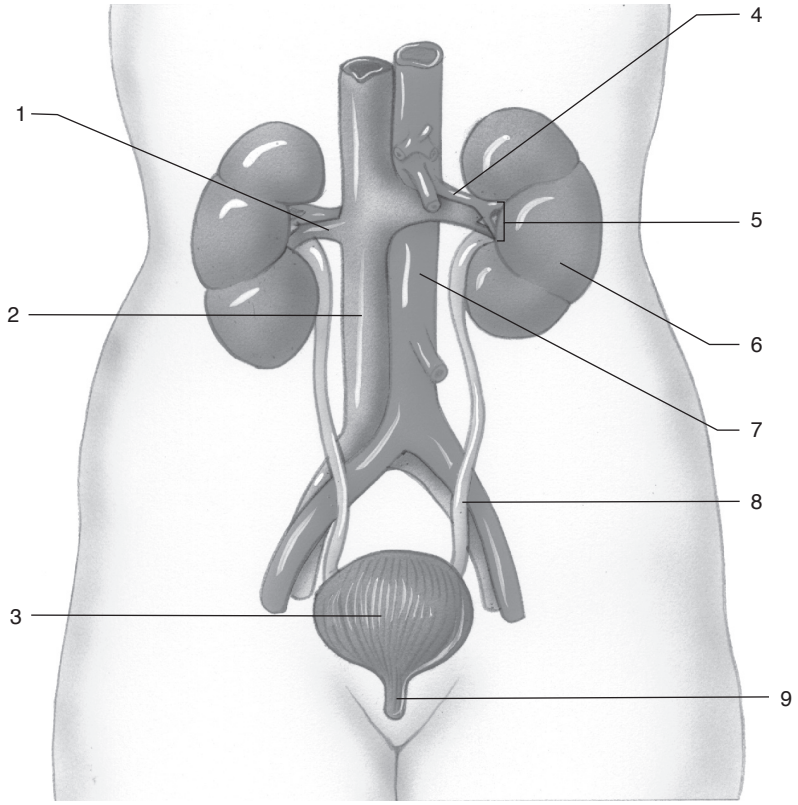
1. Urinary System, General

a. Label the figure by placing the numbers of the structures in the spaces by the correct labels.

7 Aorta	**6** Kidney	**8** Ureter
2 Inferior vena cava	**4** Renal artery	**9** Urethra
5 Hilum	**1** Renal vein	**3** Urinary bladder



b. Write the names of the organs that match the functions in the spaces at the right.

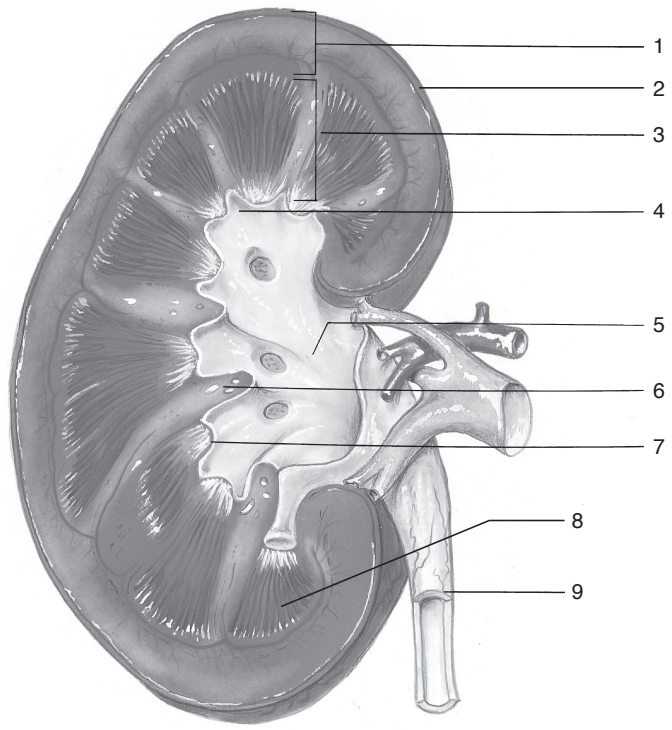
1) Stores urine temporarily. **Urinary bladder**
2) Produces urine. **Kidneys**
3) Carries urine from the body. **Urethra**
4) Carries urine from the kidneys. **Ureters**
5) Maintains composition and volume of body fluids. **Kidneys**

2. Kidneys

a. Write the names of the structures that match the statements in the spaces at the right.

