

- (1) Blood filtration      (2) Urine formation      (3) Water conservation      (4) Both (1) & (2)

Sol. Answer (3)

Loop of Henle, serves as the main function of conservation of water by countercurrent mechanism.

29. Hormone responsible for the absorption of water in DCT is

- (1) ADH      (2) ACTH      (3) Oxytocin      (4) Insulin

Sol. Answer (1)

ADH(antidiuretic hormone) is secreted by neurosecretory cells of hypothalamus which is released from posterior pituitary.

30. Blood which leaves liver and passes towards heart has higher concentration of

- (1) Bile      (2) Oxygen      (3) RBCs      (4) Urea

Sol. Answer (4)

Blood that leaves liver and passes to the heart has high concentration of urea because urea is synthesised in the hepatocytes.

31. Maximum water reabsorption occurs in

- (1) DCT      (2) PCT  
(3) Collecting duct      (4) Descending limb of loop of Henle

Sol. Answer (2)

70–80% of electrolytes, all of the nutrients and most of the water are reabsorbed in the proximal convoluted tubule (PCT). This is obligatory reabsorption.

32. Aldosterone stimulates the reabsorption of

- (1)  $\text{Na}^+$  ions      (2)  $\text{K}^+$  ions      (3) Glucose      (4)  $\text{Ca}^{2+}$  ions

Sol. Answer (1)

Aldosterone is the hormone secreted by adrenal cortex and is helpful in the absorption of  $\text{Na}^+$  from renal tubules, thereby increasing the  $\text{Na}^+$  ion concentration in the blood.

33. Micturition is

- (1) Removal of faecal matter      (2) Removal of  $\text{NH}_3$   
(3) Removal of urea      (4) Removal of urine

Sol. Answer (4)

Micturition : Voiding of urine from the urinary bladder.

Defaecation / Egestion : Removal of faecal matter

Deamination : Removal of  $\text{NH}_3$

34. In which segment of the nephron, reabsorption is minimum?

- (1) Proximal convoluted tubule (PCT)                      (2) Distal convoluted tubule (DCT)  
(3) Loop of Henle    (4) Both (1) & (2)

Sol. Answer (3)

Reabsorption is maximum in the PCT while reabsorption is minimum in ascending limb of the loop of Henle.

35. Which of the following is excretory product of liver?

- (1) Carbon dioxide    (2) Bilirubin  
(3) Biliverdin    (4) More than one option is correct

Sol. Answer (4)

Bilirubin and biliverdin are the excretory product of the liver formed by the destruction of Haemoglobin which are secreted in the bile.

36. Sweat contains

- (1) NaCl    (2) Lactic acid  
(3) Small amount of urea                                      (4) All of these

Sol. Answer (4)

Sweat contains :

- Salt e.g., NaCl
- Lactic acid
- Small amount of urea

37. What is the osmolarity of the filtrate at the hairpin bend of loop of Henle?

- (1)  $300 \text{ mOsmL}^{-1}$                       (2)  $1200 \text{ mOsmL}^{-1}$                       (3)  $600 \text{ mOsmL}^{-1}$                       (4)  $800 \text{ mOsmL}^{-1}$

Sol. Answer (2)

Osmolarity of the filtrate at the hair pin bend of loop of Henle –  $1200 \text{ mOsmL}^{-1}$ .

## SECTION - B

### Objective Type Questions

1. The parts of nephron situated in cortical region of kidney are

- (1) Loop of Henle, PCT and collecting duct                      (2) Collecting duct, PCT and malpighian corpuscle  
(3) PCT, DCT and Loop of Henle                                      (4) PCT, DCT and Malpighian corpuscle

Sol. Answer (4)

Cortex : PCT, DCT, malpighian body.

Medulla : Loop of Henle.

2. The presence of glucose and ketone bodies in urine are indicative of  
(1) Diabetes mellitus      (2) Diabetes insipidus      (3) Renal calculi      (4) Glomerulonephritis

Sol. Answer (1)

- In diabetes, the excretion of glucose is due to imbalance in glucose metabolism due to absence or deficiency of insulin.
- Due to deficiency of glucose inside the cells, cells hydrolyse fats and proteins, leading to formation of ketone bodies.

3. On an average, \_\_\_\_\_ ml of blood is filtered by the kidneys per minute which constitute roughly \_\_\_\_\_ of the blood pumped out by each ventricle of the heart in a minute.

