

Physio Renal Dr. Abdallah

1. The glomerular filtration barrier is composed of all the following except:

- a) Fenestrated capillary endothelium.
- b) Macula densa.
- c) Basement membrane.
- d) Mesangial cells.
- e) Podocytes.

2. Constriction of the afferent arteriole only:

- a) Decreases hydrostatic pressure in the glomerular capillaries.
- b) Increases GFR.
- c) Decreases RPF
- d) Increases RBF.
- e) a and c are correct.

3. Which of the following is involved in the regulation of glomerular filtration rate (GFR)?

- a) Juxtaglomerular apparatus.
- b) Afferent arteriolar tone
- c) Efferent arteriolar tone.
- d) NaCl transport at the macula densa
- e) All of the above.

4. Angiotensin II causes:

- a) increases proximal tubular reabsorption of Na & H₂O & increases secretion of H⁺.
- b) by increases distal tubular reabsorption of Na & H₂O & decreases secretion of K⁺.
- c) Decrease resistance of the efferent arteriole
- d) Increases excretion of Na & H₂O.
- e) Decreases aldosterone secretion.

5. Glomerulotubular balance:

- a) An intrinsic feed mechanism of kidneys.
- b) 1st line mechanism of defense against change in GFR.
- c) Related to Juxtaglomerular complex.
- d) Ability to increase tubular absorption in response to an increase in filtered load.
- e) None of the above.

6. Chloride is reabsorbed actively from:

- a) Early PCT.
- b) Thin part of the ascending limb of loop of Henle.
- c) Thick part of the ascending limb of loop of Henle.
- d) Collecting ducts.
- e) Distal DCT.

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7. Amiloride:

- a) Acts on intercalated cells of collecting ducts.
- b) Causes hypernatremia.
- c) Blocks ENaC.
- d) Causes hypokalemia.
- e) Impairs the ability of kidney to dilute or concentrate urine.

8. Reabsorption of Na:

- a) By primary active transport in apical side in PCT.
- b) By facilitated diffusion in luminal side of PCT.
- c) By counter transport in apical side in DCT.
- d) By Na H co transport in PCT.
- e) By secondary active transport in basolateral side of PCT.

9. in bulk flow of peritubular capillary:

- a) Increases by peritubular capillary hydrostatic pressure.
- b) Decreases by Kf of peritubular capillary
- c) Increases by peritubular colloid osmotic pressure.
- d) Increases by interstitial fluid colloid osmotic pressure.
- e) None of the above

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1. The cells of the proximal convoluted tubules:

- a) have very few mitochondria.
- b) have many brush border.
- c) responding mainly to ADH.
- d) responding mainly to aldosterone.
- e) are for reabsorption only.

2. The cortical nephrons when compared to the juxtamedullary nephrons cortical nephrons have:

- a) longer loops of Henle.
- b) greater numbers.
- c) vasa recta.
- d) major role in urine concentration.
- e) lower blood supply.

3. Renal blood flow:

- a) is about 80% of the cardiac output.
- b) is more in the medulla than in the cortex.
- c) can be calculated if renal plasma flow and GFR are known.
- d) is more in the cortex than in the medulla.
- e) is usually calculated by inulin clearance.

4. The juxtaglomerular cells of the JGA secrete:

- a) aldosterone.
- b) ADH.
- c) angiotensin II.
- d) rennin.
- e) adrenaline.

5. Concerning the juxtaglomerular (JGA) apparatus which of the following is correct:

- a) it is located in the area of contact between the afferent arteriole, efferent arteriole, and DCT.
- b) JG cells act as receptors for NaCl concentration.
- c) macula densa cells secrete rennin.
- d) its main function is to regulate glucose concentration in the plasma.
- e) it is present in the juxtamedullary nephrons only.

6. Macula densa:

- a) is present in the collecting ducts.
- b) secretes rennin.
- c) responding to an increase in glucose conc.
- d) detects NaCl load.
- e) is present in media of afferent arteriole.

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7. Which of the following is not a function of the kidney:

- a) regulation of solutes concentration.
- b) production of rennin.
- c) production of angiotensin.
- d) activation of vitamin D.
- e) urine formation.

8. All of the following are functions of the kidney except:

- a) regulation of acid base balance.
- b) production and release of rennin.
- c) conversion of angiotensin I into angiotensin II.
- d) activation of vitamin D.
- e) regulation of the volume and ionic composition of body fluids.

9. Renin hormone is secreted:

- a) from juxtaglomerular cells.
- b) from macula densa cells.
- c) from epithelial cells.
- d) in response to increased blood flow to the kidney.
- e) in response to increased NaCl.

10. The function of the kidney includes:

- a) regulation of blood pressure.
- b) regulation of the volume, composition, and PH of body fluids.
- c) control of the rate of RBCs production.
- d) all of the above are correct.
- e) only b & c are correct.

11. It is correct to say:

- a) inulin clearance equals zero in normal subjects.
- b) sodium is reabsorbed actively in the thin part of the ascending limb of loop of Henle.
- c) creatinine is used for the measurement of RPF.
- d) loop diuretics are operating through inhibition of ADH action in DCT and collecting ducts.
- e) glucose is actively reabsorbed in the luminal border of the renal tubules.

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12. The following data were collected from an adult male:

- plasma glucose level = 135 mg / dL.
- concentration of inulin in plasma = 50 mg / dL.
- concentration of inulin in urine = 6000 mg / dL.
- volume of urine collected in 40 minute = 60 ml.

the subject's GFR was:

- a) 7200 ml/min.
- b) 180 ml/min.
- c) 0.5 ml/min.
- d) 0.5 L/min.
- e) 7.2 L/min.

13. Based on the above data, his glucose tubular load was:

- a) 243 ml/min.
- b) 675 mg/min.
- c) 243 mg/dl.
- d) 243 mg/min.
- e) 243 mg/ml.