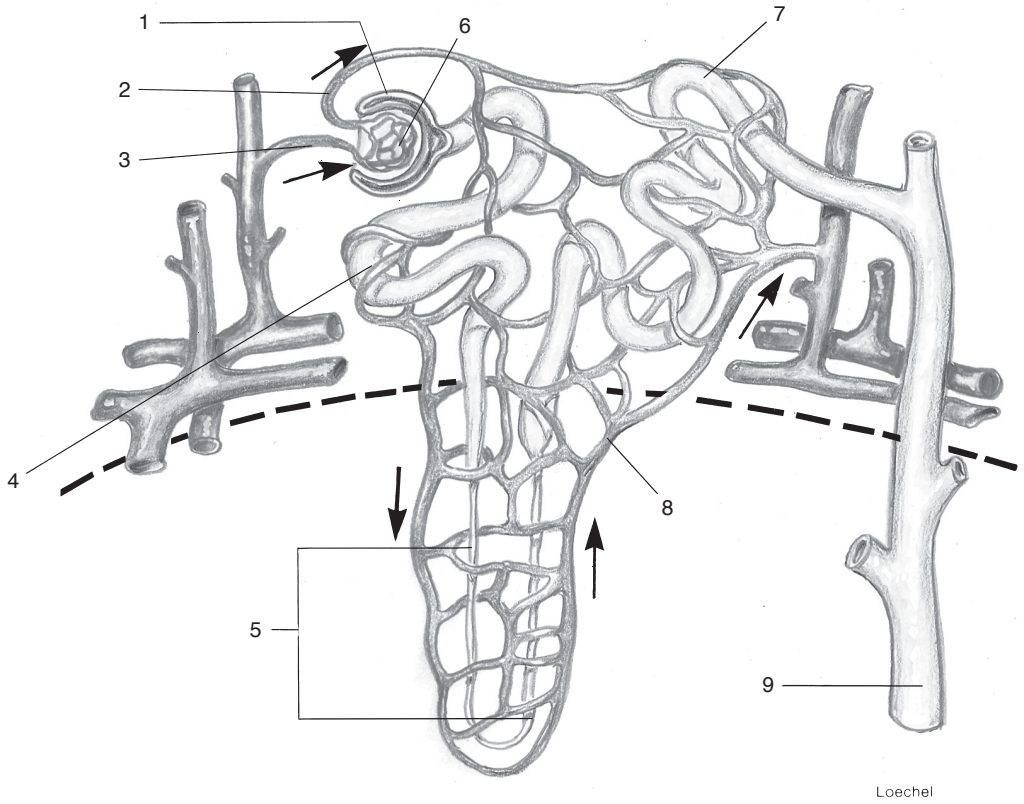
1) Outer layer containing renal corpuscles.	**Cortex**
2) Region containing renal pyramids.	**Medulla**
3) Flattened cavity continuous with ureter.	**Pelvis**
4) Receptacles surrounding renal papillae.	**Calyces**
5) Thin layer of connective tissue enveloping kidney.	**Renal capsule**
6) Arterial capillaries in renal corpuscle.	**Glomerulus**
7) Functional units of the kidneys.	**Nephrons**
8) U-shaped portion of renal tubule.	**Loop of Henle**
9) Part of renal tubule joined to glomerular capsule.	**Proximal convoluted tubule**
10) Part of renal tubule joined to a collecting duct.	**Distal convoluted tubule**
11) Formed of modified cells at point of contact of distal tubule and afferent arteriole.	**Juxtaglomerular apparatus**

b. Label the figure by placing the numbers of the structures in the spaces by the correct labels.



