SUBJECT: VETERINARY PHYSIOLOGY

CHAPTER 3: EXCRETION (IIPER1699624056)

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TERMINOLOGIES:

- **Excretion:** it is the process of removing wastes and excess materials from the body.
- **Autoregulation:** The kidneys can maintain a relatively constant GFR despite changes in blood pressure, this ability of the kidney is known as autoregulation.
- **Renal Blood Flow (RBF):** It is the total volume of blood that flows through both kidneys per unit of time.
- **Glomerulus:** It is a network of small blood vessels (or, capillaries) known as a tuft, which is located at the beginning of a nephron in the kidney where the filtration of blood occurs.
- **Bowman's Capsule:** It is a cup-shaped sac that is part of the nephron in the mammalian kidney which surrounds the glomerulus and collects the filtrate.
- **Glomerular Filtration Rate (GFR):** It is defined as the volume of fluid that is filtered through the glomerulus into Bowman's capsule per unit of time.
- **Electrolytes:** Electrolytes are salts and minerals that can conduct electrical impulses in the body.
- **Anion:** It is the negatively charged electrolyte, e.g., Cl^-, HCO_3^-, PO_4^{-3}
- **Cation:** It is the positively charged electrolyte, e.g., Na^+, K^+, Ca^{+2}
- **Passive transport:** It is the movement of the substances across a membrane from a higher to a lower concentration (i.e., down a concentration gradient) which does not require metabolic energy
- **Active transport:** It is the movement of substances across a membrane from a low concentration to a high concentration against the concentration gradient. This requires energy in the form of ATP
- **Simple Diffusion:** It is the movement of substances from a region of high concentration to a region of low concentration without the use of transport/carrier proteins

- **Facilitated Diffusion:** It is the transport of substances across a biological membrane from an area of higher concentration to an area of lower concentration with the help of a transport/ carrier protein.
- **Carrier proteins:** Carrier proteins, also known as transporters and permeases are a type of protein that transports a specific substance across cells, into the extracellular fluid, or through intracellular compartments and thus helps in facilitated diffusion.
- **Osmosis:** It is the diffusion/movement of a solvent through a semi-permeable membrane from an area of low solute concentration to an area of high solute concentration.
- **Dehydration:** It occurs when there is excess loss of water and electrolytes from the body and the body doesn't have enough water and other fluids to carry out its normal functions.
- Severe dehydration occurs when the loss of water is more than 10% of the total body weight.
- **Blood:** Blood is a fluid connective tissue consisting of plasma and blood cells (WBCs, RBCs, Platelets, etc).
- **Blood Plasma**: It is the fluid part of the blood. It is clear or straw-coloured and it makes up about 55% of the total blood volume present in the body.
- **Lymph:** It is a body fluid (similar to blood plasma in composition) which contains a high number of lymphocytes that circulate throughout the body in the lymphatic system.
- **Cerebrospinal fluid (CSF):** It is a lymph fluid that acts as the brain's lymphatic system. It is produced by the choroid plexus situated within the ventricles of the brain
- **Choroid Plexus:** They are specialized tissue in the ventricles which produces CSF by filtering blood.
- **Subarachnoid Space:** This is the space between the arachnoid mater and the pia mater where the CSF circulates.
- **Diuresis:** It is the increased production and excretion of urine by the kidneys which helps in regulating the body’s fluid balance by eliminating the excess water, electrolytes and waste products through the urine.
- **Antidiuretic Hormone (ADH):** It is the hormone released by the pituitary gland which helps to regulate water reabsorption in the kidneys.

- **Aldosterone**: it is the hormone released by the adrenal glands which helps to regulate sodium and potassium balance in the kidneys.
- **Hypovolemia:** It is a decrease in the blood volume and is often associated with dehydration.
- **Hypervolemia:** It is an increase in the blood volume and is often associated with fluid overhydration.
- **Hypokalaemia:** Low potassium levels in the blood.
- **Hyperkalemia:** High potassium levels in the blood.
- **Hydrocephalus:** Condition caused by the accumulation of the cerebrospinal fluid (CSF) in the skull leading to enlargement of the head.

REFRESHER POINTS:

- Kidneys are the chief excretory organs
- The functional unit of the kidney is the Nephron
- The number of nephrons varies considerably among different species

Species	No. of nephrons in two kidneys (approx..)
Cow	8.0×10^6
Pig	2.5×10^6
Dog	8.3×10^6
Cat	3.8×10^6
Human	2.0×10^6

- Glomerular filtration rate is 125ml/min or 180 L/day
- Glomerular membrane is completely impermeable to plasma proteins
- GFR can be measured by creatinine clearance or inulin clearance
- Filtration fraction is the percentage of the renal plasma flow that becomes glomerular filtrate (normal plasma flow - 650 ml/min; normal GFR - 125 ml/min)
- Blood flow to the two kidneys is normally 22% of the total cardiac output

Sl.no	Part	Amount of GFR reabsorbed	Remarks/function

1	Proximal tubule (action of PTH)	65%	Decrease Ca excretion
2	Descending loop of Henle	15%	More permeable to water Less permeable to urea & sodium
	The ascending loop of Henle		Less permeable to water More permeable to urea
3	Distal tubule (action of aldosterone)	10%	Active Na+ transport Secretion of K+
5	Collecting tubule (action of ADH)	9.3%	Permeable to water

- Plasma load; total amount of substance in the plasma that passes through the kidneys each minute (plasma load of glucose -600mg/min).
- Tubular load; fraction of plasma load that is filtered as glomerular filtrate (tubular load of glucose – 125 mg/min).
- Urine is thick in horse
- Tubular fluid contains 2 buffer systems namely; Ammonia buffer and phosphate buffer
- Glucosuria is a characteristic finding in enterotoxemia
- The metabolic end product of protein in mammals is urea whereas in birds & reptiles, it is uric acid
- Differences in birds from mammals include the presence of two major nephron types, renal portal system, and formation of uric acid.
- Avian kidney has 2 types of nephrons; Mammalian type (25% glomerular filtrate) & reptilian type (75% glomerular filtrate)
- Transport of tubular fluid from Bowman's capsule to renal pelvis occurs due to hydrostatic pressure gradient.
- Transport of urine from the renal pelvis to the urinary bladder occurs due to peristalsis in the ureters.
- Two countercurrent mechanisms of the kidney are countercurrent multiplier (loops of Henle) and countercurrent exchanger (vasa recta).
- Two types of mammalian nephron:

1) Cortical nephron/superficial nephrons: Short loop of Henle located in cortex & its main function is reabsorption & secretion of substances

2) Juxtamedullary nephron: A long loop of Henle extended deep in the renal medulla & its main function is concentrating the urine

