



GENITOURINARY SYSTEM

SUBJECT : MCQ(gyeton)

LEC NO. : 1-7

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- 1) A patient with cirrhosis experiences a doubling of his serum creatinine over a 6-month period after sustained heavy ingestion of a nonsteroidal antiinflammatory drug (NSAID) for his arthritis. Which of the following is the best explanation for his increased serum creatinine?
- A) Increased efferent arteriolar resistance which reduced glomerular filtration rate (GFR)
 B) Decreased Bowman's capsule pressure which reduced GFR
 C) Increased afferent arteriolar resistance which reduced GFR
 D) Increased glomerular capillary filtration coefficient which reduced GFR
 E) Increased renal prostaglandins due to the NSAID
 F) Increased nitric oxide formation due to the NSAID

- 2) 5. Administration of empagliflozin, an inhibitor of sodium-glucose co-transporter 2 (SGLT2), would be expected to cause which of the following sets of changes compared with normal?

	GFR	Resistance Afferent Arteriole	Renal Blood Flow
A)	↔	↔	↔
B)	↔	↔	↓
C)	↓	↑	↓
D)	↓	↑	↔
E)	↓	↓	↓
F)	↑	↓	↑

- 3) Given the following measurements, calculate the approximate filtration fraction:
 Glomerular capillary hydrostatic pressure = 60 mm Hg
 Colloid osmotic pressure in the glomerular capillaries = 30 mm Hg

Bowman's space hydrostatic pressure = 20 mm Hg
 Glomerular capillary filtration coefficient (Kf) = 10 ml/min/mm Hg
 Renal plasma flow = 600 ml/min
 Hematocrit = 0.4

- A) 10 mm Hg
 B) 100 ml/min
 C) 0.100
 D) 0.167
 E) 0.200
 F) 0.333

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14) Which of the following statements is *incorrect*?

- A) Creatinine concentration in the urine is normally higher than in the glomerular filtrate.
- B) Urea concentration in the urine is normally higher than in the glomerular filtrate.
- C) The proximal tubules normally reabsorb almost all of the glucose filtered by the glomerular capillaries.
- D) HCO_3^- concentration in the urine is normally higher than in the glomerular filtrate.
- E) Organic acids and bases are secreted mainly by the proximal tubules.
- F) Sodium concentration remains relatively constant as tubular fluid flows along the proximal tubule.

15) A patient with diabetes mellitus has a glomerular filtration rate of 100 ml/min, a urine flow rate of 4.0 ml/min, and a urine glucose concentration of 2 mg/ml. If he has a kidney transport maximum for glucose of 200 mg/min, what would be his approximate rate of glucose excretion?

- A) 0 mg/min
- B) 8 mg/min
- C) 100 mg/min
- D) 180 mg/min
- E) 300 mg/min
- F) Urinary excretion rate of glucose cannot be determined from these data

16) As tubular fluid passes along a juxtamedullary nephron of a person with severe central diabetes insipidus and essentially no antidiuretic hormone, where is the osmolarity lowest?

- A) Bowman's capsule (glomerular filtrate)

17) If the glomerular filtration rate (GFR) of a patient is reduced to 50% of normal and sustained at that level, you would expect to find _____ renal creatinine excretion rate, _____ renal creatinine clearance, and _____ serum creatinine concentration 6 weeks after the decrease in GFR compared with normal. Assume steady-state conditions and that the patient has maintained the same diet.

- A) Decreased, decreased, increased
- B) Decreased, no change, increased
- C) No change, increased, increased
- D) No change, no change, increased
- E) No change, decreased, increased
- F) Decreased, no change, decreased

18) If glomerular filtration rate suddenly decreases by 50%, from 80 ml/min to 40 ml/min and tubular fluid reabsorption simultaneously decreases from 78 ml/min to 40 ml/min, which of the following changes in urinary excretion rate will occur (assuming that the changes in GFR and tubular fluid reabsorption are maintained)?

- A) Urine flow rate will decrease to zero
- B) Urine flow rate will not change
- C) Urine flow rate will decrease by 50%
- D) Urine flow rate will increase by 50%

19) Calculate the approximate total renal plasma flow given the

following data:

Urine PAH concentration = 200 $\mu\text{g/ml}$
Urine flow rate = 2 ml/min
Arterial plasma paraaminohippuric acid (PAH) concentration = 1.0 $\mu\text{g/ml}$
Renal venous PAH concentration = 0.2 $\mu\text{g/ml}$
Hematocrit = 0.4

- A) 120 ml/min
- B) 200 ml/min
- C) 400 ml/min
- D) 500 ml/min
- E) 667 ml/min
- F) 833 ml/min

20) Which of the following statements is *incorrect*?

