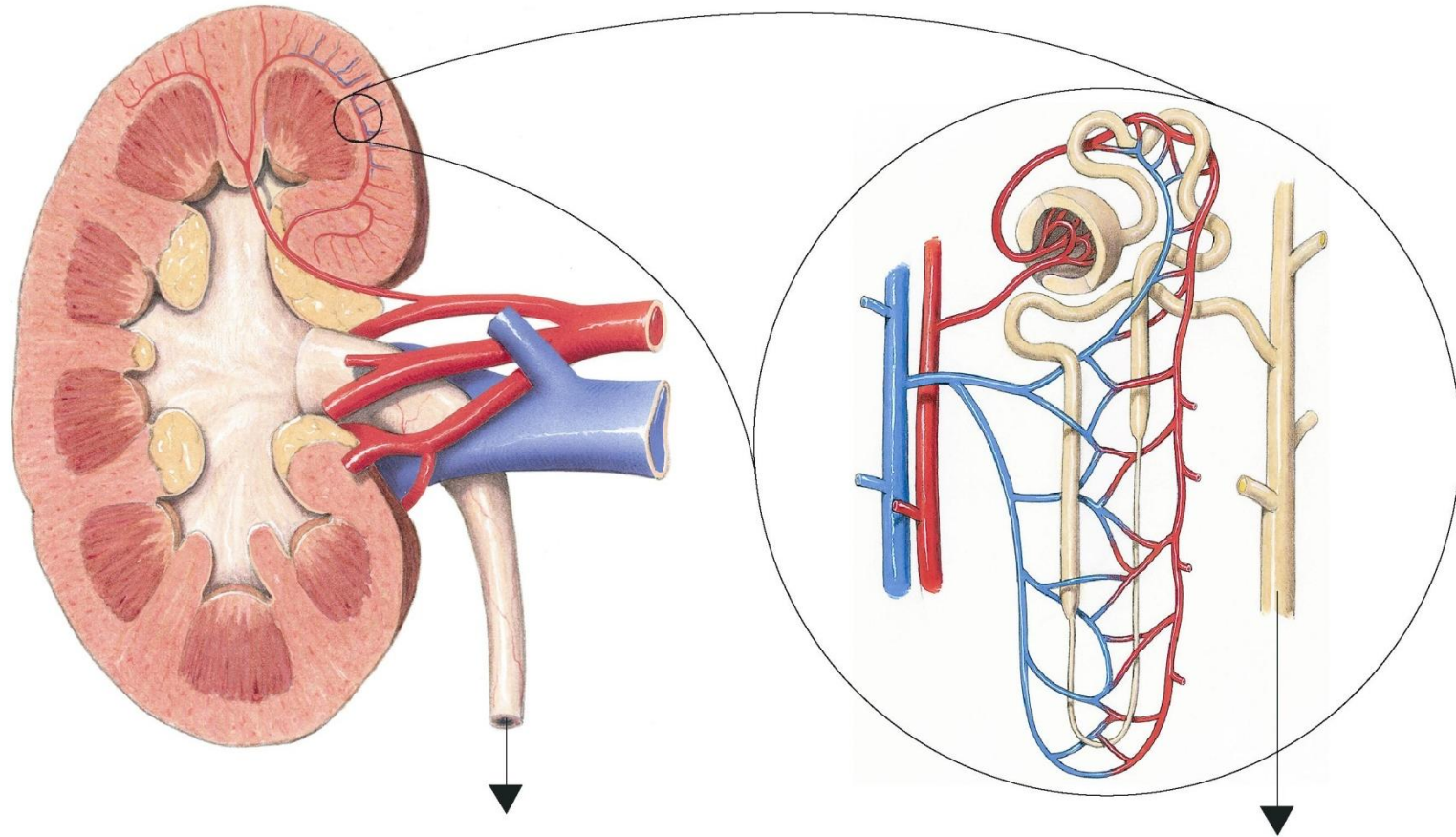


38–3 The Excretory System



Functions of the Excretory System

Every cell produces metabolic wastes.

The process by which these wastes are eliminated is called excretion.



The kidneys:

- **remove waste products from the blood.**
- **maintain blood pH.**
- **regulate the water content of the blood and, therefore, blood volume.**

The **kidneys** are located on either side of the spinal column near the lower back.