- Protein molecules are not filtered generally through glomerulus because of their large molecular size & polyanionic nature
- Juxtaglomerular (JG) apparatus is the specialized structure formed at the junction of DCT & Glomerular afferent arteriole
- The three cells of JG are macula densa, juxtaglomerular cells (JG cells), and extraglomerular mesangial cells (Lacis cells).
- Micturition is by parasympathetic activity
- Diuretics: agents/drugs that increase urine output, useful for treating edema & hypertension.
- Loop diuretics (furosemide): Inhibiting Na^+-K^+-2Cl- cotransport in luminal membrane of thick ascending limb of loop of Henle
- Osmotic diuretics (mannitol): inhibit water & solute reabsorption by increasing effective osmotic pressure of tubular fluid of PCT
- Aqueous solutions containing different amounts of materials, or solutes, make up body fluids in animal physiology. Body fluids in animals vary with their body weight, age, sex and their nutritional values.
- Body fluids are classified into three specific fluid compartments, namely the intracellular fluid (ICF), extracellular fluid (ECF), and interstitial fluid (IF) compartments. Each compartment is separated from each other by some form of a physical barrier.
- The intracellular fluid (ICF) compartment is the term used to describe any fluid that is contained inside cells by their plasma membranes. Extracellular fluid, or ECF, envelops every cell in the body. Extracellular fluid is primarily composed of two substances: plasma, a fluid component of blood, and interstitial fluid (IF), which envelops all cells not in the blood.
- Intracellular fluid is approximately 40% of the total body weight of animals and the extracellular fluid comprises 20% of the total body weight.
- The intracellular fluid is also known as Cytosol. It is the site of multiple cell processes including metabolic processes (such as glycolysis, gluconeogenesis, and PPP).

- Blood contains both extracellular fluid (the fluid in plasma) and intracellular fluid (the fluid in the red blood cells).
- Barriers which separate the different types of body fluids:

Plasma membrane	Separates ICF from surrounding interstitial fluid
Blood vessel wall	Separate interstitial fluid from plasma

- Cations (positively charged ions), and anions (negatively charged ions), are balanced in the fluids and so, most of the fluids are neutral in charge
- Components of fluid:

Intracellular body fluid	▪ High amount of potassium, phosphate, and magnesium ▪ Low amounts of bicarbonate, chloride, sodium, and protein
Extracellular body fluid	▪ High amounts of sodium, chloride, and bicarbonates ▪ Low amounts of potassium, phosphate, and magnesium

- Sodium ion (Na^+): Major electrolyte found in the extracellular fluid which is the osmotically active cation in the extracellular fluid
- Chloride ion (Cl^-): The predominant anion in the extracellular fluid
- Bicarbonates: Important in maintaining the acid-base balance
- The Sodium-potassium pumps present in the cell membranes are responsible for maintaining the high potassium and low sodium levels in the intracellular fluids
- Fluid movement between different compartments is caused by

Hydrostatic pressure	▪ Causes movement of fluid between compartments ▪ Pressure exerted by blood against the walls of the blood vessels by the pumping action of the heart
Osmotic pressure	▪ Causes movement of the fluid between the compartments along the osmotic gradient ▪ Force created by the fluid by the difference in concentration of all solutes on either side of a semi-permeable membrane.

- The hydrostatic pressure is also known as capillary blood pressure
- Fluid moves between the compartments through a process called Osmosis along an osmotic gradient.
- The Osmotic gradient is produced by the difference in concentration of all solutes on either side of a semi-permeable membrane. The magnitude of the osmotic gradient is proportional to the difference in the concentration of solutes on one side of the cell membrane to that on the other side.
- Osmolarity refers to the concentration of osmotically active particles (osmoles) per unit of solution volume, typically measured in osmoles per litre (osmol/L) of solution.
    - Units: Osmol/L (or milliosmoles per litre, mOsm/L).
    - Formula: Osmolarity (Osm/L) = (Concentration of solute × Number of particles produced when the solute dissolves) / Volume of solution (in litres)
- Water balance exists when the water intake is equal to the water output.
- The Thirst mechanism is the primary regulator of water intake which is derived from the osmotic pressure of extracellular fluids and a thirst centre present in the hypothalamus.
- The distal convoluted tubules and the collecting ducts of the nephrons are the primary regulators of water output.
- The acid-base balance of the body fluid is essential for homeostasis in the body. The water/sodium balance in the body is tightly regulated by the nervous system.
- Abnormalities of Body Fluid Volume Regulation: Hyponatremia and Hypernatremia

Abnormality	**Cause**	**Plasma Na+ Concentration**	**Extracellular Fluid Volume**	**Intracellular Fluid Volume**
Hyponatremia—dehydration	Adrenal insufficiency; overuse of diuretics	↓	↓	↑
Hyponatremia—overhydration	Excess ADH (SIADH); bronchogenic tumours	↓	↑	↑
Hypernatremia—dehydration	Diabetes insipidus; excessive	↑	↓	↓

	sweating			
Hypernatremia—overhydration	Cushing's disease; primary aldosteronism	↑	↑	↓

- Lymph is a body fluid (similar to blood plasma in composition) which contains a high number of lymphocytes that circulate throughout the body in the lymphatic system.
- Lymph contains a large amount of white blood cells which fight infections.
- Cerebrospinal fluid (CSF) is a lymph fluid that acts as the brain's lymphatic system
- CSF is present in the brain ventricles and the cranial and spinal subarachnoid spaces
- CSF maintains the intracranial pressure of the brain and acts as a lubricant and a mechanical barrier against shock.
- Clinicopathological indicators of fluid and electrolyte imbalances
    - Dehydration
    - Overhydration
- Dehydration: Excessive loss of water from the body.
- Severe dehydration occurs when the loss of water is more than 10% of the total body weight.
- Dehydration leads to a decrease in volumes and increase in the osmolarity in both the ICF and ECF
- Cellular overhydration also called water intoxication is caused by renal insufficiency or consumption of large amounts of water.
- Fluid therapy is the plan that is designed to provide water and electrolytes in quantities that meet normal daily fluid needs and replace the fluid lost through urinary, gastrointestinal, and evaporative functions.
- Fluid therapy can be divided into four phases: the resuscitation phase, the optimization phase, the stabilization phase, and the evacuation phase.
- Indications of fluid therapy:
    - Dehydration: When there is excess loss of water from the body, fluid therapy can be administered to restore the water balance.
    - Surgery: fluid therapy is administered to the animals, before, during and after any surgical procedures to compensate for the loss of any fluid and also to maintain the normal functions of the organs and blood pressure.