- A) Beta-adrenergic stimulation would tend to cause hypokalemia by shifting potassium from the extracellular fluid into the cells
- B) A powerful diuretic that inhibits proximal tubule or loop of Henle sodium reabsorption would tend to increase potassium secretion by the collecting tubules
- C) Injection of excess insulin into a patient would tend to cause hypokalemia
- D) Strenuous, sustained exercise may tend to cause significant hyperkalemia
- E) Increased extracellular fluid osmolarity would tend to cause hypokalemia

- B) Fluid leaving the proximal tubule and entering the loop of Henle
- C) Fluid leaving the descending thin limb and entering the ascending thin limb of the loop of Henle
- D) Fluid leaving the thick ascending segment of the loop of Henle and entering the early distal tubule
- E) Fluid in the cortical collecting tubules
- F) Fluid leaving the collecting ducts (urine)

21) If GFR = 60 ml/min, urine flow rate = 2.0 ml/min, plasma K^+ concentration = 4.0 mmol/l, and urine K^+ concentration = 80 mmol/l, what is the approximate rate of K^+ excretion?

- A) 0.08 mmol/min
- B) 0.16 mmol/min
- C) 0.32 mmol/min
- D) 16 mmol/min
- E) 160 mmol/min
- F) Excretion rate of K^+ cannot be determined from these data

22) Which of the following occurs in type A intercalated cells of the collecting tubules?

- A) Secretion of H^+ , reabsorption of HCO_3^- , and reabsorption of K^+
- B) Secretion of H^+ , reabsorption of HCO_3^- , and secretion of K^+
- C) Secretion of K^+ , reabsorption of Na^+ , and reabsorption of HCO_3^-
- D) Reabsorption of H^+ , secretion of HCO_3^- , and secretion of K^+
- E) Reabsorption of H^+ , secretion of HCO_3^- , and reabsorption of K^+

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13) Which of the following statements is *incorrect*?

- A) Urea transporters UT-A1 and UTA-3 in the collecting ducts are activated by antidiuretic hormone (ADH)
- B) Urea reabsorption in the inner medullary collecting duct is greater than in the distal tubule during dehydration
- C) Increased ADH markedly increases urea reabsorption by the cortical collecting tubule
- D) The inner medullary collecting tubule reabsorbs more urea during antidiuresis than the thick ascending limb of Henle's loop

- E) The cortical collecting tubule is less permeable to urea than is the inner medullary collecting duct during antidiuresis
- F) Passive diffusion of urea into the thin loops of Henle is facilitated by the urea transporter UT-A2

14) Acute metabolic alkalosis tends to _____ K^+ secretion by the cortical collecting tubules and _____ plasma K^+ concentration.

- A) decrease, decrease
- B) decrease, increase
- C) increase, increase
- D) increase, decrease
- E) cause no change in, increase
- F) cause no change in, cause no change in

15) Which of the following statements is *incorrect*?

- A) Carbonic anhydrase inhibitors tend to cause metabolic acidosis.
- B) Thiazide diuretics inhibit the Na-Cl co-transporter in the distal tubules.
- C) Osmotic diuretics tend to increase potassium secretion.
- D) Aldosterone antagonists (e.g., spironolactone) tend to cause hypokalemia.
- E) Sodium channel blockers (e.g., amiloride) inhibit sodium transport across the luminal membrane of the collecting tubules.
- F) Loop diuretics (e.g., furosemide) tend to cause hypokalemia.

17) Atrial natriuretic peptide causes which of the following effects?

- A) Reduced renal tubular sodium reabsorption
- B) Reduced renin secretion
- C) Increased renal sodium excretion
- D) Only A and C
- E) A, B, and C

18) If creatinine clearance = 100 ml/min, urine flow rate = 1.0 ml/min, plasma Na^+ concentration = 140 mmol/l, and urine Na^+ concentration = 80 mmol/l, what is the approximate rate of Na^+ excretion?

- A) 0.08 mmol/min
- B) 0.16 mmol/min
- C) 16 mmol/min
- D) 160 mmol/min
- E) Excretion rate of Na^+ cannot be calculated from these data

19) What is the theoretical maximum clearance rate possible for a substance X that is freely filtered, actively secreted by the renal tubules, and completely cleared from the plasma given the following data?

Glomerular filtration rate = 100 ml/min
Plasma concentration of a substance X = 2 mg/ml
Urine flow = 5 ml/min
Renal plasma flow = 800 ml/min

- A) 5 ml/min
- B) 100 ml/min
- C) 200 ml/min
- D) 500 ml/min
- E) 800 ml/min
- F) 1000 ml/min

20) A 36-year-old woman reports headaches and frequent urination. Laboratory values reveal the following information.

Urine specific gravity = 1.003
Urine protein = negative
Plasma sodium (Na^+) = 165 mmol/l
Plasma potassium (K^+) = 4.4 mmol/l
Plasma creatinine = 1.4 mg/dl
Blood pressure = 88/40 mm Hg
Heart rate = 115 beats/min

What is the most likely cause of her elevated plasma Na^+ concentration?

