65a A&P: Urinary System

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Class Outline

5 minutes	Attendance, Breath of Arrival, and Reminders
10 minutes	Lecture:
25 minutes	Lecture:
15 minutes	Active study skills:
60 minutes	Total

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Class Reminders

ABMP Exam Coach

- "Access your ABMP account" using instructions on page A-74
- Familiarize yourself with ABMP Exam Coach, especially the "Study Subjects" section
- Preview the preparation assignments for MBLEx Prep classes (74a, 75a, 80a, 81a, 84a, 86a, 87a)

Assignments:

- 66a Review Questions (due before class starts)

Quizzes and Exams:

- 66a Quiz (59a, 61a, 62a, 63a, 64a/b, 65a/b)
- 68a Kinesiology Quiz – **all muscles learned so far!**
- 70a exam – see syllabus for material covered.

Preparation for upcoming classes:

- 65b Business: Meet Employers and Self-Employed Therapists
  Packet B: 25; Have 10 questions to ask the panelists.
- 66b Integration Massage: Side-lying and Pregnancy Massage Review
- 67a Pathology: Urinary System
  Packet E: 171-172; RQ – Packet A-206

Classroom Rules

Punctuality - everybody's time is precious

- Be ready to learn at the start of class; we'll have you out of here on time
- Tardiness: arriving late, returning late after breaks, leaving during class, leaving early

The following are not allowed:

- Bare feet
- Side talking
- Lying down
- Inappropriate clothing
- Food or drink except water
- Phones that are visible in the classroom, bathrooms, or internship

You will receive one verbal warning, then you'll have to leave the room.

65a A&P: Urinary System

Packet E - 165

Introduction

Cells of the body metabolize nutrients, producing wastes such as nitrogen, ___ammonia___, and urea which are toxic to the body.

Other substances also accumulate as a result of metabolic activities: sodium chloride, sodium sulfate, phosphate, hydrogen molecules, and ions.

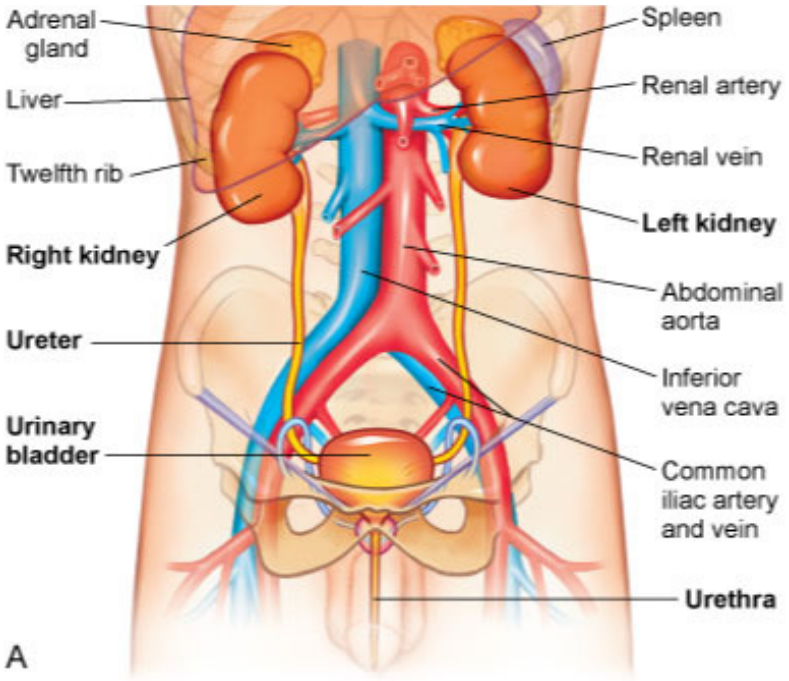
Introduction

All of these waste materials must be excreted from the body for homeostasis to be maintained and for metabolism to function optimally.

Several systems contribute to waste elimination – respiratory, integumentary, digestive, and urinary.