- 2 types of fluid:
    - Crystalloids: Lactated Ringer's solution, 0.45% NaCl (hypotonic solution), 3% NaCl (hypertonic solution), 5% Dextrose in water, etc.
    - Colloids: Albumin, Dextran, Hydroxyethyl starch (or Hetastarch), Haemaccel and Gelofusine
- Routes of administration for IV fluids
    - Intravenous (IV) route: the fluid is directly injected into the vein of the animal. It is the most common and the most rapid method for fluid delivery.
    - Subcutaneous (SC) route: fluids are injected under the skin (Subcutaneous layer). This route is suitable for restoring mild dehydration or for maintenance fluids.
    - Intraperitoneal (IP) route: It is directly administered into the abdominal cavity.
    - Oral route: It can be directly administered/ingested orally. This route is especially for restoring very mild dehydration.

(A) Fill in the blanks

1. _____ has the lowest plasma clearance
2. _____increases GFR
3. The body's most powerful sodium-retaining hormone is _____
4. Glomerular epithelium has a _____charge
5. The marker substance for estimation of GFR is _____
6. The Micturition centre is located at _____
7. _____is the process of emptying the urinary bladder
8. Counter current is formed by _____
9. During low blood pressure, the kidney secretes _____
10. The macrophage of the kidney is a _____
11. Marked loss of sodium and accumulation of potassium from the body in the absence of _____
12. A major excretory product in birds is _____
13. Specific gravity of urine is highest in _____
14. Epithelial cells present in the visceral layer of the bowmen's capsule are _____
15. Kidneys are situated outside the _____
16. Juxtamedullary nephrons make up about _____of the total number
17. When water moves across the tight junction, some of the solutes are carried with it. This process is referred to as _____
18. Urine is thick in_____
19. Diuretics that inhibit sodium chloride reabsorption in the early distal tubule are _____
20. The inability of the kidney to concentrate or dilute the urine is called _____
21. Loss of large quantities of plasma proteins into the urine is characterized by _____
22. Body fluids are aqueous solutions with differing concentrations of materials, called _____
23. _____includes the interstitial fluid, blood plasma, and fluids found in other reservoirs in the body
24. _____are fluids found in the small spaces between cells not contained within blood vessels
25. _____are the fluids present in the cytosol of cells
26. _____is also referred to as plasma volume
27. _____is present outside the capillaries and it immediately surrounds the cells
28. _____is found in body cavities

29. The _____ helps the solute in contributing to the movement of water between cells and their surrounding medium.
30. Fluid moves between compartments as a result of_____, which is the force a fluid exerts against a wall.
31. In Osmosis, the water moves from the side where the _____to the side of the membrane where _____
32. In the movement of some solutes between compartments, the _____transport process consumes energy whereas the _____transport process does not consume energy
33. _____helps in governing the movement of water in the nephrons of the kidneys to ensure proper filtering of the blood to form urine.
34. The hydrostatic pressure is also known as _____
35. The majority of the cerebrospinal fluid is produced by the _____situated within the ventricles of the brain
36. _____is a condition of the blood which results due to the excess loss of hydrogen ions.
37. _____is a condition of excess acidity of the blood which results from an overabundance of hydrogen ions.
38. _____may lead to rapid reduction in plasma sodium concentration, for example, can cause brain cell oedema and neurological symptoms.
39. The _____is the primary regulator of water intake in animals.
40. _____causes osmotic diuresis in animals.
41. The main goal of fluid therapy is to maintain and restore the _____ in animals.
42. The maintenance fluids are the fluids given to compensate for ongoing losses and to meet the _____needs of the animal
43. _____ are the type of fluid solutions that contain electrolytes and can pass through the cell membranes.
44. _____ are the type of fluid solutions that contain large molecules and stay within blood vessels.
45. _____ is the space between the arachnoid mater and the pia mater where the CSF circulates.
46. _____ are small, bean-shaped structures that filter lymph and contain immune cells.
47. _____ is the network of vessels, nodes, and organs that helps in transporting the lymph throughout the body.
48. The major electrolytes present in the extracellular fluid include sodium, chloride, and _____.

49. Aldosterone, a hormone released by the adrenal glands, promotes the reabsorption of _____ and excretion of _____in the kidneys.
50. During long periods of dehydration, the release of the _____ hormone stimulates the thirst response, encouraging water intake.

(B) Multiple choice questions

1. Major anion in ECF is

a) Sulphate
b) Chloride
c) Phosphate
d) Bicarbonate

2. Normal glomerular filtration rate (GFR) is

(a) 100 ml/min
(b) 125 ml/min
(c) 150 ml/min
(d) 200 ml/min

3. Marker substance for estimation of renal plasma flow (RPF)

a) Creatinine
b) Para aminohippuric acid (PAH)
c) Mannitol
d) Inulin

4. Normal filtration fraction (FF) at the glomerulus of the kidney is

a) 5% of RPF
b) 10% of RPF
c) 20% of RPF
d) 30% of RPF

5. The maximum rate at which a substance is reabsorbed from the renal tubule is known as

a) Glomerular filtration rate
b) Transport maximum
c) Net filtration pressure

d) Renal threshold

6. During micturition

a) Contraction of detrusor muscle and relaxation of internal urethral sphincter
b) Relaxation of detrusor muscle and contraction of internal urethral sphincter
c) Contraction of detrusor muscle and contraction of internal urethral sphincter
d) Relaxation of detrusor muscle and relaxation of internal urethral sphincter

7. Spironolactone acts as a diuretic by

a) Stimulating action of vasopressin
b) Inhibiting/action of vasopressin
c) Inhibiting action of aldosterone
d) Stimulating action of aldosterone

8. Obligatory water re-absorption occurs in

a) PCT
b) DCT
c) Loop of Henle
d) collecting duct

9. Specialised cells of DCT seen in close contact with afferent and efferent arterioles are

a) Macula densa
b) Lacis cell
c) Glomerular cells
d) Podocytes

10. Which of the following decreases the glomerular filtration rate

a) Nor epinephrine
b) Angiotensin II
c) Endothelin cells
d) All of the above

11. The capillary that drains into an arteriole

a) Lymphatic capillary
b) Glomerular capillary

c) Pulmonary capillary
d) Systemic capillary

12. Marker substance for estimation of plasma volume

a) Inulin
b) Sucrose
c) Evans blue dye (T-1824)
d) All of the above

13. Epithelial cells present in the visceral layer of Bowman's capsule

a) Glomeruli
b) Pedicels
c) Podocyte
d) Juxta glomerular cell

14. During hypoxia, kidney secretes

a) Erythropoietin
b) Thrombopoietin
c) Renin
d) Calcitriol

15. The water content of the plasma is

a) 60-71%
b) 70-81%
c) 81-82%
d) 91-92%

16. Marker substance for estimation of total body water content

a) Antipyrine
b) Deuterated
c) Tritiated water
d) All of the above

17. Net filtration pressure at the glomerulus of the kidney is

a) 10 mm Hg

b) 12 mm Hg
c) 12.5 mm Hg
d) 15 mm Hg

18. Afferent arteriole of the glomerulus is supplied by

a) Interlobular artery
b) Pulmonary artery
c) Hepatic artery
d) None of the above