- A) Primary aldosteronism
- B) Diabetes mellitus
- C) Diabetes insipidus
- D) Simple dehydration caused by insufficient water intake and heavy exercise
- E) Bartter syndrome
- F) Liddle syndrome

21) Which of the following tends to decrease potassium secretion by the cortical collecting tubule?

- A) Increased plasma potassium concentration
- B) A diuretic that decreases proximal tubule sodium reabsorption
- C) A diuretic that inhibits the action of aldosterone (e.g., spironolactone)
- D) Acute alkalosis
- E) High sodium intake

Questions 22 and 23

Use the following clinical laboratory test results to answer Questions 22 and 23.

Urine flow rate = 1 ml/min
Urine inulin concentration = 100 mg/ml
Plasma inulin concentration = 2 mg/ml
Urine urea concentration = 50 mg/ml
Plasma urea concentration = 2.5 mg/ml

22) What is the GFR?

- A) 25 ml/min
- B) 50 ml/min
- C) 100 ml/min
- D) 125 ml/min
- E) None of the above

23) What is the net urea reabsorption rate?

- A) 0 mg/min
- B) 25 mg/min
- C) 50 mg/min
- D) 75 mg/min
- E) 100 mg/min



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24) In normal kidneys, which of the following is true of the osmolarity of renal tubular fluid that flows through the early distal tubule in the region of the macula densa?

- A) Usually isotonic compared with plasma
- B) Usually hypotonic compared with plasma
- C) Usually hypertonic compared with plasma
- D) Hypertonic, compared with plasma, in antidiuresis

25) Which of the following changes would be expected in a patient with diabetes insipidus due to a lack of ADH secretion, assuming free access to water and normal thirst mechanisms for controlling water intake?

28) Which of the following would cause the greatest decrease in GFR in a person with otherwise normal kidneys?

- A) Decrease in renal arterial pressure from 100 to 80 mm Hg in a normal kidney
- B) 50% increase in glomerular capillary filtration coefficient
- C) 50% increase in proximal tubular sodium reabsorption
- D) 50% decrease in afferent arteriolar resistance

- E) 50% decrease in efferent arteriolar resistance
- F) 5 mm Hg decrease in Bowman's capsule pressure



	Plasma Osmolarity Concentration	Plasma Sodium Concentration	Plasma Renin Concentration	Urine Volume
A)	↔	↔	↓	↑
B)	↔	↔	↑	↑
C)	↑	↑	↑	↑
D)	↑	↑	↔	↔
E)	↓	↓	↓	↔

26) A 26-year-old woman recently decided to adopt a healthier diet and eat more fruits and vegetables. As a result, her potassium intake increased from 80 to 160 mmol/day. Which of the following conditions would you expect to find 2 weeks after she increased her potassium intake, compared with before the increase?

29) A patient with severe hypertension (blood pressure 185/110 mm Hg) is referred to you. A renal magnetic resonance imaging scan shows a tumor in the kidney, and laboratory findings include a very high plasma renin activity of 12 ng angiotensin I/ml/h (normal = 1). The diagnosis is a renin-secreting tumor. Which of the following changes would you expect to find in this patient, under steady-state conditions, compared with normal?

	Plasma Aldosterone Concentration	Sodium Excretion Rate	Plasma Potassium Concentration	Renal Blood Flow
A)	↔	↓	↓	↑
B)	↔	↔	↓	↑
C)	↑	↔	↓	↓
D)	↑	↓	↔	↓
E)	↑	↓	↓	↔

	Potassium Excretion Rate	Sodium Excretion Rate	Plasma Aldosterone Concentration	Plasma Potassium Concentration
A)	↔	↔	↑	Large increase (>1 mmol/l)
B)	↔	↓	↑	Small increase (<1 mmol/l)
C)	↑ 2x	↔	↑	Small increase (<1 mmol/l)
D)	↑ 2x	↑	↓	Large increase (>1 mmol/l)
E)	↑ 2x	↑	↔	Large increase (>1 mmol/l)

27) When the dietary intake of K⁺ increases, body K⁺ balance is maintained by an increase in K⁺ excretion primarily by which of the following?

- A) Decreased glomerular filtration of K⁺
- B) Decreased reabsorption of K⁺ by the proximal tubule
- C) Decreased reabsorption of K⁺ by the thick ascending limb of the loop of Henle
- D) Increased K⁺ secretion by the late distal and collecting tubules
- E) Shift of K⁺ into the intracellular compartment

30) The following laboratory values were obtained in a 58-year-old man:
 Urine volume = 4320 ml of urine collected during the preceding 24 hours
 Plasma creatinine = 3 mg/100 ml
 Urine creatinine = 50 mg/100 ml
 Plasma potassium = 4.0 mmol/l
 Urine potassium = 30 mmol/l

What is his approximate GFR, assuming that he collected all of his urine in the 24-hour period?