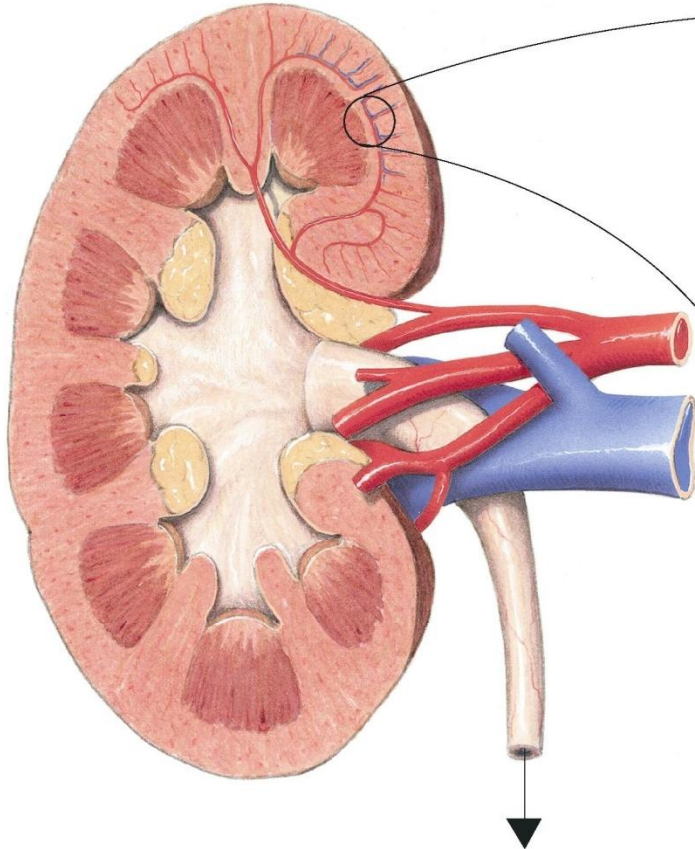
A tube, called the **ureter**, leaves each kidney, carrying urine to the urinary bladder.

The **urinary bladder** is a saclike organ where urine is stored before being excreted.

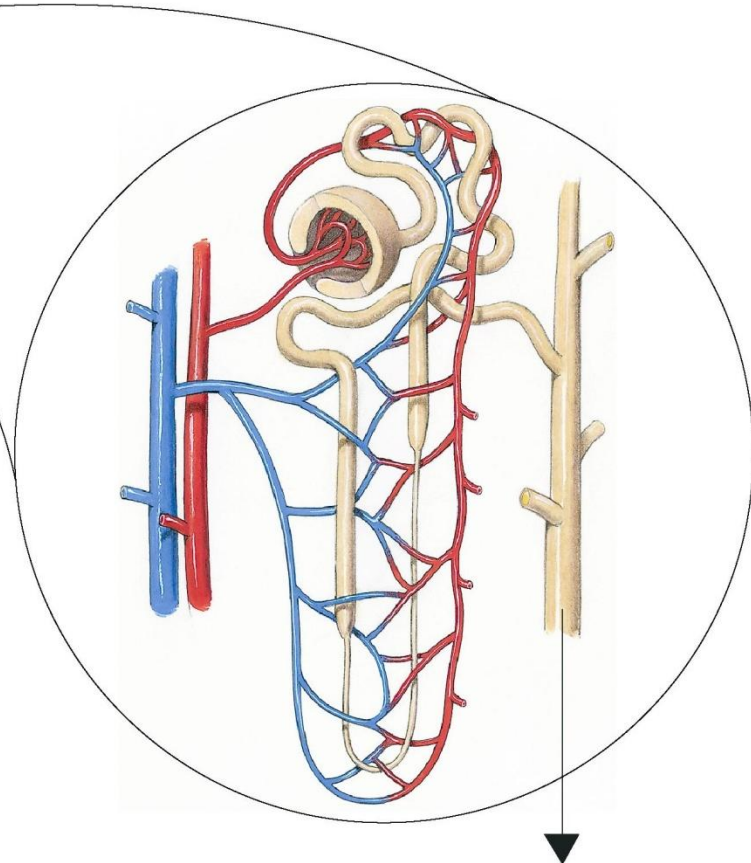
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Structure of the Kidneys