19. The number of nephrons in two kidneys of cattle is

a) 4,000,000
b) 8,000,000
c) 6,000,000
d) 5,000,000

20. The number of nephrons in the pig is

a) 1.25,000,000
b) 2.5,000,000
c) 3,000,000
d) 4,000,000

21. The dog has only

a) 1 papilla
b) 2 papilla
c) 3 papilla
d) None

22. The right kidney is slightly

a) Higher than the left
b) Lower than the left
c) Same level
d) None

23. The product of the permeability of the membrane and the filtration area of the glomerular capillary wall is called

a) Glomerular filtration
b) Filtration Coefficient (Kf)
c) Glomerular filtration rate
d) None of the above

24. Important functions of kidneys are

a) Regulation of acid-base balance
b) Regulation of arterial pressure
c) Produce erythropoietin
d) All of the above

25. Differences from mammals include the presence of

a) Two major nephron types
b) Renal portal system
c) Formation of uric acid instead of urea as the major end product of nitrogen metabolism, and postrenal modification of ureteral urine.
d) All of the above

26. Bowmen's capsular fluid has the same composition of plasma except

a) Colloids
b) Crystalloids
c) Emulsoids
d) Cel-sols

27. Powerful diuretics that decrease active reabsorption in the thick ascending loop of Henle

a) Furosemide
b) Bumetanide
c) Ethacrynic acid
d) All of the above

28. Which of the following is not associated with diabetes mellitus

a) Increased urine formation

b) Increased thirst
c) Renal threshold for glucose is exceeded
d) Lack of ADH

29. If excess glucose fails to be reabsorbed (renal threshold exceeded), the effective Osmotic Pressure in the tubular lumen

a) Increased
b) Not changed
c) Decreased
d) Becomes ineffective

30. Which one of the following nephron components is lacking in reptilian nephrons

a) Bowman's capsule
b) Loop of Henle
c) PCT
d) d) DCT

31. Renal portal blood enters the vascular supply perfusing the renal tubules at the level of -

a) Glomerulus
b) Vasa recta
c) Perivascular capillary
d) Vena cavae

32. Uric acid precipitates in the renal tubules to

a) Avoid ammonia toxicity
b) Avoid obligatory water excretion
c) Make it more slippery
d) Have a better mixing with faeces

33. Which one of the following hormones promotes tubular reabsorption of Na" and tubular secretion of K'

a) ADH
b) Aldosterone
c) Secretin
d) Vasopressin

34. Water reabsorption from urine deposited in the cloaca may occur in the

a) Cloaca
b) Colon and caecum
c) Colon
d) Rectum

35. Which one of the following nephron parts accounts for the largest amount of water, glucose, amino acids and vitamin reabsorption

a) Glomerulus
b) DCT
c) PCT
d) CT

36. Which one of the following measurements would be the lowest in any one-time

a) Renal blood flow
b) Renal plasma flow
c) Renal perfusion fraction of cardiac output
d) Filtration rate of glomerulus

37. What prevents the backflow of urine from the bladder into the ureters

a) Angle of ureter entrance at the uterovesicular junction
b) A discrete muscular sphincter
c) Constant peristaltic waves towards the bladder
d) There is nothing to prevent it.

38. Which one of the following nephron parts is associated with the establishment of a high salt concentration in the medulla of the kidney?

a) Bowman's capsule
b) Loop of Henle
c) PCT
d) DCT

39. The cells in the late distal and cortical collecting tubules that secrete potassium are called

a) Principal cells

b) Lacis cell
c) Glomerular cells
d) None of the above

40. Which hormone to a large extent determines whether the kidney excretes a dilute or a concentrated urine

a) Secretin
b) ADH
c) Aldosterone
d) Vasopressin

41. The kidneys after ingestion of excess water

a) Remove excess water as well as solutes
b) Remove excess water but the total amount of solute excreted remains relatively constant
c) Does not remove excess water as well as solutes
d) None of the above

42. Conservation of water by the kidney by excreting concentrated urine

a) Australian hopping mouse can concentrate urine to as high as 10,000 mOsm/L
b) Animals adapted to aquatic environments have minimal urine concentrating ability; they can concentrate the urine to only about 500 mOsm/L
c) Both are correct
d) None of them is correct

43. Percentage of JM nephron in various species

a) Beaver is 0%,
b) Pig is 3%,
c) Cat & Dog is 100%)
d) All of the above

44. Percentage of plasma concentration for the smallest plasma proteins (albumin) having a molecular weight of about 69,000 appear in the filtrate

a) 0.5 – 0.1
b) 0.1 – 0.15

c) 0.2 – 0.3
d) 0.3 – 0.4

45. Protein molecules are normally restricted from filtration through the glomerular membrane because of

a) Their size and polyanionic nature
b) Their molecular shape
c) Their size and polycationic nature
d) Their combinations with cations

46. which one of the following would have the highest values for hematocrit and plasma protein concentration

a) Blood in the afferent arterioles
b) Blood in the efferent arterioles
c) Tubular filtrate
d) None of the above

47. Relative medullary thickness (mm) for kidneys in dogs is

a) 3
b) 4.3
c) 4.8
d) 5.8

48. The thin descending limb, thin ascending limb, and thick ascending limb of the loop of Henle:

a) Have the same lumen diameter
b) Have the same relative medullary thickness
c) Have a lumen diameter corresponding to the limb being thin or thick
d) All of the above

49. High plasma concentration of creatinine is an indication of

a) Liver disease
b) Kidney disease
c) Lung disease
d) None of the above

50. Aquatic animals generally excrete

a) Uric acid
b) Urea
c) Ammonia
d) Both (a) and (c)

51. which marks the beginning of distal tubules in mammalian nephron

a) Juxta-glomerular cells
b) Macula densa
c) Lacis cells
d) None of the above

52. Osmolarity of plasma is about

a) 100 mOsm/kg of water
b) 200 mOsm/kg of water
c) 300 mOsm/kg of water
d) 400 mOsm/kg of water

53. The pH of urine in herbivores is usually

a) Alkaline
b) Acidic
c) Neutral
d) Both (a) and (b)

54. Consistency of urine is thick and syrupy in the horse due to the presence of

a) Pyruvate
b) Carbonate
c) Sulphate
d) Nitrate

55. Angiotensinogen is a proenzyme converted to an active form by

a) Angiotensin I
b) Angiotensin-converting enzyme (ACE)
c) Renin

d) Rennin

56. Angiotensin I is converted to Angiotensin II by

a) Bradykinin
b) Angiotensin-converting enzyme (ACE)
c) Renin
d) Rennin

57. The only part in the renal tubule where sodium is secreted

a) Ascending thin loop of Henle
b) Ascending thick loop of Henle
c) Descending loop of Henle
d) Distal tubule