14. If the plasma inulin = 2 mg%, the urine inulin = 2 mg/ml, and the volume of urine = 1ml/min, the GFR will be:

- a) 1 ml/min.
- b) 125 ml/min.
- c) 200 ml/min.
- d) 100 ml/min.
- e) 100 mg/min.

15. Which of the following decreases filtration from the glomeruli:

- a) an increase in the diameter of afferent arteriole.
- b) a mild constriction of the efferent arteriole.
- c) an increase in bowman's capsule pressure.
- d) an increase in renal blood flow.
- e) an increase in filtration coefficient (K f).

16. Clearance of a substance is:

- a) the amount of the substance cleared by the kidney per minute.
- b) the amount of the substance excreted in urine per minute.
- c) the volume of plasma cleared from the substance per minute.
- d) the volume of plasma filtered per minute.
- e) the amount of substance filtered.

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17. GFR is increased when:

- a) afferent arteriole is constricted.
- b) efferent arteriole is severely constricted.
- c) efferent arteriole is mildly constricted.
- d) efferent arteriole is dilated.
- e) pressure in bowman's capsule is increased.

18. Which of the following substances is filtered by the glomerular capillary but not reabsorbed by the renal tubules:

- a) inulin.
- b) glucose.
- c) sodium chloride.
- d) urea.
- e) none of the above is correct.

19. Which of the following causes an increase in GFR:

- a) sever constriction of the efferent arterioles.
- b) constriction of the afferent arterioles.
- c) increased plasma osmotic pressure.
- d) increased Bowman's capsule osmotic pressure.
- e) decreased glomerular hydrostatic capillary pressure.

20. It is correct to say that:

- a) PAH clearance is 250 ml/min.
- b) inulin clearance is 80 ml/min.
- c) glucose clearance is zero.
- d) the maximal urine osmolarity reaches 70 m.osm/L.
- e) none of the above is correct.

21. If the clearance of a substance which is freely filtered is less than that of inulin:

- a) there is a net reabsorption of the substance in the tubules.
- b) there is a net secretion of the substance in the tubules.
- c) the substance becomes bound to protein in the tubules.
- d) the substance is neither secreted nor reabsorbed.
- e) the substance is secreted in the PCT to a greater degree than in the DCT.

22. Which of the following is used for the measurement of GFR for substance (x):

- a) $U_x \cdot P_x / V$
- b) $V_x \cdot P_x / U_x$
- c) U_x / V_x
- d) $U_x \cdot V / P_x$
- e) none of the above.

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23. The glomerular filtrate:

- a) is different from plasma in its ionic composition.
- b) production rate is about 1 ml/min.
- c) is hypotonic compared to plasma.
- d) contains a small amount of albumin.
- e) none of the above.

24. Aldosterone hormone increases Na^+ reabsorption from which of the following part of the nephron:

- a) glomerulus.
- b) descending limb of loop of Henle.
- c) distal convoluted tubule.
- d) thick part of the ascending limb of loop of Henle.
- e) proximal convoluted tubule.

25. Which of the following is reabsorbed passively in the PCT:

- a) Na^+ .
- b) K^+ .
- c) glucose.
- d) urea.
- e) amino acids.

26. Chloride is reabsorbed actively from:

- a) PCT.
- b) DCT.
- c) thick part of the ascending limb of loop of Henle.
- d) thin part of the ascending limb of loop of Henle.
- e) collecting ducts.

27. Glucose:

- a) is partially reabsorbed in the PCT.
- b) is partially reabsorbed in the DCT.
- c) is completely reabsorbed in the DCT.
- d) has a clearance value of zero ml/min.
- e) is completely reabsorbed by all segments of renal tubules.

28. If the plasma glucose level is 150 mg/dl and $\text{GFR} = 100 \text{ ml/min}$, the tubular load for glucose would be:

- a) 125 mg/min.
- b) 1500 mg/min.
- c) 150 mg/min.
- d) 90 mg/ml.
- e) 190 mg/ml.

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29. Glucose is:

- a) reabsorbed actively at the DCT.
- b) reabsorbed passively at the PCT.
- c) reabsorbed actively at the PCT.
- d) reabsorbed actively at the DCT & PCT.
- e) filtered but neither reabsorbed nor secreted by the nephron.

30. As plasma glucose concentration rises above the normal level:

- a) the tubular transport maximum for glucose rises linearly.
- b) the amount of glucose filtered increases linearly.
- c) the renal clearance of glucose rises above zero.
- d) all the above are correct.
- e) both b & c are correct.

31. Sodium reabsorption in PCT is:

- a) passive at basal border.
- b) by secondary active transport at basal border.
- c) by co transport at luminal border.
- d) about 90% of the filtered amount.
- e) about 65% of the filtered amount.

32. Which of the following substances is reabsorbed actively by the renal tubules:

- a) urea.
- b) glucose.
- c) bicarbonate.
- d) water.
- e) creatinine.

33. Aldosterone increases sodium reabsorption from which of the following parts of the nephron:

- a) DCT and collecting ducts.
- b) PCT.
- c) glomerulus.
- d) ascending limb of loop of Henle.
- e) descending limb of loop of Henle.

34. Sodium reabsorbed passively in:

- a) PCT.
- b) DCT.
- c) descending limb of loop of Henle.
- d) thin part of the ascending limb of loop of Henle.
- e) CD.

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35. Which of the following diuretics is K⁺ sparing:

- a) carbonic anhydrase inhibitors (acetazolamide).
- b) loop diuretics (frusemide).
- c) chlorothiazides.
- d) spironolactone.
- e) ADH antagonist.

36. The free water clearance of a subject whose urine flow rate is 2 ml/min, plasma osmolarity is 300 mOsmol/L, and urine osmolarity is 300 mOsmol/L is:

- a) 4500 ml/min.
- b) 2 ml/min.
- c) 600 mOsmol/L.
- d) 1 ml/min.
- e) zero ml/min.

37. It is correct to say:

- a) the majority of water reabsorption occurs in the DCT.
- b) 99% of the filtered water is reabsorbed by osmosis.
- c) ADH increases water reabsorption from the PCT.
- d) water reabsorption from the PCT increases the osmolarity of medullary interstitial fluid.
- e) counter current exchanger is the function of loop of Henle.

