Excretory Products and Their Elimination

Chapter 19

FACT/DEFINITION TYPE QUESTIONS

1. Uricotelic mode of passing out nitrogenous wastes is found in
(a) reptiles and bird
(b) birds and annelids
(c) amphibians and reptiles
(d) insects and amphibians

2. Ammonia is the main nitrogenous excretory material in
(a) amphibians (b) turtles
(c) tadpoles (d) reptiles

3. Mechanism of uric acid excretion in a nephron is
(a) osmosis (b) diffusion
(c) ultrafiltration (d) secretion

4. Why bony fishes, aquatic amphibian and aquatic insects are called ammonotelic animals?
(a) They excrete ammonia as their excretory product.
(b) They excrete ammonia as a least toxic nitrogenous waste product.
(c) They excrete uric acid in the form of pellet and paste with a minimum loss of water.
(d) These animals have nephridia as their excretory organ which helps to remove nitrogenous waste and maintain a fluid and ionic balance.

5. Excretion of nitrogenous waste product in semi-solid form occur in
(a) amniotes (b) desert animals
(c) ureotelic animals (d) uricotelic animals

6. The projections of renal pelvis are called
(a) hiluses
(b) calyces
(c) medullary pyramids
(d) renal columns

7. The number of nephrons in a kidney is equal to
(a) the number of Bowman's capsules.
(b) sum of Bowman's capsules and glomeruli.
(c) double the number of Bowman's capsules.
(d) sum of Bowman's capsules and Malpighian corpuscles.

8. Glomerulus and Bowman's capsule constitute
(a) nephrotome (b) renal corpuscle
(c) renal capsule (d) malpighian tubule

9. In which part of the excretory system of mammals you can first use the term urine for fluid it contains?
(a) Bowman's capsule (b) Loop of Henle
(c) Collecting tubule (d) Ureter

10. Columns of Bertini in the kidneys of mammals are formed as extensions of
(a) Cortex into medulla
(b) Cortex into pelvis
(c) Medulla into pelvis
(d) Pelvis into ureter

11. Blood vessel leading to glomerulus is called
(a) renal artery (b) renal vein
(c) efferent arteriole (d) afferent arteriole

12. Which one of the following is not a part of a renal pyramid?
(a) Loops of Henle
(b) Peritubular capillaries
(c) Convoluted tubules
(d) Collecting ducts

13. The efferent arteriole emerging from the glomerulus forms a fine capillary network around the renal tubule called the _____.
(a) vasa recta (b) loop of Henle
(c) collecting duct (d) peritubular capillaries

14. Juxta-glomerular apparatus is formed by cellular modification in the
(a) afferent arteriole and DCT
(b) efferent arteriole and PCT
(c) afferent arteriole and PCT
(d) efferent arteriole and DCT

15. Which of the following accessory excretory structure eliminates NaCl, lactic acid and urea?
(a) Kidney (b) Liver
(c) Sebaceous gland (d) Sweat gland

16. Which of the following components of blood does not enter into the nephron?
(a) Urea (b) Water
(c) Glucose (d) Plasma protein

17. Kidney helps in the conservation of useful materials and excretion of wastes and therefore they receive 20% of the heart's output of blood (as much as the heart and brain combined). On a percentage basis which substance is most completely reabsorbed by the kidneys?
(a) Water (b) Glucose
(c) Urea (d) Sodium

18. The site and principal mechanism for the passage of glucose into the bloodstream in the human kidney is the
(a) collecting duct, by active secretion.
(b) distal convoluted tubule, by passive diffusion.
(c) glomerulus, by selective reabsorption.
(d) proximal convoluted tubule, by selective reabsorption.

19. The part of the nephron impermeable to water is
(a) proximal tubule
(b) distal tubule
(c) ascending limb of Henle's loop
(d) collecting duct

20. Reabsorption of chloride ions from glomerular filtrate in kidney tubule occurs by
(a) active transport (b) diffusion
(c) osmosis (d) brownian movement

21. Colloidal osmotic pressure in blood plasma is mainly due to
(a) albumin (b) globulin
(c) fibrinogen (d) sodium chloride

22. The ascending loop of Henle is permeable for
(a) ammonia (b) glucose
(c) sodium (d) water

23. Loop of Henle takes part in absorption of
(a) potassium (b) glucose
(c) water (d) urea

24. In comparison to blood plasma, percentage of glucose in glomerular filtrate is
(a) higher (b) equal
(c) lower (d) nil

25. Glomerular filtration rate (GFR) in a healthy individual is approximately
(a) 100 ml/minute, i.e., 180 liters per day.
(b) 125 ml/minute, i.e., 180 litres per day.
(c) 120 ml/minute, i.e., 100 litres per day.
(d) 130 ml/minute, i.e., 120 litres per day.

26. The maximum reabsorption of useful substances back into the blood from filtrate in a nephron occurs in
(a) PCT (b) Loop of Henle
(c) DCT (d) collecting duct

27. A fall in glomerular filtration rate (GFR) activates
(a) adrenal cortex to release aldosterone.
(b) adrenal medulla to release adrenaline.
(c) juxta - glomerular cells to release renin.
(d) posterior pituitary to release vasopressin.

28. The part of the nephron that helps in active reabsorption of sodium is
(a) bowman's capsule
(b) distal convoluted tubules
(c) ascending limb of Henle's loop
(d) proximal convoluted tubules

29. Which region of the kidney nephron is the main site of amino acid reabsorption?
(a) Glomerulus
(b) Bowman's capsule
(c) Proximal convoluted tubule
(d) Distal convoluted tubule

30. Which of the following hormone is secreted from kidney ?
(a) ANF (b) Erythropoietin
(c) Rennin (d) Aldosterone

31. Which of the following is directly responsible for increasing glomerular blood pressure and hence GFR?
(a) Aldosterone (b) ANF
(c) Angiotensin II (d) Renin

32. In the renal tubules the permeability of the distal convoluted tubule and collecting duct to water is controlled by
(a) aldosterone (b) vasopressin
(c) growth hormone (d) renin

33. The function of renin is
(a) degradation of angiotensinogen
(b) stimulation of corpus luteum
(c) to reduce blood pressure
(d) vasodilatation

34. Volume of urine is regulated by
(a) aldosterone
(b) aldosterone and ADH
(c) aldosterone, ADH and testosterone
(d) ADH alone

35. The hormone that promotes reabsorption of water from glomerular filtrate is
(a) oxytocin (b) vasopressin
(c) calcitonin (d) relaxin

36. Juxta-glomerular cells of renal cortex synthesizes an enzyme called
(a) ADH (b) oxytocin
(c) renin (d) urochrome

37. Which one is an important constituent of renin angiotensinogen-aldosterone system?
(a) JGA cell (b) Macular cell
(c) Erythropoetin (d) Plasma cell

38. The voluntary response to the distension of urinary bladder is
(a) polyurea (b) micturition
(c) mellitus (d) menstruation

STATEMENT TYPE QUESTIONS

39. Which of the following statement is correct?
(a) Vasa recta is not present in cortical nephrons.
(b) Maximum number of nephrons in kidney are juxta-medullary type.
(c) DCT of many nephrons open into collecting tubule.
(d) All of the above

40. Which of the following statement is not correct with respect to human kidney?
(a) The peripheral region is called cortex and central medulla.
(b) Malpighian capsules are present in the cortex region.
(c) Blood enters glomerulus through efferent arterioles.
(d) The concave part of kidney is called hilus.