- (1) 500–600, 1/5<sup>th</sup>      (2) 1100–1200, 1/3<sup>rd</sup>      (3) 500–600, 1/3<sup>rd</sup>      (4) 1100–1200, 1/5<sup>th</sup>

Sol. Answer (4)

1100–1200 ml of blood/min; 1/5<sup>th</sup> of the blood pumped out by each ventricle.

4. Which of the following statement is incorrect?

- (1) ADH is a vasoconstrictor      (2) Aldosterone facilitates water reabsorption  
(3) ANF enhances sodium reabsorption      (4) ANF causes vasodilation

Sol. Answer (3)

ANF (antinatriuretic factor) secreted by heart which facilitates Na<sup>+</sup>/salt excretion in opposition to the increase in blood pressure/GFR.

5. Which one of the following statement is incorrect?

- (1) The medullary zone of kidney is divided into a few conical masses called medullary pyramids projecting into calyces  
(2) Inside the kidney the cortical region extends in between the medullary pyramids as renal pelvis  
(3) Glomerulus along with Bowman's capsule is called the renal corpuscle  
(4) Renal corpuscle, proximal convoluted tubule (PCT) and distal convoluted tubule (DCT) of the nephron are situated in the cortical region of kidney

Sol. Answer (2)

Inside kidney, cortical region that extends in between the medullary region are known as columns of Bertini.

6. Which one influences the activity of kidney?

- (1) Vasopressin      (2) Thyroxine  
(3) Vasopressin and aldosterone      (4) Gonadotrophin

Sol. Answer (3)

Vasopressin and aldosterone influence the activity of kidney.

7. Which of the following pairs is wrong?

- |                 |   |             |               |   |          |
|-----------------|---|-------------|---------------|---|----------|
| (1) Uricotelic  | – | Birds       | (2) Ureotelic | – | Insects  |
| (3) Ammonotelic | – | Bony fishes | (4) Ureotelic | – | Elephant |

Sol. Answer (2)

Insects are uricotelic.

8. A fresh water fish maintains osmoregulation by

- (1) Continuously taking in water and eliminating excess of salts
- (2) Eliminating excess of water and taking up salts from the environment
- (3) Taking both water and salt from the environment
- (4) Eliminating both salt and water into the environment

Sol. Answer (2)

Osmoregulation in fresh water fish occurs by

- (i) Continuously passing out dilute urine.
- (ii) Uptake of salt due to loss of ions from the body.

9. Consider the following water conservation mechanisms

- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| A. Nasal countercurrent mechanism | B. Dependence on metabolic water    |
| C. Highly hypertonic urine        | D. Living more on protein rich diet |

The kangaroo rat living in desert can survive without drinking water because of

- |              |              |              |              |
|--------------|--------------|--------------|--------------|
| (1) A, B & C | (2) A, B & D | (3) B, C & D | (4) A, C & D |
|--------------|--------------|--------------|--------------|

Sol. Answer (1)

Nasal counter current mechanism, utilisation of metabolic water and passing out of hypertonic urine are adaptation of conservation of water in kangaroo rat.

10. Select the true statement

- (1) In fishes kidney play a major role in ammonia excretion
- (2) Ammonia is 100,000 times less toxic than urea
- (3) Sharks retain a large amount of urea in the blood as a major osmolyte to balance the osmolarity of the body fluids
- (4) Most terrestrial reptile excrete ammonia

Sol. Answer (3)

Most terrestrial reptiles excrete uric acid.

- In fishes gills play a major role in excretion of nitrogenous waste by diffusion.
- Urea is less toxic than ammonia by 1,00,000 times.
- Shark retains urea and TMAO to maintain the osmolarity.

11. The kidneys not only remove the waste products from the blood but also play a very important role in maintaining
- (1) Equilibrium of the body
  - (2) Temperature of the body
  - (3) Constant composition of the blood irrespective of the nature of the food or fluid intake
  - (4) Blood pressure constant

Sol. Answer (3)

Kidneys also maintain the osmolarity by excretion of excess salts or uptake of salts from filtrate.

12. Henle's loops are found in those animals which excrete hypertonic urine. One of the following does not have Henle's loop
- (1) Birds
  - (2) Mammals
  - (3) Frogs
  - (4) Reptiles

Sol. Answer (3)

Frogs are aquatic and have mesonephric kidney and they excrete out dilute urine.

