Department of physiology & Biochemistry
University of Jordan
Faculty of Medicine
Midterm Exam/ Physiology2025/2026

1. Regarding reabsorption of filtered HCO3-. One of the following is NOT true
A. involves conversion of H+ and HCO3- to CO2 in the proximal tubular fluid.
B. involves conversion of CO2 in proximal tubule cells to H+ and HCO3-.
C. is almost 100% at normal filtered HCO3- loads.
D. involves net secretion of H+ by proximal tubule cells.
E. The presence of carbonic anhydrase in important in this process.
4

2. A patient presents with a twofold-elevated serum creatinine level compared to baseline for 12 hours. In order to prevent worsening azotemia, the patient's glomerular filtration rate must be increased. Which of the following is an appropriate manipulation?
A. Constricting renal afferent arteriole
B. Dilating renal afferent arteriole
C. Dilating renal efferent arteriole
D. Increasing glomerular capillary colloid oncotic pressure
E. Increasing hydrostatic pressure in Bowman's space
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3. A 45-year-old woman donates a healthy kidney to her sister. In regards to creatinine, which of the following is expected to be decreased in the donor after full recovery from the operation?
A. Clearance
B. Plasma concentration
C. Production
D. Renal excretion
E. Storage
1

4. Use the data below to calculate the net amount of substance X secreted by the kidney. (x is freely filtered)
Clearance of inulin = 120 mL/min
Plasma concentration of X = 10 mg/dL
Urine concentration of X = 10 mg/mL
Urinary flow rate = 1.5 mL/min

a. 1 mg/min
b. 2 mg/min
c. 3 mg/min
d. 4 mg/min
e. 5 mg/min
3

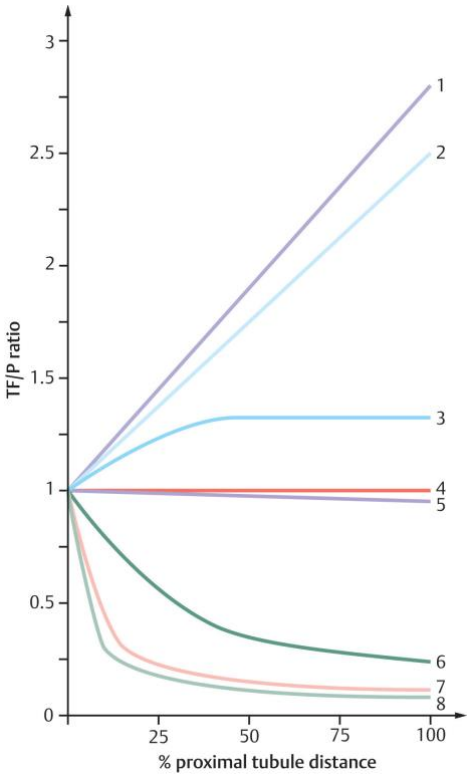
5. Assuming constant glomerular filtration rate, plasma volume, and urine flow rate, the renal clearance of which of the following substances will increase when its plasma concentration is significantly increased?
A. Creatinine
B. Inulin
C. Mannitol
D. phosphate
E. a glomerular marker.
4

6. All the following substances shows transport maximum (Tmax) characteristics EXCEPT?
A. phosphate
B. glucose.
C. amino acid.
D. PAH.
E. inulin.
5

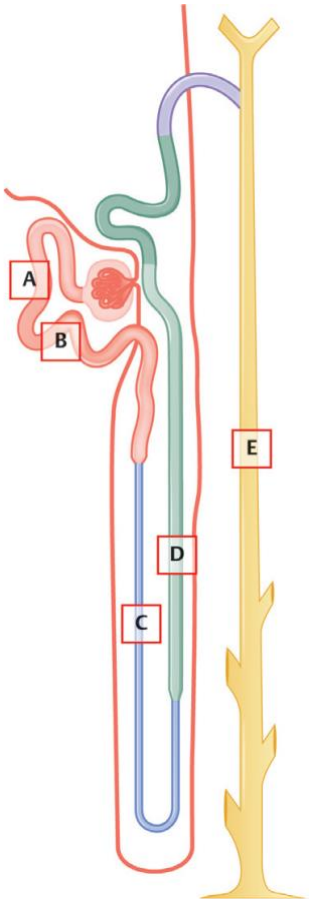
7. In a healthy person with a normal balanced diet, which of the following substances has the greatest fraction excreted in the urine compared to plasma?
A. Creatinine
B. Glucose
C. Inulin
D. Para-aminohippurate
E. Urea
4