41. If Henle's loop were absent from mammalian nephron which of the following event is to be expected ?
(a) There will be no urine formation.
(b) There will be hardly any change in the quality and quantity of urine formed.
(c) The urine will be more concentrated.
(d) The urine will be more dilute.

42. Almost all the aquatic animals excrete ammonia as the nitrogenous waste product. Which of the following statement is not in agreement with this situation?
(a) Ammonia is easily soluble in water.
(b) Ammonia is released from the body in a gaseous state.
(c) Ammonia is highly toxic and needs to be eliminated as and when formed.
(d) Ammonia gets converted into a less toxic form called urea.

43. Which one of the following statements in regard to the excretion by the human kidneys is correct?
(a) Ascending limb of Loop of Henle is impermeable to electrolytes.
(b) Descending limb of Loop of Henle is impermeable to water.
(c) Distal convoluted tubule is incapable of reabsorbing HCO_3^-.
(d) Nearly 99 per cent of the glomerular filtrate is reabsorbed by the renal tubules.

44. Which one of the following statements is correct with respect to kidney's function and regulation?
(a) During summer when body loses lots of water by evaporation, the release of ADH is suppressed.
(b) When someone drinks lot of water, ADH release is suppressed.
(c) Exposure to cold temperature stimulates ADH release.
(d) An increase in glomerular blood flow stimulates formation of Angiotensin II.

45. Which of the following statement is correct regarding urine formation?
(a) Filtration and reabsorption takes place before secretion.
(b) Filtration and secretion takes place before reabsorption.
(c) Secretion takes place before reabsorption and filtration.
(d) Reabsorption takes place before filtration and secretion.

46. Which of the following statement is incorrect?
(a) Counter-current flow of blood in vasa recta helps to retain the reabsorbed sodium in the renal medulla.
(b) Glomerular filterate is protein free plasma.
(c) Vasa recta carry glomerular filterate from distal convoluted tubule to the collecting duct.
(d) Glomerular filterate in Bowman's capsule is isotonic to the plasma.

47. Which of the following statements are correct?
(i) Glucose has high threshold value.
(ii) Urine is concentrated in Henle's loop.
(iii) Haemodialyser removes urea, uric acid, glucose and proteins.
(iv) In glomerulus, urea, uric acid, water, glucose and plasma proteins are filtered out.
(a) (i), (iii) and (iv) (b) (ii), (iii) and (iv)
(c) (i) and (ii) (d) (i) and (iii)

48. Which of the following statements is/are true?

(i) Urine is hypertonic in distal convoluted tubule.

(ii) When the urine passes into the collecting tubule, it becomes hypotonic.

(iii) Urine is isotonic in proximal convoluted tubule.

(iv) Urine becomes more and more hypotonic as it passes through the Henle's loop.

(a) (i) and (iv) only (b) (i), (ii) and (iii) only

(c) (ii) and (iii) only (d) (iii) only

ASSERTION/REASON TYPE QUESTIONS

In the following questions, a statement of Assertion is followed by a statement of Reason.

(a) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

(b) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.

(c) If Assertion is true but Reason is false.

(d) If both Assertion and Reason are false.

49. **Assertion :** Aquatic animals like whales and seals are said to be ureotelic animals.

Reason : It is because of the fact that their main nitrogeneous waste product is urea.

50. **Assertion :** Kidney maintains the osmotic concentration of the blood.

Reason : Kidney eliminates either hypotonic or hypertonic urine according to the need of the body.

51. **Assertion :** In the descending limb of loop of Henle, the urine is hypertonic, whereas in ascending limb of loop of Henle, the urine is hypotonic.

Reason : Descending limb is impermeable to sodium, while ascending limb is impermeable to water.

52. **Assertion :** Secreting hypotonic urine is effective in reducing urinary loss of water.

Reason : Hypotonic urine is more concentrated and higher in osmotic pressure than the blood.

53. **Assertion :** Aldosterone is a steroid hormone and is important in the control of sodium and potassium ion concentration in mammals.

Reason : It upgrades sodium ion concentration in the ECF by promoting reabsorption of sodium ions from renal tubules and excretion of potassium ions in urine.

54. **Assertion :** Main constituent of human urine is ammonia.

Reason : If human urine is allowed to stand for some time, it smells strongly of ammonia.

MATCHING TYPE QUESTIONS

55. Match the excretory functions given in column-I with the parts of the excretory system in column-II. Choose the correct combination from the given options.

	Column-I (Function)		**Column-II (Parts of excretory systems)**
A.	Ultra filtration	I.	Henle's loop
B.	Concentration of urine	II.	Ureter
C.	Transport of urine	III.	Urinary bladder
D.	Storage of urine	IV.	Malpighian corpuscle
		V.	Proximal convoluted tubule

(a) A – IV; B – I; C – II; D – III

(b) A – IV; B – III; C – II; D – I

(c) A – V; B – IV; C – I; D – III

(d) A – V; B – IV; C – I; D – II

56. Match the disorders given in column-I with their feature given in column-II and choose the correct option.

	Column-I (Disorders)		**Column-II (Feature)**
A.	Uremia	I.	Excess of protein in urine
B.	Hematuria	II.	Presence of high ketone bodies in urine
C.	Ketonuria	III.	Presence of blood cells in urine
D.	Glycosuria	IV.	Presence of glucose in urine
E.	Proteinuria	V.	Excess of urea in blood

(a) A - V; B -III; C - II; D - IV; E - I

(b) A - IV; B - V; C - III; D - II; E - I

(c) A - V; B -III; C - IV; D - II; E - I

(d) A - III; B -V; C - II; D - I; E - IV

57. Which of the following parts of the nephron given in column I is correctly matched with their functions given in column II?

	Column-I (Parts of the nephron)		**Column-II (Functions)**
A.	Proximal convoluted tubules	I.	Sodium is reabsorbed actively in this region.
B.	Distal convoluted tubules	II.	Sodium and water are reabsorbed under the influence of hormone in this region.
C.	Descending limb	III.	Primary site of glucose and amino acid reabsorption.
D.	Ascending limb	IV.	Major substance reabsorbed here is water by osmosis.

(a) A – I; B – II; C – III; D – IV
(b) A – IV; B – I; C – II; D – III
(c) A – III; B – IV; C – II; D – I
(d) A – III; B – II; C – IV; D – I

58. Which of the following hormone/enzyme is/are correctly paired with its function?

I. Renin – Enzyme that catalyses the formation of angiotensin I.
II. Aldosterone – Regulates water reabsorption at the distal convoluted tubule.
III. Anti-diuretic hormone (ADH) – It is a powerful vasoconstrictor that stimulates the secretion of aldosterone.
IV. Angiotensin II – Promotes reabsorption of sodium at distal convoluted tubule.

