1) The kidney is primarily an excretory organ, but it also maintains ECF volume and blood pressure and has an endocrine function. Some of its endocrine functions include

* A. Vitamin D metabolism
* B. Erythropoietin synthesis
* C. Renin synthesis
  D. Atrial Naturietic peptide synthesis
  E. Vitamin C metabolism

2) The primary function of glomeruli is

  A. Reabsorption, and in a normal dog this rate is approximately 0.3-0.5 ml/kg/minute
  B. Filtration, and in a normal dog this rate is approximately 0.3-0.5 ml/kg/minute
  C. Reabsorption, and in a normal dog this rate is approximately 3-5 ml/kg/minute
* D. Filtration, and in a normal dog this rate is approximately 3-5 ml/kg/minute

3) Normal glomeruli filter such that the following pass freely

  A. Water, molecules less than 2 nm in size and negatively charged molecules upto 4 nm in size
  B. Water, molecules less than 2 nm in size and positively charged proteins
  C. Water and molecules less than 5 nm in size
* D. Water, molecules less than 2 nm in size and many positively charged molecules upto 4 nm in size

4) Filtration within the glomerular capillary is a function of :

* A. Hydrostatic pressure, Oncotic pressure, Ultrafiltration coefficient
  B. Hydrostatic pressure, Osmotic pressure, Active transport
  C. Oncotic pressure, Ultrafiltration coefficient, Active transport
  D. Hydrostatic pressure, Oncotic pressure, Blood pressure

5) Tubuloglomerular feedback refers to the action of

  A. Vascular smooth muscle responses
  B. Macula densa located in the afferent arteriole
  C. Renin secretion by cells of the juxtaglomerular apparatus
* D. Macula densa located in the distal tubule

6) When blood pressure in a normal dog increases from 100 mmHg to 150mmHg

  A. GFR increases, but more than the proportional increase in blood pressure
  B. GFR increases in proportion, by 50%
* C. GFR remains constant
  D. GFR increases, but less than the proportional increase in blood pressure

7) In typical horses or cattle, which kidney is palpable during a rectal exam?

  A. Neither
* B. Left
  C. Both
  D. Right

8) The kidney has a heterogenous population of "short-loop" and "long-loop" nephrons the proportion of which is species-variable. Which of the following statements is true?

  A. Shorter loops are thought to enhance the ability to concentrate urine
* B. Longer loops are thought to enhance the ability to concentrate urine
  C. Shorter loops are thought to enhance the ability to reabsorb glucose
  D. Longer loops are thought to enhance the ability to reabsorb glucose

9) Creatinine clearance is

  A. the volume of creatinine that is cleared per unit time
  B. the net weight of creatinine cleared in 24 hours
* C. the volume of blood plasma that is cleared of creatinine per unit time
  D. the rate at which creatinine is created less the rate at which it is cleared

10) Azotemia

  A. is caused by failure of a large number of nephrons
  B. is similar to uremia, except a more serious condition
* C. is an increased concentration of urea and creatinine in the bloodstream
  D. encapsulates the clinical signs resulting from renal failure, when kidney function is compromised and urea is retained in the blood.

11) Assuming a normal animal, which of the following statements regarding glomerular filtrate is closest to the truth?

  A. 40% of inulin is reabsorbed in the proximal tubule, the remainder in the descending loop of Henle
* B. 60% of the Na+ and water are reabsorbed in the proximal convoluted tubule
  C. 50% of glucose is reabsorbed in the proximal tubule, the remainder in the descending loop of Henle
  D. 60% of water and 30% of Na+ is reabsorbed in the proximal convoluted tubule
  E. 20% of creatinine is reabsorbed in the proximal tubule, the remainder is excreted

12) The loop of Henle immediately follows the proximal tubule. It has a descending limb which travels from the cortex into the medulla of the kidney, followed by an ascending limb. In the descending limb

* A. The osmolality of the filtrate progressively increases due to diffusion of Na+ into the tubule and due to the continued reabsorption of water
  B. The osmolality of the filtrate progressively increases due to diffusion of water into the tubule
  C. The osmolality of the filtrate continues to reduce due to reabsorption of Na+ and water
  D. The osmolality of the filtrate progressively reduces due to reabsorption of water

13) By the time filtrate reaches the distal tubule, only 10% of Na+ and about 20% of water of the original glomerular filtrate remain.