8. The glomerular filtration rate of a person is 100 mL/min. The plasma concentration of drug X is 2 mg/mL; the urine concentration of drug X is 50 mg/ mL; and the urine flow rate is 1 mL/min. Drug X is a small molecule that is not bound to plasma proteins. Which of the following can be concluded about drug X in regards to renal tubules?
A. It is neither secreted nor reabsorbed by tubules.
B. The tubules reabsorbed 50 mg/min of it.
C. The tubules reabsorbed 150 mg/min of it.

D. The tubules secreted 50 mg/min of it.
E. The tubules secreted 150 mg/min of it
3



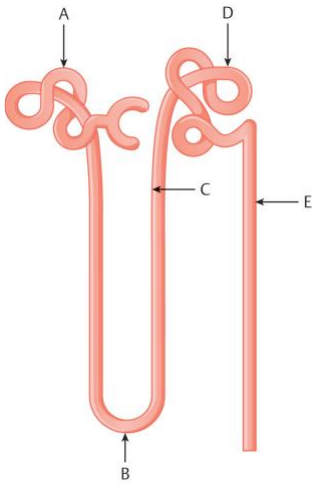
9. The image below shows the tubular fluid/plasma (TF/P) ratio for several different substances that are freely filtered (labeled 1–8) along the length of the proximal tubule. Which of the following best describes the proximal tubule reabsorption of the substance represented by line 3?
A. Not reabsorbed at all in the proximal tubule
B. Reabsorbed at a rate that is equal to water reabsorption
C. Reabsorbed at a rate that is faster than water reabsorption
D. Reabsorbed at a rate that is slower than water reabsorption
E. Reabsorbed completely in the proximal tubule
4



10. A 63-year-old patient reports that whenever he is outdoors on a very cold day, he has a strong urge to urinate and then produces a fairly large volume of urine that is light in color. This response is most likely mediated by the decrease of a hormone that normally acts at which of the following sites at the nephron?

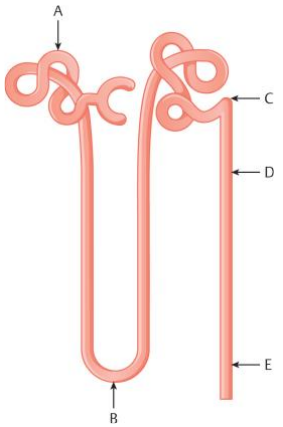
A. A
B. B
C. C
D. D
E. E

5



11. In which portion of the nephron (labeled A–E on the image) will the tubular fluid osmolality remain constant in the presence or absence of antidiuretic hormone?
A. A
B. B
C. C
D. D
E. E
1

12. Which of the following conditions the most likely to present with an impaired ability to maximally concentrate urine?
A. Patient being on low-protein diet.
B. Patient feeling cold due to overt hypothyroidism
C. Patient receiving carbonic anhydrase inhibitors
D. Patient presenting with gastrointestinal bleeding
E. Patient receiving high-dose corticosteroid therapy.
1



13. As part of a micropuncture study of renal transport in rats, a fluid sample from a renal tubular segment was analyzed and showed an osmolality of 1,100 mOsm/kg and a pH of 4.8. If the results were extrapolated to a human nephron, from which segment of the renal nephron (labeled A–E in image) was the fluid most likely taken?
A. A
B. B
C. C
D. D
E. E
5

14. A new drug that will lead to an increase in the rate of reabsorption of filtered bicarbonate by the proximal renal tubule. Which of the following is the most likely mechanism?
A. Decreasing arterial blood PCO2
B. Decreasing glomerular filtration rate
C. Increasing pH inside the tubule cells
D. Inhibiting of carbonic anhydrase activity
E. Stimulating of the luminal Na+/H+ exchanger
5

15. A drug has a side effect of inhibiting the conversion of glutamine to bicarbonate and ammonium in renal proximal tubular cells. If this drug were administered for some time to a patient with a healthy kidney, which of the following changes would you expect to occur in response to this side effect?
A. A decrease of K+ in plasma
B. A decrease in plasma pH
C. An increase in plasma NH4+
D. An increase in urinary pH
E. Excess H+ excretion by titratable acid as a compensatory response.
2