(a) Only I (b) Only III
(c) I, II and III (d) II, III and IV

59. Which of the following is correctly matched with its function of a specific part of a human nephron?

(a) Afferent arteriole – Carries the blood away from the glomerulus towards renal vein.
(b) Podocytes – Create minute spaces (slit pores) for the filtration of blood into the Bowman's capsule.
(c) Henle's loop – Reabsorption of the major substances from the glomerular filtrate.
(d) Distal convoluted tubule – Reabsorption of K^+ ions into the surrounding blood capillaries.

60. Select the option which shows correct matching of animal with there excretory organs and excretory product.

	Animal	Excretory organs	Excretory product
(a)	Housefly	Renal tubules	Uric acid
(b)	*Labeo* (Rohu)	Nephridial tubes	Ammonia
(c)	Salamander	Kidney	Urea
(d)	Peacock	Kidney	Urea

61. Select the correct match of the types of organs given in column I with their role in excretion given in column II.

Column I (Types of organ)		Column II (Role in excretion)
A.	Lungs	I. Secretes bile-containing substances like bilirubin, biliverdin, cholesterol, degraded steroid hormones, vitamins and drugs.
B.	Liver	II. Eliminates water and salts in sweat and substances like sterols, hydrocarbons and waxes through sebum.
C.	Skin	III. Remove large amounts of CO_2 (18 litres/day) and also significant quantities of water every day
D.	Kidney	IV. Remove wastes (metabolic by-products) and regulate pH, ion concentration, volume and osmolarity of blood

(a) A – I; B – II; C – III; D – IV
(b) A – II; B – I; C – II; D – IV
(c) A – III; B – I; C – IV; D – II
(d) A – IV; B – IV; C – III; D – I

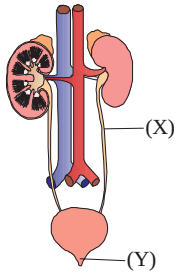
62. Select the correct match of the types of neuron present in column I with its location given in column II.

Column I		Column II
A.	Fall in GFR	I. Activate the JG cells to release renin
B.	Angiotensin II	II. Increases the glomerular blood pressure and thereby GFR
C.	Renin	III. Carries out the conversion of angiotensinogen in the liver to angiotensin I.
D.	Aldosterone	IV. Causes reabsorption of Na+ and water from the distal parts of the tubule. This also leads to an increase in blood pressure and GFR.
E.	An excessive loss of fluid from the body	V. Activate osmoreceptors which stimulate the hypothalamus to release ADH from the neurohypophysis

(a) A – I; B – II; C – III; D – V
(b) A – III; B – V; C – II; D – I
(c) A – III; B – I; C – IV; D – IV
(d) A – V; B – IV; C – III; D – II

DIAGRAM TYPE QUESTIONS

63. The label X and Y in the given diagram of human urinary system represents



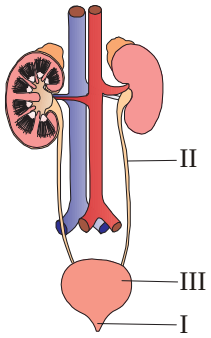
(a) X- Urethra, Y- Ureter

(b) X- Ureter, Y- Urethra

(c) X- Bladder, Y- Urethra

(d) X- Ureter, Y- Bladder

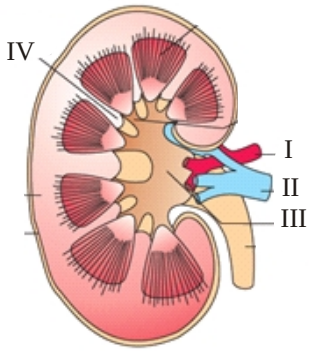
64. Which is the correct order for the path taken by urine after it leaves the kidney?



(a) I → II → III (b) III → I → II

(c) II → III → I (d) II→ I → III

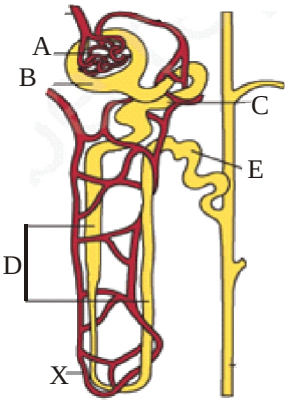
65. The given figure shows the longitudinal section of kidney with few structures labelled as I, II, III & IV identify renal vein in the given figure.



(a) I (b) II

(c) III (d) IV

Directions for (Q. 66 to 68): Refer the given diagrammatic representation of a nephron of human excretory system and answer the following questions.



66. The label X represents _____ that function in _____.

(a) Vasa recta- Reabsorption of water, minerals and digestive end products.

(b) Henle's loop- Filtration of plasma leaving the blood.

(c) Vasa recta- Filtration of plasma leaving the blood.

(d) Henle's loop- Reabsorption of water, minerals and digestive end products.

67. Which blood component would not usually pass through the membranes from region A to region B?

(a) Mineral salts (b) Red blood cells

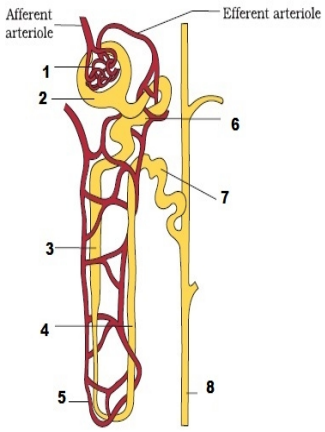
(c) Urea (d) Water

68. After the blood enters the kidney, it travels to the _____.

(a) A (b) B

(c) C (d) D

Directions for (Q. 69 to 72): Refer the given figure of nephron showing blood vessels and duct and answer the questions.



69. Which parts in the above figure have minimum reabsorption and play a significant role in the maintenance of high osmolarity of medullary interstitial fluid?

(a) 1 and 2 (b) 3 and 4

(c) 5 and 6 (d) 7 and 8

70. Cells of which part is lined by simple cuboidal brush border epithelium that increases the surface area for reabsorption? Identify the name also.

(a) 3, Descending limb of loop of Henle

(b) 5, Vasa recta

(c) 6, Proximal convoluted tubule

(d) 7, Collecting duct

71. Which part is capable of reabsorption of HCO3 - and selective secretion of hydrogen and potassium ions and NH_3 to maintain the pH and sodium-potassium balance in blood?

(a) 1 (b) 3

(c) 5 (d) 7

72. Which structures have an ability to produce the concentrated urine?

(a) 1, 2, 3 (b) 3, 4, 5

(c) 6, 7, 8 (d) 2, 4, 7

CRITICAL THINKING TYPE QUESTIONS

73. Workers in deep mines usually suffer from dehydration because
(a) water is lost due to evaporation.
(b) water is lost due to defecation.
(c) water is lost in the form of urine.
(d) water is lost along with salts in the form of sweat.

