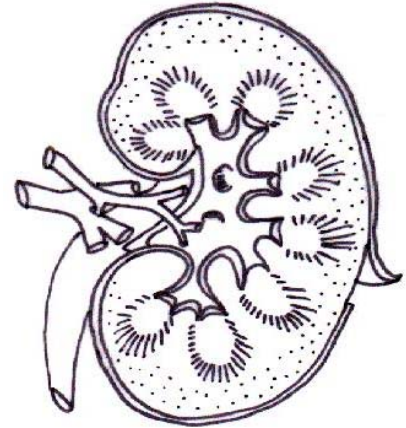
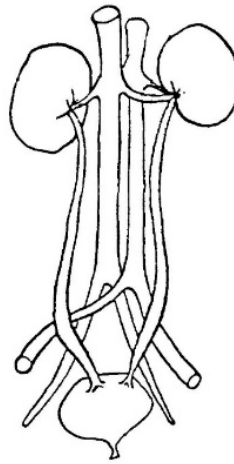
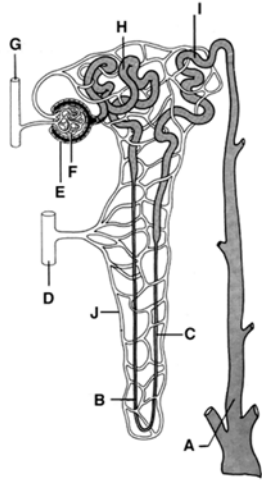


## Urinary System – Potential Test Questions Answer Key

1. Label parts of urinary system (diagram)
2. Label parts of kidney (diagram)
3. Label parts of nephron (diagram)



4. Name the four major functions of the urinary system.

- Excretion of metabolic wastes
- Osmoregulation
- Regulation of acid-base balance
- Secretion of hormones

5. List the four MAIN waste products found in the urine.

- urea (primary nitrogenous waste)
- ammonia / ammonium
- creatinine
- uric acid

6. Trace the path of urine from its formation to its exit.

afferent arteriole → glomerulus → Bowman's capsule → proximal convoluted tubule (PCT) → loop of Henle → distal convoluted tubule (DCT) → collecting duct → renal pelvis → ureter → urinary bladder → urethra

7. Compare the male and female urethra.

The male urethra carries both semen and urine (at separate times) whereas the female urethra is only used for urine

8. Describe the structure of a kidney using the terms renal medulla, renal cortex, renal pyramid and renal pelvis.

The **renal cortex** is the outer layer of the kidney where the majority of the nephron is found and the **renal medulla** is the inner region that is divided into cone-shaped masses called **renal pyramids** where the loop of the nephron dips down into the kidney. The **renal pelvis** is a central space that collects the urine coming from the collecting ducts and connects to the ureter.

9. What part of the nephron is found in the renal medulla?

Loop of Henle

10. Distinguish between pressure filtration, tubular reabsorption and tubular excretion.

- Pressure filtration: small molecules and ions diffuse from the blood in the glomerulus to the Bowman's capsule
- Tubular reabsorption: molecules and ions that are needed by the body are returned to the blood stream
- Tubular excretion: larger substances (wastes) are removed from the blood by active transport in the DCT

11. What is meant by the term "filtrate"?

All substances that were small enough to be filtered into the Bowman's capsule. Contains not only waste products but useful products as well so cannot be called "urine" at this point.

12. What is the purpose of the convolutions found at the proximal and distal tubule of the nephron?

The convolutions lengthen the tubes, increasing both surface area and time spent, to aid in tubular reabsorption and tubular excretion.

13. Describe the three processes of urine formation. Include in your description:

a. Name of the process	Pressure Filtration	Tubular Reabsorption	Tubular Excretion
b. Location on the nephron & c. direction of transfer	glomerulus to Bowman's capsule	proximal convoluted tubules (PCT) to peritubular capillary network	peritubular capillary network to distal convoluted tubules (DCT)
d. Method of transfer	Passive (diffusion)	Both passive (diffusion) and active (carrier proteins)	Active transport
e. 2 molecules / ions	Water, nitrogenous wastes, nutrients (amino acids, glucose), ions...	Most water, nutrients, required [ions]...	H <sup>+</sup> , K <sup>+</sup> , creatinine, drugs (antibiotics)...