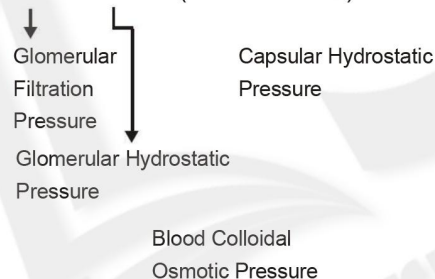
Loop of Henle is absent.

13. Which of the following defines the net filtration pressure (NFP)?

- (1)  $BCOP - (GHP + CHP)$
- (2)  $GHP - (BCOP + CHP)$
- (3)  $(BCOP + GHP) - CHP$
- (4)  $(GHP - CHP) + BCOP$

Sol. Answer (2)

$$NFP = GHP - (BCOP + CHP)$$



14. Which of the following is correct?

- (1) Afferent arteriole is narrower than the efferent arteriole
- (2) Efferent venule is narrower than vein
- (3) Efferent arteriole is narrower than afferent arteriole
- (4) Both afferent and efferent arteriole are of same diameter

Sol. Answer (3)

Efferent arteriole is narrower than the afferent arteriole to add to the glomerular filtration pressure for ultrafiltration.

15. Concentration of sodium and chloride ions is lowest

- (1) Near the cortex
- (2) Deep in medulla
- (3) In the interstitial fluid
- (4) In the middle of Henle's loop

Sol. Answer (1)

Near the cortex osmolarity of the region is  $200-300 \text{ mOsmL}^{-1}$  which increases down the medulla upto  $1200 \text{ mOsmL}^{-1}$ . Hence,  $\text{Na}^+$  and  $\text{Cl}^-$  ion concentration is lowest in the cortical region.

16. Angiotensin - II increases the blood volume by

- (1) Signalling PCT to reabsorb more NaCl and water    (2) Stimulating adrenal gland to release aldosterone  
(3) By stimulating the release of ADH    (4) More than one option is correct

Sol. Answer (4)

Angiotensin II stimulates :

- (i) Adrenal gland → Aldosterone → Uptake of  $\text{Na}^+$  from DCT and collecting duct.  
(ii) Signalling PCT to absorb more water.

17. When the volume of body fluid falls below normal, ADH

- (1) Decreases permeability of distal convoluted tubule and collecting tubule  
(2) Increases permeability of distal convoluted tubule and collecting tubule  
(3) Has nothing to do with permeability of convoluted tubule  
(4) Decreases permeability of proximal convoluted tubule

Sol. Answer (2)

Increase in the permeability of DCT and collecting duct known as conditional reabsorption of water regulated by amount of ADH.

18. The yellow colour of urine is due to

- (1) Uric acid    (2) Urea    (3) Urochrome    (4) Melanin

Sol. Answer (3)

Yellow colour is due to urochrome – a degradation product of bile pigments - bilirubin and biliverdin.

19. Vitamin excreted by urine in higher vertebrates is

- (1) A    (2) D    (3) K    (4) C

Sol. Answer (4)

Vitamin C being water soluble excreted out in urine; vitamin A, D, E and K are fat soluble and stored in liver.

20. Haematuria is the disorder involving

- (1) The loss of blood through the urine    (2) Loss of haemoglobin in RBC  
(3) Loss of glucose in urine    (4) The increase in concentration of blood urea

Sol. Answer (1)

The loss of blood in the urine – Haematouria.

## SECTION - C

### Previous Years Questions

1. The part of nephron involved in active reabsorption of sodium is [NEET (Phase-2)-2016]

- (1) Distal convoluted tubule    (2) Proximal convoluted tubule  
(3) Bowman's capsule    (4) Descending limb of Henle's loop

Sol. Answer (2)

Proximal convoluted tubule is involved in active reabsorption of sodium.



2. Human urine is usually acidic because [Re-AIPMT-2015]
- (1) Hydrogen ions are actively secreted into the filtrate
  - (2) The sodium transporter exchanges one hydrogen ion for each sodium ion, in peritubular capillaries
  - (3) Excreted plasma proteins are acidic
  - (4) Potassium and sodium exchange generates acidity

Sol. Answer (1)

3. Removal of proximal convoluted tubule from the nephron will result in [AIPMT-2015]
- (1) No urine formation
  - (2) More diluted urine
  - (3) More concentrated urine
  - (4) No change in quality and quantity of urine

Sol. Answer (2)

PCT is lined by simple brush border cuboidal epithelium which increases the surface area for reabsorption.