  A. Most of the remaining water and Na+ is reabsorbed in the distal tubule
  B. Some of the remaining water and Na+ is reabsorbed in the distal tubule
  C. Most of the remaining water is reabsorbed in the distal tubule
* D. Most of the remaining Na+ is reabsorbed in the distal tubule

14) The fractional excretion rate of a substance is related to the fractional reabsorption rate (both expressed as percentages) by the following formula

  A. Fractional excretion rate minus Fractional reabsorption rate = 100
  B. Fractional excretion rate divided by Fractional reabsorption rate = 100
  C. Fractional excretion rate multiplied by Fractional reabsorption rate = 100
* D. Fractional excretion rate plus Fractional reabsorption rate = 100

15) During proximal tubular reabsorption

  A. The key driving force is the Na/H antiporter activity with the pumps residing on the basal (capillary) end of lumen epithelial cells.
* B. The key driving force is the Na-K-ATPase activity with the pumps residing on the basal (capillary) end of lumen epithelial cells.
  C. The key driving force is the Na/H antiporter activity with the pumps residing on the apical (lumen) end of lumen epithelial cells.
  D. The key driving force is the Na-K-ATPase activity with the pumps residing on the apical (lumen) end of lumen epithelial cells.

16) In the proximal tubule, glucose is reabsorbed from the filtrate in a 2 step process :

  A. facilitated diffusion across the luminal membrane, then primary active transport across the basolateral membrane
  B. primary active transport across the luminal membrane, then passive, carrier-mediated diffusion across the basolateral membrane
  C. secondary active transport across the luminal membrane, then active transport across the basolateral membrane
* D. secondary active transport across the luminal membrane, then passive, carrier-mediated diffusion across the basolateral membrane

17) Diabetes Mellitus results in glucosuria (glucose in urine) primarily because

  A. Diabetes upsets the Na-K-ATPase pump, the primary driver of reabsorption in the proximal tubule
  B. Diabetes causes damage to nephrons
* C. Glucose reabsorption is a saturable process and can be overwhelmed
  D. Glucose diffuses from peritubular capillaries into the proximal convoluted tubule
  E. Glucose diffuses from peritubular capillaries into the distal tubule

18) 60-65% of glomerular filtrate is reabsorbed in the proximal convoluted tubule (PCT). With respect to this reabsorption

  A. If inulin is present in the filtrate, is it absorbed in proportion (60-65%)
  B. Nearly 100% of sodium and glucose are reabsorbed
* C. The osmolality of the filtrate does not change significantly during its passage through the PCT
  D. Na+ initially diffuses into the filtrate; however, by the end of the passage through the PCT, there's a 30% (approx.) reduction in filtrate Na+.
  E. Diffusion is the primary driving force

19) Anti-diuretic hormone (ADH) is synthesized in the hypothalamus and is released when the body needs to conserve water. Which part of the nephron does it act upon?

* A. Collecting duct
  B. Distal tubule
  C. Proximal convoluted tubule
  D. Loop of Henle
  E. Glomerulus

20) The key determinant of extra-cellular fluid (ECF) and effective circulating volume (ECV) in healthy animals is

  A. Potassium balance
* B. Na+ balance
  C. Blood pressure
  D. Glomerular function

21) Relative changes in volume of ECF are sensed by

  A. High-pressure sensors in the atria & pulmonary vessels, aortic arch and carotid sinus and the juxtaglomerular apparatus of the kidney
* B. Low-pressure sensors in the atria & pulmonary vessels, high pressure baroreceptors in the aortic arch and carotid sinus and the juxtaglomerular apparatus of the kidney
  C. High-pressure sensors in the atria & pulmonary vessels, low pressure baroreceptors in the aortic arch and carotid sinus and the juxtaglomerular apparatus of the kidney
  D. Low-pressure sensors in the atria & pulmonary vessels, aortic arch and carotid sinus and the juxtaglomerular apparatus of the kidney

22) When Na+ intake occurs, the ratio of ECF (extra-cellular fluid) to ICF (intra-cellular fluid) changes as follows

  A. Remains the same because along with excess Na+ absorbed into the ECF, water also follows
* B. Increases because the osmolality of ECF increases as Na+ is prevented from entering ICF
  C. Increases because the osmolality of ECF decreases as Na+ is prevented from entering ICF
  D. Decreases because the osmolality of ECF increases as Na+ is prevented from entering ICF