14. Explain the difference in microscopic structure which suggests that the PCT, but not the DCT, is specialized for reabsorption.

The PCT has tightly packed microvilli to increase surface area for reabsorption, whereas the DCT has more numerous mitochondria to aid in active transport but lacks the microvilli.

15. Identify path of specific substances (e.g. nicotine, red blood cells, amino acids, chloride ions...) through a nephron.

Like the diagrams we drew in class. Trace the pathway of a specific substance, showing where it would flow.

Ask yourself: 1) is it big or small? 2) is it needed or a waste?

Does it end up in the blood or the urine?

16. A patient's urinalysis revealed a high level of glucose. What diagnosis would you consider?

Diabetes

17. Give the term that refers to the maintenance of the appropriate balance of water and salt in the blood.

Osmoregulation

18. How is salt reabsorption coupled to water reabsorption?

Once salt is reabsorbed, it creates an area that is hypertonic which passively causes the water to flow to the area of hypertonicity.

19. State the name of and location of the source gland for aldosterone. Describe where on the nephron aldosterone acts, what it does, and the overall effect.

If blood pressure is too low, aldosterone is produced by the adrenal cortex of the adrenal glands located on the top of the kidneys. Aldosterone causes the excretion of potassium ions and reabsorption of sodium ions, followed by the reabsorption of water. This causes an increase in blood volume and blood pressure.

20. What is the relationship between aldosterone, the juxtaglomerular apparatus, and renin?

When the **juxtaglomerular apparatus** detects that blood pressure is too low to allow for proper pressure filtration from the glomerulus, it secretes **renin**. Renin aids in the formation of **aldosterone** by the adrenal cortex.

21. What does the juxtaglomerular apparatus secrete?

Renin

22. What draws water out of the descending limb of the loop of Henle and the collecting duct?

The hypertonic environment maintained in the renal medulla

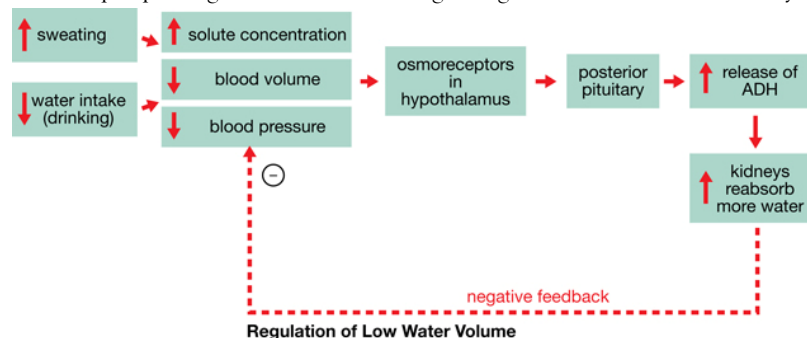
a. Where does this water end up?

The interstitial fluid then into the peritubular capillary network (blood)

23. Where would ADH work on the nephron and what does it do?

ADH causes the collecting duct to become more permeable to water by increasing the number of aquaporins in the cells, and therefore more water is reabsorbed and less urine is created.

24. Diagram a negative feedback loop explaining the role of ADH in regulating blood volume and osmolarity.



25. Describe some medical uses of diuretics. Why are they sometimes abused?  
Used to reduce blood pressure by increasing urine production.  
Can be abused by people who wish to quickly, though temporarily, lose weight (e.g. body builders or boxers)
26. Some medications are used as a “diuretic”.
- What effect does a diuretic have on the urinary system?  
Causes an increase in urine
  - Name another substance that is a diuretic.  
Alcohol or caffeine
  - Why would a doctor prescribe a diuretic to a patient with high blood pressure?  
Increase in urine production (less water returned to blood) causes decreased blood pressure
27. How do the kidneys control ion levels to maintain blood pH and homeostasis?  
If the blood is too acidic, the kidneys excrete more hydrogen ions into the urine and reabsorb more bicarbonate to raise the pH.  
The conversion of ammonia to ammonium is another method used to alter the pH.
28. Explain why only waste products in the blood and not blood nutrients move into the dialysate solution during the hemodialysis procedure.  
The dialysis machine runs in such a way that the dialysate solution is always “fresh” and a solute concentration gradient is maintained. Higher concentration of wastes flows out of the blood, across a membrane, and into the dialysis tubing, and the used dialysate is removed from the machine.