58. Cortical nephrons lack

a) Glomerulus
b) Ascending thin limb
c) Descending thin limb
d) Proximal tubule

59. which of the following is the function of the kidney

a) Erythropoiesis
b) Regulation of acid-base balance
c) Produce rennin
d) All of the above

60. Which of the following substances are not filtered during glomerular filtration

a) Proteins with a molecular weight of more than 70,000 Dalton
b) Salts
c) Amino acid
d) Both (a) and (c)

61. Water, which is the most important constituent of the body fluid makes up about _____of the total body weight of the animal.

a) 40 %

b) 50 %
c) 60%
d) 70%

62. Intracellular fluid is approximately____ of the total body weight

a) 40%
b) 50%
c) 60%
d) 30%

63. Extracellular fluid is approximately____ of the total body weight

a) 40%
b) 50%
c) 60%
d) 20%

64. Solute uses the _____ to help water travel between cells and the surrounding medium.

a) Brownian movement
b) Hydrostatic pressure
c) Osmotic pressure
d) None of the above

65. Interstitial fluid (IF) is _____

a) the fluid that bathes all of the body's cells except for blood cells
b) the fluid component of blood
c) fluid that is contained inside cells by their plasma membranes.
d) fluids found between membranes

66. The pressure exerted by any fluid against a wall, which is caused by its own weight or pumping force is called the

a) Osmotic pressure
b) Hydrostatic pressure
c) Capillary pressure
d) None of the above

67. Body fluids are classified into which of the following specific fluid compartments?

a) Intracellular fluid
b) Extracellular fluid
c) Interstitial fluid
d) All of the above

68. The _____ transport process requires the consumption of ATP to facilitate the movement of the solutes between the compartments against their concentration gradient

a) Active
b) Passive
c) Simple
d) Facilitated

69. The _____ transport process utilizes the ability of a molecule or ion to pass through a membrane and in this transport process the molecules diffuse from an area of higher concentration to an area of lower concentration.

a) Diffusion
b) Active
c) Passive
d) Facilitated diffusion

70. When the hydrostatic pressure in the kidneys increases, then

a) There is an increase in the amount of water leaving the capillaries, and more urine filtrate is formed.
b) There is a decrease in the amount of water leaving the capillaries, and more urine filtrate is formed
c) There is an increase in the amount of water leaving the capillaries, and less amount of urine filtrate is formed
d) There is a decrease in the amount of water leaving the capillaries, and less urine filtrate is formed

71. A cation has a(n) _____ charge.

a) Neutral
b) Positive

c) Alternating
d) Negative

72. An anion has a(n)_____ charge.

a) Neutral
b) Positive
c) Alternating
d) Negative

73. The fluid found inside and outside the cells is called as

a) Extracellular fluid
b) Intracellular fluid
c) Body fluid
d) Interstitial fluid

74. An intracellular fluid

a) Interstitial fluid
b) Cytosol
c) Lymph
d) Blood plasma

75. The excess loss of water and electrolytes from the body is called

a) Thirst
b) Dehydration
c) Sweating
d) Panting

76. Functions of the Cerebrospinal fluid (CSF) include

a) Maintaining the intracranial pressure of the brain
b) Act as a lubricant
c) Act as a mechanical barrier against shock
d) All of the above

77. The pH of the CSF is

a) 6.5-7

b) 7.3-7.4
c) 6.3-6.4
d) 6.8-7.1

77. Which of the following is an example of transcellular fluid?

a) Intraocular fluid
b) Intravascular fluid
c) Synovial fluid
d) Cerebrospinal fluid

78. Osmoconcentration is the

a) Loss of salt and increased water concentration
b) Loss of water and increased salt concentration
c) Loss of water and salt both
d) None of the above

79. _____ is a clear, colourless liquid that fills the ventricles (cavities) of the brain and the spinal cord

a) Synovial fluids
b) Amniotic fluids
c) Peritoneal fluids
d) Cerebrospinal fluids

80. The body fluid or liquid found inside the cells and contained by their plasma membranes is called

a) Interstitial fluid
b) Transcellular fluid
c) Cytosol
d) Extracellular fluid

81. The body fluid composition of tissue varies by

a) Tissue type
b) Age of the animal
c) Gender of the animal
d) All of the above

82. The chief intracellular cation is
    a) Na^+
    b) K^+
    c) Ca^{+2}
    d) Cl^-
83. The chief extracellular cation is
    a) Na^+
    b) K^+
    c) Ca^{+2}
    d) Cl^-

84. Dehydration
    a) Occurs when the loss of water is more than 10% of the total body fluid.
    b) Decrease in volumes in both the ICF and ECF
    c) Increase in the osmolarity in both the ECF and ICF
    d) All of the above

85. What is diuresis?

    a) Increased production and excretion of urine
    b) Decreased production of urine
    c) Normal urine production
    d) Inability to produce urine

86. Which of the hormones promotes the reabsorption of water and helps in reducing diuresis?

    a) Antidiuretic hormone (ADH)
    b) Cortisol
    c) Insulin
    d) Aldosterone

87. the purpose of fluid therapy is to

    a) To induce anaesthetic conditions during surgical procedures
    b) To promote weight gain in the animals
    c) To maintain and restore hydration levels in the body
    d) To prevent dental issues of the animals

88. Lactated Ringer's solution is a _____ type of fluid

    a) Colloid
    b) Hypertonic solution
    c) Crystalloid

d) Alkalinizing solution

89. Haemaccel is a ____ type of fluid

a) Colloid
b) Hypertonic solution
c) Crystalloid
d) Alkalinizing solution

90. Intravenous (IV) fluid administration is commonly used to treat:

a) Mild dehydration
b) Severe dehydration
c) Routine hydration maintenance
d) Both a and b

91. Subcutaneous (SC) fluid administration is commonly used to treat:

a) Mild dehydration
b) Severe dehydration
c) Routine hydration maintenance
d) Both a and c

92. During shock, the fluid therapy helps by:

a) Decreasing the blood volume through increased excretion
b) Increasing the tissue perfusion
c) Lowering the blood pressure by increasing the blood volume
d) Increasing the blood volume through infusions

93. From where is the cerebrospinal fluid (CSF) produced?

a) Hypothalamus
b) Spinal cord
c) Choroid plexus in the brain
d) Adrenal gland

94. Formation of lymph occurs in which part of the body?

a) Bone marrow
b) Spleen

c) Lymph nodes
d) Spinal cord

95. The primary function of the lymph in the body is

a) Carrying oxygen from the lungs
b) Carrying oxygen to tissues
c) Carrying nutrients to cells
d) Immune defence