74. Which of the following sets of animals produce the same substances as their chief excretory product?
(a) Fish, pigeon and frog
(b) Camel, housefly and snake
(c) Frog, monkey and dog
(d) *Amoeba*, ant and antelope

75. Filtration slits are formed by
(a) endothelial lining of glomerular capillaries.
(b) inner epithelium of Bowman's capsule.
(c) basement membrane.
(d) the participation of all of these.

76. The cells named podocytes occur in
(a) inner wall of Bowman's capsule
(b) outer wall of Bowman's capsule
(c) in the wall of glomerulus
(d) in the wall of Henle's loop

77. Ultrafiltration occurs in a glomerulus when
(a) hydrostatic pressure exceeds osmotic pressure.
(b) osmotic pressure exceeds hydrostatic pressure.
(c) capsular hydrostatic pressure exceeds glomerular hydrostatic pressure.
(d) colloidal osmotic pressure plus capsular pressure remain less than glomerular hydrostatic pressure.

78. Filtration fraction is the ratio of
(a) glomerular filtration rate (GFR) to renal plasma flow (RPF)
(b) glomerular filtrate to urine
(c) haemoglobin to oxyhaemoglobin
(d) O_2 to CO_2

79. In a mammalian kidneys, Bowman's capsules occur in __(i)__ while loops of Henle are situated in __(ii)__.
(a) (i) – cortex, (ii) – medulla
(b) (i) – medulla, (ii) – cortex
(c) (i) – cortex, (ii) – pelvis
(d) (i) – pelvis, (ii) – medulla

80. Urine is hypertonic
(a) in Bowman's capsule.
(b) in PCT.
(c) in the middle of descending & ascending limb of Henle's loop.
(d) at the end of ascending limb of Henle's loop.

81. Diuresis is a condition characterized by
(a) increase in urine volume.
(b) increased glucose excretion.
(c) decrease in urine volume.
(d) decrease in electrolyte balance.

82. In nephron water absorption is maximum in
(a) proximal convoluted tubule (PCT).
(b) ascending limb of Henle.
(c) descending limb of Henle.
(d) distal convoluted tubule (DCT).

83. Human urine contains
(a) 95% water, 2.6% urea, 2% salts and some uric acid.
(b) 99% water and 1% urea.
(c) 92% water and 8% salts.
(d) 90% water, 8% uric acid and 2% proteins.

84. Glomerular filtrate contains
(a) blood without blood cells and proteins
(b) plasma without sugar
(c) blood with proteins but without cells
(d) blood without urea

85. __i___ and ___ii___ carries the waste products.
(a) i- Renal artery, ii- Renal vein
(b) i- Renal vein, ii- Urethra
(c) i- Renal vein, ii- Ureter
(d) i- Renal artery, ii-Ureter

86. The urine under normal conditions does not contain glucose because
(a) the normal blood sugar is fructose.
(b) glucose of blood is not filtered in the glomerulus.
(c) glucose in glomerular filtrate is reabsorbed in the uriniferous tubules.
(d) glucose in glomerular filtrate is converted into glycogen.

87. When a person is suffering from poor renal reabsorption, which one of the following will not help in maintenance of blood volume?
(a) increased ADH secretion.
(b) decreased glomerular filtration.
(c) increased arterial pressure in kidneys.
(d) decreased arterial pressure in kidneys.

88. Atrial natriuretic factor (ANF) is released in response to the increase in blood volume and blood pressure. Which of the followings is not the function of ANF? It
(a) stimulates aldosterone secretion.
(b) inhibits the release of renin from JGA.
(c) stimulates salt loss in urine.
(d) inhibits sodium reabsorption from collecting duct.

89. Through the thick segment of ascending limb of Henle's loop the
(a) NaCl can pass by active transport from filtrate to the interstitial fluid.
(b) NaCl can pass by passive transport into interstitial fluid.
(c) NaCl cannot pass from the filtrate to interstitial fluid.
(d) Water can pass freely from filtrate to interstitial fluid.

90. Which of the following is likely to accumulate in dangerous proportion in the blood of a person whose kidney is not working properly?

(a) Ammonia (b) Urea
(c) Lysine (d) Sodium chloride

91. If excess water passes out from tissues without being restored by kidneys, the cells would
(a) burst open and die
(b) not be affected at all
(c) extract water from plasma
(d) shrivel and die

92. There is no sugar in urine. The blood entering the kidney has more sugar than leaving the kidney because
(a) sugar is used by kidney cells in metabolism.
(b) sugar is absorbed by bladder.
(c) sugar is absorbed by proximal convoluted tubule.
(d) sugar is absorbed in Loop of Henle.

93. In human beings the capsular urine entering the Proximal Convoluted Tubule (PCT) is
(a) isotonic to blood
(b) hypotonic to blood
(c) hypertonic to blood
(d) isotonic to sea water

94. If the diameter of afferent renal arteriole is decreased and that of efferent renal arteriole increased, ultra filtration will
(a) be faster
(b) be slower
(c) not take place
(d) take place in the same speed

95. What will happen if the stretch receptors of the urinary bladder wall are totally removed?
(a) There will be no micturition
(b) Urine will not collect in the bladder
(c) Micturition will continue
(d) Urine will continue to collect normally in the bladder

96. In a kidney machine, which of the following passes from the blood to the dialysis fluid?
(a) Glucose (b) Plasma protein
(c) Red blood cells (d) Urea

97. Excretion means
(a) removal of substances which have never been a part of body.
(b) removal of faecal matter from the body.
(c) removal of substances not required in the body.
(d) all of the above.

98. Urine of a human suffering from diabetes inspidus is
(a) concentrated with glucose
(b) concentrated without glucose
(c) watery with glucose
(d) watery without glucose

99. Which one of the following correctly explains the function of a specific part of a human nephron ?
(a) Podocytes : Create minute spaces (slit pores) for the filtration of blood into the Bowman's capsule.
(b) Henle's loop : Most reabsorption of the major substances from the glomerular filtrate.
(c) Distal convoluted tubule : Reabsorption of K^+ ions into the surrounding blood capillaries.
(d) Afferent arteriole : Carries the blood away from the glomerular towards renal vein.

100. Which one of the following enables the mammalian kidney to regulate water reabsorption during states of dehydration?
(a) The cells of the tubules detect the osmotic pressure of the blood.
(b) Water is extracted from the glomerular filtrate in the proximal tubules.
(c) The kidney produces a hypotonic urine.
(d) Hormones increase the permeability of the collecting ducts.