4 Calyx
2 Renal capsule
6 Renal column
1 Renal cortex
3 Renal medulla
7 Renal papilla
5 Renal pelvis
8 Renal pyramid
9 Ureter

c. Label the figure by placing the numbers of the structures in the spaces by the correct labels.



3 Afferent arteriole
9 Collecting duct
7 Distal convoluted tubule
2 Efferent arteriole
1 Glomerular capsule
6 Glomerulus
5 Nephron loop
8 Peritubular capillary
4 Proximal convoluted tubule

3. Urine Formation

a. Write the words that complete the sentences in the spaces at the right.

A decrease in the glomerular filtration rate causes the ____1___ apparatus to secrete ____2___ , which triggers the ____3___-____4___ mechanism. The end product of these reactions is ____5___ , which increases systemic blood pressure by ____6___ arterioles, stimulating ____7___ secretion by the posterior pituitary, and stimulating ____8___ secretion by the adrenal cortex.

1) **Juxtaglomerular**
2) **Renin**
3) **Renin**
4) **Angiotensin**
5) **Angiotensin II**
6) **Constricting**
7) **ADH**
8) **Aldosterone**

b. Write the terms that match the statements in the spaces at the right.

1) Passage of water and solutes from glomerulus into glomerular capsule. **Filtration**
2) Plasma component that cannot pass through glomerular pores. **Proteins**
3) Force producing filtration. **Glomerular blood pressure**
4) Fluid in glomerular capsule. **Filtrate**
5) Recovery of needed materials from filtrate into the blood. **Tubular reabsorption**
6) Volume of filtrate formed per day. **180 liters**

7) Method of transport of sodium ions. **Mostly active transport**

8) Method of transport of water. **Osmosis**

9) Method of transport of glucose. **Active transport**

10) Method of transport of chloride ions. **Mostly passive electro-chemical attraction**

11) Substance reabsorbed that concentrates the urine. **Water**

12) Passage of substances from blood into the filtrate. **Tubular secretion**

13) Actively secreted ion. **H^+**

14) Passively secreted ion. **K^+**

c. Indicate whether each statement is true (T) or false (F).

__T__ Urine contains waste and excessive materials removed from the blood.

__T__ Urine formation depends upon maintenance of the blood pressure within the glomeruli.

__T__ Most of the filtrate volume is reabsorbed.

__T__ Negatively charged ions and positively charged ions are electrochemically attracted to each other.

__T__ The active reabsorption of sodium ions increases the rate of water reabsorption by osmosis.

4. Maintenance of Blood Plasma Composition

a. Write the terms that match the statements in the spaces at the right.

1) Hormone promoting water reabsorption. **Antidiuretic hormone**

2) Hormone promoting reabsorption of Na^+. **Aldosterone**

3) Hormone promoting secretion of K^+. **Aldosterone**

4) Hormone decreasing blood level of Ca^{++}. **Calcitonin**

5) Hormone increasing blood level of Ca^{++}. **Parathyroid hormone**

6) Three nitrogenous wastes in urine. **Urea**, **Uric acid**, **Creatinine**

b. Indicate whether each statement is true (T) or false (F).

1) __F__ Cellular activity does not affect plasma composition.

2) __T__ Plasma composition is changed by the work of kidneys.

3) __F__ Electrolytes are totally reabsorbed into the blood.

4) __T__ About 99% of water in the filtrate is reabsorbed.

5) __F__ Water is lost from the body only in urine.

6) __T__ Urine volume is reduced when water intake is curtailed.

7) __T__ Perspiring heavily may reduce the volume of urine.

8) __T__ Electrolyte balance is largely maintained by the active reabsorption of positively charged ions.

9) __F__ Nephrons remove all nitrogenous wastes from the blood.

10) __T__ Urea is the most abundant nitrogenous waste in urine.

11) __F__ Urea is formed by the kidneys from amine groups.