- A) 20 ml/min
- B) 30 ml/min
- C) 40 ml/min
- D) 50 ml/min
- E) 60 ml/min
- F) 80 ml/min
- G) 100 ml/min



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- 31) What would cause the greatest degree of hyperkalemia?
- Increase in potassium intake from 60 to 180 mmol/day in a person with normal kidneys and a normal aldosterone system
 - Chronic treatment with a diuretic that inhibits the action of aldosterone
 - Decrease in sodium intake from 200 to 100 mmol/day
 - Chronic treatment with a diuretic that inhibits loop of Henle $\text{Na}^+2\text{Cl}^- - \text{K}^+$ co-transport
 - Chronic treatment with a diuretic that inhibits sodium reabsorption in the collecting ducts

- 32) Which change tends to increase GFR?
- Increased afferent arteriolar resistance
 - Decreased efferent arteriolar resistance
 - Increased glomerular capillary filtration coefficient
 - Increased Bowman's capsule hydrostatic pressure
 - Decreased glomerular capillary hydrostatic pressure

- 33) Which of the following changes, compared with normal, would you expect to find 3 weeks after a patient ingested a toxin that caused sustained impairment of proximal tubular NaCl reabsorption? Assume that there has been no change in diet or ingestion of electrolytes.

	Glomerular Filtration Rate	Afferent Arteriolar Resistance	Sodium Excretion
A)	↔	↔	↑
B)	↔	↔	↑
C)	↓	↑	↑
D)	↓	↑	↔
E)	↑	↓	↔

- 34) A patient has the following laboratory values: arterial pH = 7.13, plasma $\text{HCO}_3^- = 15 \text{ mEq/l}$, plasma chloride concentration = 118 mEq/l, arterial $\text{PCO}_2 = 28 \text{ mm Hg}$, and plasma Na^+ concentration = 141 mEq/l. What is the most likely cause of his acidosis?
- Salicylic acid poisoning
 - Diabetes mellitus
 - Diarrhea
 - Emphysema

- 35) Which changes would you expect to find after administering a vasodilator drug that caused a 50% decrease in afferent arteriolar resistance and no change in arterial pressure?
- Decreased renal blood flow, decreased GFR, and decreased peritubular capillary hydrostatic pressure
 - Decreased renal blood flow, decreased GFR, and increased peritubular capillary hydrostatic pressure
 - Increased renal blood flow, increased GFR, and increased peritubular capillary hydrostatic pressure
 - Increased renal blood flow, increased GFR, and no change in peritubular capillary hydrostatic pressure
 - Increased renal blood flow, increased GFR, and decreased peritubular capillary hydrostatic pressure

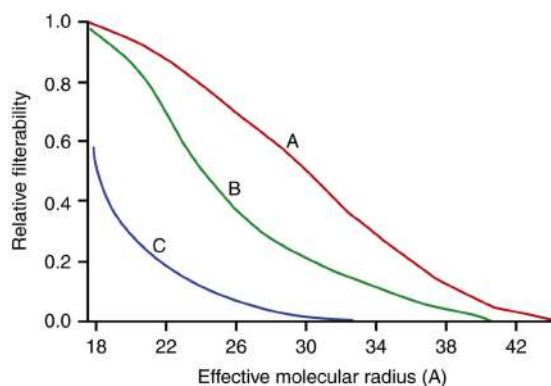
- 36) If the average hydrostatic pressure in the glomerular capillaries is 50 mm Hg, the hydrostatic pressure in the Bowman's space is 12 mm Hg, the average colloid osmotic pressure in the glomerular capillaries is 30 mm Hg, and there is no protein in the glomerular ultrafiltrate, what is the net pressure driving glomerular filtration?

- 8 mm Hg
- 32 mm Hg
- 48 mm Hg
- 60 mm Hg
- 92 mm Hg

- 37) The GFR of a 26-year-old man with glomerulonephritis decreases by 50% and remains at that level for one month. For which substance

would you expect to find the greatest increase in plasma concentration?

- Creatinine
- K^+
- Glucose
- Na^+
- Phosphate
- H^+



- 38) Lines A, B, and C on the figure above show the relative filterability by the glomerular capillaries of dextran molecules as a function of their molecular radius and electrical charges. Which lines on the graph best describe the electrical charges of the dextrans?
- A = polycationic; B = neutral; C = polyanionic
 - A = polycationic; B = polyanionic; C = neutral
 - A = polyanionic; B = neutral; C = polycationic
 - A = polyanionic; B = polycationic; C = polycationic
 - A = neutral; B = polycationic; C = polyanionic
 - A = neutral; B = polyanionic; C = polycationic

- 39) If distal tubule fluid creatinine concentration is 5 mg/100 ml and plasma creatinine concentration is 1.0 mg/100 ml, what is the approximate percentage of the water filtered by the glomerular capillaries that remains in the distal tubule?