96. Elevated levels of blood urea nitrogen (BUN) indicates

a) Hypokalaemia
b) Hypercalcemia
c) Overhydration
d) Dehydration

97. Hyponatremia is the deficiency of

a) Sodium
b) Calcium
c) Potassium
d) Magnesium

98. the condition in which there is a high content of potassium in the blood is

a) Hyperkalemia
b) Hypokalemia
c) Hyponatremia
d) Hypocalcemia

99. The primary physiological process associated with diuresis is

a) Sodium reabsorption
b) Water retention
c) Urine production
d) Aldosterone secretion

100. In the _____ part of the nephron, the majority of water reabsorption occurs during diuresis

a) Proximal convoluted tubule

b) Distal convoluted tubule

c) Collecting duct

d) Loop of Henle

(C) Match the following:

	Column A		Column B
a	Pig	i	4.15×10^6
b	Cow	ii	1.0×10^6
c	Human	iii	1.9×10^6
d	Cat	iv	4.0×10^6
e	Dog	v	1.25×10^6

a) a-v, b-iv, c-ii, d-iii, e-i

b) a-iv, b-iii, c-ii, d-i, e-v

c) a-v, b-iii, c-ii, d-i, e-iv

d) a-ii, b-iv, c-iii, d-i, e-v

2. Removal of wastes and excess materials from the body through

	Column A		Column B
a	Volatile substance	i	Skin
b	Soluble, non-irritant solid substance	ii	Liver
c	Fats and its derivatives	iii	Kidneys
d	Heavy metals	iv	Lungs

a) a-i, b-iv, c-iii, d-ii

b) a-iv, b-iii, c-i, d-ii

c) a-ii, b-iv, c-iii, d-i

d) a-iii, b-ii, c-i, d-iv

3. Important transport maximus for substances that are actively reabsorbed by the tubules

	Column A		Column B
a	Glucose	i	1.5mM/min
b	Plasma protein	ii	75 mg/min
c	Urate	iii	375 mg/min
d	Amino acids	iv	30 mg/min
e	Lactate	v	15 mg/min

a) a-iii, b-v, c-iv, d-ii, e-i
b) a-ii, b-iv, c-iii, d-i, e-v
c) a-iv, b-ii, c-iii, d-v, e-i
d) a-iii, b-iv, c-v, d-i, e-ii
e) a-ii, b-v, c-i, d-iii, e-iv

4. Classes of diuretic

	Column A		Column B
a	Loop diuretics	i	Triamterene
b	Osmotic diuretics	ii	Furosemide
c	Aldosterone antagonists	iii	Spironolactone
d	Sodium channel blockers	iv	Acetazolamide
e	Carbonic anhydrase inhibitors	v	Mannitol

a) a-ii, b-iv, c-iii, d-v, e-i
b) a-i, b-v, c-ii, d-iv, e-iii
c) a-ii, b-v, c-iii, d-i, e-iv
d) a-iii, b-i, c-ii, d-v, e-iv
e) a-i, b-iv, c-v, d-ii, e-iii

5. Hormonal control of tubular reabsorption:

	Column A		Column B
a	Aldosterone	i	Increases Na^+ and water reabsorption
b	Angiotensin II	ii	Increases water reabsorption
c	ADH	iii	Increases Na^+ reabsorption and increases K^+ secretion
d	Sympathetic nervous system	iv	Increases Ca reabsorption
e	Parathyroid hormone	v	Its activation increases Na^+ reabsorption

a. a-iii, b-i, c-ii, d-v, e-iv
b. a-ii, b-iii, c-ii, d-i, e-v
c. a-iv, b-i, c-v, d-ii, e-iii
d. a-i, b-iii, c-iv, d-v, e-ii

6. Causes of chronic renal failure

	Column A		Column B
a	Metabolic disorder	i	Renal calculi
b	Immunologic disorders	ii	Renal hypoplasia
c	Urinary tract obstruction	iii	Glomerulonephritis
d	Congenital disorders	iv	Diabetes mellitus
e	Primary tubular disorders	v	Nephrotoxins

a) a-iv, b-ii, c-i, d-v, e-iii
b) a-v, b-ii, c-iii, d-iv, e-i
c) a-v, b-iii, c-iv, d-ii, e-i
d) a-iv, b-iii, c-i, d-ii, e-v

7. Nephrons and its function

	Column A		Column B
a	Superficial nephrons	i	Its main function is to concentrate the urine
b	Juxtamedullary nephron	ii	Its main function is the reabsorption & secretion of substances
c	Loops of Henle	iii	Countercurrent exchanger
d	vasa recta	iv	Countercurrent multiplier

a) a-ii, b-i, c-iv, d-iii
b) a-i, b-ii, c-iii, d-iv
c) a-iii, b-iv, c-ii, d-i
d) a-iv, b-iii, c-i, d-ii

8. Nature and formation of filtrate

	Column A		Column B
a	Glomerular filtrate	i	Ultrafiltrate of plasma
b	Diuresis	ii	High hydrostatic pressure favouring filtration
c	Glomeruli	iii	Increased urine formation
d	Peritubular capillaries	iv	Low hydrostatic pressure favouring reabsorption

a) a-iii, b-ii, c-iv, d-i
b) a-iii, b-ii, c-i, d-iv
c) a-i, b-iii, c-ii, d-iv
d) a-i, b-ii, c-iii, d-iv

9. Percentage of JM nephron (long looped nephron) in various species

	Column A		Column B
a	Pig	i	27
b	Dog	ii	28
c	Kangaroo rat	iii	0
d	Rat	iv	3
e	Beaver	v	100

a) a-iii, b-v, c-i, d-iv, e-ii
b) a-iv, b-v, c-i, d-ii, e-iii
c) a-iv, b-iii, c-ii, d-i, e-v
d) a-v, b-iv, c-iii, d-ii, e-i

10. Classes of diuretic and tubular site of action

	Column A		Column B
a	Thiazide diuretics	i	Proximal tubule
b	Loop diuretics	ii	Distal tubule and connecting tubule
c	Carbonic anhydrase inhibitors	iii	Thick ascending limb of loop of Henle
d	Competitive inhibitors of aldosterone	iv	Mainly proximal tubule
e	Osmotic diuretics	v	Cortical collecting tubule

a) a-ii, b-iii, c-iv, d-v, e-i
b) a-i, b-iii, c-v, d-ii, e-iv
c) a-ii, b-iii, c-i, d-v, e-iv
d) a-iii, b-iv, c-i, d-ii, e-v

11. Body fluid compartments

	Column A		Column B
a	Extracellular fluid	i	the fluid filling up the spaces of chambers formed from the linings of the epithelial cells
b	Intracellular fluid	ii	the body fluid located within the cell or all cells of an organism
c	Interstitial Fluid	iii	the body fluid located outside the cell or cells of an organism
d	Transcellular fluid	iv	the fluid filling up the spaces between cells

a) a-iii, b-ii, c-iv, d-i
b) a-i, b-ii, c-iii, d-iv
c) a-iv, b-iii, c-ii, d-i
d) a-iii, b-ii, c-i, d-iv

