

The following questions are important topics which the doctor focused on, they can come as either MCQ or SAQ, this is by no means a reference.

Lect.1 Renal Functions

- *Which renal tubule parts functions more in **secretion**?*
Distal convoluted tubule, because it does not contain microvilli
- *where is the **Macula Densa** located & what is its function?*
located in the juxtaglomerular Apparatus specifically in the distal tubule. Function as chemoreceptors (Detect changes in chemical composition) or as osmoreceptors (Detect change in osmolarity)
They produce signals that promote renin secretion by Juxtaglomerular cells
- *Which cells of the JGA act as mechanoreceptors?*
Juxtaglomerular cells
- *Which cell in the collecting tubule of the renal tubules functions in maintaining acid-base balance?*
Intercalated cells.
- *Which cell in the collecting tubule of the renal tubules functions in maintaining water and salt balance?*
Principal cells.
- *Where are the podocytes located and what are they?*
Found in visceral layer of glomerular capsule.
Podocytes are modified branching epithelial.
- *What is the filtration membrane, where is it located and what is it made of?*
A filter that lies between the blood and interior of the glomerular capsule.
Made of 3 layers: A) Fenestrated endothelium. B) Visceral membrane of glomerular capsule. C) Basement membrane (which is composed of fused basal laminae of the other 2 layers)
- *What is the difference between the glomerular filtrate and the plasma?*
Glomerular filtrate has much less proteins in its composition than the plasma.

Lect2. GFR

- *What is the definition of the tubular secretion?*

It's the **selective transfer** of substances from Peritubular Capillary → tubular lumen.

- *56 year-old patient came to the clinic with a severe shock and drop in blood pressure known to also have hypertension and diabetes mellites, has a glomerular hydrostatic pressure of 30mmHg, oncotic pressure of glomerular blood 25mmHg, capsular hydrostatic pressure of 15mmHg. Calculate the Net Filtration Pressure.*

$$NFP = HP_g - (OP_g + HPC)$$

$$NFP = 30 - (25 + 15) = -10 \text{ mmHg}$$

- *What does this NFP indicate?*
Indicates that there is no filtration.
- *If this condition is left untreated what is the most expected outcome?* Acute Renal Failure (Acute Renal Injury)

Lect3 Clearance

- *What is the function of Prostaglandin F in the regulation of GFR?*
It causes renal vasoconstriction that results in decrease in RBF and GFR.
- *What is the function of Prostaglandin D/I/E in regulation of GFR?*
They cause renal vasodilation that results in increase in RBF and GFR.
- *37 year old man came into the clinic for a routine checkup, blood tests showed that the blood glucose was 900 mg/dL, knowing that the tubular transport maximum (T_{MAX}) is 380mg/min, what is the expected amount of glucose that will be found in the urine?*

First you need to calculate the glucose filtration rate, that is done by multiplying the blood glucose level by 1.25

$$\text{Glucose filtration rate} = 900 * 1.25 = 1125 \text{ mg/min}$$

$$\text{Then we deduct the T}_{MAX} \text{ from the glucose filtration rate to give us the amount excreted } 1125 - 380 = 745 \text{ mg/min}$$

Lect.4 & 5 Renal Transport Process

- **Sodium is mostly reabsorbed by:**
Primary Active Transport.
- **Glucose is mostly reabsorbed by:**
From tubular lumen to tubular cell by **Carrier Mediated secondary active transport**. From Tubular cell to peritubular capillary by **Carrier-mediated passive transport**.
- **Where does the ADH dependent reabsorption occur?**
In the medullary connecting duct.
- **Which part of the Loop of Henle is more permeable to water?**
Thin Descending Limb.
- **Specify 4 factors affecting sodium reabsorption.**
1)GFR: and increase in GFR causes an increase in Na filtration 2)Aldosterone: Causes sodium retention
3)Estrogens: Cause reabsorption of sodium. (pregnant women more at risk of developing edema)
4)Natriuretic Hormone: Causes decreased Sodium absorption