4. Which of the following does not favour the formation of large quantities of dilute urine? [AIPMT-2015]
- (1) Atrial-natriuretic factor
  - (2) Alcohol
  - (3) Caffeine
  - (4) Renin

Sol. Answer (4)

Renin increases the blood volume and therefore does not favour the formation of large quantities of dilute urine.

5. Which of the following causes an increase in sodium reabsorption in the distal convoluted tubule? [AIPMT-2014]
- (1) Increase in aldosterone levels
  - (2) Increase in antidiuretic hormone levels
  - (3) Decrease in aldosterone levels
  - (4) Decrease in antidiuretic hormone levels

Sol. Answer (1)

Hormone aldosterone released by adrenal gland induces the distal parts of tubule to reabsorb more  $\text{Na}^+$ .

6. The maximum amount of electrolytes and water (70-80 percent) from the glomerular filtrate is reabsorbed in which part of the nephron? [AIPMT (Prelims)-2012]
- (1) Proximal convoluted tubule
  - (2) Descending limb of loop of Henle
  - (3) Ascending limb of loop of Henle
  - (4) Distal convoluted tubule

Sol. Answer (1)

PCT has brush border epithelium.

7. Which one of the following options gives the correct categorisation of animals according to the type of nitrogenous wastes (A, B, C) they eliminate? [AIPMT (Mains)-2012]

	A (Ammonotelic)	B (Ureotelic)	C (Uricotelic)
(1)	Pigeon, Humans	Aquatic Amphibia, Lizards	Cockroach, Frog
(2)	Frog, Lizards	Aquatic Amphibia, Humans	Cockroach, Pigeon
(3)	Aquatic Amphibia	Frog, Humans	Pigeon, Lizards, Cockroach
(4)	Aquatic Amphibia	Cockroach, Humans	Frog, Pigeon, Lizards

Sol. Answer (3)

Uricotelic : Pigeons, cockroach, lizards

Ureotelic : Humans

Ammonotelic : Amphibians (larva)

8. A fall in glomerular filtration rate (GFR) activates [AIPMT (Mains)-2012]
- (1) Posterior pituitary to release vasopressin
  - (2) Juxtra glomerular cells to release renin
  - (3) Adrenal cortex to release aldosterone
  - (4) Adrenal medulla to release adrenaline

Sol. Answer (2)

A fall in the GFR stimulates the JG cells to release renin which results in the conversion of inactive angiotensinogen to angiotensin-II which is a vasoconstrictor.

9. Which one of the following is not a part of a renal pyramid? [AIPMT (Prelims)-2011]
- (1) Loops of Henle
  - (2) Peritubular capillaries
  - (3) Convoltuted tubules
  - (4) Collecting ducts

Sol. Answer (3)

Convoltuted tubules : Proximal convoluted tubules (PCT) and distal convoluted tubules (DCT) are present in cortex while rest are in medulla which comprises renal pyramids.

10. Which one of the following correctly explains the function of a specific part of a human nephron? [AIPMT (Prelims)-2011]
- (1) Afferent arteriole: carries the blood away from the glomerulus towards renal vein.
  - (2) Podocytes: Create minute spaces (slit pores) for the filtration of blood into the Bowman's capsule.
  - (3) Henle's loop: most reabsorption of the major substances from the glomerular filtrate
  - (4) Distal convoluted tubule: reabsorption of  $K^+$  ions into the surrounding blood capillaries

Sol. Answer (2)

Slit-pores are present in the podocytes (present on the visceral epithelium of Bowman's capsule of Nephron).

11. Uricotelic mode of passing out nitrogenous wastes is found in [AIPMT (Prelims)-2011]
- (1) Insects and Amphibians
  - (2) Reptiles and Birds
  - (3) Birds and Annelids
  - (4) Amphibians and Reptiles

Sol. Answer (2)

Uricotelic : Reptiles, insects, birds.

Ammonotelic : Aquatic insects, amphibians (larva).