- 5%
- 10%
- 20%
- 50%
- 80%
- 95%



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40) Which change tends to increase peritubular capillary fluid reabsorption?

- A) Increased blood pressure
- B) Decreased filtration fraction
- C) Increased efferent arteriolar resistance
- D) Decreased angiotensin II
- E) Increased renal blood flow

41) An adrenal tumor that causes excess aldosterone secretion would tend to _____ plasma K^+ concentration, _____ plasma pH, _____ renin secretion, and _____ blood pressure.

- A) decrease, decrease, decrease, decrease
- B) decrease, increase, decrease, increase
- C) decrease, decrease, decrease, increase
- D) decrease, increase, increase, increase
- E) increase, increase, decrease, increase
- F) increase, decrease, decrease, increase

42) Which of the following tends to increase potassium secretion by the cortical collecting tubule?

- A) A diuretic that inhibits the action of aldosterone (e.g., spironolactone)
- B) A diuretic that decreases loop of Henle sodium reabsorption (e.g., furosemide)
- C) Decreased plasma potassium concentration
- D) Acute metabolic acidosis
- E) Low sodium intake

43) A 48-year-old woman reports severe polyuria (producing about 0.5 l of urine each hour) and polydipsia (drinking two to three glasses of water every hour). Her urine contains no glucose, and she is placed on overnight water restriction for further evaluation. The next morning, she is weak and confused, her sodium concentration is 160 mEq/l, and her urine osmolality is 80 mOsm/l. Which of the following is the most likely diagnosis?

- A) Diabetes mellitus
- B) Diabetes insipidus
- C) Primary aldosteronism
- D) Renin-secreting tumor
- E) Syndrome of inappropriate ADH

44) Which substance is filtered most readily by the glomerular capillaries?

- A) Albumin in plasma
- B) Neutral dextran with a molecular weight of 25,000
- C) Polycationic dextran with a molecular weight of 25,000
- D) Polyanionic dextran with a molecular weight of 25,000
- E) Red blood cells

45) A 22-year-old woman runs a 10-km race on a hot day and becomes dehydrated. Assuming that her ADH levels are very high and that her kidneys are functioning normally, in which part of the renal tubule is the most water reabsorbed?

- A) Proximal tubule
- B) Loop of Henle
- C) Distal tubule
- D) Cortical collecting tubule

50) Which of the following would cause the most serious hypokalemia?

- A) A decrease in potassium intake from 150 mEq/day to 60 mEq/day
- D) An increase in sodium intake from 100 to 200 mEq/day
- C) Excessive aldosterone secretion plus high sodium intake
- D) Excessive aldosterone secretion plus low sodium intake
- E) A patient with Addison's disease
- F) Treatment with a beta-adrenergic blocker
- G) Treatment with spironolactone

A 26-year-old woman reports that she has had a severe migraine and

46) Furosemide (Lasix) is a diuretic that also produces natriuresis. Which of the following is an undesirable side effect of furosemide due to its site of action on the renal tubule?

- A) Edema
- B) Hyperkalemia
- C) Hypercalcemia
- D) Decreased ability to concentrate the urine
- E) Heart failure

47) A female patient has unexplained hypernatremia (plasma Na^+ = 167 mmol/l) and reports frequent urination and large urine volumes. A urine specimen reveals that the Na^+ concentration is 15 mmol/l (very low) and the osmolality is 155 mOsm/l (very low). Laboratory tests reveal the following data: plasma renin activity = 3 ng angiotensin I/ml/h (normal = 1.0), plasma ADH = 30 pg/ml (normal = 3 pg/ml), and plasma aldosterone = 20 ng/dl (normal = 6 ng/dl). Which of the following is the most likely reason for her hypernatremia?

- A) Simple dehydration caused by decreased water intake
- B) Nephrogenic diabetes insipidus
- C) Central diabetes insipidus
- D) Syndrome of inappropriate ADH
- E) Primary aldosteronism
- F) Renin-secreting tumor

48) Which change would you expect to find in a dehydrated person deprived of water for 24 hours?

- A) Decreased plasma renin activity
- B) Decreased plasma antidiuretic hormone concentration
- C) Increased plasma atrial natriuretic peptide concentration
- D) Increased water permeability of the collecting duct

49) Insulin (type 1) diabetes mellitus is often diagnosed because of polyuria (high urine flow) and polydipsia (frequent drinking) that occur because of which of the following?

