

Mastery Series: Urinary System Overview

1. How much blood flows to the kidneys each minute?
2. How do you think blood flow to the kidneys is altered during fight or flight?
3. How do you think urine output changes during fight or flight?
4. Describe the blood flow to the kidneys, starting at the abdominal aorta.
5. Does filtration of blood begin in the cortex or the medulla of the kidney?
6. Once blood is filtered at the glomerulus, is urine ultimately collected in the cortex or the medulla of the kidney?
7. What are the parts of each nephron?
8. Is blood found in the parts of the nephron or filtered fluid?
9. Why does each part of the nephron have a peritubular capillary next to it?
10. Compare the blood pressure of the glomerular capillaries with the blood pressure in a skeletal capillary bed.
11. What is the significance of the higher-than-average blood pressure in the glomerulus?
12. Why does the kidney have two capillary beds?
13. What would happen to the kidney's ability to filter blood if blood pressure dropped precipitously?
14. What is the disadvantage of the kidneys' higher than average glomerular blood pressure?
15. Compare the meanings of the names "afferent" and "efferent" arterioles. When have you learned those words in your studies up until now?
16. How do the afferent and efferent arterioles of the glomerular capillary bed work together to maintain the necessary blood pressure of the glomerulus? Compare their behavior during low systemic blood pressure and during high systemic blood pressure.
17. If the afferent arteriole constricts
 - a. what happens to systemic blood pressure?
 - b. What happens to glomerular capillary pressure?
 - c. What happens to filtration?
 - d. What happens to urine output?
18. If the afferent arteriole dilates,
 - a. what happens to systemic blood pressure?
 - b. What happens to glomerular capillary pressure?
 - c. What happens to filtration?
 - d. What happens to urine output?
19. What is allowed to be filtered at the glomerulus? What is not allowed to be filtered?

1. 1.2 L
2. Decreased
3. Decreased
4. Abdominal aorta→renal artery→segmental arteries→interlobar arteries→arcuate arteries→cortical radiate arteries→afferent arteriole→glomerulus (capillary bed for filtration into the start of the nephron)→efferent arteriole→peritubular caps (capillary bed that follows along beside the nephron, delivering oxygen and reabsorbing glucose, amino acids, electrolytes and water)→cortical radiate veins→arcuate veins→interlobar veins→segmental veins→renal veins→inferior vena cava
5. Cortex
6. Medulla (the collecting ducts protrude down toward the renal pelvis)
7. Bowman's capsule (receives filtered fluid); proximal convoluted tubule (vast majority of reabsorption occurs here); loop of Henle; distal convoluted tubule (very sensitive to aldosterone); collecting duct (very sensitive to ADH)
8. No
9. For delivering oxygen to the cells of the tubule; and of course for reabsorption of solutes and/or water
10. Significantly higher (about 55mmHg)
11. Ensures that fluid is adequately filtered out into the nephron for "cleaning"
12. One is for filtration, the other is for reabsorption
13. Stop
14. Delicate and among the first organs to be damaged by hypertension
15. Afferent: toward (the glomerulus); efferent: away (from the glomerulus). Other place: afferent (sensory) impulses move **toward** the brain; efferent (motor) neurons fire **away** from the brain
16. They can independently constrict or dilate as needed. During low systemic blood pressure, the afferent arteriole will dilate and the efferent arteriole will constrict to ensure adequate blood flow to the glomerulus. This will increase pressure (and filtration) in the glomerulus. If systemic blood pressure is high, the afferent arteriole will constrict and the efferent arteriole will dilate to prevent blood pressure from rising too high in the glomerulus. In this way, the kidney can self-regulate its blood flow regardless of systemic pressure.
17. A) Goes up b) goes down; c) goes down; d) goes down
18. A) goes down; b) goes up; c) goes up; d) goes up
19. Water, glucose, amino acids, Na⁺ and other electrolytes; plasma proteins; RBCs, WBCs