101. If the afferent arteriole that supplies blood to the glomerulus becomes dilated,
(a) the protein concentration of the filtrate decreases.
(b) hydrostatic pressure in the glomerulus decreases.
(c) the glomerular filtration rate increases.
(d) all of the above

102. "X" causes reabsorption of "Y" and water from the distal parts of the tubule. This also leads to an increase in "Z" and glomerular filtration rate (GFR).
Identify X, Y and Z.
(a) X: ADH; Y: Na+; Z: Blood pressure
(b) X: ADH; Y: K+; Z: Blood pressure
(c) X: Aldosterone; Y: Na+; Z: Blood pressure
(d) X: Aldosterone; Y: K+; Z: Ionic concentration

103. Under normal conditions which one is completely reabsorbed in the renal tubule?
(a) Salts (b) Urea
(c) Glucose (d) Uric acid

104. Identify the parts mentioned below which constitute a part of single uriniferous tubule.
i. Loop of Henle.
ii. Collecting duct
iii. Bowman's capsule
iv. Distal convoluted tubule
(a) i, ii and iii (b) ii, iii and iv
(c) i, iii and iv (d) All of the above

105. A patient was diagnosed that one process of his excretory system was not functioning properly due to which his urine is not concentrating.
Identify the organ of the excretory system on which concentration of urine depends.
(a) Collecting duct
(b) Bowman's capsule
(c) Length of loop of Henle
(d) Proximal convoluted tubules

106. Which are the following group of hormones participate in the regulation of the renal function?
(a) ADH, TSH and ANF
(b) PCT, TSH and ANF
(c) ADH, DCT and Aldosterone
(d) ADH, ANF and Aldosterone

Hints & Solutions

Chapter 19 : Excretory Products and Their Elimination

1. (a) An uricotelic organism produces uric acid as a result of de-amination. Examples of such organism are birds and insects.

2. (c) The animals which excrete ammonia are called ammonotelic animals. The example includes aquatic invertebrates, bony fishes, aquatic amphibians, tadpoles, aquatic insects, etc.

3. (d) Mechanism of uric acid excretion in a nephron is called secretion. Certain chemicals in the blood that are not removed by filtration from the glomerular capillaries is removed by a process of urine formation are called tubular secretion. Ions removed from the blood by tubular secretion include potassium, hydrogen, and ammonium ions and foreign substances like drugs, penicillin, creatinine and uric acid etc.

4. (a) Bony fishes, aquatic amphibian and aquatic insects are called ammonotelic animals because these animals excrete ammonia as their nitrogenous waste products. Being the most toxic form ammonia requires large amount of water for its elimination. Aquatic animals, like crustaceans, bony fishes and amphibian larvae, generally are ammonotelic since ammonia diffuses more easily through membranes and it is more water-soluble than the other nitrogen wastes.

5. (d) Excretion of nitrogenous waste product in semi-solid form is found in uricotelic animals.

6. (b) Hilus leads to funnel shaped cavity called renal pelvis with projections called calyces.

7. (a) The number of nephron in a kidney is equal to the number of Bowman's capsule.

8. (b) Malpighian corpuscle (renal corpuscle) comprises glomerulus and Bowman's capsule. The malpighian corpuscle is named after Marcello Malpighi, an italian physician and biologist.

9. (c) The collecting duct system contains of a series of tubules and ducts that connect the nephrons to the ureter. It takes part in the maintenance of electrolyte and fluid balance through reabsorption and excretion. These processes are regulated by aldosterone and antidiuretic hormone. Therefore it refers as the part of the excretory system which contains fluids as urine.

10. (b) The renal column (or column of Bertini) is a medullary extension of the renal cortex in between the renal pyramids. It allows the cortex to be better anchored. Each column consists of lines of blood vessels and urinary tubes and a fibrous material.

11. (d) Glomerulus is a tuft of capillaries formed by afferent arteriole(a fine branch of renal artery).

12. (c) Convoluted tubules is not a part of renal pyramid but a portion of the nephron in the kidney that functions in concentrating urine and in maintaining salt, water, and sugar balance. Renal pyramids (also called malpighian pyramids) consist mainly of tubules that transport urine from the cortical (or outer) part of the kidney, where urine is produced, to the calyces or cup-shaped cavities in which urine collects before it passes through the ureter to the bladder. The point of each pyramid, called the papilla, projects into a calyx.

13. (d) The efferent arteriole emerging from the glomerulus forms a fine capillary network around the renal tubule called the peritubular capillaries.

14. (a) Juxta-glomerular apparatus is a microscopic structure located between the vascular pole of the renal corpuscle and the returning distal convoluted tubule of the same nephron. It is formed by cellular modification in the afferent arteriole and DCT.

15. (d) Sweat glands are highly vascular and tubular glands that separate the waste products from the blood and excrete them in the form of sweat. Sweat excretes excess salt and water from the body.

16. (d) Plasma protein of blood does not enter into the nephron.

17. (b) Glucose is 100% reabsorbed and thus a healthy person will excrete no glucose in the urine. Sodium and water are usually over 99% reabsorbed. Urea is the main excretory product formed as a result of protein breakdown.

18. (d) The proximal convoluted tubule is the site whereby selective reabsorption occurs, restoring the level of metabolities in the tubule and prevents excessive loss of useful substances.

19. (c) The ascending limb of Henle's loop is impermeable to water but allows transport of electrolytes like sodium. So, the filtrate gets diluted.

20. (b) Diffusion is the movement of molecules from a high concentration to a low concentration. Diffusion helps to reabsorb chloride ions from the glomerular filtrate in kidney tubules.

21. (a) Colloidal osmotic pressure in blood plasma is mainly due to albumin.

22. (c) The ascending limb is impermeable to water but allows transport of electrolytes like sodium. So, the filtrate gets diluted.

23. (c) Loop of Henle is a long, U-shaped portion of the tubule takes part in the absorption of water and conducts urine within each nephron of the kidney of reptiles, birds, and mammals. The important function of the loop of Henle appears to be the recovery of water and sodium chloride from the urine which allows production of urine that is far more concentrated than blood, limiting the amount of water needed as intake for survival. Many species that live in arid environments such as deserts have highly efficient loops of Henle.

24. (b) In comparison to blood plasma, percentage of glucose in glomerular filtrate is equal.

25. (b) The amount of the filtrate formed by the kidneys per minute is called glomerular filtration rate (GFR). GFR in a healthy individual is approximately 125 ml/minute, i.e., 180 litres per day.

26. (a) PCT (proximal convoluted tubule) is a small tubular structure within the nephron and connects Bowman's capsule with the proximal straight tubule. It is essential for the reabsorption of water and solutes from filtrate within the nephron. The lining of the PCT contains many protein channels, which use both active and passive transport to move substances such as glucose and electrolytes across the tubule's lining and into the interstitial fluid for reabsorption. Nearly all of essential nutrients, and 70-80 percent of electrolytes and water are reabsorbed by this segment. The epithelium of the PCT also prevents waste products from being reabsorbed into the bloodstream.