38. Which of the following parts of the nephron shows the highest osmolarity:

- a) PCT.
- b) DCT.
- c) thick part of the ascending limb of loop of Henle.
- d) cortical collecting ducts.
- e) medullary collecting ducts.

39. Concerning water reabsorption by the nephrons:

- a) ADH increases water reabsorption from the PCT.
- b) the thick part of the ascending limb of loop of Henle is impermeable to water.
- c) the collecting ducts are the main sites for water reabsorption.
- d) counter current mechanism increases water reabsorption from the DCT.
- e) reabsorption of water decreases the osmolarity of urine.

40. The tubular fluid is iso-osmotic at the end of:

- a) proximal tubules.
- b) descending limb of loop of Henle.
- c) ascending limb of loop of Henle.
- d) distal tubules.
- e) medullary collecting tubules.

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41. The counter current mechanism of the nephron:

- a) is dependent on GFR.
- b) is necessary for producing concentrated urine.
- c) can be inhibited by ADH.
- d) is a function of the cortical nephrons only.
- e) both b & d are correct.

42. Medullary hyperosmolarity causes:

- a) increased Na^+ reabsorption from the DCT.
- b) increased H^+ secretion from the PCT.
- c) increased H_2O reabsorption from the collecting ducts.
- d) release of angiotensinogen.
- e) dilution of urine.

43. Hydrogen ion secretion decrease in case of:

- a) increased plasma concentration of CO_2 .
- b) increased Na^+ reabsorption.
- c) increased Cl^- reabsorption.
- d) inhibition of carbonic anhydrase.
- e) decreased K^+ secretion.

44. Primary active secretion of H^+ occurs at:

- a) the PCT.
- b) late DCT.
- c) thick part of the ascending limb of loop of Henle.
- d) early DCT.
- e) the descending limb of loop of Henle.

45. Tubular secretion of hydrogen ions is:

- a) increased in renal failure.
- b) increased by lowering plasma PCO_2 .
- c) increased by hyperventilation.
- d) increased by marked increase in Na^+ reabsorption.
- e) increased by inhibiting carbonic anhydrase (C.A) activity in the cell.

46. Reaction of secreted hydrogen ion by the nephron with filtered phosphate:

- a) occurs mainly in PCT.
- b) is the source of titrable acids in urine.
- c) occurs in both PCT & DCT.
- d) is the source of ammonia in urine.
- e) normally consumes most of the secreted H^+ .

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47. Chronic renal failure is associated with:

- a) alkalosis due to a decrease in H^+ secretion.
- b) polycythemia due to over secretion of erythropoietin.
- c) hypokalemia.
- d) edema due to an increase in filtration and urinary output.
- e) hypertension due to an increase in rennin production and Na^+ & water retention.

48. Which of the following is a result of chronic renal failure:

- a) alkalosis.
- b) hypotension.
- c) anemia.
- d) high fixed specific gravity of urine.
- e) hypokalemia.

49. It is correct to say:

- a) diabetes insipidus causes high urine osmolarity.
- b) chronic renal failure would causes azotemia.
- c) in chronic renal failure, anemia is mainly due to iron deficiency.
- d) aldosterone secretion tends to raise the urinary fluid volume.
- e) both a & b are correct.

50. Normal urine contains:

- a) large number of RBCs.
- b) 99% of the filtered urea.
- c) large amount of globulin.
- d) large amount of glucose.
- e) none of the above is correct.

51. Micturition reflex involves:

- a) a center in the 4th and 5th thoracic segment of the spinal cord.
- b) efferent sympathetic fibers in the pelvic nerve.
- c) stimulus due to increased pressure in the urinary bladder.
- d) a receptor located in the urethral sphincter.
- e) none of the above.

52. Micturition reflex:

- a) its afferent fibers are in the vagus.
- b) its efferent fibers are in the vagus.
- c) its receptors are chemoreceptors.
- d) its afferent fibers are in the pelvic.
- e) its response includes relaxation of the wall of the bladder.

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53. It is correct to say:

- a) there is a direct relation between H^+ secretion and Na^+ reabsorption.
- b) urea reabsorption increases water reabsorption from PCT.
- c) potassium secretion is a function of intercalated cells of the DCT.
- d) formation of titratable acid is the most important mechanism by which free H^+ is removed from the renal tubules.
- e) juxtamedullary nephrons have short loops of Henle.

54. It is correct to say:

- a) K^+ reabsorption occurs in all segments of the nephron except the descending limb of loop of henle.
- b) an increase in intracellular K^+ causes its secretion in the PCT.
- c) an increase in H^+ secretion causes an increase in K^+ secretion.
- d) there is an inverse relation between Cl^- reabsorption and HCO_3^- reabsorption.
- e) counter current exchanger is a function of loop of Henle.

55. Concerning Henle's loop which of the following is correct:

- a) the descending limb is impermeable to water.
- b) the cortical type acts as a counter current multiplier.
- c) the juxtamedullary type is shorter than the cortical type.
- d) the descending limb is impermeable to sodium.
- e) the thick part of the ascending limb is impermeable to sodium.

56. It is correct to say:

- a) secretion of renin is inversely proportional to the concentration of sodium in DCT.
- b) insulin is used to measure GFR.
- c) sodium has renal tubular transport maximum.
- d) filtration coefficient has no effect on GFR.
- e) none of the above is correct.

57. It is correct to say:

- a) renin is used to estimate GFR.
- b) inulin has tubular transport maximum.
- c) juxtaglomerular nephrons are important for the counter current system.
- d) inulin clearance is 80 ml/min.
- e) both c & d are correct.

58. It is correct to say:

- a) the PCT contains JG cells which secretes renin.
- b) the descending limb of loop of Henle is freely permeable to electrolytes.
- c) renal tubular secretion occurs in the glomeruli.
- d) the renal clearance of urea is lower than that of inulin.
- e) both a & d are correct.