12. Which one of the following statements is correct with respect to kidney function regulation? [AIPMT (Prelims)-2011]
- (1) During summer when body loses lot of water by evaporation, the release of ADH is suppressed
  - (2) When someone drinks lot of water, ADH release is suppressed
  - (3) Exposure to cold temperature stimulates ADH release
  - (4) An increase in glomerular blood flow stimulates formation of Angiotensin II

Sol. Answer (2)

- During summer when body loses a lot of water by evaporation, the release of ADH is increased.
- Exposure of cold temperature decreases the release of ADH.
- Decrease in glomerular blood flow stimulates the formation of angiotensin-II.

13. Which one of the following statements in regard to the excretion by the human kidneys is correct? [AIPMT (Prelims)-2010]

- (1) Ascending limb of Loop of Henle is impermeable to electrolytes
- (2) Descending limb of Loop of Henle is impermeable to water
- (3) Distal convoluted tubule is incapable of reabsorbing  $\text{HCO}_3$
- (4) Nearly 99 percent of the glomerular filtrate is reabsorbed by the renal tubules

Sol. Answer (4)

Nearly 99% of glomerular filtrate is reabsorbed by renal tubules as kidney filters 180 L/day of blood while excretes only 1–1.5 L of urine daily.

14. The principal nitrogenous excretory compound in humans is synthesised [AIPMT (Prelims)-2010]

- (1) In the liver, but eliminated mostly through kidneys
- (2) In kidneys, but eliminated mostly through liver
- (3) In kidneys as well as eliminated by kidneys
- (4) In liver and also eliminated by the same through bile

Sol. Answer (1)

Nitrogenous waste produced in liver through urea cycle but eliminated in kidneys.

15. In which one of the following organisms its excretory organs are correctly stated? [AIPMT (Mains)-2010]

- (1) Humans – Kidneys, sebaceous glands and tear glands
- (2) Earthworm – Pharyngeal, integumentary and septal nephridia
- (3) Cockroach – Malpighian tubules and enteric caeca
- (4) Frog – Kidneys, skin and buccal epithelium

Sol. Answer (2)

16. What will happen if the stretch receptors of the urinary bladder wall are totally removed ?

[AIPMT (Prelims)-2009]

- |                                  |  |
|----------------------------------|--|
| (1) Micturition will continue    | (2) Urine will continue to collect normally in the bladder |
| (3) There will be no micturition | (4) Urine will not collect in the bladder                  |

Sol. Answer (3)

No micturition will occur. As stretch receptor signals cortex to empty the bladder when half filled.

17. Angiotensinogen is a protein produced and secreted by [AIPMT (Prelims)-2006]

- |                        |  |
|------------------------|--|
| (1) Macula densa cells | (2) Endothelial cells (cells lining the blood vessels) |
| (3) Liver cells        | (4) Juxtaglomerular (JG) cells                         |

Sol. Answer (3)

Angiotensinogen is secreted by liver cells i.e., hepatocytes.

18. The net pressure gradient that causes the fluid to filter out of the glomeruli into the capsule is

[AIPMT (Prelims)-2005]

- |              |              |              |              |
|--------------|--------------|--------------|--------------|
| (1) 20 mm Hg | (2) 75 mm Hg | (3) 30 mm Hg | (4) 50 mm Hg |
|--------------|--------------|--------------|--------------|

Sol. Answer (1)

19. In Ornithine cycle, which of the following wastes are removed from the blood? [AIPMT (Prelims)-2005]

- (1) Urea and urine            (2) Ammonia and urea            (3) CO<sub>2</sub> and ammonia            (4) CO<sub>2</sub> and urea

Sol. Answer (3)

Ornithine cycle removes - CO<sub>2</sub> and NH<sub>3</sub>

20. A person is undergoing prolonged fasting. His urine will be found to contain abnormal quantities of:

[AIPMT (Prelims)-2005]

- (1) Fats                            (2) Ketones                            (3) Amino acids                            (4) Glucose

Sol. Answer (2)

Ketones are the breakdown of proteins like aceto-acetic acid during fasting. During fasting the energy source deflects in the cytoplasm, so proteins and fats are broken down leading to formation of ketone bodies.

21. Two animals in which the nitrogenous wastes are excreted from body in the form of uric acid are

- (1) Birds and lizards                            (2) Frogs and cartilaginous fishes  
(3) Insects and bony fishes                            (4) Mammals and mollusc

Sol. Answer (1)

Uricotelic : Birds and lizards

Ureotelic : Frogs and cartilaginous fishes

Ammonotelic : Molluscs

22. Uricotelism is found in

- (1) Mammals and birds                            (2) Fishes and fresh water protozoans  
(3) Birds, reptiles and insects                            (4) Frogs and toads

Sol. Answer (3)

Uricotelic - Birds, reptiles and insects.