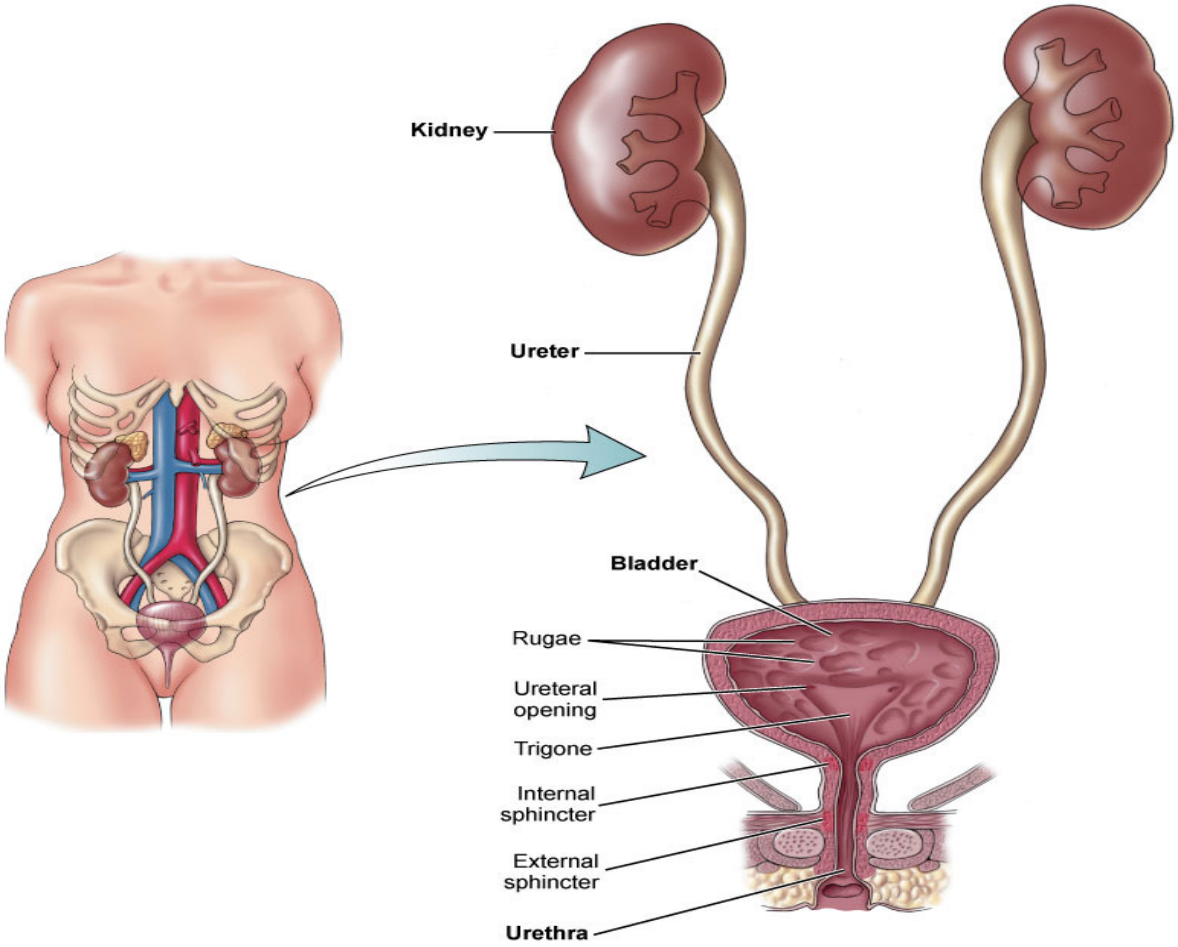
Introduction

The kidneys within the urinary system filter the waste products from the blood and produce urine. It travels through the ureters and down to the urinary bladder, which contains it until expelling it out of the body through the urethra.