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59. It is correct to say that:

- a) the cells of DCT determine the final composition of urine.
- b) in the descending limb of vasa recta NaCl passes from the blood to the medullary interstitium.
- c) emptying of the urinary bladder can not occur after sensory denervation of the bladder
- d) all of the above are correct.
- e) both b & c are correct.

60. Which of the following undergoes filtration, reabsorption, and secretion by the renal tubules:

- a) bicarbonate.
- b) potassium.
- c) hydrogen.
- d) phosphate.
- e) chloride.

61. Concerning the proximal convoluted tubules (PCT):

- a) the fluid in the PCT is isotonic with plasma.
- b) H⁺ are actively reabsorbed in the PCT.
- c) about 99 % of the filtered fluid is reabsorbed.
- d) all of the above are correct.
- e) only a & c are correct.

62. The permeability of the cell membrane in the PCT:

- a) is much less for water than urea.
- b) allows water to diffuse rapidly following actively reabsorbed solutes.
- c) is high for inulin.
- d) both a & c are correct.
- e) both b & c are correct.

63. It is correct to say:

- a) the fluid in the PCT is generally hypertonic to plasma.
- b) the pressure in the Bowman's capsule is normally about 28 mmHg.
- c) below the renal threshold level none of the substance should appear in the urine.
- d) contraction of the mesangial cells increases GFR.
- e) inulin clearance is zero.

64. In the proximal convoluted tubules (PCT) all of the following occur EXCEPT:

- a) active absorption of 65% of sodium.
- b) absorption of 65% of water under the control of ADH.
- c) complete active absorption of amino acids.
- d) complete active absorption of glucose.
- e) secondary active H⁺ secretion.

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65. Respiratory acidosis is associated with:

- a) an increased PH and increased PCO₂.
- b) decreased PH and decreased PCO₂.
- c) an increased PH and normal PCO₂.
- d) decreased PH and increased PCO₂.
- e) decreased PH and normal PCO₂.

66. Metabolic alkalosis will be observed in a patient with:

- a) hyperventilation.
- b) Hyperaldosteronism.
- c) renal failure.
- d) persistent vomiting.
- e) diabetes.

67. Metabolic acidosis is caused by:

- a) hyperventilation.
- b) hypoventilation.
- c) excessive loss of bicarbonate.
- d) prolonged vomiting.
- e) large intake of anti acid treatment.

68. The role of kidney in acid-base regulation includes:

- a) conversion of lactic acid into glycogen.
- b) conversion of ammonia into urea.
- c) conversion of NH₃ into ammonium ion (NH₄⁺).
- d) increase formation of ketone bodies.
- e) inhibition of C.A in the tubular cells.

69. Respiratory acidosis is caused by:

- a) sever diarrhea.
- b) ingestion of large volume of NaCl.
- c) hyperventilation.
- d) hypoventilation.
- e) exercise.

70. Metabolic acidosis could be caused by:

- a) excessive diarrhea.
- b) excessive intake of fruits.
- c) gastric bleeding.
- d) uncontrolled diabetes insipidus.
- e) vomiting of gastric juice.

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71. Hyperventilation increases blood PH because:

- a) it activates neural mechanisms that remove acids from the blood.
- b) it makes hemoglobin is stronger acid.
- c) it increases PO₂ in the blood.
- d) it decreases PCO₂ in the blood.
- e) it increases H⁺ in the blood.

72. In uncompensated respiratory alkalosis:

- a) the plasma PH is high, but the HCO₃⁻ concentration is low.
- b) the PH and the HCO₃⁻ concentrations are low.
- c) the PH is low but the HCO₃⁻ concentration is high.
- d) the PH is low, but the arterial PCO₂ is high.
- e) none of the above is correct.

73. A 25 years old male patient suffers from sever diarrhea. This patient's acid-base status is likely to shows:

- a) metabolic acidosis.
- b) metabolic alkalosis.
- c) respiratory acidosis.
- d) respiratory alkalosis.
- e) a compensated respiratory acidosis.

74. Renal blood flow is dependent on:

- a) Juxtaglomerular apparatus
- b) Na⁺ at macula densa
- c) Afferent vasodilatation
- d) Arterial pressure
- e) Efferent vasoconstriction

75. Factors (not) affecting renal blood flow/GFR:

- a) Sympathetic nervous system
- b) Sodium flow past macula densa
- c) Afferent arteriolar vasodilatation
- d) Arterial pressure
- e) Efferent arteriolar vasoconstriction

76. Renal blood flow:

- a) Is 600-650ml/min per kidney
- b) Is directly measured by infusing PAH
- c) Is increased by sympathetic tone

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77. Renal blood flow:

- a) Greater per unit mass than cerebral blood flow
- b) Is greater in the medulla compared to the cortex
- c) Is closely related to tubular sodium reabsorption
- d) Only sympathetically mediated
- e) Some noradrenergic endings on JG complex and tubules
- f) Parasympathetic via hypogastric plexus

78. Which has the greatest renal clearance?

- a) PAH
- b) Glucose
- c) Urea
- d) Water
- e) Inulin

79. The ascending limb of the Loop of Henle is:

- a) Impermeable to Na⁺
- b) Involved in active transport of K⁺ into the lumen
- c) Involved in active transport of Cl⁻ out of lumen
- d) Involved in active transport of Na⁺ into lumen
- e) Hypotonic at the top
- f) Actively transports water

80. Regarding glucose handling in the kidney

- a) Reuptake is passive
- b) T_m is the same for all nephrons
- c) D-glucose more rapidly absorbed than L-glucose
- d) Reabsorption is inversely proportional to lipid solubility

81. Water filtration by the kidney:

- a) Is 180 l/hr
- b) Is 125 ml/min
- c) Up to 90% is reabsorbed
- d) Most drugs have MW less than 600 and are freely filtered

82. Significant tubular reabsorption occurs with:

- a) Phosphate
- b) Creatinine
- c) Urea
- d) Sulphate
- e) All of the above

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83. Increased GFR is caused by