Lect.6 Micturition

- **Describe the different sensations from the urinary bladder at different urine volumes.**
From 150-300ml → The first urge to void urine. From 300-400ml → sense of fullness of the bladder. From 400-600ml → sense of discomfort.
From 600-700ml → sense of pain.
- **What is the cause of the distention of the urinary bladder and what does its distension produce?** The cause is the increase in the intra-vesical pressure, the distension of the urinary bladder produces reflex contraction of its wall and relaxation of the internal & external urethral sphincter which is known as the micturition reflex.
- **What is the denervation of the afferent supply to the urinary bladder characterized by?**
Loss of Urinary bladder sensations and reflex micturition, retention of smooth muscle intrinsic responses, tonic bladder (unable to contract) & retention with overflow (dribbling). A good example Tabes Dorsalis which is an inflammation of the spinal cord.
- **What is the denervation of the afferent & efferent supply to the urinary bladder characterized by & what is it associated with?**
Increase in smooth muscle intrinsic response, hypertonic bladder (spasmodic bladder) & abolishment of reflexes.
Associated with uncontrolled periodic micturition.
A good example is an injury to the cauda equine or a tumor in that area.

Quiz Lecture 1

1) Which of the following has a function in maintaining the acid-base balance of the body ?

- A. Juxtaglomerular cells
- B. Principle cells
- C. Intercalated cells
- D. Macula densa

2) Which of the following is a protein made by the kidney ?

- A. Angiotensin
- B. Mesangial Matrix
- C. Creatinine
- D. Erythropoietin

3) Which of the following is not a part of filtration membrane ?

- A. Fenestrated endothelium
- B. Visceral membrane of the glomerular capsule
- C. Capsular space
- D. Filtration slits

4) Arteriole walls have juxtaglomerular cells .

- A. True
- B. False

5) Which of the following changes tends to increase glomerular filtration rate (GFR):

- A. Increased afferent arteriolar resistance
- B. Decreased efferent arteriolar resistance
- C. Increased glomerular capillary filtration coefficient
- D. Increased Bowman's capsule hydrostatic pressure

6) Which of the following is a cell of the connecting tubules ?

- A. Intercalated disc .
- B. Principal cells .
- C. Macula densa
- D. Juxtaglomerular cells

6.
5.
4.
3.
2.
1.

Quiz Lecture 2

1) Blood pressure in the glomerulus is high because?

- A. Low oncotic pressure .
- B. High capsular hydrostatic pressure .
- C. Afferent arterioles have larger diameters than efferent arterioles .
- D. Thick basement membrane .

2) Which of the following is correct?

- A. 99% of glomerular filtration rate excreted
- B. 1% of glomerular filtration rate reabsorbed
- C. 50% of glomerular filtration rate reabsorbed
- D. 1% of glomerular filtration rate excreted

3) What is the percentage of filtered amount of fluid that enters the glomeruli ?

- A. 1%
- B. 99%
- C. 20%
- D. 15%

7) Which of the following is correct?

- A. If the GFR is too high the tubules reabsorb wastes that should be eliminated .
- B. If the GFR is too high there will be threat of dehydration and electrolyte depletion .
- C. If the GFR is too high Fluid will flow sluggishly through tubules .

4) Inulin is a polymer of fructose, and it's used in research to precisely measure GFR.

- A. True
- B. False

5) The elimination of substances from the body in the urine called :

- A. Tubular secretion
- B. Tubular reabsorption
- C. Urine Excretion
- D. Glomerular Filtration

6) glomerular hydrostatic pressure (GHP) :

- A. push fluid out of vessels .
- B. push fluid back into vessels .
- C. Has no effect on filtration .

8) It is the intrinsic capability of blood vessels to constrict when blood pressure is increased?

- A. Hormonal Control of GFR
- B. Sympathetic Control of GFR
- C. Myogenic mechanism
- D. Tubuloglomerular feedback mechanism

Recall

8.
7.
6.
5.
4.
3.
2.
1.