12. Examples of different body fluids

	Column A		Column B
A	Interstitial Body Fluid	i	Blood plasma
B	Transcellular body fluid	ii	Lymphatic fluid, renal interstitial fluid
C	Intravascular body fluid	iii	Intraocular, peritoneal, pleural, cerebrospinal, digestive, and synovial fluid.

a) A-i, B-ii, C-iii
b) A-iii, B-ii, C-i
c) A-ii, B-iii, C- i

13. Abnormalities of Body Fluid Volume Regulation & their cause

	Column A		Column B

A	Hyponatremia—dehydration	i	Excess ADH (SIADH); bronchogenic tumours
B	Hyponatremia—overhydration	ii	Cushing's disease; primary aldosteronism
C	Hypernatremia—dehydration	iii	Diabetes insipidus; excessive sweating
D	Hypernatremia—overhydration	iv	Adrenal insufficiency; overuse of diuretics

a) A-i, B-ii, C-iii, D- iv
b) A-iii, B-ii, C-iv, D-i
c) A-ii, B-iii, C- i, D-iv
d) A-iv, B-i, C-iii, D-ii

14.

	Column A		Column B
A	Thirst Mechanism	i	Reduction in the amount of water lost in the urine.
B	The distal convoluted tubules and collecting ducts of the nephrons	ii	Primary regulator of water intake
C	Dehydration	iii	Water loss exceeds water intake
D	Antidiuretics	iv	Primary regulator of water output

a) A-i, B-ii, C-iii, D- iv
b) A-iii, B-ii, C-iv, D-i
c) A-ii, B-iv, C- iii, D-i
d) A-iv, B-i, C-iii, D-ii

15.

	Column A		Column B
A	Crystalloids	i	Ensures that the proper levels of essential minerals like sodium and potassium in the body are maintained.

B	Colloids	ii	It contains large molecules and stays within blood vessels.
C	Maintenance fluid	iii	It contains electrolytes and can pass through cell membranes.
D	Electrolytic balance	iv	Given to compensate for ongoing losses of fluid and to meet daily water need

a) A-i, B-ii, C-iii, D- iv
b) A-iii, B-ii, C-iv, D-i
c) A-ii, B-iv, C- iii, D-i
d) A-iv, B-i, C-iii, D-ii

(D). Statement type questions:

1. Statement 1: Plasma glucose of a healthy person almost never becomes high enough to cause excretion of glucose in the urine

   Statement 2: In uncontrolled diabetes mellitus, plasma glucose may rise to high levels, causing the filtered load of glucose to exceed the transport maximum and resulting in urinary glucose excretion.

   a) Only statement 1 is correct
   b) Only statement 2 is correct
   c) Both statements 1 and 2 are correct
   d) Neither statement 1 nor 2 is correct

2. Statement 1: About 65% of the filtered load of sodium and water and a slightly lower percentage of chloride are reabsorbed by the proximal tubule before the filtrate reaches the loop of Henle.

   Statement 2: These percentages can be increased or decreased under normal conditions.

   a) Only statement 1 is correct
   b) Only statement 2 is correct
   c) Both statements 1 and 2 are correct
   d) Neither statement 1 nor 2 is correct

3. Statement 1: The second halves of the distal tubule and the subsequent cortical collecting tubule have similar functional characteristics, and are composed of principal cells and intercalated cells.

   Statement 2: Both the principal cells and intercalated cells reabsorb sodium and water from the lumen and secrete potassium ions into the tubular lumen.

a) Only statement 1 is correct
b) Only statement 2 is correct
c) Both statements 1 and 2 are correct
d) Neither statement 1 nor 2 is correct

4. Statement 1: Salt glands in birds secrete the excess salt when food with a high salt content is ingested or when seawater is drunk.
   Statement 2: Salt glands function only when there is a salt load; otherwise, they are at rest.
   a) Only statement 1 is correct
   b) Only statement 2 is correct
   c) Both statements 1 and 2 are correct
   d) Neither statement 1 nor 2 is correct
5. Statement 1: The concentrating ability of the kidney is impaired due to the rapid flow of tubular fluid through the collecting ducts that prevents adequate water reabsorption.
   Statement 2: It is also impaired due to the rapid flow through both the loop of Henle and the collecting ducts that prevents the countercurrent mechanism from operating effectively to concentrate the medullary interstitial fluid solutes.
   a) Only statement 1 is correct
   b) Only statement 2 is correct
   c) Both statements 1 and 2 are correct
   d) Neither statement 1 nor 2 is correct
6. Statement 1: When water moves across the tight junction by osmosis, some of the solutes are carried with it, known as solvent drag.
   Statement 2: The reabsorption of water, organic solutes, and ions is coupled to sodium reabsorption, changes in sodium reabsorption significantly influence the reabsorption of water and many other solutes.
   a) Only statement 1 is correct
   b) Both the statements are correct but statement 2 is not the correct reason for Statement 1
   c) Both the statements are correct and statement 2 is the correct reason for Statement 1
   d) Both the statements are incorrect
7. Statement 1: The right kidney is slightly lower than the left
   Statement 2: A large area is occupied by the liver in which the kidney is located
   a) Only statement 1 is correct

b) Both the statements are correct but statement 2 is not the correct reason for Statement 1
c) Both the statements are correct and statement 2 is the correct reason for Statement 1
d) Both the statements are incorrect

8. Statement 1: Reabsorption of glucose is referred to as secondary active transport
   Statement 2: Glucose itself is reabsorbed uphill against a chemical gradient, however, it is secondary to primary active transport.
   a) Only statement 1 is correct
   b) Both the statements are correct but statement 2 is not the correct reason for Statement 1
   c) Both the statements are correct and statement 2 is the correct reason for Statement 1
   d) Both the statements are incorrect
9. Statement 1: The action of ADH plays a key role in controlling the degree of dilution or concentration of the urine
   Statement 2: In the absence of ADH, the permeability of the distal tubules and collecting ducts to water is high causing the kidneys to excrete large amounts of dilute urine.
   a) Only statement 1 is correct
   b) Both the statements are correct but statement 2 is not the correct reason for Statement 1
   c) Both the statements are correct and statement 2 is the correct reason for Statement 1
   d) Both the statements are incorrect
10. Statement 1: There is a limit for most substances that are actively reabsorbed or secreted at which the solute can be transported (Transport maximum).
    Statement 2: This limit is due to the saturation of the specific transport systems involved when the amount of solute delivered to the tubule (tubular load) exceeds the capacity of the carrier proteins and specific enzymes involved in the transport process.
    a) Only statement 1 is correct
    b) Both the statements are correct but statement 2 is not the correct reason for Statement 1
    c) Both the statements are correct and statement 2 is the correct reason for Statement 1

d) Both the statements are incorrect

11. Statement 1: The sodium-potassium pump employs the active transport process to pump the sodium molecules out of cells and potassium molecules into cells

    Statement 2: Transport of the glucose molecules into the cells is accomplished with the help of active transportation using glucose transporters

    a) Only statement 1 is correct
    b) Only statement 2 is correct
    c) Both the statements are correct
    d) Both the statements are incorrect

12. Statement 1: Severe dehydration can lead to kidney failure

    Statement 2: During dehydration the hydrostatic pressure in the kidney drops low, which results in a decrease in the removal of nitrogenous wastes from the bloodstream hampering the normal functioning of the kidneys

    a) Only statement 1 is correct
    b) The reason for the statement is correct
    c) Both statements and reason are correct
    d) Neither statement nor reason is correct

13. Statement 1: Sweating causes the loss of water from the sweat glands causing the depletion of water and an increase in the solute concentration in the skin tissue.