27. (c) The amount of the filtrate formed by the kidneys per minute is called glomerular filtration rate (GFR). GFR in a healthy individual is approximately 125 ml/minute, *i.e.*, 180 litres per day. A fall in GFR can activate the JG cells to release renin which can stimulate the glomerular blood flow and thereby the GFR back to normal. Renin converts angiotensinogen in blood to angiotensin I and further angiotensin II. Angiotensin II being powerful vasoconstrictor increases the glomerular blood pressure and thereby GFR.

28. (c) Loop of Henle is a U- shaped tube that consists of an ascending and descending limb. Its primary role is to concentrate the salts in the interstitium, the tissue surrounding the loop. Descending limb are thin walled and permeable to water but impermeable to salt and thus only indirectly contributes to the concentration of the interstitium. The ascending limbs are thick walled and impermeable to water. It actively reabsorbs the remaining 25% of the filtered K^+ and some amounts of Cl^-, some Na^+ is also reabsorbed by diffusion due to electrostatic attraction of reabsorbed Cl^-

29. (c) Glomerulus and Bowmans capsule are involved in ultrafiltration. In the proximal convoluted tubules the mitochondria provide energy for active transport. The cells here are adapted for reabsorption. The amino acids diffuse into the cells and are actively transported to the intercellular spaces, where they diffuse into the surrounding capillaries.

30. (b) Erythropoietin is a glycoprotein hormone that controls erythropoiesis, or the formation of red blood cell. It acts as a cytokine (protein signaling molecule) for erythrocyte (red blood cell) precursors in the bone marrow. It is produced by interstitial fibroblasts in the kidney in close association with peritubular capillary and promixal convoluted tubule.

31. (c) Angiotensin II is a powerful vasoconstrictor that increases the glomerular blood pressure and thereby GFR.

32. (b) Vasopressin regulates the permeability of DCT and collecting duct to water.

33. (a) Renin converts angiotensinogen in blood to angiotensin I and further to angiotensin II (a vasoconstrictor).

34. (b) Aldosterone and ADH maintains the volume of urine. Aldosterone, produced by the adrenal cortex, causes the retention of water in the body by increasing the levels of sodium and potassium ions in the blood, which causes the body to reabsorb more water. Antidiuretic hormone (ADH) produced by the hypothalamus and released by the posterior pituitary, causes more water to be retained by the kidneys when water levels in the body are low.

35. (b) Vasopressin promotes reabsorption of water from the glomerular filtrate. Vasopressin, also known as antidiuretic hormone (ADH), is a neurohypophysial hormone. It helps to retain water in the body and constrict blood vessels. Vasopressin regulates the body's retention of water by acting to increase water reabsorption in the collecting ducts of the nephron, which is the functional component of the kidney.

36. (c) A fall in glomerular blood flow/glomerular blood pressure/GFR activates the juxtaglomerular cells to release renin. For more refer answer 27.

37. (a) Juxtaglomerular apparatus (JGA) is an important constituent of renin-angiotensinogen- aldosterone system (RAAS). Renin-angiotensin-aldosterone system is a hormone system that helps regulate long-term blood pressure and blood volume in the body. It is a specialized region of a nephron where the afferent arteriole and distal convoluted tubule (DCT) comes in direct contact with each other.

38. (b) Micturition is the process by which the urine from the urinary bladder is excreted.

39. (a) Vasa recta is absent or highly reduced in cortical nephrons.

40. (c) Blood enters glomerulus through afferent arterioles.

41. (d) Henle's loop is a U-shaped tube that consists of a descending limb and ascending limb. Its primary role is to concentrate the salt in the interstitium, the tissue surrounding the loop. In the absence of Henle's loop, the urine will be more dilute.

42. (d) In ureotelic animals, ammonia is converted into less toxic urea (for conservation of water).

43. (d) Ascending limb of Loop of Henle are thick walled and impermeable to water. Descending limb of loop of Henle is thin walled and permeable to water but impermeable to salt and thus indirectly contributes to the concentration of the interstitium. Distal convoluted tubule is a portion between the loop of Henle and the collecting duct system which is capable of reabsorption of HCO_3^- and selective secretion of hydrogen and potassium ions and NH_3 to maintain the pH and sodium-potassium balance in the blood.

44. (b) Antidiuretic hormone (ADH) helps regulate water balance in the body by controlling the amount of water by the kidneys reabsorb while they are filtering wastes out of the blood. When someone drinks lots of water, ADH release is suppressed. Therefore, if there is too little ADH or the kidneys do not respond to ADH, then too much water is lost through the kidneys, the urine produced is more dilute than normal, and the blood becomes more concentrated. This can cause excessive thirst, frequent urination, dehydration. If there is too much ADH, then water is retained, blood volume increases, and the person may experience nausea, headaches, disorientation, lethargy, and low blood sodium (hyponatremia).

45. (a) Urine formation is the result of ultrafiltration or glomerular filtration of the blood plasma by the glomeruli, selective reabsorption by the tubules and secretion by the tubules. Glomerular filtration is the first of the three processes that forms urine. Tubular reabsorption is the second process in the formation of urine from filtrate and tubular secretion is the third process in the urine formation.

46. (c) Vasa recta are a series of straight capillaries in the medulla. They lie parallel to the loop of Henle.

47. (c) Haemodialyzer removes urea, uric acid, glucose and proteins. In glomerulus, urea, uric acid, water, glucose and plasma proteins are filtered out.

48. (d) Urine is hypotonic in distal convoluted tubule. When the urine passes into the collecting tubule, it becomes hypertonic. Urine becomes more and more hypotonic as it passes through the DCT.

49. (a) Ureotelism is the process of excretion of urea. Aquatic animals like whales and seals are said to be ureotelic animals because their major nitrogenous waste product is urea.

50. (a) Kidney plays an important role in maintaining the concentration and osmotic pressure of blood. When water intake of an animal is very high, the urine excreted has to be hypotonic and lower in osmotic pressure than their blood in order to remove the excess water.

On the contrary, when there is a shortage of water, the urine excreted needs to be hypertonic and higher in osmotic pressure than their blood to reduce the loss of water with urine.

51. (a) Descending limb of loop of Henle is permeable to water but not to sodium. Consequently water moves out into interstitium and concentration of sodium in tubular filtrate rises making filtrate hypertonic. Ascending limb of loop of Henle is impermeable to water but permeable to sodium and makes the filtrate hypotonic.

52. (d) Hypotonic urine means concentration of urine is less than that of blood. Hypertonic urine is more concentrated than blood and has high osmotic pressure than the blood, therefore it helps in reducing the loss of water with urine. The urine is filtered by the Bowman's capsule. The tubules of nephrons reabsorb a large quantity of water making urine more concentrated.

53. (a) Aldosterone is one of the important mineralocorticoids in humans secreted by adrenal cortex. Its main function is to regulate sodium content of the body . It increases sodium ion concentration in the blood by absorbing sodium ions from renal tubules. Excessive production of aldosterone causes a disease aldosteronism. It symptoms include high blood pressure, high blood volume.