Kidney



Nephron

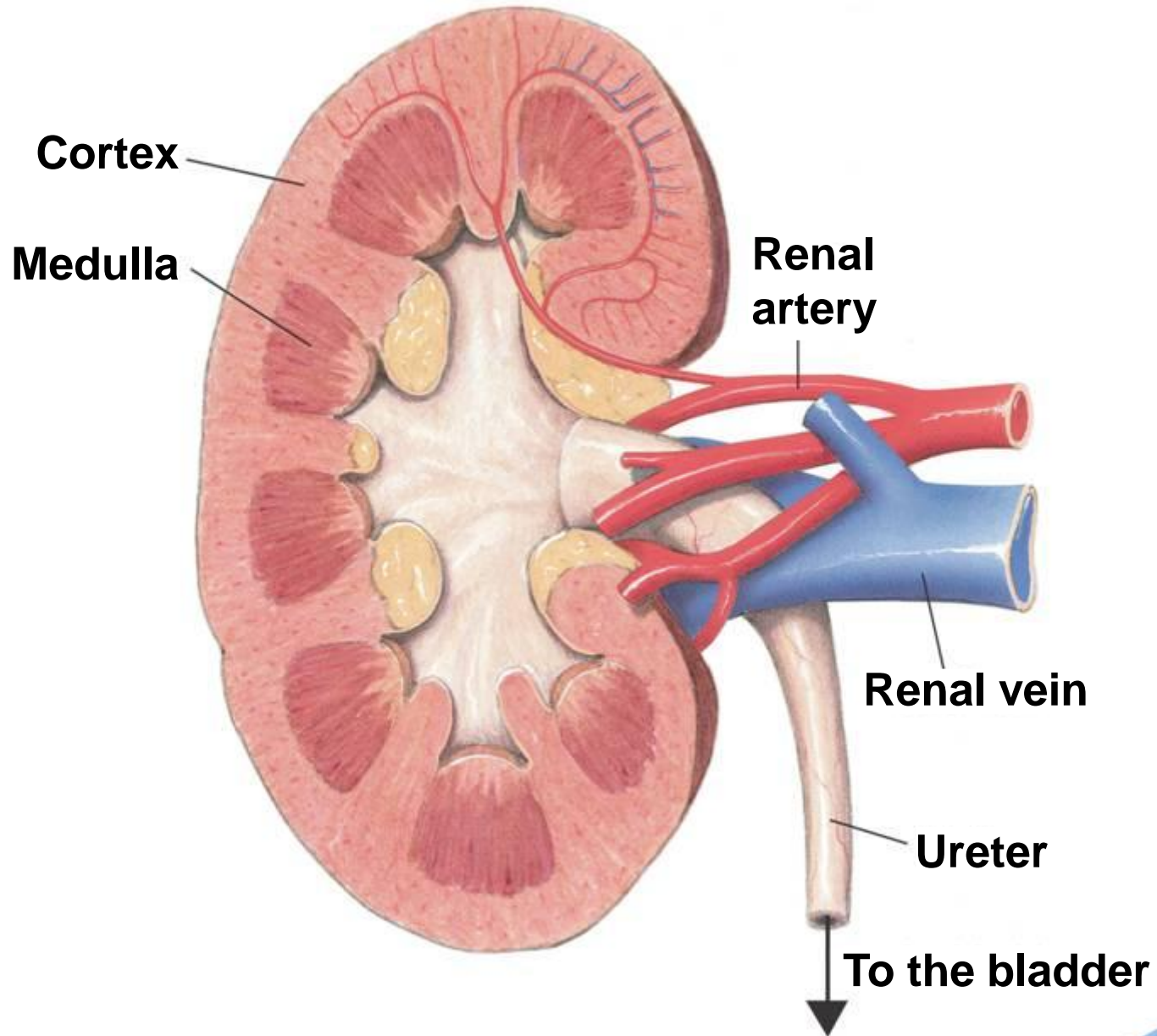


Kidney Structure

A kidney has two distinct regions:

- The inner part is called the renal medulla.
- The outer part is called the renal cortex.