- A) Increased delivery of glucose to the collecting duct interferes with the action of antidiuretic hormone
- B) Increased glomerular filtration of glucose increases Na^+ reabsorption via the sodium-glucose co-transporter
- C) When the filtered load of glucose exceeds the renal threshold, a rising glucose concentration in the proximal tubule decreases the osmotic driving force for water reabsorption
- D) High plasma glucose concentration decreases thirst

E) High plasma glucose concentration stimulates ADH release from the posterior pituitary

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51. Under conditions of normal renal function, which of the following statements is true of the concentration of urea in tubular fluid at the end of the proximal tubule?
- It is higher than the concentration of urea in tubular fluid at the tip of the loop of Henle
 - It is higher than the concentration of urea in the plasma
 - It is higher than the concentration of urea in the final urine in antidiuresis
 - It is lower than plasma urea concentration because of active urea reabsorption along the proximal tubule

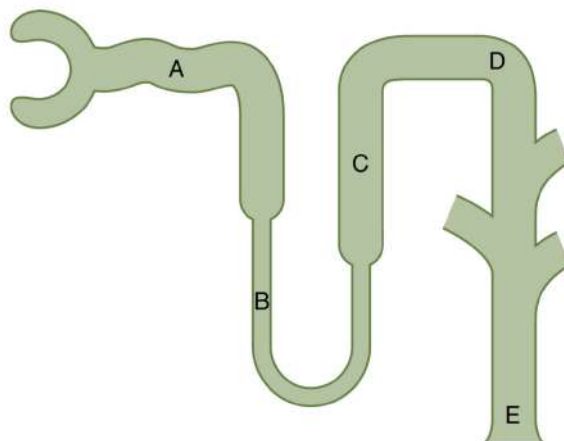
52. Which change, compared with normal, would be expected to occur, under steady-state conditions, in a patient whose severe renal disease has reduced the number of functional nephrons to 25% of normal?
- Increased GFR of the surviving nephrons
 - Decreased urinary creatinine excretion rate
 - Decreased urine flow rate in the surviving nephrons
 - Decreased urinary excretion of sodium
 - Increased urine-concentrating ability

53. Which statement is correct?
- Urea reabsorption in the medullary collecting tubule is less than in the distal convoluted tubule during antidiuresis
 - Urea concentration in the interstitial fluid of the renal cortex is greater than in the interstitial fluid of the renal medulla during antidiuresis
 - The thick ascending limb of the loop of Henle reabsorbs more urea than the inner medullary collecting tubule during antidiuresis
 - Urea reabsorption in the proximal tubule is greater than in the cortical collecting tubule

54. A patient's urine is collected for 2 hours, and the total volume is 600 ml during this time. Her urine osmolarity is 150 mOsm/l, and her plasma osmolarity is 300 mOsm/l. What is her "free water clearance"?
- +5.0 ml/min
 - +2.5 ml/min
 - 0.0 ml/min
 - 2.5 ml/min
 - 5.0 ml/min

55. If a person has a kidney transport maximum for glucose of 350 mg/min, a GFR of 100 ml/min, a plasma glucose level of 150 mg/dl, a urine flow rate of 2 ml/min, and no detectable glucose in the urine, what would be the approximate rate of glucose reabsorption, assuming normal kidneys?
- Glucose reabsorption cannot be estimated from these data
 - 0 mg/min
 - 50 mg/min
 - 150 mg/min
 - 350 mg/min

56. A selective decrease in *efferent* arteriolar resistance would _____ glomerular hydrostatic pressure, _____ GFR, and _____ renal blood flow.
- increase, increase, increase
 - increase, decrease, increase
 - increase, decrease, decrease
 - decrease, increase, decrease
 - decrease, decrease, increase
 - decrease, increase, increase



For Questions 82–85, choose the appropriate nephron site in the above figure.

60-67

57. In a patient with severe central diabetes insipidus caused by a lack of ADH secretion, which part of the tubule would have the lowest tubular fluid osmolarity?
- A
 - B
 - C
 - D
 - E
58. In a person on a very low potassium diet, which part of the nephron would be expected to reabsorb the most potassium?
- A
 - B
 - C
 - D
 - E

59. Which part of the nephron normally reabsorbs the most water?

- A
- B
- C
- D
- E

60. In a normally functioning kidney, which part of the tubule has the lowest permeability to water during antidiuresis?
- A
 - B
 - C
 - D
 - E



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- 61) A patient reports that he is always thirsty, and his breath has an acetone smell. You suspect that he has diabetes mellitus, and the diagnosis is confirmed by a urine sample that tests positive for glucose and a blood sample that shows a fasting blood glucose concentration of 400 mg/dl. Compared with normal, you would expect to find which changes in his urine?

	Urine pH	NH ₄ ⁺ Excretion	Urine volume (ml/24 h)	Renal HCO ₃ ⁻ Production
A)	↓	↓	↓	↓
B)	↓	↑	↓	↓
C)	↑	↓	↓	↓
D)	↓	↑	↑	↑
E)	↑	↑	↑	↑

- 62) Which nephron segment is the primary site of magnesium reabsorption under normal conditions?