12) __T__ Buffers are chemicals in body fluids that either combine with or release hydrogen ions.

13) __F__ The production of carbon dioxide by metabolizing cells tends to make the blood more alkaline.

14) __T__ Kidneys help to regulate the pH of body fluids by secreting excess hydrogen ions into the filtrate.
15) __T__ Water and electrolyte balance in body fluids is essential for normal cell functioning.
16) __T__ ADH is released by the posterior pituitary gland when the water concentration of the blood is reduced.
17) __F__ Aldosterone is secreted by the adrenal cortex when the concentration of K^+ in the blood is reduced.
18) __T__ ADH increases the permeability of the distal tubules and collecting ducts to water.
19) __T__ Electrolyte concentrations in the blood affect the movement of water into cells by osmosis.

5. Excretion of Urine

a. Write the terms that match the statements in the spaces at the right.

1) Carry urine to urinary bladder. **Ureters**
2) Provides temporary storage of urine. **Urinary bladder**
3) Muscle in wall of urinary bladder. **Detrusor muscle**
4) Carries urine from urinary bladder. **Urethra**
5) Method of urine transport by ureters. **Peristalsis**
6) Type of muscle composing the internal urethral sphincter. **Smooth muscle**
7) Type of muscle composing the external urethral sphincter. **Skeletal muscle**
8) Type of muscle in walls of ureters. **Smooth muscle**

b. Write the words that complete the sentences in the spaces at the right.

The accumulation of ____1___ stretches the urinary bladder wall, which triggers the ____2___ reflex. This reflex causes rhythmic involuntary contractions of the ____3___ muscle and opens the involuntarily controlled ____4___ urethral sphincter. If the voluntarily controlled ____5___ urethral sphincter is relaxed, ____6___ occurs.

1) **Urine**
2) **Micturition reflex**
3) **Detrusor**
4) **Internal**
5) **External**
6) **Micturition**

6. Characteristics of Urine

Indicate whether each statement is true (T) or false (F).

1) __T__ The color of urine is due to the presence of urochrome.
2) __T__ The pH of urine is usually slightly acidic.
3) __F__ Normal urine is never alkaline.
4) __T__ Urine has a specific gravity greater than 1.000.
5) __T__ Normal urine does not contain proteins or hemoglobin.

7. Disorders of the Urinary System

Write the names of the disorders matching the statements in the spaces at the right.

1) Inflammation of the glomeruli. **Glomerulonephritis**
2) Inflammation of the urinary bladder. **Cystitis**
3) Inflammation of nephrons and renal pelvis. **Pyelonephritis**
4) Excessive urine production. **Diuresis**
5) Kidney stones. **Renal calculi**
6) Inflammation of the urethra. **Urethritis**
7) Deposits of uric acid in the renal pelvis. **Renal Calculi**
8) Characterized by uremia. **Renal failure**
9) Characterized by protein in the urine. **Glomerulonephritis**

8. Clinical Applications 

a. A 60-year-old woman comes to the clinic with severe edema of her lower legs and feet. A diuretic is prescribed, and she is placed on a salt-free diet. She is also advised to take a 30-minute walk each morning and afternoon and to elevate her feet higher than her head for 20-minute periods morning and afternoon. Explain how the diuretic will reduce her edema. **The diuretic counters the action of ADH to increase the excretion of water. As the concentration of water in blood decreases, more interstitial fluid is reabsorbed into the blood and then excreted by the kidneys.**

Explain how the salt-free diet will help reduce her edema. **Decreasing salt intake decreases the osmotic pressure of body fluids and reduces blood volume which helps the removal of excessive interstitial fluid.**

Explain how elevating her feet and walking will help reduce her edema. **Elevating the feet uses gravity to aid the return of venous blood and lymph, and contractions of leg muscles propels venous blood and lymph upward. The improved circulation of blood and movement of lymph aids removal of excess interstitial fluid.**

b. Explain why women develop cystitis more frequently than men. **The shorter female urethra makes it easier for bacteria to enter the urinary bladder.**