    Statement 2: During sweating, the depletion of water from the skin tissue and the replacement of the depleted water from the bloodstream to the sweat glands is because of an osmotic gradient.

    a) Only statement 1 is correct
    b) Only statement 2 is correct
    c) Both the statements are correct
    d) Both the statements are incorrect

14. Statement 1: Sodium depletion in the blood can cause low blood pressure and low urine volume leading to acute kidney failure

    Statement 2: potassium deficiency in the blood can lead to acute or chronic diarrhoea, apathy, confusion and weakness

    a. Only statement 1 is correct
    b. Only statement 2 is correct
    c. Both the statements are correct
    d. Both the statements are incorrect

15. Statement 1: Loss of water from the extracellular fluid led to increased plasma sodium concentration resulting in increased osmolarity. This results in hypernatremia or dehydration.

    Statement 2: Dehydration can occur from an inability to secrete antidiuretic hormone, which is needed for the kidneys to conserve water.

    a) Only statement 1 is correct
    b) Only statement 2 is correct
    c) Both the statements are correct
    d) Both the statements are incorrect

16. Statement 1: Males have a higher volume of body fluid as compared to females as females have more amount of fat tissues

    Statement 2: Lean tissues have higher fluid content than fat tissues.

    a) Both the statements are correct and statement 2 is the correct reason for Statement 1
    b) Both the statements are correct but statement 2 is not the correct reason for Statement 1
    c) Both the statements are incorrect
    d) Only statement 2 is correct

17. Statement 1: Crystalloids are fluid solutions that contain larger molecules, preventing them from passing through cell membranes.

    Statement 2: Lactated Ringer's solution, 0.45% NaCl, and 5% Dextrose in water are crystalloid fluids

    a) Only statement 1 is correct
    b) Only statement 2 is correct
    c) Both the statements are correct
    d) Both the statements are incorrect

18. Statement 1: The kidneys play a central role in regulating water and electrolyte balance.

    Statement 2: The kidneys filter the blood, reabsorb the essential substances, and excrete the waste products through urine

    a) Both the statements are correct and statement 2 is the correct reason for Statement 1
    b) Both the statements are correct but statement 2 is not the correct reason for Statement 1

c) Both the statements are incorrect

d) Only statement 2 is correct

19. Statement 1: The hormone aldosterone plays a key role in maintaining the electrolyte balance in the body

Statement 2: Aldosterone is released by the adrenal glands and promotes the reabsorption of sodium and excretion of potassium from the kidneys.

a) Only statement 1 is correct

b) Only statement 2 is correct

c) Both the statements are correct

d) Both the statements are incorrect

20. Statement 1: An increase in the hormone levels of aldosterone can contribute to hypokalaemia.

Statement 2: Hypokalaemia is associated with an increased risk of blood clotting.

a) Only statement 1 is correct

b) Only statement 2 is correct

c) Both the statements are correct

d) Both the statements are incorrect

References:

1. Dukes Physiology of Domestic Animals
2. Guyton and Hall Textbook for Medical Physiology
3. Fluid, Electrolyte, and Acid-Base Disorders in Small Animal Practice

ANSWER KEYS:

Fill in the Blanks:

1. Glucose
2. Prostaglandin
3. Angiotensin II
4. Negative
5. Inulin
6. Pons
7. Micturition
8. Vasa recta
9. Renin

10. Mesangial cell
11. Aldosterone
12. Uric acid
13. Horse
14. Podocyte
15. Peritoneal cavity
16. 15%
17. Solvent drag
18. Horse
19. Thiazide derivatives
20. Isosthenuria
21. Nephrotic syndrome
22. Solutes
23. Extracellular fluid (ECF)
24. Interstitial fluid (IF)
25. Intracellular fluid (ICF)
26. Intravascular fluid
27. Interstitial fluid
28. Transcellular fluid
29. Osmotic pressure
30. Hydrostatic pressure
31. water concentration is high (and the concentration of solute is low); the water concentration is low (and the concentration of solute is high)
32. Active; Passive
33. Hydrostatic pressure
34. Capillary blood pressure
35. Choroid plexus
36. Alkalosis
37. Acidosis
38. Hyponatremia or cell swelling
39. Thirst mechanism
40. Diabetes mellitus
41. Hydration level
42. Daily

43. Crystalloids
44. Colloids
45. Subarachnoid space
46. Lymph nodes
47. Lymphatic system
48. Bicarbonate
49. Sodium; Potassium
50. Antidiuretic hormone (ADH)

Multiple choice questions

1. b
2. b
3. b
4. c
5. b
6. a
7. c
8. a
9. a
10. d
11. b
12. c
13. c
14. a
15. d
16. d
17. a
18. a
19. b
20. a
21. a
22. b
23. b
24. d

25. d
26. a
27. d
28. d
29. a
30. b
31. c
32. b
33. b
34. b
35. c
36. d
37. a
38. b
39. a
40. b
41. b
42. c
43. d
44. c
45. a
46. b
47. b
48. a
49. b
50. c
51. b
52. c
53. a
54. b
55. c
56. b
57. c
58. b

59. d
60. a
61. c
62. a
63. d
64. c
65. a
66. b
67. d
68. a
69. c
70. a
71. b
72. d
73. c
74. b
75. b
76. d
77. b
78. d
79. b
80. d
81. d
82. b
83. a
84. d
85. a
86. a
87. c
88. c
89. a
90. d
91. d
92. b

93. c
94. c
95. d
96. d
97. a
98. a
99. c
100. d

Match the Column:

1. a
2. b
3. d
4. c
5. a
6. d
7. a
8. c
9. b
10. c
11. a
12. c
13. d
14. c
15. b

Statement type questions:

1. c
2. c
3. a
4. c
5. c
6. c
7. c

8. c
9. a
10. c
11. a
12. c
13. c
14. c
15. c
16. a
17. b
18. a
19. c
20. a