- a) Increased cardiac output
- b) Afferent arteriolar vasoconstriction
- c) Efferent arteriolar vasodilatation
- d) Increased chloride delivery to the macula densa

84. Which of the following is involved in the regulation of glomerular filtration rate (GFR)?

- a) Juxtaglomerular apparatus
- b) Afferent arteriolar tone
- c) Efferent arteriolar tone
- d) Chloride transport at the macula densa
- e) All of the above

85. The formula for GFR is:

- a) $GFR = K_f (HPG - HPB + OPG - OPB)$
- b) $GFR = K_f (HPG - HPB - OPG + OPB)$
- c) $GFR = K_f (HPG + HPB - OPG + OPB)$
- d) $GFR = K_f (HPG + HPB - OPG - OPB)$
- e) $GFR = K_f (HPG - HPB - OPG - OPB)$

86. The effect of PTH on the kidney is to:

- a) Increase Ca excretion and increase phosphate excretion
- b) Increase Ca excretion and decrease phosphate excretion
- c) Decrease Ca excretion and increase phosphate excretion
- d) Decrease Ca excretion and decrease phosphate excretion
- e) None of the above

87. Water handling by kidney (% reabsorption)

- a) 93%
- b) 94%
- c) 99%
- d) 99.4%
- e) 99.9%

89. Resistance to renal blood flow is chiefly determined by:

- a) Renal artery
- b) Afferent & efferent arterioles
- c) Interlobular & arcuate arteries
- d) Peritubular capillaries

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90. For renal clearance of a substance to exceed Inulin,

- a) Increase in GFR
- b) Must be secreted by either the proximal or distal tubules
- c) Must have a lower molecular weight than Inulin

91. If a substance is cleared by the kidney at a rate greater than inulin, it must be:

- a) Freely filtered
- b) Actively secreted
- c) Actively reabsorbed

92. If a substance is found in the urine at a HIGHER concentration than inulin, then

- a) It must be filtered more
- b) It is secreted into the lumen
- c) There is less reabsorption in the DCT

93. Water excretion by the kidney is due to:

- a) Osmosis
- b) Active transport into the lumen
- c) Passive secretion in the collecting tubules
- d) Solvent drag
- e) Facilitated diffusion
- f) Paracellular movement

94. Angiotensin II causes:

- a) Increases proximal tubular reabsorption of Na & H₂O & increases secretion of K⁺
- b) Increases distal tubular reabsorption of Na & H₂O & decreases secretion of K⁺
- c) Decreases distal tubular reabsorption of Na & H₂O
- d) Increases excretion of Na & H₂O

95. Glomerulotubular balance:

- a) Involves afferent arteriole feedback loop
- b) Involves efferent arteriole feedback loop
- c) Juxtaglomerular complex
- d) Ability to increase tubular absorption in response to an increase in filtered load
- e) None of the above
- f) Tubular resorption is matched to GFR

96. Kidneys produce:

- a) Erythropoietin
- b) ADH
- c) Angiotensin II
- d) ANP
- e) Cholecalciferol

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97. Renal nerve sympathetic stimulation

- a) Causes increased sodium reabsorption from the PCT
- b) Inhibits renin release
- c) Increased GFR

98. Water reabsorption by the kidney:

- a) 90% in proximal tubule
- b) 60% in distal tubule
- c) By active transport
- d) None of the above.

99. Glomerular filtration rate (GFR):

- a) Is independent of the size of the capillary bed
- b) Depends only on the hydrostatic and osmotic pressure differences across the capillary
- c) Is determined by the same forces governing filtration across all other capillaries
- d) Depends only on the permeability of the capillary
- e) Requires active transport

100. Pressure diuresis:

- a) Due to decreased reabsorption of Na^+ & water in peritubular capillaries
- b) Regulated by macula densa
- c) Increase ADH
- d) Increase angiotensin
- e) Control by JGA

101. What is the minimum amount of urine required to excrete 600mOsm

- a) 100ml
- b) 500ml
- c) 1 litre
- d) 2 litre
- e) 4 litre

102. Increase in GFR occurs with

- a) Increased sympathetic stimulation
- b) Decreased renal blood flow
- c) Hypoproteinaemia
- d) Ureteric obstruction
- e) None of the above

103. Regarding renal clearance:

- a) Inulin clearance measures renal blood flow
- b) Creatine clearance correlates with GFR
- c) Filtration fraction measured as inulin clearance/ PAH clearance

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104. Regarding urea:

- a) Urea is formed from ...ornithine
- b) 10% is reabsorbed by kidney
- c) None of the above

105. The clearance (or 'renal regulation') of which ONE of the following is NOT regulated by a hormone:

- a) Sodium
- b) Potassium
- c) Calcium
- d) Phosphate
- e) Sulphate

106. Biggest contribution to urine concentration by:

- a) Na⁺ absorption in thick ascending limb
- b) Passive diffusion of urea in collecting ducts
- c) Chloride absorption in distal convoluted tubule

107. High osmolarity of renal medullary interstitium is due to:

- a) secretion of H₂O into ascending loop of Henle
- b) diffusion of H₂O into ascending loop of Henle
- c) active transport of Na from vasa recta
- d) passive reabsorption of urea from collecting duct
- e) Cl absorption in distal tubule

108. The amount of H⁺ filtered by the kidney per day:

- a) 3.6 mmol
- b) 36 nmol
- c) 0.68 mmol
- d) 6.8 mmol
- e) 68 mmol

109. Concerning renal ontogeny:

- a) the pronephros is a transitory kidney present during the embryonic life of all vertebrates
- b) the mesonephros is a functional yet transitory kidney during intrauterine life of mammals
- c) a main morphological difference between the metanephros (permanent kidney) and the mesonephros, is the development of the loop of Henle
- d) A and C are correct
- e) all are correct

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110. The main barrier precluding the free passage of albumin across the glomerular capillary walls is formed by:

- a) the fenestrated glomerular endothelium
- b) anionic proteoglycan clusters within the glomerular basement membrane
- c) the filtration slits in between visceral epithelial cells (podocytes)
- d) none are correct
- e) all are correct

111. Concerning the measurement of renal plasma flow (RPF) and glomerular filtration rate (GFR):

- a) inulin is a good GFR marker because it is freely filtered in the glomeruli and it is not reabsorbed, or secreted, by the renal tubules
- b) inulin concentration in the proximal tubule's lumen increases progressively as water is reabsorbed in the segment of the nephron
- c) PAH (para-amino-hippuric acid) is a good marker of renal plasma flow because it is freely filtered and is rapidly secreted by the proximal tubule; as a result very little PAH reaches the renal vein
- d) A and C are correct
- e) all are correct

112. Concerning the functional histology of the kidney:

- a) the superficial nephrons have short loops of Henle; thus, they have a low capacity to reabsorb salt (salt losing nephrons)
- b) the deep nephrons have long loops of Henle; thus they have a high capacity to reabsorb salt and water
- c) in dehydration, the blood flow to deep nephrons tends to increase
- d) A and C are correct
- e) all are correct

113. The following factor(s) tend(s) to INCREASE the rate of glomerular filtration (GFR):

- a) decreased albumin concentration in plasma
- b) vasodilation of the afferent (pre-glomerular) arteriole
- c) vasoconstriction of the efferent (post-glomerular) arteriole
- d) A and C are correct
- e) all are correct

114. The following factor(s) tend(s) to INCREASE the rate of glomerular filtration (GFR):

- a) sympathetic stimulation (norepinephrine) of the afferent arteriole
- b) obstruction of the renal tubules, ureter or urethra
- c) vasodilation of the efferent arteriole
- d) none are correct
- e) all are correct

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115. Concerning the function of the glomerular mesangial cells:

- a) mesangial cells can contract and cause some decrease in total glomerular filtration area
- b) mesangial cells play a major role in systemic angiotensin II production
- c) mesangial cells are phagocytic and play a role in the clearing of proteins and immune-deposits entrapped in the mesangium
- d) A and C are correct
- e) all are correct

116. Concerning the function of the proximal tubule:

- a) most of the glomerular ultrafiltrate is reabsorbed in the proximal tubule in an iso-osmotic fashion.
- b) the concentration of PAH doesn't change much along the length of the proximal tubule
- c) under normal conditions, most of the filtered glucose and bicarbonate are reabsorbed in the proximal tubule
- d) A and C are correct
- e) all are correct

117. Concerning metabolic energy (at production) for renal transport:

- a) the main substrate for proximal tubule is glucose
- b) the cortical PO₂ is about 10 mmHg
- c) the papillary tissues normally generate ATP via oxidative metabolism
- d) A and C are correct
- e) all are correct

118. Concerning water reabsorption by the proximal tubule:

- a) main driving forces for water reabsorption in the proximal tubule are solute uptake and oncotic pressure in peritubular capillaries
- b) a significant amount of water uptake in the proximal tubule is dependent on sodium uptake by the Na/H antiports present in their luminal membrane
- c) aquaporine-I (water channels) are abundantly present in the cellular membranes of proximal tubule cells
- d) A and C are correct
- e) all are correct

119. Concerning the THICK loop of Henle:

- a) the thick segment of the loop has a very powerful Na/K/2Cl pump that moves salt from the tubular lumen into the peritubular space
- b) water and urea move freely across the epithelium of the thick ascending segment of the loop
- c) following the administration of furosemide (lasix) large volumes of diluted urine are produced
- d) A and C are correct
- e) all are correct

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120. Concerning urinary concentration:

- a) the thick loop of Henle generates most of the osmotic gradient needed for reabsorption of water in the collecting duct
- b) the tubular urine that reaches the collecting duct is generally hypotonic with respect to plasma
- c) in the absence of ADH, urine is not concentrated along the length of the collecting duct
- d) A and C are correct
- e) all are correct

121. Concerning the transport of urea in the different segments of the nephron:

- a) main tubular urea source is the plasma via the glomerular ultrafiltrate
- b) the urea concentration in the lumen of the cortical collecting ducts increases as water is reabsorbed
- c) the thin loop of Henle and the medullary collecting duct are permeable to urea
- d) A and C are correct
- e) all are correct

122. Concerning the macula densa:

- a) the macula densa senses the total amount of sodium chloride (sodium chloride concentration times volume) of tubular urine being delivered by the loop of Henle into the distal convoluted tubule
- b) if the delivery of sodium chloride is lower than normal the macula densa signals the afferent arteriole (pre-glomerular) to release renin
- c) renin release causes intravascular angiotensin formation and indirectly aldosterone release
- d) A and C are correct
- e) all are correct

123. Concerning angiotensin II:

- a) the exocrine renin-angiotensin-aldosterone system includes angiotensinogen production by the liver, renin secretion by the juxtaglomerular apparatus and angiotensin-converting enzyme present at the luminal surface of endothelial cells
- b) aldosterone, but not Ang II, stimulate thirst and salt appetite
- c) angiotensin II induces marked increases in sodium reabsorption by the loop of Henle and the collecting duct
- d) A and C are correct
- e) all are correct

124. Within an hour following intravenous angiotensin II infusion, the following is(are) clinically evident:

- a) increased sodium uptake in the proximal tubular epithelium
- b) systemic vasoconstriction
- c) increased plasma aldosterone
- d) A and C are correct
- e) all are correct

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125. Within eight hours following large intravenous aldosterone infusion the following is(are) clinically evident:

- a) unchanged sodium reabsorption by the collecting duct
- b) decreased potassium and hydrogen excretion in urine
- c) hypernatremia (high sodium in plasma), hypokalemia (low potassium in plasma) and alkalosis (low hydrogen ion activity in plasma)
- d) A and C are correct
- e) all are correct

126. Concerning arterial blood pressure regulation:

- a) prostaglandins and dopamine and bradykinin are vasodilators
- b) ADH, angiotensin II and epinephrine are vasoconstrictors
- c) the vasodilator/vasoconstrictor ratio that regulates total peripheral resistance plus cardiac stroke volume and heart rate are determinants of blood pressure
- d) all are correct
- e) none are correct