- Proximal tubule
- Descending limb of the loop of Henle
- Ascending limb of the loop of Henle
- Distal convoluted tubule
- Collecting ducts

- 63) Which changes would you expect to find in a newly diagnosed 10-year-old patient with type 1 diabetes and uncontrolled hyperglycemia (plasma glucose = 300 mg/dl)?

	Thirst (Water Intake)	Urine Volume	Glomerular Filtration Rate	Afferent Arteriolar Resistance
A)	↑	↓	↑	↓
B)	↑	↑	↓	↑
C)	↑	↑	↑	↓
D)	↓	↑	↑	↑
E)	↓	↓	↓	↓

Questions 100 and 101

To evaluate kidney function in a 45-year-old woman with type 2 diabetes, you ask her to collect her urine for a 24-hour period. She collects 3600 ml of urine in that period. The clinical laboratory returns the following results after analyzing the patient's urine and plasma samples: plasma creatinine = 4 mg/dl, urine creatinine = 32 mg/dl, plasma potassium = 5 mmol/l, and urine potassium = 10 mmol/l.

- 64) What is this patient's approximate GFR, assuming that she collected all her urine in the 24-hour period?

- 10 ml/min
- 20 ml/min
- 30 ml/min
- 40 ml/min

E) 80 ml/min

- 65) What is the net renal tubular reabsorption rate of potassium in this patient?

- 1.050 mmol/min
- 0.100 mmol/min
- 0.037 mmol/min
- 0.075 mmol/min

E) Potassium is not reabsorbed in this example

- 66) Which change would you expect to find in a patient who developed acute renal failure after ingesting poisonous mushrooms that caused renal tubular necrosis?

- Increased plasma bicarbonate concentration
- Metabolic acidosis
- Decreased plasma potassium concentration
- Decreased blood urea nitrogen concentration
- Decreased hydrostatic pressure in Bowman's capsule

- 67) Which of the following is true of the tubular fluid that passes through the lumen of the early distal tubule in the region of the macula densa?

- It is usually isotonic
- It is usually hypotonic
- It is usually hypertonic
- It is hypertonic in antidiuresis
- It is hypertonic when the filtration rate of its own nephron decreases to 50% below normal

- 68) In a person with normal kidneys and normal lungs who has chronic metabolic acidosis, you would expect to find all of the following, compared with normal, EXCEPT:

- Increased renal excretion of NH₄Cl
- Decreased urine pH
- Decreased urine HCO₃⁻ excretion
- Increased plasma HCO₃⁻ concentration
- Decreased plasma P_{CO2}

- 69) If the renal clearance of substance X is 300 ml/min and the glomerular filtration rate is 100 ml/min, it is most likely that substance X is

- Filtered freely but not secreted or reabsorbed

B) Bound to plasma proteins

C) Secreted

D) Reabsorbed

E) Bound to tubular proteins

F) Clearance of a substance cannot be greater than the GFR

- 70) Which change tends to increase urinary calcium (Ca²⁺) excretion?

- Extracellular fluid volume expansion
- Increased plasma parathyroid hormone concentration
- Decreased blood pressure
- Increased plasma phosphate concentration
- Metabolic alkalosis

- 71) Which statement is true?

- ADH increases water reabsorption from the ascending loop of Henle

B) Water reabsorption from the descending loop of Henle is normally less than that from the ascending loop of Henle

C) Sodium reabsorption from the ascending loop of Henle is normally less than that from the descending loop of Henle

D) Osmolarity of fluid in the early distal tubule would be less than 300 mOsm/l in a dehydrated person with normal kidneys and increased ADH levels