Anatomy

- Kidneys
- Ureters
- Urethra
- Urinary bladder

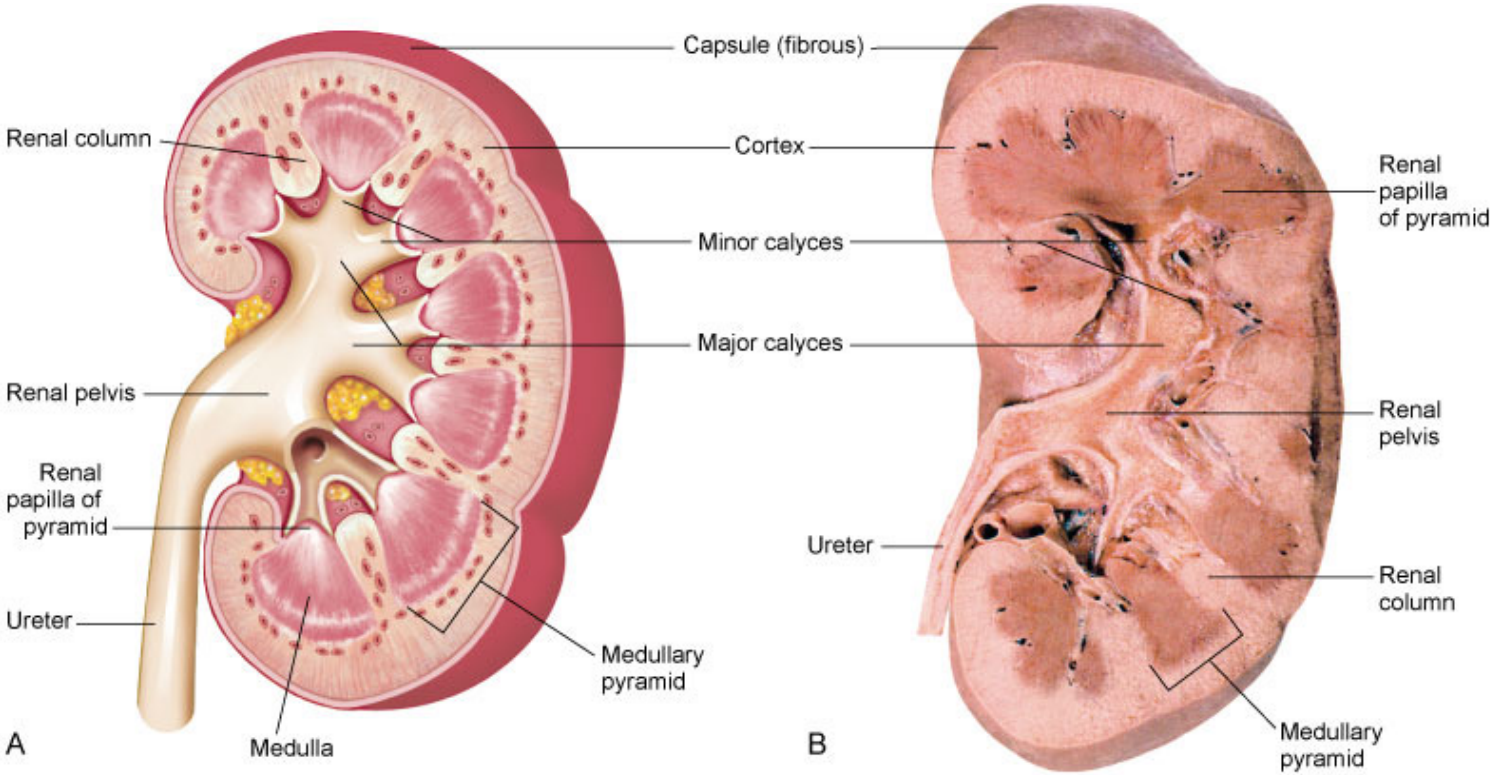


Physiology

- Eliminates wastes and foreign substances
- Regulates chemical composition of blood
- Regulates blood pH
- Regulates blood volume and fluid balance
- Regulates blood pressure
- Maintains homeostasis