54. (d) Urea is the chief nitrogenous constituent of human urine, though it possesses small amount of ammonia. But when the urine is allowed to stand for sometime, bacterial degradation occurs and it leads to the production of ammonia from urine. And thus it smells strongly.

55. (a) Ultrafiltration is a filtration under high pressure which occurs at the arterial end of the glomerulus. The filtrate from the glomerulus passes into the renal capsule and moves into the renal tubule. Concentration of urine takes place in Henle's loop. The primary role of the loop of Henle is to concentrate the salt in the interstitium, the tissue surrounding the loop. Transport of urine takes place in ureter. Ureters are narrow tubes started as a pelvis within kidney opening into a common urinary bladder which opens outside through urethra. Urinary bladder is a sac like structure which stores urine temporarily.

56. (a) Uremia refers to increased level of urea and other nitrogenous waste compounds in the blood that are normally eliminated by the kidneys. Hematuria is the presence of blood in the urine. Ketonuria is the excretion of abnormally large amounts of ketone bodies in the urine. It is the characteristic of diabetes mellitus, starvation, or other medical conditions. Glycosuria is a condition characterized by an excess of sugar in the urine. It is typically associated with diabetes or kidney disease. Proteinuria is the presence of abnormal quantities of protein in the urine, which may indicate damage to the kidneys.

57. (d) Proximal convoluted tubule connects Bowman's capsule with the proximal straight tubule and the primary site of glucose and amino acid reabsorption. Distal convoluted tubules are responsible for the resorption of sodium, water and secretion of hydrogen potassium. Descending limb of loop of Henle is a place where reabsorption of major substances takes place with the help of osmosis. Ascending limb of loop of Henle is a place where sodium is reabsorbed actively.

58. (a) Renin is an enzyme that catalyses the formation of angiotensin I.

Aldosterone promotes reabsorption of sodium at distal convoluted tubule. Anti-diuretic hormone regulates water reabsorption at the distal convoluted tubule. Angiotensin II is a powerful vasoconstrictor that stimulates the secretion of aldosterone.

59. (b) Afferent arterioles enters the glomerulus at the vascular pole and divides into capillaries which subsequently merge to form efferent arterioles. Henle's loop has minimum reabsorption. It plays a significant role in the maintenance of osmolarity of the medullary interstitial fluid. *i.e* concentration of urine. In Distal convoluted tubules reabsorption of water and sodium takes place. It is also capable of reabsorption of $HCO3^-$ and selective secretion of hydrogen and potassium ions.

60. (c) Salamander (amphibia; caudata) excretes urea with the help of kidneys.

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

62. (a) A - I, B - II, C - III, D - IV, E - V.

The JGA plays a complex regulatory role. A fall in glomerular blood flow/glomerular blood pressure/ GFR can activate the JG cells to release renin which converts angiotensinogen to angiotensin I and further to angiotensin II. Angiotensin II, being a powerful vasoconstrictor, increases the glomerular blood pressure and thereby GFR. Angiotensin II also activates the adrenal cortex to release aldosterone. Aldosterone causes reabsorption of Na+ and water from the distal parts of the tubule. This also leads to an increase in blood pressure and GFR. Osmoreceptors in the body are activated by changes in blood volume, body fluid volume and ionic concentration. An excessive loss of fluid from the body can activate these receptors which stimulate the hypothalamus to release antidiuretic hormone (ADH) or vasopressin from the neurohypophysis.

63. (b) The label X represents ureters, while label Y represents urethra. Ureters are narrow tubes started as a pelvis within kidney opening into a common urinary bladder which opens outside through urethra. Urinary bladder is a sac like structure which stores urine temporarily.

64. (c) The nephron carries the urine into the collecting tubule of the kidney from where it is carried to ureter**.** From ureter, the urine passes into the urinary bladder**.** The urinary bladder stores the urine until it is forced out of the body, through an opening known as the urethra.The label II represents ureter, label III represents urinary bladder and label I represents urethra.

65. (b) The label II represents renal vein while label I represent renal artery, label III represents renal pelvis and label IV represents renal column.

66. (a) The label X represents vasa recta that function in the reabsorption of water, minerals and digestive end products.

67. (b) In the given figure of nephron, red blood cells would not usually pass through the membranes from the region A (Glomerulus) to region B (Bowman's capsule). Capillaries of the glomerulus are lined by endothelial cells. These contain numerous pores (called fenestrae) 70-100 nm in diameter. These pores allow for the free filtration of fluid, plasma solutes and protein. However they are not large enough that red blood cells can be filtered.

68. (a) Label represents glomerulus. After the blood enters the kidney, it travels to the glomerulus.

69. (b) 3 and 4 are respectively descending limb and ascending limb of loop of Henle. They have minimum reabsorption and play a significant role in the maintenance of high osmolarity of medullary interstitial fluid.

70. (c) Part marked as 6 is proximal convoluted tubule (PCT). PCT is the convoluted portion of the vertebrate nephron that lies between Bowman's capsule and

the loop of Henle. Cells of PCT are lined by simple cuboidal brush border epithelium that increases the surface area for reabsorption. The cells lining the PCT absorb organic nutrients, plasma proteins, & ions from the tubular fluid & release them into the interstitial fluid surrounding the renal tubule where this reabsorbed fluid enters the peritubular capillaries.

71. (d) Distal convoluted tubule (DCT) is marked as 7. The DCT is an important site for the active secretion of ions, acids, drugs, & toxins and the selective reabsorption of sodium ions from the tubular fluid. In the final portions of the DCT, an osmotic flow of water assists in concentrating the tubular fluid.

72. (b) 3, 4 and 5 are respectively descending limb, ascending limb of loop of Henle and vasa recta. These three structures have an ability to produce the concentrated urine through the process of countercurrent exchange system. Counter current mechanism (the process due to which urine is made hypertonic) is regular exchange of Na^+ ions between the ascending and descending limbs of kidney.

73. (d) Workers in deep mines usually suffer from dehydration because water is lost along with salts in the form of sweat.

74. (c) Frog, monkey and dog, all are ureotelic animals. They excrete their wastes in the form of urea.

75. (b) The epithelial cells (podocytes) of the Bowman's capsule are arranged in an intricate manner so as to leave some minute spaces called filtration slits (slit pores).

76. (a) Podocytes are found in the inner wall of Bowman's capsule. Podocyles send foot processes over the length of the glomerulus.

77. (d) Ultrafiltration is an entirely passive process. It occurs in glomerulus when colloidal osmotic pressure plus capsular pressure remain less than glomerular hydrostatic pressure.

78. (a) Filtration fraction is the ratio of the glomerular filtration rate (GFR) to the renal plasma flow (RPF) i.e FF = GFR/RPF. The filtration fraction, therefore, represents the proportion of the fluid reaching the kidneys which passes into the renal tubules.

79. (a) In a mammalian kidney, Bowman' capsule occur in cortex while loops of Henle are situated in medulla. Bowman capsule is a cup-like sac at the beginning of the tubular component of a nephron that performs the first step in the filtration of blood to form urine. A glomerulus is enclosed in the sac. Loop of Henle is the part of a kidney tubule which forms a long loop in the medulla of the kidney, from which water and salts are reabsorbed into the blood.