23) When a large dose of potassium is absorbed into the blood stream from food, regulation is necessary to avoid life-threatening hyperkalemia. Acute regulation occurs by

  A. A rapid secretion by cells of the late distal tubule and cortical collecting ducts primarily triggered by aldosterone
* B. A rapid uptake by cells primarily triggered by insulin
  C. A rapid increase in GFR so that net excretion of K+ occurs
  D. A rapid uptake by cells primarily triggered by epinephrine

24) Regulation of potassium excretion occurs primarily by modulating the action of cells in the

  A. Loop of Henle, through the influence of norepinephrine
* B. Late distal convuluted tubule and cortical collecting duct
  C. Proximal tubule, through the influence of aldosterone
  D. Glomerulus to increase GFR
  E. Loop of Henle, through the influence of aldosterone

25) A healthy dog would have plasma corresponding to approximately

* A. About 20% of extra-cellular fluid
  B. About 20% body weight
* C. 4-5% body weight
  D. About 4-5% of intra-cellular fluid

26) Osmotic pressure is measured in units of

* A. Hydrostatic pressure
  B. Osmolality
  C. Osmolarity
  D. Difference in particle concentrations

27) Osmolarity and osmolality are, essentially, identical concepts. The difference between them is

* A. How they are measured. Osmolarity is solute/litre; osmolality is solute/Kg
  B. They are identical concepts; in fact, there is no difference between them.
  C. How they are measured. Osmolality is solute/litre; osmolarity is solute/Kg
  D. They are not identical concepts. Osmolarity related to hydrostatic pressure while osmolality relates to solute concentration

28) The approximate osmolarity of ECF is 300 mOsm/L. Substance ABC is permeable across the cell membrane. If 1 litre of 600 mOsm/L ABC solution is intravenously fed to a dog, the short-term impact will be

* A. The ECF/ICF proportion will remain the same as ABC will equilibrate between ICF and ECF
  B. ECF volume will increase by less than 1 litre because the 600 mOsm/L ABC will result in ECF hypotonicity thus pushing water from ECF to ICF.
  C. ECF volume will increase by more than 1 litre because the 600 mOsm/L ABC will result in ECF hypertonicity thus drawing in water from ICF.
  D. ECF volume will increase by exactly 1 litre because ICF volume is tightly regulated by active transport mechanisms.

29) Oncotic pressure is

  A. the total osmotic pressure of a solution
  B. the osmotic pressure created due to the presence of all dissolved substances
* C. the osmotic pressure created due to the presence of large protein molecules
  D. the difference between the hydrostatic pressure and the osmotic pressure of a solution

30) The typical osmolality of blood in a healthy animal is approximately

* A. 300 milliOsmoles/Kg
  B. 250 Osmoles/liter
  C. 300 gms/liter
  D. 300 mmHg
  E. 300 milliOsmoles/liter

31) The typical water requirements for a healthy small dog are

* A. 60 ml/kg/day
  B. 20 ml/kg/hour
  C. 10 ml/kg/hour
  D. 40 ml/kg/day

32) If you are told that an animal that normally weighs 50 kg is 5% dehydrated, it means that it need a water replenishment of (litres)

  A. 3.0
  B. 5.0
* C. 2.5
  D. 1.5

33) Hypertonic dehydration can result from

* A. Diuretic use that causes more water than salt to be lost
  B. Diarrhea or vomiting
  C. Excess sodium intake
  D. Diuretic use that causes more salt than water to be lost
  E. Hemorrhage

34) The osmolarity of plasma is approximately 300 mOsm/litre. What is the approximate osmolarity of a 0.9% NaCl solution?

  A. 30 mOsm/litre
  B. 150 mOsm/litre
* C. 300 mOsm/litre
  D. 3000 mOsm/litre
  E. It is impossible to convert as osmolarity and % concentration are different concepts.