Quiz Lecture 3

1) All of the following are criteria of a substance used for GFR measurement, except?

- A. Should not be secreted by the tubular cells.
- B. Should not be reabsorbing by the tubular cells.
- C. Should not be toxic.
- D. Should be metabolized.

2) If T_{max} for a certain nephron was 200 and blood glucose was 200 mg/ml with normal GFR (125ml/min) the excreted glucose equals ?

- A. 0
- B. 25
- C. 50
- D. 75

Explanation for Q2 : the amount of filtrated glucose is 250 depending on "Normal GFR" thus Excreted amount will be 50 not zero

3) Renal Clearance can give an indication of the functioning of the kidneys .

- A. True
- B. False

4) The glucose started to appear in the urine before the transport maximum is reached because ?

- A. Not all nephrons have the same transport maximum for glucose.
- B. Filtered load of glucose is completely reabsorbed.
- C. None of the above

5) To measure renal plasma flow we will have to measure : Renal blood flow first ?

- A. True
- B. False

5. B
4. A
3. A
2. C
1. D

Quiz Lecture 4

1- When you're in formal situation and you can't go to bathroom, but your bladder is full, what will happen?

- A. Inhibit the Pelvic nerve.
- B. Inhibit the pudendal nerve.
- C. Inhibit the Hypogastric nerve.
- D. Inhibit the Parasympathetic system. E. Inhibit the sympathetic system

2- when the urinary becomes stretched, there's an increase in the frequency of action potentials traveling from?

- A. The urinary bladder to the sacral region.
- B. The parasympathetic neurons from the spinal cord to the urinary bladder. C. Somatic motor neurons.
- D. Ascending spinal pathways to the pons and cerebrum

3- if urination is not convenient, the brain sends impulses down the spinal cord to inhibit the micturition reflex?

- A. True. B. False.

4- first stimulation in the micturition reflex is when the volume reaches?

- A. Urine volume reaches 150ml.
- B. Urine volume reaches 300ml.
- C. Urine volume reaches 400ml.
- D. Urine volume reaches 560ml.
- E. Urine volume reaches 700ml

Quiz Lecture 5

1) 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

3) Which of the following is true about glucose reabsorption from the tubular lumen to the tubular cell?

- A. It is done by carrier-mediated passive transport.
- B. Direction of transport is downhill.
- C. No energy is consumed in the process.
- D. It is done by secondary active transport of sodium

5) Which of the following is false regarding the reabsorption of bicarbonate ion (HCO₃⁻) ?

- A. H⁺ is formed inside the cells then secreted in the tubular fluid.
- B. H⁺ combines with HCO₃⁻ in the tubular fluid forming H₂CO₃.
- C. CO₂ diffuses into the cells where it combines with H₂O by activity of an extracellular carbonic anhydrase.
- D. The renal tubules are poorly-permeable to HCO₃⁻.

2) Which of the following is false about sodium reabsorption?

- A. Sodium is reabsorbed in the early proximal convoluted tubule.
- B. Sodium enters the tubule at the luminal membrane
- C. Sodium is passively transported out using the Na-K ATPase pump.
- D. All of the above are correct.

4) Which method of transport is used for peptides in the process of reabsorption?

- A. Facilitated diffusion.
- B. Active transport
- C. Endocytosis.
- D. Passive diffusion.

6) Which of the following is true regarding the proximal tubule?

- A. Leaky epithelium not permeable to ions & water.
- B. Reabsorption is isosmotic.
- C. Na reabsorption occurs only through transcellular transport.
- D. Chloride ion concentration is less in the tubular lumen than outside.

6.
5.
4.
3.
2.
1.

Quiz Lecture 6

1) The part of loop of Henle which is permeable to water is ?

- A. Thick ascending limb
- B. Thin ascending limb
- C. Thin descending limb
- D. All of them

2) Secretion of molecules is higher in which of the following segments of the nephron ?

