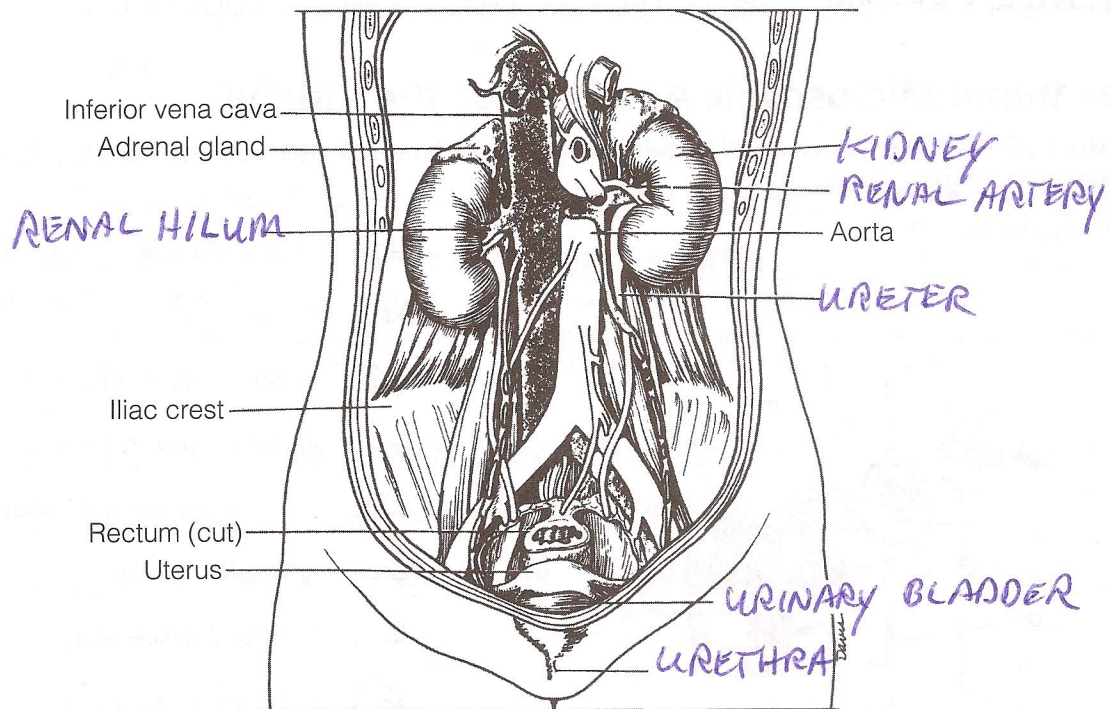


# Functional Anatomy of the Urinary System

## Gross Anatomy of the Human Urinary System

1. What is the function of the fat cushion that surrounds the kidneys in life? HOLDS THE KIDNEYS IN PLACE IN THE RETROPERITONEAL CAVITY
2. Complete the labeling of the diagram to correctly identify the urinary system organs. Then respond to the questions that follow.



Which of the structures identified above is applicable to the following statements?

- KIDNEY 1. maintains water and electrolyte balance of the blood
- URINARY BLADDER 2. serves as a storage area for urine
- URETHRA 3. transports urine to the body exterior
- RENAL ARTERY 4. transports arterial blood to the kidney
- KIDNEY 5. produces urine
- URETER 6. transports urine to the urinary bladder
- URETHRA 7. is shorter in women than in men

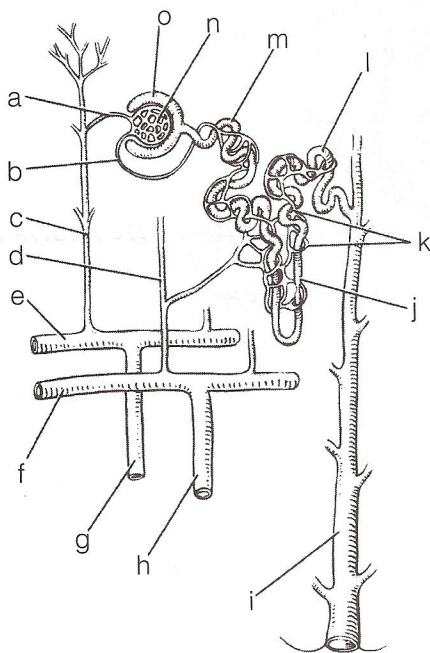
## Gross Internal Anatomy of the Pig or Sheep Kidney

3. Match the appropriate structure in column B to its description in column A. (Some responses may be used more than once.)