127. Concerning cell volume regulation:

- a) the Na/H and Cl/HCO₃ antiports are involved in hypertonic cell volume regulation
- b) rapid efflux of cytoplasmic water is followed by volume regulatory KCL efflux
- c) KCL efflux is involved in hypotonic cell volume regulation
- d) A and C are correct
- e) all are correct

128. Intravenous administration of 1.5 liters of isotonic Ringer's solution to a healthy adult could cause:

- a) increased cardiac output and renal blood flow
- b) increased GFR
- c) increased atrial natriuretic peptide and decreased renin in plasma
- d) A and C are correct
- e) all are correct

129. Renin

- a) Increased H₂O reabsorption
- b) Decreased sodium reabsorption
- c) All formation
- d) Increased sodium reabsorption
- e) Decreased phosphate reabsorption

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130. Atrial natriuretic peptide

- a) Increased H₂O reabsorption
- b) Decreased sodium reabsorption
- c) All formation
- d) Increased sodium reabsorption
- e) Decreased phosphate reabsorption

131. ADH

- a) Increased H₂O reabsorption
- b) Decreased sodium reabsorption
- c) All formation
- d) Increased sodium reabsorption
- e) Decreased phosphate reabsorption

132. AII

- a) Increased H₂O reabsorption
- b) Decreased sodium reabsorption
- c) All formation
- d) Increased sodium reabsorption
- e) Decreased phosphate reabsorption

133. PTH

- a) Increased H₂O reabsorption
- b) Decreased sodium reabsorption
- c) All formation
- d) Increased sodium reabsorption
- e) Decreased phosphate reabsorption

134. Which one of the following is correct about nonvolatile acids.

- a) they are not essential to eliminate from the body
- b) we generate much greater amounts of nonvolatile than volatile acids
- c) they are fully buffered by bone
- d) they are products of intermediary metabolism and protein degradation
- e) they are eliminated by the lungs

135. All of the following occur within one hour of eating a large acid load EXCEPT:

- a) the acid load is immediately buffered by intracellular proteins and phosphates as well as extracellular bicarbonate
- b) the lungs will begin eliminating CO₂ generated as a result of the acid load
- c) the kidney will eliminate all the nonvolatile acids and regenerate bicarbonate to replace all the bicarbonate used in buffering
- d) hemoglobin will buffer some of the protons

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136. If the pH is 7.60 (H^+ concentration = 25 nEq/L) and the pCO_2 is 40 mmHg, what is the HCO_3^- concentration (in mEq/liter).

- a) 10
- b) 20
- c) 30
- d) 40

137. A patient takes a drug overdose and becomes comatose. His blood pCO_2 was 40 mmHg ten minutes ago, but you discover it is now 80 mmHg. Which one of the following statements about this patient is correct.

- a) the pH of his CSF is likely to fall more slowly than the pH of his blood
- b) the pH of his blood is likely to fall more slowly than the pH of his CSF
- c) the pH of the blood and CSF will not change because he will rapidly eliminate bicarbonate in the urine in response to the rise in pCO_2
- d) the pH of the blood and CSF will change to a similar degree in this time period

138. Which one of the following statements is true about the proximal tubule.

- a) the Na^+/K^+ ATPase drives sodium into the cell from the urine side of the tubule
- b) Na^+/H^+ exchange is largely the mechanism by which hydrogen ion secretion occurs
- c) bicarbonate reabsorption is independent of carbonic anhydrase activity
- d) the pH in the lumen of the proximal tubule can reach as low as about 5.0

139. A patient ingests antifreeze and needs to eliminate the ingested acid. Renal elimination of the protons in this excess acid is primarily accomplished by which of the following mechanisms.

- a) increased urinary ammonium excretion
- b) increased urinary excretion of phosphates
- c) hyperventilation
- d) increased urinary free hydrogen ion concentration
- e) increased urinary sulfate excretion

140. Renal ammonium ion excretion is increased by aldosterone, elevated blood pCO_2 and acidemia

- a) true
- b) false

141. Which one of the following statements is correct with regard to net collecting duct hydrogen ion secretion.

- a) it is decreased by increased renal production of ammonia
- b) it is increased by increased reabsorption of sodium through the apical sodium channel
- c) it is not affected by the presence or absence of titratable acids
- d) aldosterone does not modify collecting duct hydrogen ion secretion

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142. An increase in the concentration of plasma potassium causes increase in:

- a) release of renin
- b) secretion of aldosterone
- c) secretion of ADH
- d) release of natriuretic hormone
- e) production of angiotensin II .

143. Amino acids are almost completely reabsorbed from the glomerular filtrate via active transport in the:

- a) proximal tubule
- b) loop of Henle
- c) distal tubule
- d) collecting duct
- e) renal pelvis

145. Glomerular filtration rate would be increased by :

- a) constriction of the afferent arteriole
- b) a decrease in afferent arteriolar pressure
- c) compression of the renal capsule
- d) a decrease in the concentration of plasma protein
- e) a decrease in renal blood flow

146. The greatest amount of hydrogen ion secreted by the proximal tubule is associated with :

- a) excretion of potassium ion
- b) excretion of hydrogen ion
- c) reabsorption of calcium ion
- d) reabsorption of bicarbonate ion
- e) reabsorption of phosphate ion

147. In controlling the synthesis and secretion of aldosterone, which of the following factors is least important ?

- a) renin
- b) angiotensin II
- c) concentration of plasma Na^+
- d) concentration of plasma K^+
- e) adrenocorticotrophic hormone (ACTH)

148. Renal correction of acute hyperkalemia will result in :

- a) alkalosis
- b) acidosis
- c) increased secretion of HCO_3^-
- d) increased secretion of H^+
- e) increased secretion of Na^+

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149. Most of the glucose that is filtered through the glomerulus undergoes reabsorption in the :

- a) proximal tubule
- b) descending limb of the loop of Henle
- c) ascending limb of the loop of Henle
- d) distal tubule
- e) collecting duct

150. Ammonia is an effective important urinary buffer for which of the following reasons :

- a) its production in the kidney decrease during chronic acidosis
- b) the walls of the renal tubules are impermeable to NH_3
- c) the walls of the renal tubules are impermeable to NH_3
- d) its acid base reaction has a low pKa
- e) none of the above .