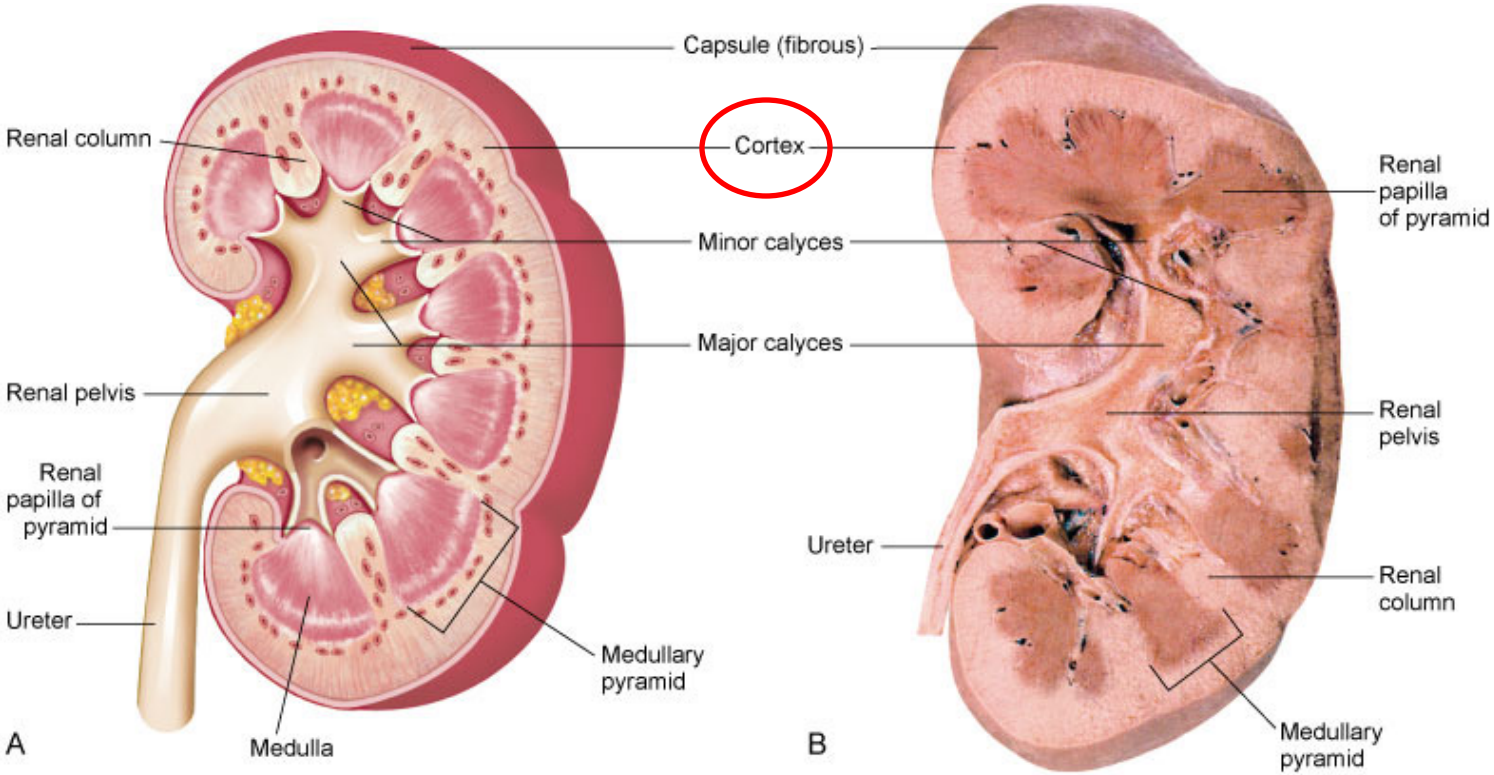
Kidneys

Kidneys Principal organs of the urinary system located in the upper lumbar region. They process ___blood___ and form urine to be excreted.