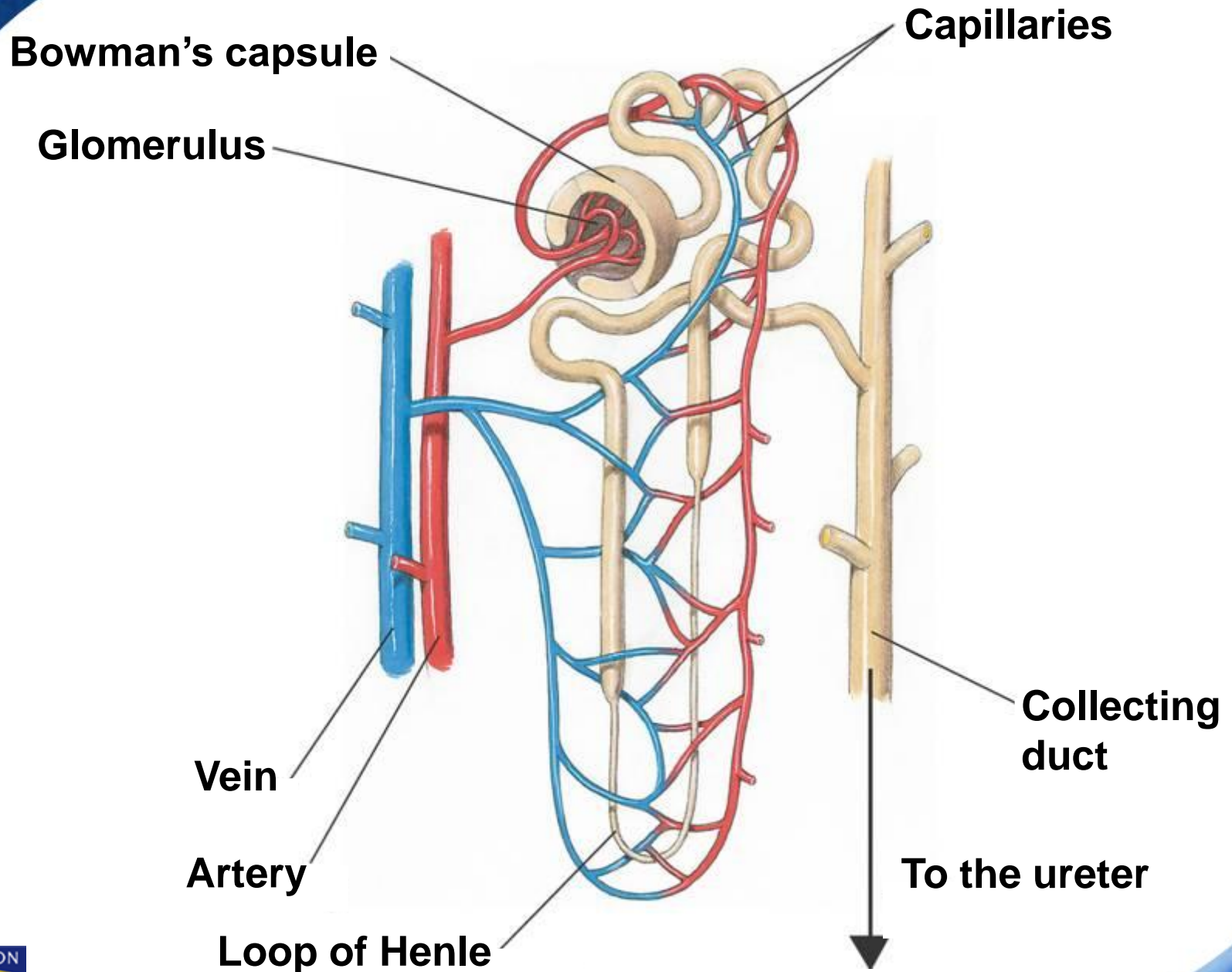
38-3 The Excretory System → The Kidneys



The functional units of the kidney are called **nephrons**.