35) In comparison to blood, Lactated Ringer's solution is

  A. hypertonic
* B. isotonic
  C. hypotonic or hypertonic; it depends on how warm it is.
  D. hypotonic

36) D5W is dextrose (glucose) 5% in water with an osmolarity of about 250 mOsm/liter. When a substantial amount is administered intravenously, the patient's plasma is likely to get

  A. Very hypertonic
  B. Mildly hypotonic
* C. Very hypotonic
  D. No change, as the D5W's osmolarity is approximately the same as blood
  E. Mildly hypertonic

37) Aldosterone's main functions are :

  A. Activation of Na/H antiporter in the proximal tubule and stimulation of H+ secretion in the collecting duct
  B. Activation of basolateral Na/K-ATPase pumps in the loop of Henle and stimulation of H+ secretion in the distal tubule
  C. Activation of basolateral Na/K-ATPase pumps in the proximal tubule and stimulation of HCO- secretion in the collecting duct
* D. Activation of basolateral Na/K-ATPase pumps in the distal tubule and stimulation of H+ secretion in the collecting duct

38) What is the significance of GFR?

  A. GFR depicts the ability to reabsorb vital nutrients
  B. GFR is an index of cardiovascular fitness
* C. GFR is an index of the functioning renal mass
  D. GFR is an index of diabetes mellitus

39) Urea concentration in plasma (BUN) is not a reliable indicator of GFR because :

  A. Actually, Urea is a reliable indicator of GFR
* B. Urea production is not constant
* C. Urea is reabsorbed as a passive participant in Na, water reabsorption
  D. Urea excretion is not related to GFR as it is excreted directly into the distal tubule

40) Active transport in the proximal tubule occurs

  A. Only through the paracellular route
  B. Through both the paracellular route and the trancellular route
  C. Only passive reabsorption occurs in the proximal tubule
* D. Only through the transcellular route

41) With respect to renal handling of sodium in the loop of Henle

* A. About 25% of Na+ is reabsorbed using the Na/K/2Cl symport mechanism
  B. About 25% of Na+ is reabsorbed using the Na/K/ATPase mechanism
  C. About 25% of Na+ is reabsorbed using specialized Na channels
  D. About 25% of Na+ is reabsorbed using the Na/Cl symport mechanism

42) Urine concentration and dilution is controlled by which processes :

* A. The variability in water permeability of the collecting duct in response to ADH.
* B. The generation of a hypertonic medullary interstitium, which allows the formation of a concentrated urine
  C. The variability in water permeability of the distal convoluted tubule in response to ADH.
* D. The dilution of the tubular fluid by the thick ascending limb (Henle’s loop) and distal convoluted tubule, which allows the formation of dilute urine
  E. The dilution of the tubular fluid by the proximal convoluted tubule, which allows the formation of dilute urine

43) Diabetes Insipidus occurs when there is a malfunction in

  A. the response of the kidney to Aldosterone
  B. the response of the kidney to Angiotensin II
* C. ADH production by the hypothalamus or ADH response in nephrons
  D. the response of the kidney to ANP
  E. the Na/K/ATPase pump in the basolateral membrane of the nephron

44) Which respect to chronic renal failure

* A. PUPD occurs when more than 66% of function is lost, whereas Azotemia (high BUN, Creatinine) occurs when more than 75% of renal function is lost
  B. PUPD occurs when more than 50% of function is lost, whereas Azotemia (high BUN, Creatinine) occurs when more than 66% of renal function is lost
  C. PUPD occurs when more than 75% of function is lost, whereas Azotemia (high BUN, Creatinine) occurs when more than 66% of renal function is lost
  D. PUPD occurs when more than 66% of function is lost, whereas Azotemia (high BUN, Creatinine) occurs when more than 66% of renal function is lost

45) When referring to concentration, equivalence

* A. is used when referring to a solute that dissociates into more than one particle
  B. is used when referring to a solute that does not fully dissociate
  C. is used when referring to large proteins or colloids
  D. is used when referring to a weak acid

46) Normal plasma has a specific gravity (SG) of about

  A. 1.080 to 1.100 g/ml
  B. 1.800 to 1.900 g/ml
* C. 1.008 to 1.010 g/ml
  D. 1.003 to 1.005 g/ml

47) About how much water exists in a healthy adult animal?

  A. 70-80%
* B. 50-70%
  C. 40-50%
  D. 30-40%

48) Total body water (TBW) is about 60% of body weight. What proportion of TBW is within intra-cellular fluid (ICF)?

  A. 50%
* B. 66%
  C. 33%
  D. 40%

49) ANP, or Atrial natriuretic peptide, has an action

  A. that works independent of hormones involved in the RAAS system
  B. is produced in the mesengial cells of the kidney
* C. that opposes the RAAS system
  D. that enhances the RAAS system