Column A		Column B
<u>FIBROUS CAPSULE</u>	1. smooth membrane clinging tightly to the kidney surface	cortex
<u>MEDULLA</u>	2. portion of the kidney containing mostly collecting ducts	medulla
<u>CORTIX</u>	3. portion of the kidney containing the bulk of the nephron structures	calyx
<u>CORTIX</u>	4. superficial region of kidney tissue	renal column
<u>RENAL PELVIS</u>	5. basinlike area of the kidney, continuous with the ureter	fibrous capsule
<u>CALYX</u>	6. an extension of the pelvis that encircles the apex of a pyramid	renal pelvis
<u>RENAL COLUMN</u>	7. area of cortexlike tissue running between the medullary pyramids	

## Functional Microscopic Anatomy of the Kidney

4. Match each of the lettered structures on the diagram of the nephron (and associated renal blood supply) on the left with the terms on the right:



- I 1. collecting duct
- N 2. glomerulus
- K 3. peritubular capillaries
- L 4. distal convoluted tubule
- M 5. proximal convoluted tubule
- G 6. interlobar artery
- C 7. cortical radiate artery
- e 8. arcuate artery
- D 9. cortical radiate vein
- B 10. efferent arteriole
- F 11. arcuate vein
- J 12. loop of Henle
- A 13. afferent arteriole
- H 14. interlobar vein
- O 15. glomerular capsule

5. Using the terms provided in question 4, identify the following:

- GLOMERULUS 1. site of filtrate formation  
PROXIMAL CONVOLUTED TUBULE 2. primary site of tubular reabsorption  
COLLECTING DUCT 3. structure that conveys the processed filtrate (urine) to the renal pelvis  
PERITUBULAR CAPILLARIES 4. blood supply that directly receives substances from the tubular cells  
GLOMERULUS 5. its inner (visceral) membrane forms part of the filtration membrane

6. Explain why the glomerulus is such a high-pressure capillary bed. BECAUSE AFFERENT ARTERIOLE FEEDING INTO IT IS A GREATER DIAMETER COMPARED TO THE EFFERENT ARTERIOLE  
 How does the high pressure help the glomerulus form filtrate? THE HIGH PRESSURE HELPS TO FORCE FLUID OUT OF THE GLOMERULUS

7. What structural modification of certain tubule cells enhances their ability to reabsorb substances from the filtrate?

MICROVILLI

8. Trace a drop of blood from the time it enters the kidney in the renal artery until it leaves the kidney through the renal vein.

Renal artery → SEGMENTAL ARTERY → INTERLOBAR → ARCUATE → CORTICAL RADIATE → AFFERENT ARTERIOLE → GLOMERULUS → EFFERENT ARTERIOLE → PERITUBULAR CAPILLARIES → CORTICAL RADIATE VEIN → ARCUATE VEIN → INTERLOBAR VEIN → renal vein

9. Trace the anatomical pathway of a molecule of creatinine (metabolic waste) from the glomerular capsule to the urethra. Note each microscopic and/or gross structure it passes through in its travels, and include the names of the subdivisions of the renal tubule.

Glomerular capsule → PROXIMAL CONVOLUTED TUBULE → LOOP OF HENLE → DISTAL CONVOLUTED TUBULE → COLLECTING DUCT → MINOR CALYX → MAJOR CALYX → RENAL PELVIS → URETER → URINARY BLADDER → urethra

## Urinalysis: Characteristics of Urine

10. What is the normal volume of urine excreted in a 24-hour period? 1.0 - 1.8 liters

11. List three nitrogenous wastes that are routinely found in urine:

UREA, URIC ACID, CREATININE ~~AMMONIA~~ AMMONIUM

List three substances that are absent from the urine of healthy individuals:

GLUCOSE, AMINO ACIDS, BLOOD PROTEINS

List two substances that are routinely found in filtrate but *not* in the urine product:

GLUCOSE, AMINO ACIDS

12. Explain why urinalysis is a routine part of any good physical examination. IF THERE ARE ABNORMAL SUBSTANCES IN THE URINE IT CAN INDICATE DISEASE ISSUES IN THE BODY

13. What substance is responsible for the normal yellow color of urine? UROCHROME UROCHROME

14. Which has a greater specific gravity: 1 ml of urine or 1 ml of distilled water? 1 ml of URINE

Explain. SPECIFIC GRAVITY IS RELATED TO THE AMOUNT OF SOLUTES IN A SOLUTION + URINE WILL ALWAYS HAVE MORE SOLUTES THAN DISTILLED WATER

15. Explain the relationship between the color, specific gravity, and volume of urine. USUALLY THE GREATER THE VOLUME OF URINE THE LESS COLOR IT HAS + THE LOWER THE AMOUNT OF SOLUTES + THUS LOWER SPECIFIC GRAVITY.

### Abnormal Urinary Constituents

16. How does a urinary tract infection influence urine pH? IT INCREASES THE PH

17. Several specific terms have been used to indicate the presence of abnormal urine constituents. Identify which urine abnormalities listed in column A might be caused by each of the conditions listed in column B.

Column A		Column B
<u>HEMATURIA</u>	1. blood in the urine	albuminuria
<u>HEMOGLOBINURIA</u>	2. hemolytic anemia	glycosuria
<u>GLYCOSURIA</u>	3. eating a 5-lb box of candy at one sitting	hematuria
<u>ALBUMINURIA</u>	4. pregnancy	hemoglobinuria
<u>KETONURIA</u>	5. starvation	ketonuria
<u>PYURIA</u>	6. urinary tract infection	pyuria

18. What are renal calculi, and what conditions favor their formation? THEY ARE KIDNEY STONES. COME FROM EXCESSIVELY CONCENTRATED URINE

19. What change would you expect to occur in a urine sample that has been stored at room temperature? IT WILL GROW BACTERIA + SMELL LIKE AMMONIA