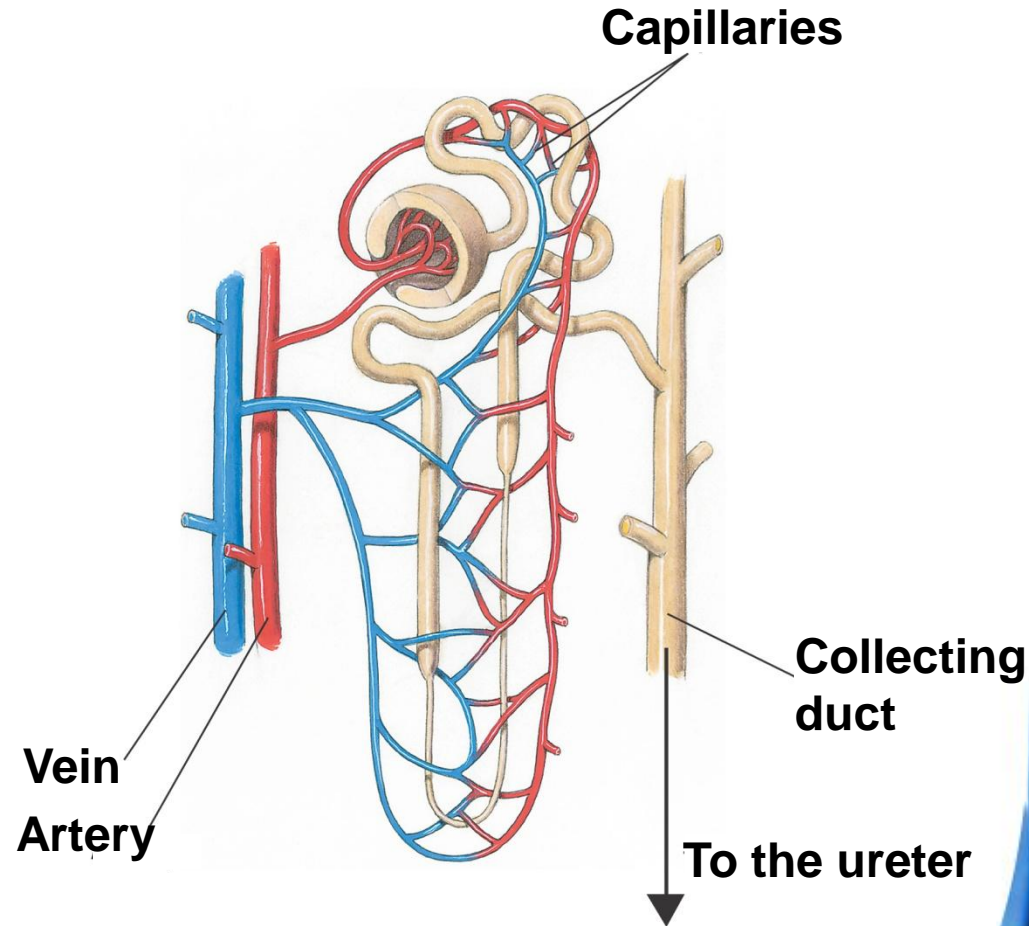
Nephrons are located in the renal cortex, except for their loops of Henle, which descend into the renal medulla.

38-3 The Excretory System → The Kidneys



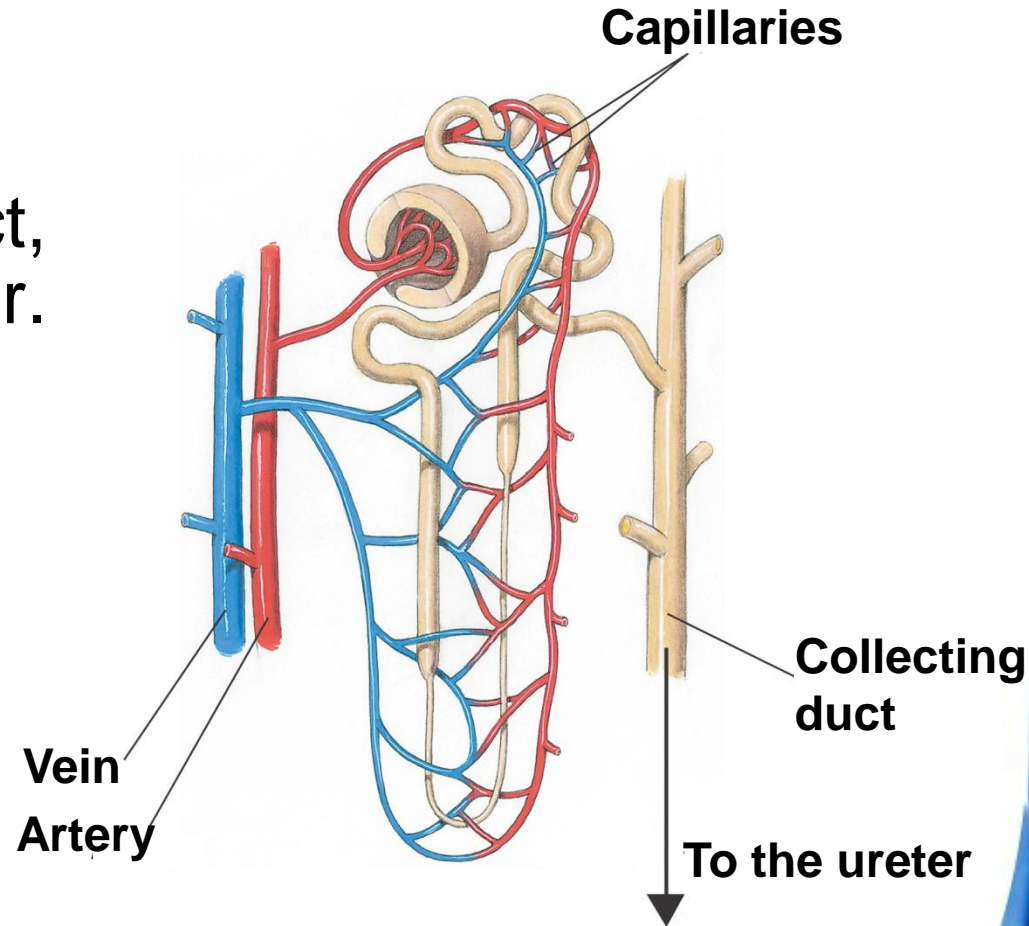
Each nephron has its own blood supply:

- an arteriole
- a venule
- a network of capillaries connecting them



38-3 The Excretory System → The Kidneys

Each nephron releases fluids to a collecting duct, which leads to the ureter.





How is blood filtered?



As blood enters a nephron through the arteriole, impurities are filtered out and emptied into the collecting duct.

The purified blood exits the nephron through the venule.

The mechanism of blood purification involves two distinct processes: filtration and reabsorption.

Filtration

Passing a liquid or gas through a filter to remove wastes is called **filtration**.

The filtration of blood mainly takes place in the glomerulus.

The **glomerulus** is a small network of capillaries encased in the top of the nephron by a hollow, cup-shaped structure called **Bowman's capsule**.

Fluid from the blood flows into Bowman's capsule.

The materials filtered from the blood include water, urea, glucose, salts, amino acids, and some vitamins.

Plasma proteins, cells, and platelets remain in the blood because they are too large to pass through the capillary walls.

Reabsorption

Most of the material removed from the blood at Bowman's capsule makes its way back into the blood.

The process in which liquid is taken back into a vessel is called **reabsorption**.

Almost 99% of the water that enters Bowman's capsule is reabsorbed into the blood.

When the filtrate drains in the collecting ducts, most water and nutrients have been reabsorbed into the blood.

Remaining material, called urine, is emptied into a collecting duct.

Urine is primarily concentrated in the loop of Henle.

The **loop of Henle** is a section of the nephron tubule in which water is conserved and the volume of urine minimized.

As the kidney works, purified blood is returned to circulation while urine is collected in the urinary bladder.

Urine is stored here until it is released from the body through a tube called the **urethra**.

Control of Kidney Function

The activity of the kidneys is mostly controlled by the composition of the blood.

In addition, regulatory hormones are released in response to the composition of blood.

When you drink a liquid, it is absorbed into the blood through the digestive system.

As a result, the concentration of water in the blood increases.

As the amount of water in the blood increases, the rate of water reabsorption in the kidneys decreases.

Less water is returned to the blood, and excess water is sent to the urinary bladder to be excreted as urine.

When the kidneys detect an increase in salt, they respond by returning less salt to the blood by reabsorption.

The excess salt the kidneys retain is excreted in urine, thus maintaining the composition of the blood.

Homeostasis by Machine

Humans have two kidneys, but can survive with only one.