Ureotelic - Mammals, frogs and toads.

Ammonotelic - Fresh water protozoans and fishes.

23. A terrestrial animal must be able to

- (1) Excrete large amount of water in urine                            (2) Conserve water  
(3) Actively pump salts out through the skin                            (4) Excrete large amounts of salts in urine

Sol. Answer (2)

Conservation of water is the evolutionary trait of terrestrial animals.

24. Uric acid is the chief nitrogenous component of the excretory products of

- (1) Frog                            (2) Man                            (3) Earthworm                            (4) Cockroach

Sol. Answer (4)

Uricotelic : Cockroach

Ammonotelic : Frog

Ureotelic : Man, earthworm (in unfavourable condition uricotelic)

25. If an osmoconformer animal is placed in sea water then
- (1) It will develop ionocytes to actively absorb the salts from outside
  - (2) It will develop a thick body cover to prevent entry of excess of water
  - (3) It will start passing diluted urine
  - (4) It will change osmolarity of its body fluid

Sol. Answer (4)

Osmoconformers change the osmolarity of their body fluid while osmoregulators do not change their osmolarity.

26. Contractile vacuole to pump out excess of water is found in
- (1) Fresh water protozoans
  - (2) Marine protozoans
  - (3) Parasitic protozoans
  - (4) Lower chordates

Sol. Answer (1)

Fresh water protozoans contain contractile vacuoles to pump out excess water.

27. In ureotelic animals, urea is formed by
- (1) Kreb's cycle
  - (2) EM pathway
  - (3) Ornithine cycle
  - (4) Cori's cycle

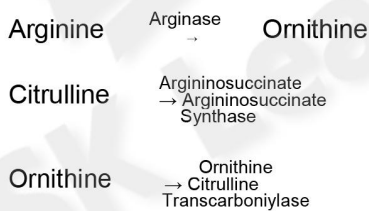
Sol. Answer (3)

Ornithine cycle/urea cycle

- Kreb Henseleit cycle : Elimination of urea.
- EM pathway/Kreb's cycle : Degradation of PA or metabolism of glucose to produce ATP.
- Cori's cycle : Between liver and muscle involving storage of glycogen.

28. Arginase enzyme will be operating at which step of the ornithine cycle?
- (1) Ornithine → Urea
  - (2) Arginine → Ornithine
  - (3) Ornithine → Citrulline
  - (4) Citrulline → Argininosuccinate

Sol. Answer (2)



29. Uric acid is produced by metabolism of
- (1) Adenine
  - (2) Guanine
  - (3) Cytosine
  - (4) Both (1) & (2)

Sol. Answer (4)

Uric acid is produced by metabolism of purines.

30. Which out of the four parts mentioned below does not constitute a part of single uriniferous tubule?
- (1) Distal convoluted tubule
  - (2) Collecting duct
  - (3) Bowman's capsule
  - (4) Loop of Henle

Sol. Answer (2)

Collecting duct is not part of uriniferous tubules. Only the Bowman's capsule, PCT, loop of Henle and DCT which forms collectively the uriniferous tubules in nephrons.

31. Match the following

Column I	Column II
a. PCT	(i) Functions in $\text{Na}^+$ & $\text{K}^+$ haemostasis
b. Descending loop of Henle	(ii) Permeable to NaCl but impermeable to water
c. Ascending loop of Henle	(iii) Permeable to water but not to salt
d. DCT	(iv) Reabsorbing about 90% of the important buffer $\text{HCO}_3^-$ from filtrate
(1) a(i), b(ii), c(iii), d(iv)	(2) a(i), b(iii), c(ii), d(iv)
(3) a(iv), b(iii), c(ii), d(i)	(4) a(ii), b(iii), c(i), d(iv)

Sol. Answer (3)

32. Brush border surface is the distinct feature of which of the following part of nephron?

- |         |                                     |
|---------|-------------------------------------|
| (1) PCT | (2) Ascending limb of loop of Henle |
| (3) DCT | (4) Collecting duct                 |

Sol. Answer (1)

- Bowman's capsule → Simple squamous epithelium
- Proximal convoluted tubule → Brush bordered simple cuboidal epithelium
- Descending limbs of loop of henle → Squamous epitheilum
- Ascending limb of loop of henle → Simple cuboidal epithelium
- Distal convoluted tubule → Simple cuboidal epithelium

33. Which of the following statement is not true?

- (1) Descending limb of loop of Henle is permeable to urea
- (2) DCT functions in  $\text{K}^+$ ,  $\text{Na}^+$  homeostasis
- (3) Descending limb is impermeable to water
- (4) Loop of Henle is largely responsible for concentrating urine

Sol. Answer (3)

Descending limb of loop of Henle is permeable to water.