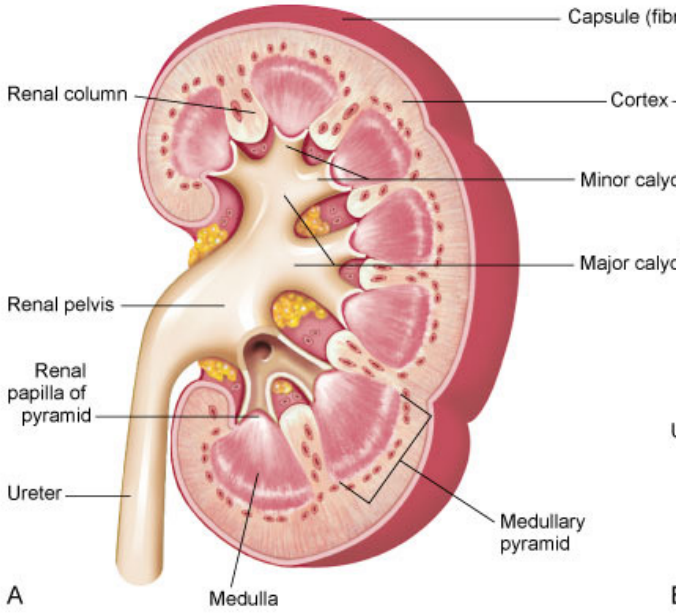
Kidneys

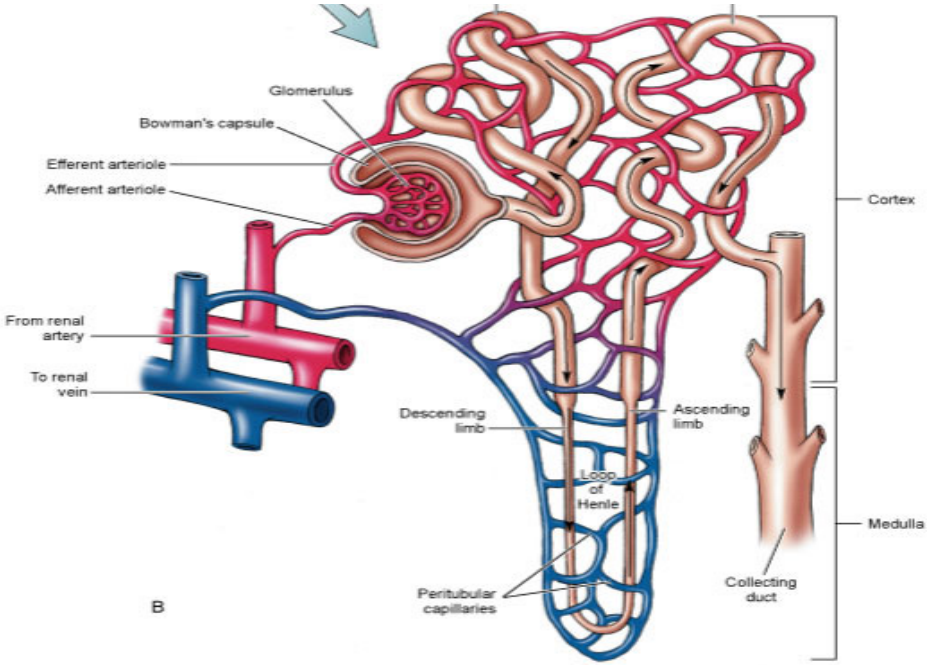
Renal cortex _____Outer_____ region of the kidney where the nephron's glomerulus and Bowman's capsule are located.



Kidneys

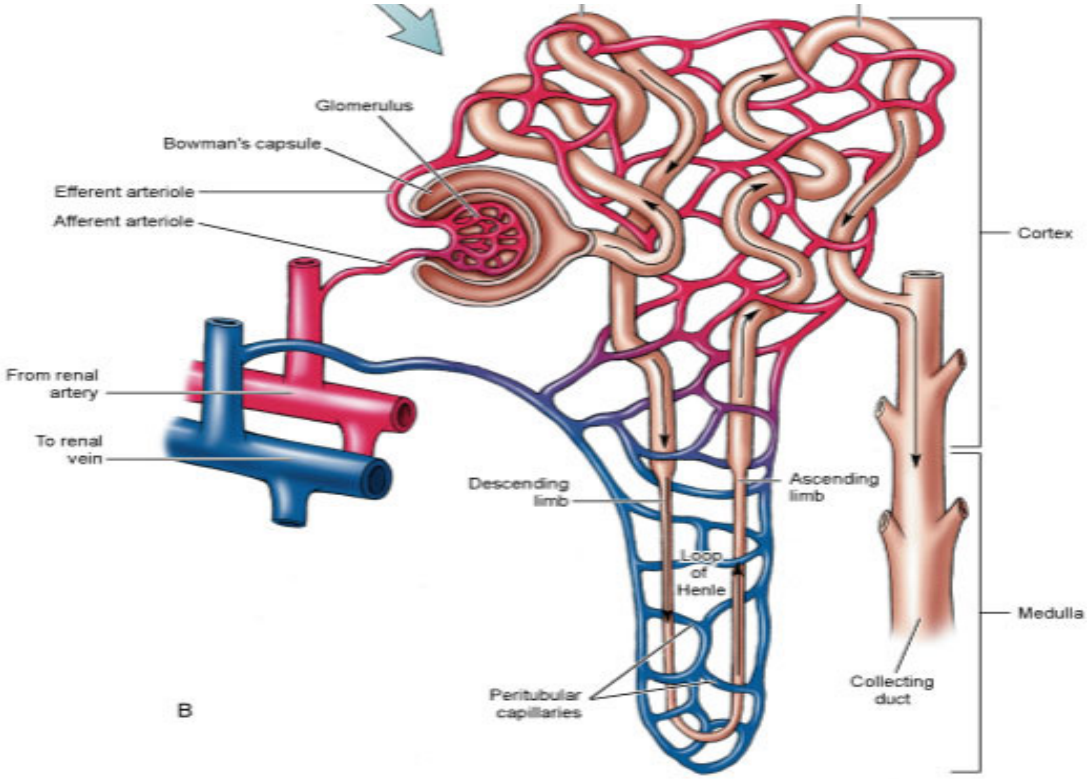
Renal medulla Inner region of the kidney where the nephron's loop of Henle is located.





