

Saladin 7E
Answer Key
Chapter 23, The Urinary System

Testing Your Comprehension

1. In kwashiorkor, the concentration of protein in the blood plasma is greatly reduced. This reduces capillary reabsorption, one of the forces opposing glomerular filtration. The GFR would therefore rise.
2. (a) Using the formula $C = UV/P$, her rate of renal clearance is $C = (8.6 \text{ mg/mL})(55 \text{ mL/hr}) / (0.25 \text{ mg/mL}) = 1,892 \text{ mL/hr} = 31.5 \text{ mL/min}$. (b) Her rate of urea excretion is $(8.6 \text{ mg/mL})(55 \text{ mL/hr})(24 \text{ hr/day}) = 11,352 \text{ mg/day} = 11.35 \text{ g/day}$. This is slightly below normal.
3. ACE inhibitors cause vasodilation and thus reduce blood pressure. This patient was showing poor renal perfusion already, and this condition would become even worse if the blood pressure dropped significantly. This would explain the renal failure (drop in renal clearance) brought on by the drug.
4. A renin inhibitor reduces the conversion of angiotensinogen into angiotensin I, so it ultimately lowers angiotensin II levels. With less of this vasoconstrictor in circulation, the blood vessels dilate, and generalized vasodilation lowers the blood pressure.
5. (a) The thin segment of the nephron loop is highly permeable to water; its cells present a minimal barrier to water diffusion. The thick segment is heavily engaged in active transport; thus it requires a lot of ATP and must have prominent mitochondria to provide it. The cells are thicker because of this, and the thicker cells are less permeable to water. (b) The PCT is much longer and has a prominent brush border on its epithelial cells, whereas the DCT is much shorter and its epithelial cells are almost smooth-surfaced. Both differences suggest that the PCT has a much greater absorptive function than the DCT. In fact, the PCT reabsorbs about 65% of the glomerular filtrate, whereas the DCT reabsorbs an average of only 14%. (c) The afferent arteriole has a significantly larger diameter than the efferent arteriole, resulting in high blood pressure in the glomerulus between them. This is the driving force of glomerular filtration.