34. Hypertonicity of filtrate is minimum at

- |                           |                                |
|---------------------------|--------------------------------|
| (1) Base of loop of henle | (2) Inner most part of medulla |
| (3) Outer part of medulla | (4) Cortical region            |

Sol. Answer (4)

Hypertonicity is minimum at the cortex region ( $30 \text{ mOsmL}^{-1}$ ) while osmolarity/hypertoxicity is maximum at the deep medulla region ( $1200 \text{ mOsmL}^{-1}$ ).

35. As the glomerular filtrate courses the tubules, its composition and osmotic concentration changes, due to tubular reabsorption. Which of the following is incorrect match regarding the segment of nephron and osmotic concentration of filtrate?

Segment of nephron	Osmotic concentration of filtrate
(1) Proximal convoluted tubule	Isotonic to blood plasma
(2) Descending limb of Henle's loop	Hypertonic
(3) Ascending limb of Henle's loop	Hypotonic
(4) Bowman's capsule	Hypotonic

Sol. Answer (4)

The filtrate of the Bowman's capsule is isotonic to the blood.

36. Concentration of urine depends upon which of the following?

- |                      |  |
|----------------------|--|
| (1) Bowman's capsule | (2) Length of Henle's loop                         |
| (3) PCT              | (4) Network of capillaries arising from glomerulus |

Sol. Answer (2)

Concentration of urine depends on the loop of Henle. The animals which need to conserve water have longer loop of Henle.

37. If Henle's loop were absent from mammalian nephron, which of the following is to be expected ?

- (1) There will be no urine formation
- (2) There will be hardly any change in the quality and quantity of urine formed
- (3) The urine will be more concentrated
- (4) The urine will be more dilute

Sol. Answer (4)

Loop of Henle is concerned with the concentration of urine. Absence of loop of Henle results in passing out of dilute urine.

38. Which of the following changes can occur in response to increased Angiotensin-II level?

- (1) Increase in the glomerular hydrostatic pressure (GHP)
- (2) Inhibition of aldosterone
- (3) Decrease in the GFR
- (4) Decrease in BCOP

Sol. Answer (1)

Increase in GFR occurs in response to Angiotensinogen-II by :

- (i) Uptake of more  $\text{Na}^+$  inside
- (ii) Rendering release of aldosterone

39. Which one is mainly responsible for absorption of  $\text{Na}^+$  in the PCT part of nephron?

- |                    |                                     |
|--------------------|-------------------------------------|
| (1) Angiotensin-II | (2) Angiotensin-I                   |
| (3) Aldosterone    | (4) Atrial Natriuretic Factor (ANF) |

Sol. Answer (1)



40. In response to decrease in blood volume and blood pressure which of the following do not occur?

- (1) Secretion of renin (2) Secretion of aldosterone  
(3) Secretion of vassopressin (4) Secretion of ANF

Sol. Answer (4)

In response to increase in blood pressure on the atrial wall, ANF is secreted and thereby decreases GFR.

41. Which of the following is not a feature of cortical nephrons?

- (1) These are more common, approximately 85% of nephrons  
(2) Their glomeruli are in outer cortex  
(3) Their loop of Henle extend to a short distance into the medulla  
(4) They are associated with vasa recta

Sol. Answer (4)

Vasa recta is absent in corticol nephron.

42. A condition of failure-of kidney to form urine is called

- (1) Anuria (2) Deamination (3) Entropy (4) Uraemia

Sol. Answer (1)

Anuria : Absence of urination.

Deamination : Removal of ammonia

Entropy : A term related to the state of matter.

Uraemia : Condition of presence of urea in blood.