E) ADH decreases the urea permeability in the medullary collecting tubules

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GENITOURINARY SYSTEM

72. Which change would you expect to find in a patient consuming a high-sodium diet (200 mEq/day) compared with the same patient on a normal-sodium diet (100 mEq/day), assuming steady-state conditions?
- Increased plasma aldosterone concentration
 - Increased urinary potassium excretion
 - Decreased plasma renin activity
 - Decreased plasma atrial natriuretic peptide
 - An increase in plasma sodium concentration of at least 5 mmol/l
73. What would tend to decrease GFR by more than 20% in a normal kidney?
- Decrease in renal arterial pressure from 100 to 85 mm Hg
 - 50% decrease in afferent arteriolar resistance
 - 50% decrease in efferent arteriolar resistance
 - 50% increase in the glomerular capillary filtration coefficient
 - Decrease in plasma colloid osmotic pressure from 28 to 20 mm Hg
74. Acute metabolic acidosis tends to ____ intracellular K⁺ concentration and ____ K⁺ secretion by the cortical collecting tubules.
- Increase, increase
 - Increase, decrease
 - Decrease, increase
 - Decrease, decrease
 - Cause no change in, increase
 - Cause no change in, cause no change in
75. In a person on a high-potassium (200 mmol/day) diet, which part of the nephron would be expected to secrete the most potassium?
- Proximal tubule
 - Descending loop of Henle
 - Ascending loop of Henle
 - Early distal tubule
 - Collecting tubules
76. A 26-year-old construction worker is brought to the emergency department with a change in mental status after working a 10-hour shift on a hot summer day (average outside temperature was 97°F [36°C]). The man had been sweating profusely during the day but did not drink fluids. He has a fever of 102°F [39°C], a heart rate of 140 beats/min, and a blood pressure of 100/55 mm Hg in the supine position. Upon examination, he has no perspiration, appears to have dry mucous membranes, and is poorly oriented to person, place, and time. Assuming that his kidneys were normal yesterday, which set of hormone levels describes his condition, compared with normal?
- High ADH, high renin, low angiotensin II, low aldosterone
 - Low ADH, low renin, low angiotensin II, low aldosterone
 - High ADH, low renin, high angiotensin II, low aldosterone
 - High ADH, high renin, high angiotensin II, high aldosterone
 - Low ADH, high renin, low angiotensin II, high aldosterone
77. Which change would tend to increase Ca²⁺ reabsorption in the renal tubule?
- Extracellular fluid volume expansion
 - Increased plasma parathyroid hormone concentration
 - Increased blood pressure
 - Decreased plasma phosphate concentration
 - Metabolic acidosis
78. In a person with chronic respiratory acidosis who has partial renal compensation, you would expect to find which changes, compared with normal? ____ urinary excretion of NH₄⁺; ____ plasma HCO₃⁻ concentration; and ____ urine pH.
- Increased, increased, decreased
 - Increased, decreased, decreased
 - No change in, increased, decreased
 - No change in, no change in, decreased
 - Increased, no change in, increased
79. Increases in both renal blood flow and GFR are caused by which mechanism?
- Dilation of the afferent arterioles
 - Increased glomerular capillary filtration coefficient
 - Increased plasma colloid osmotic pressure
 - Dilation of the efferent arterioles
80. A 55-year-old male patient with hypertension has had his blood pressure reasonably well controlled by administration of a thiazide diuretic. At his last visit (6 months ago), his blood pressure was 130/75 mm Hg, and his serum creatinine was 1 mg/100 ml. He has been exercising regularly for the past 2 years but recently has reported knee pain and began taking large amounts of a nonsteroidal antiinflammatory drug. When he arrives at your office, his blood pressure is 155/85 mm Hg, and his serum creatinine is 2.5 mg/100 ml. What best explains his increased serum creatinine level?
- Increased efferent arteriolar resistance that reduced GFR
 - Increased afferent arteriolar resistance that reduced GFR
 - Increased glomerular capillary filtration coefficient that reduced GFR
 - Increased angiotensin II formation that decreased GFR
 - Increased muscle mass due to the exercise
81. An older adult patient reports muscle weakness and lethargy. A urine specimen reveals a Na⁺ concentration of 600 mmol/l and an osmolarity of 1200 mOsm/l. Additional laboratory tests provide the following information: plasma Na⁺ concentration = 167 mmol/l, plasma renin activity = 4 ng angiotensin I/ml/h (normal = 1 ml/h), plasma ADH = 60 pg/ml (normal = 3 pg/ml), and plasma aldosterone = 15 ng/dl (normal = 6 ng/dl). What is the most likely reason for this patient's hypernatremia?
- Dehydration caused by decreased fluid intake
 - Syndrome of inappropriate ADH
 - Nephrogenic diabetes insipidus
 - Primary aldosteronism
 - Renin-secreting tumor



GENITOURINARY SYSTEM

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|------|------|------|------|
| 1)c. | 25)c | 48)b | 70)e |
| 2)c. | 26)c | 49)c | 71)d |
| 3)d. | 27)d | 50)c | 72)c |
| 4)d. | 28)e | 51)b | 73)c |
| 5)b. | 29)c | 52)a | 74)d |
| 6)f | 30)d | 53)d | 75)e |
| 7)b | 31)b | 54)b | 76)d |
| 8)e | 32)c | 55)d | 77)b |
| 9)a | 33)d | 56)e | 78)a |
| 10)d | 34)c | 57)e | 79)a |
| 11)b | 35)c | 58)a | 80)b |
| 12)e | 36)a | 59)a | 81)c |
| 13)c | 37)a | 60)c | |
| 14)d | 38)a | 61)d | |
| 15)d | 39)c | 62)c | |
| 17)e | 40)c | 63)c | |
| 18)a | 41)b | 64)b | |
| 19)e | 42)b | 65)d | |
| 20)c | 43)b | 66)b | |
| 21)c | 44)c | 67)b | |
| 22)b | 45)a | 68)d | |
| 23)d | 46)d | 69)c | |
| 24)b | 47)b | | |

Good luck 

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