- A. PCT
- B. Thin ascending limb
- C. Thin descending limb
- D. DCT

3) 8-15% of water reabsorbed in the distal convoluted tubule needs ?

- A. Aldosterone
- B. Antidiuretic hormone (ADH)
- C. Angiotensin II
- D. B&C

4) Intracellular potassium is about

- A. 125 mM
- B. 150 mM
- C. 3.5 mM

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

- A. Increased plasma potassium concentration
- B. A diuretic that decrease proximal tubule sodium reabsorption
- C. A diuretic that inhibit the action of aldosterone (eg. spironolactone)
- D. Acute alkalosis

6) Which of the following diuretics inhibits (Na⁺, 2Cl⁻, K⁺) cotransport in the loop of Henle as its primary action?

- A. Thiazide diuretics
- B. Osmotic diuretic
- C. Furosemide

6.
5.
4.
3.
2.
1.

Quiz Lecture 7

1) Which of the following is caused after afferent and efferent arterioles constriction by sympathetic activity:

- A. Increase GFR.
- B. More Na⁺ reaching macula densa.
- C. More Na⁺ reabsorbed in PCT.
- D. Increase Na⁺ filtered load.

2) Which of the following is caused by ADH:

- A. Distal part of nephron will be permeable to water.
- B. Urea reabsorption in PCT.
- C. Increase reabsorption of water in all parts of nephron.
- D. Increase NaCl reabsorption in thin descending limb.

3) The hypothalamic thirst center is stimulated by:

- A. A. By a decline in plasma volume of 10–15% or by increases in plasma osmolality of 1–2%.
- B. By a decline in plasma volume of 1–2% or by increases in plasma osmolality of 10–15%.
- C. Thirst.
- D. ADH releasing.

4) Angiotensin II receptors are found in:

- A. Juxtaglomerular cells.
- B. Macula densa.
- C. Zona glomerulosa.
- D. Intercalated cells.

5) The ADH is synthesized in:

- A. Posterior pituitary.
- B. Anterior pituitary.
- C. cells located within the supraoptic and paraventricular nuclei of the hypothalamus
- D. Neurohypophysis

6) Feedback signals that inhibit the thirst centers include:

- A. inhibition of stomach and intestinal stretch receptors.
- B. Moistening of the mucosa of the mouth and throat.
- C. A and B.
- D. None above.

Quiz lecture 8

1) The only part in nephron which is permeable to water and impermeable to ions:

- A. PCT.
- B. Thin descending limb.
- C. Cortical part of collecting ducts.
- D. Thick ascending limb.

2) The fluid in PCT is:

- A. Hyperosmotic.
- B. Isoosmotic.
- C. Hypoosmotic.
- D. Depends on ADH.

3) The absorption of Na⁺ in ascending loop of Henle:

- A. All passively.
- B. All actively.
- C. Passive in thick, active in thin.
- D. Active in thick, passive in thin.

4) In presence of ADH, the Osmolality of medullary tissue is up to 1200 mOsm/kg H₂O by:

- A. Due to NaCl.
- B. Due to urea.
- C. Due to urea and NaCl.
- D. The osmolality never reach 1200 in medullary tissue

5) In presence of ADH, the reabsorption of water in collecting duct:

- A. Actively all way long.
- B. Active only in cortical CD.
- C. Passive all way long.
- D. Passive only in cortical CD.

6) ADH administration will not stop diuresis if it is:

- A. due to lack of ADH.
- B. Due to excess ingestion of water.
- C. Nephrogenic Diabetes Insipidus.
- D. A and B.

6.8
5.5
4.0
3.3
2.2
1.0

6.9
5.5
4.0
3.0
2.8
1.8

Quiz lecture 9 and 10 (TEAM 435)

1) Most enzymes function optimally at pH ?

- A- 7.8
- B- 7.4
- C- 6.8
- D- 2

3) Normal BLOOD pH range for adults

- A- 7.45-7.8
- B- 6.8-7.35
- C- 6.8-6.8
- D- 7.35-7.45

5) Most important buffering system is ?