43. A person who is on a long hunger strike and is surviving only on water, will have

- (1) Less amino acids in his urine  
(2) More glucose in his blood  
(3) Less urea in his urine  
(4) More sodium in his urine

Sol. Answer (3)

Less urea in the urine is due to absence of the protein rich diet which on digestion results in arrival of amino acids to hepatocytes and consequently urea synthesis.

44. Which of the following is not present in sweat?

- (1) Amino acid (2) NaCl  
(3) Lactic acid (4) Uric acid

Sol. Answer (4)

Uric acid is not excreted in sweat while urea, amino acid, lactic acid, glucose, salts etc. are excreted out.

45. Body fluids of sharks and coelocanths can be termed as

- (1) Hyperosmotic and hypoionic to sea water (2) Hyperosmotic and hyperionic to sea water  
(3) Hyposmotic and hypotonic to sea water (4) Hyposmotic and hyperionic to sea water

Sol. Answer (1)

Hypertonic by hypoionic to sea water due to conservation or storage of osmolytes and loss of salts.

## SECTION - D

## Assertion-Reason Type Questions

1. A : Pregnant women may show some presence of glucose in their post prandial urine although they have no diabetes.  
R : In pregnant women the glomerular filtration rate is slightly increased. As a result the tubular load of glucose exceeds the tubular maximum for glucose reabsorption.

Sol. Answer (1)

In post prandial urine glucose is more in pregnant woman as GFR increases and tubular load exceeds the absorption limit.

In order to increase the glucose availability to the foetus, the glucose concentration of plasma glucose level is high.

2. A : Atrial Natriuretic factor is released by wall of atria.  
R : It inhibits the release of renin from Juxta glomerular apparatus.

Sol. Answer (2)

ANF released by atria in response to increase in blood pressure and volume followed by inhibition of renin formation.

3. A : Inner wall of Bowman's capsule is lined with specialized cells - podocytes having a number of projections.  
R : These projections increases the surface area for absorptions.

Sol. Answer (3)

Podocytes are present in the inner wall of the Bowman's capsule. Podocytes projection is to limit the size of filtrate solutes.

4. A : Kidneys are retroperitoneal in position.  
R : Kidneys are covered with peritoneum only on ventral surface.

Sol. Answer (1)

Kidneys are fused to the dorsal wall, so peritoneum covers only the ventral side. This is called retroperitoneal arrangement of kidney.

5. A : Uric acid is produced by metabolism of purine and pyrimidine.  
R : Uric acid has high toxicity and soluble in water.

Sol. Answer (4)

Uric acid is formed from purine and is least toxic and insoluble in water.

6. A : In the descending limb of loop of Henle, the urine is hypertonic, while in ascending limb of loop of Henle, the urine is hypotonic.

R : Descending limb is impermeable to  $\text{Na}^+$ , while ascending limb is impermeable to  $\text{H}_2\text{O}$ .

Sol. Answer (1)

Descending loop of Henle is permeable to water, so hypertonic filtrate is there while ascending loop of Henle is more permeable to salt and thus hypotonic filtrate is there.

7. A : The final reabsorption of water from urine into blood occurs through the collecting duct of a mammalian nephron, resulting in the production of hyperosmotic urine.  
R : The loop of Henle is responsible for the formation of a sodium gradient across the depth of the medullary interstitium of a mammalian kidney.

Sol. Answer (2)

Reabsorption of filtrate occurs in collecting duct while loop of Henle forms sodium gradient by being selectively permeable to salts in different parts of the loop of Henle.

8. A : Diabetes insipidus is marked by excessive urination and too much thirst of water.

R : Anti-diuretic hormone (ADH) is synthesized by the posterior lobe of pituitary gland.

Sol. Answer (3)

ADH is synthesized by neurosecretory cells of Hypothalamus in posterior lobe of pituitary.

9. A : Inulin is used in testing kidney function especially glomerular filtration.

R : Inulin is a fructan storage polysaccharide.

Sol. Answer (2)

Inulin is a fructan storage polysaccharide and is not metabolised in human body and completely excreted out. So, used in testing of kidney failure.

10. A : Tubular secretion is of considerable importance in marine teleost fishes.

R : These have aglomerular kidney i.e., no filtration occurs and tubular secretion is the only way of excretion.

Sol. Answer (1)

Tubular secretion is of considerable importance in teleosts as they have aglomerular kidney.

Their adaptation is so as to release less urine while excretion of excess salts out.