151. The amount of potassium excreted by the kidney will decrease if :

- a) distal tubular flow increases
- b) circulating aldosterone level increase
- c) dietary intake of potassium increase
- d) Na^+ reabsorption by the distal nephron decreases
- e) the excretion of organic ions increase .

152. In the presence of ADH, The distal nephron is least permeable to :

- a) water .
- b) ammonia .
- c) urea .
- d) sodium .
- e) carbon dioxide.

153. Which of the following substances will be more concentrated at the end of the proximal tubule than at the beginning of the proximal tubule ?

- a) glucose .
- b) creatinine .
- c) sodium .
- d) bicarbonate .

154. When a person is dehydrated, hypotonic fluid will be found in the:

- a) glomerular filtrate .
- b) proximal tubule .
- c) loop of Henle .
- d) distal convoluted tubule .
- e) collecting duct .

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155. Which one of the following statements about aldosterone is correct?

- a) it produces its effect by activating C-AMP .
- b) it produces its effect by increasing membrane permeability to potassium
- c) it causes an increased reabsorption of hydrogen ion.
- d) it has its main effect on the proximal tubule .
- e) it is secreted in response to an increase in blood pressure .

156. The effect of antidiuretic hormone (ADH) on the kidney is to :

- a) increase the permeability of the distal nephron to water.
- b) increase the excretion of Na⁺
- c) increase the excretion of water
- d) increase the diameter of the renal artery .

157. In the distal tubules, sodium reabsorption is increased directly by increased :

- a) sympathetic nerve stimulation of the kidney .
- b) atrial natriuretic hormone secretion .
- c) antidiuretic hormone secretion .
- d) aldosterone secretion
- e) angiotensin secretion .

158. The ability of the kidney to excrete a concentrated urine will increase if:

- a) the permeability of the proximal tubule to water decreases .
- b) the rate of blood flow through the medulla decreases .
- c) the rate of flow through the loop of Henle increases .
- d) the activity of the Na-K pump in the loop of Henle decreases
- e) the permeability of the collecting duct to water decreases .

159. The glomerular filtration rate will increase if :

- a) circulating blood volume increase .
- b) the afferent arteriolar resistance increases .
- c) the efferent arteriolar resistance decreases .
- d) the plasma protein concentration decreases .

160. The volume of plasma needed each minute to supply a substance at the rate at which it is excreted in the urine is known as the :

- a) diffusion constant of the substance
- b) clearance of the substance
- c) extraction ratio of the substance
- d) tubular mass of the substance
- e) filtration rate of the substance .

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161. An increase in the osmolarity of the extracellular compartment will:

- a) stimulate the volume and osmoreceptors , and inhibit ADH secretion
- b) inhibit the volume and osmoreceptors , and stimulate ADH secretion .
- c) inhibit the volume and osmoreceptors , and inhibit ADH secretion
- d) stimulate the volume and osmoreceptors , and stimulate ADH secretion
- e) cause no change in ADH secretion

162. Select the correct answer about proximal tubules :

- a) K⁺ is secreted in exchange with the Na⁺ which is reabsorbed under the effect of aldosterone
- b) glucose , amino acids & proteins are completely reabsorbed
- c) only 10% of the filtered water is reabsorbed
- d) parathormone increase phosphate reabsorption .

163. The primary renal site for the secretion of organic ions e.g urate, creatinine is :

- a) proximal tubule
- b) loop of Henle
- c) distal tubule
- d) collecting duct .

164. Major determinants of plasma osmolarity include all the following except:

- a) sodium
- b) hemoglobin
- c) chloride
- d) albumin
- e) glucose

165. H⁺ secretion in the distal nephron is enhanced by all the following except :

- a) an increase in the level of plasma aldosterone
- b) an increase in the tubular luminal concentration of poorly reabsorbable anions
- c) hyperkalemia
- d) metabolic acidosis
- e) respiratory acidosis

166. Extracellular bicarbonate ions serve as effective buffer for all the following except :

- a) sulfuric acid
- b) phosphate acid
- c) lactic acid
- d) carbonic acid
- e) β - hydroxybutyric acid

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167. All the following statements are true for the H^+ secreted into the lumen of the distal nephron except:

- a) can combine with NH_4^+
- b) can combine with HCO_3^-
- c) can combine with HPO_4^{2-}
- d) can remain as free H^+
- e) is secreted by an H^+ - ATPase pump

168. The glomerular filtration barrier is composed of all the following except :

- a) fenestrated capillary endothelium .
- b) macula densa .
- c) basement membrane .
- d) podocytes .
- e) mesangial cells .

169. The amount of H^+ excreted as titratable acid bound to phosphate would be increased by all the following except :

- a) an increase in the amount of phosphate filtered at the glomerulus .
- b) an increase in the pH of the urine .
- c) an increase in the dietary intake of phosphate
- d) an increase in the level of plasma parathyroid hormone (PTH)
- e) a decrease in the renal tubular maximum (T_m) for phosphate reabsorption .

170. About the proximal convoluted tubules , all are true except :

- a) reabsorb most of Na^+ ions in glomerular filtrate
- b) reabsorb most of Cl^- ions in glomerular filtrate
- c) reabsorb most of K^+ ions in glomerular filtrate
- d) contains JGCs which secrete renin

171. About urea, all are true except :

- a) concentration rises in tubular fluid as the glomerular filtrate passes down the nephron.
- b) is actively secreted by the renal tubular cells
- c) concentration in the blood rises slightly after a high protein diet
- d) causes osmotic diuresis when its blood concentration is increased .