- A) Bone
- B) Phosphate Buffering System
- C) Bicarbonate buffer system
- D) Protein Buffers

2) As $[H^+]$ ↑

- A- pH falls – acidosis
- B- pH increases – alkalosis
- C- pH increases – acidosis
- D- pH falls – alkalosis

4) What is fastest system involved in control of $[H^+]$?

- A- Excretion of H by kidneys
- B- Excretion of CO_2 by lungs
- C- Buffer

6) important source of buffer in CHRONIC metabolic acidosis?

- A) Phosphate Buffering System
- B) Protein Buffers
- C) Bicarbonate buffer system
- D) Bone

1-B 2-A 3-D 4-C 5-C 6-D

1- When a patient has PH changes first line of defense will be the physiological buffer system, if it's not enough the chemical buffer system will take place?

- A. True. B. False.

3- Increase alveolar ventilation decreases what?

- A. Intracellular Fluid H^+ Concentration and Lowers pH.
- B. Intracellular Fluid CO_2 Concentration and Raises pH.
- C. Extracellular Fluid H^+ Concentration and Raises pH.
- D. Extracellular Fluid CO_2 Concentration and Lowers pH.
- E. None of the above.

5- Phosphate buffer system does not have much effect as intracellular fluid buffer. However, it's a major extracellular buffer and important in renal tubular fluid?

- A. True.
- B. False.

2- Since $[H_2CO_3]$ very low, that's make it?

- A. Easily to estimate.
- B. Difficult to measure.
- C. Ineffective on the equation.
- D. Need to replace it with other component.
- E. Both B & D.

4- All of the following are chemical buffers system, except?

- A. Phosphate.
- B. Bicarbonate.
- C. Respiratory.
- D. Protein.
- E. Bone

6- What is the correct sequence of events?

- A. Conversion of H_2CO_3 to CO_2 and H_2O .
- B. Conversion of HCO_3^- to H_2CO_3 .
- C. Bind of H^+ with HCO_3^- .
- D. All of the above.
- E. None of the above.

1-B 2-E 3-C 4-C 5-B 6-D

Quiz Lecture 11

1- A climber attempts an assault on a high mountain in the Andes and reaches an altitude of 5000 meters (16,400 ft) above sea level. What will happen to his arterial PCO₂ and pH?

- a) Both will be lower than normal.
- b) The pH will rise and PCO₂ will fall.
- c) Both will be higher than normal due to the physical exertion.
- d) The pH will fall and PCO₂ will rise

Answer B

2- Which out of the following conditions will not cause respiratory alkalosis?

- a) Fever
- b) Anxiety
- c) Laryngeal obstruction
- d) Salicylate toxicity

Answer B

3- Which of the following laboratory results below indicates compensated metabolic alkalosis?

- a) Low p CO₂, normal bicarbonate and, high pH
- b) b) Low p CO₂, low bicarbonate, low pH
- c) c) High p CO₂, normal bicarbonate and, low p H
- d) d) High pCO₂, high bicarbonate and High pH

Answer: D

4- In a man undergoing surgery, it was necessary to aspirate the contents of the upper gastrointestinal tract. After surgery, the following values were obtained from an arterial blood sample: pH 7.55, PCO₂ 52 mm Hg and HCO₃⁻ 40 mmol/l. What is the underlying disorder?

- a) Metabolic acidosis
- b) b) Respiratory alkalosis
- c) c) Metabolic alkalosis
- d) d) Respiratory acidosis

Answer: C

5- A young woman is found comatose, having taken an unknown number of sleeping pills an unknown time before. An arterial blood sample yields the following values: pH – 6.90, HCO₃⁻ 13 meq/liter, PaCO₂ 68 mmHg. This patient's acid-base status is most accurately described as

- a) Uncompensated metabolic acidosis
- b) b) uncompensated respiratory acidosis
- c) c) simultaneous respiratory and metabolic acidosis
- d) d) respiratory acidosis with partial renal compensation

Answer: C