80. (b) Urine is hypertonic in the middle of descending and ascending limb of Henle's loop.

81. (a) Diuresis is characterized by increased urine volume. ADH prevents diuresis by facilitating water reabsorption from DCT and collecting duct.

82. (a) PCT increases the surface area for reabsorption. PCT reabsorbs most of the nutrients, and 70-80% of electrolytes and water.

83. (a) Urine is a liquid produced by the kidneys to remove waste products from the bloodstream. Human urine is transparent, yellowish in colour and variable in chemical composition. It consists primarily of water (95%), with organic solutes including urea (2.6%), creatinine, uric acid, and trace amounts of enzymes, carbohydrates, hormones, fatty acids, pigments, and mucins, and inorganic ions such as sodium (Na^+), potassium (K^+), chloride (Cl^-), magnesium (Mg^{2+}), calcium (Ca^{2+}), ammonium (NH_4^+), sulfates (SO_4^{2-}), and phosphates (PO_4^{3-}).

84. (a) The molecules that leave the blood & enter the glomerular capsule are called glomerular filtrate. Glomerular filtrate contains blood without blood cells and proteins.

85. (d) Renal artery and ureter carries the waste products. Renal vein carries pure blood back to the heart.

86. (c) Under normal conditions, urine does not contain glucose because glucose in glomerular filtrate is reabsorbed in the uriniferous tubules.

87. (c) The kidneys control plasma volume by controlling how much water a person excretes. The plasma volume has a direct effect on the total blood volume, which has a direct effect on one's blood pressure. Salt (NaCl) will lead to osmosis; the diffusion of water into the blood. When a person is suffering from poor renal reabsorption, increased arterial pressure in kidneys will not help to maintain the blood volume.

88. (a) ANF is secreted by heart under the influence of too much blood in the circulatory system. ANF stimulates the loss of sodium in urine while aldosterone absorbs sodium from glomerular filtrate.

89. (a) The ascending limb of loop of Henle has a thin and a thick segment. The thin ascending limb is found in the medulla of the kidney, and the thick ascending limb can be divided into a part that is in the renal medulla and a part that is in the renal cortex. Through the thick segment of ascending limb of loop of Henle,

the NaCl can pass by active transport from the filtrate to the interstitial fluid. The medullary ascending limb remains impermeable to water. Sodium, potassium (K^+) and chloride (Cl^-) ions are reabsorbed by active transport. K^+ is passively transported along its concentration gradient through a K^+ leak channel in the apical aspect of the cells, back into the lumen of the ascending limb.

90. (b) One of the most important things the kidneys excrete nitrogenous waste. As the liver breaks down amino acids it also releases ammonia. The liver then quickly combines that ammonia with carbon dioxide, creating urea which is the primary nitrogenous end product of metabolism in humans. The liver turns the ammonia into urea because it is much less toxic. Therefore, urea is likely to accumulate in dangerous proportion in the blood of a person whose kidney is not working properly.

91. (b) If the excess water passes out from the tissue without being restored by kidneys, the cells would not be affected at all. Individual cells have no role to play in this process. Excess water in the blood affects the osmoreceptors present in hypothalamus and volume receptors present in left atrium, ventricles and pulmonary veins. This causes ADH release so that body hydration is regulated by removal of excess water by kidney.

92. (a) The most important work of kidney is to extract waste from blood, balance body fluids, form urine, and aid in other important functions of the body. Usually urine contains no sugar but the blood entering the kidney has more sugar than leaving the kidney because sugar is used by the kidney cells in metabolism.

93. (a) In human beings, the capsular urine entering the proximal convoluted tubule is isotonic to blood. Because the plasma membranes in the proximal tubule are freely permeable to water, so that water and salt are removed in proportionate amounts.

94. (c) Ultrafiltration, a type of membrane filtration, refers to the passage of protein-free fluid from the glomerular capillaries into Bowman's space. Blood flows into these capillaries through the afferent arteriole and leaves through the efferent arteriole. The blood pressure in the efferent arteriole is higher than the blood pressure in the afferent arteriole. This is because the efferent arteriole has a smaller diameter than the afferent arteriole. If the diameter of the afferent renal arterioles is decreased and that of efferent renal arteriole increased, ultrafiltration will not take place.

95. (d) Urinary bladder is a sac like structure which stores urine temporarily. It is made up of smooth and involuntary muscles. The lumen of urinary bladder is lined by transition epithelium, which has great power of stretching. If the stretch receptors of the urinary bladder wall are totally removed, the urine will continue to collect normally in the bladder.

96. (d) During dialysis, as the patient's blood is passed through dialysing solution, most of the wastes like urea present in it pass through selectively permeable cellulose tubes into the dialysing solution. The clean fluid is then pumped back into the vein of patient's arm.

97. (c) Excretion is the process of removing waste products produced in the cells of living organism.

98. (d) Deficiency of ADH causes diabetes insipidus which is characterized by excessive dilute urine, without glucose.

99. (a) Glomerular podocytes are highly specialized cells with a complex cytoarchitecture and plays a major role in establishing the selective permeability of glomerular filtration barrier.

100. (d) During states of dehydration, the hormone ADH (anti-diuretic hormone) is produced, which increases the permeability of the collecting ducts and increases water reabsorption.

101. (c) Changes in the afferent arteriole pressure affects glomerular filtration rate. Increases in pressure will increase filtration rate and decreases will decrease filtration rate.

102. (c) Aldosterone causes reabsorption of Na+ and water from the distal parts of the tubule. This also leads to an increase in blood pressure and glomerular filtration rate (GFR).

103. (c) The cells lining the proximal convoluted tubule are well adapted for reabsorption of materials from the filtrate. They have abundant mitochondria and bear numerous microvilli on the free side thus giving brush border appearance. The cells reabsorb entire glucose, amino acids, most of the inorganic ions, much of the water as well as some urea from the filtrate.

104. (c) A uriniferous tubule/nephron is a long tubule differentiated into four regions - Bowman's capsule, proximal convoluted tubule, loop of Henle and distal convoluted tubule. Collecting ducts are the larger

tubes, each receiving the collecting tubules of several nephrons. It does not form a part of the uriniferous tubule.

105. (c) Concentration of urine depends upon the length of Henle's loop. Loop of Henle is the hairpin shaped section of a kidney tubule situated between the proximal and distal tubules in the nephron. It consists of a thin descending limb which is permeable to water and a thick ascending limb which is impermeable to water complex movements of ions and water across the walls of the loop enable it to function as a countercurrent multiplier, resulting in the production of concentrated urine in the collecting duct.

106. (d) Antidiuretic hormone (ADH, or vasopressin), aldosterone (the principal mineralocorticoid secreted by the adrenal cortex) and atrial natriuretic factor (ANF) are hormones that participate in the regulation of the renal function.