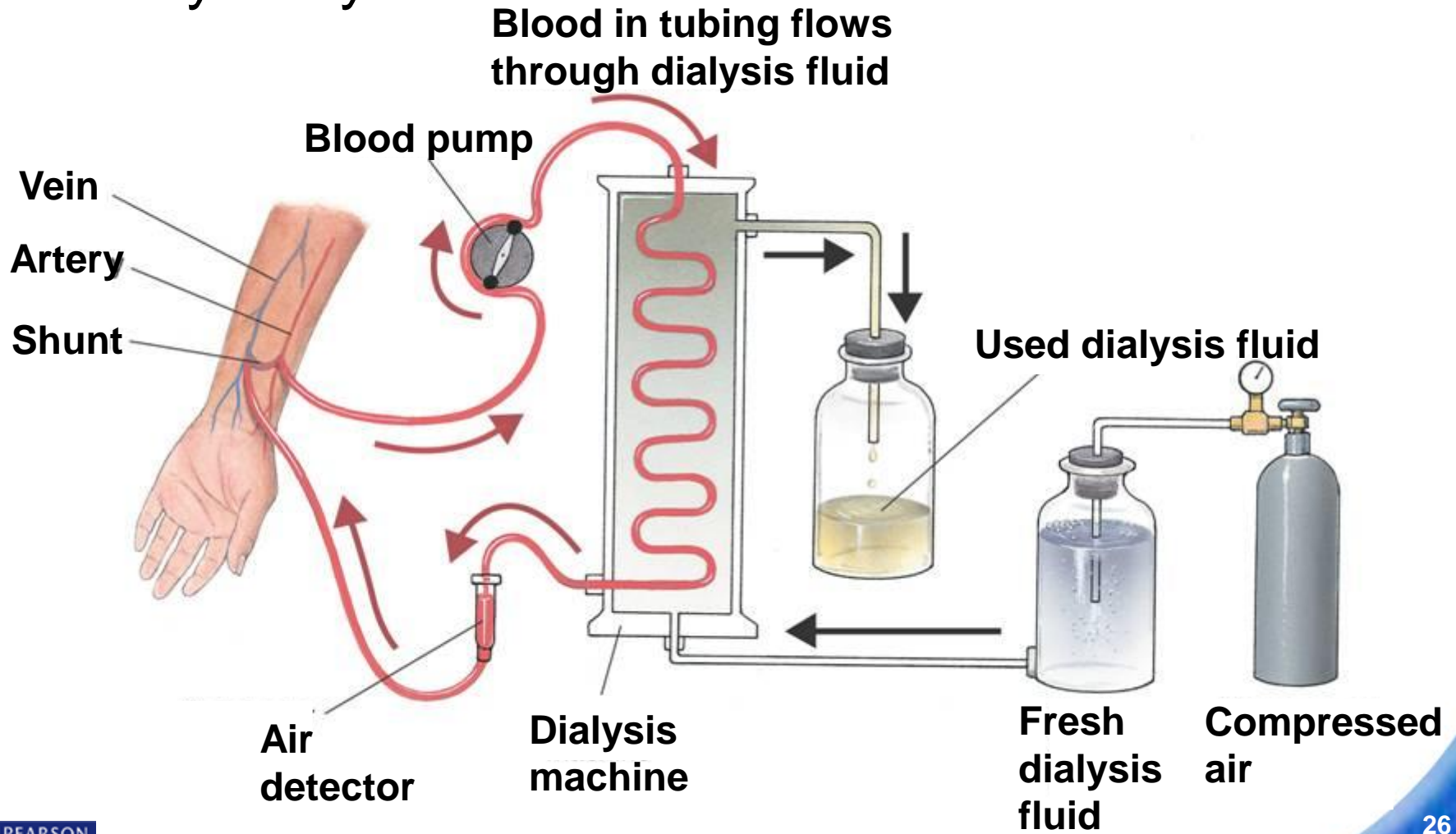
If both kidneys are damaged by disease or injury, there are two options:

- a kidney transplant
- kidney dialysis

Kidney dialysis works as follows:

- Blood is removed by a tube and pumped through special tubing that acts like nephrons.
- Tiny pores in the tubing allow salts and small molecules to pass through.
- Wastes diffuse out of the blood into the fluid-filled chamber, allowing purified blood to be returned to the body.

Kidney Dialysis



38-3 Section QUIZ

Continue to:

Section QUIZ

- or -

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38–3 Section QUIZ

1

A dialysis machine performs the function of which structure in the excretory system?

A

a. nephron

b. ureter

c. urethra

d. glomerulus

38–3 Section QUIZ

2 In the human body, the kidneys play an important role in

- a. producing digestive enzymes.
- b. circulating the blood.
- c. destroying old red blood cells.

A d. maintaining homeostasis.

38–3 Section QUIZ

- 3** In the nephron, most filtration occurs in the
- a. renal tubule.
 - b. capillaries.
 - A** c. glomerulus.
 - d. loop of Henle.

38–3 Section QUIZ

4 Urine leaves the body through the

- a. loop of Henle.
- b. glomerulus.

A c. urethra.

d. bladder.

- 5** Materials filtered out of the blood include all of the following EXCEPT:
- a. water.
 - b. urea.
 - c. amino acids.
 - A** d. plasma proteins.

END OF SECTION