Nephron

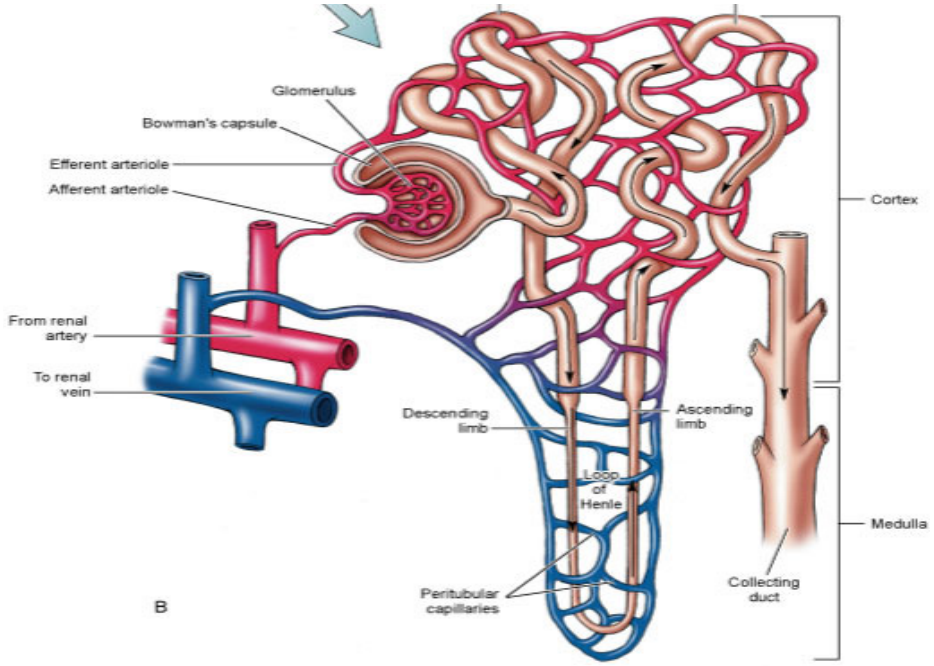
Nephrons Kidney's filtering units. Parts: glomerulus, Bowman's capsule, renal tubule.



Nephron

Glomerulus In the nephron, a small ball of fine capillaries within the Bowman's capsule.

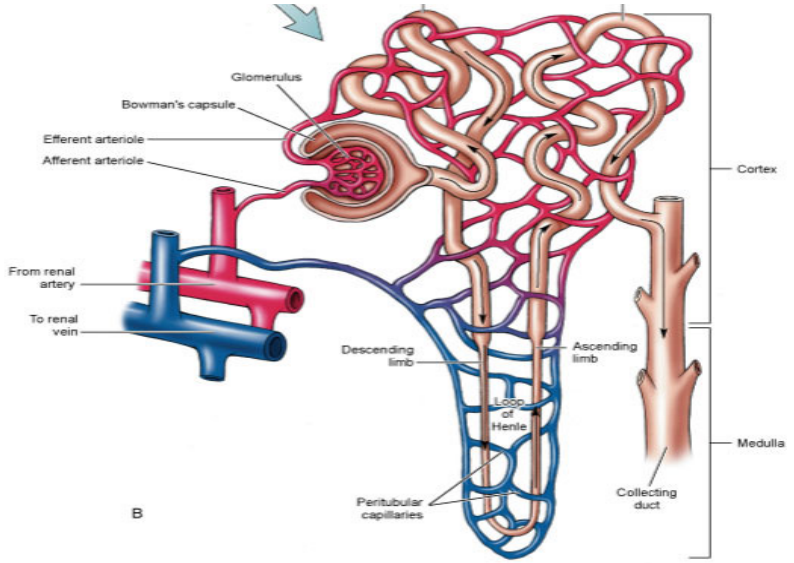
Bowman's capsule Hollow cup-shaped <u>mouth</u> of a nephron.



Nephron

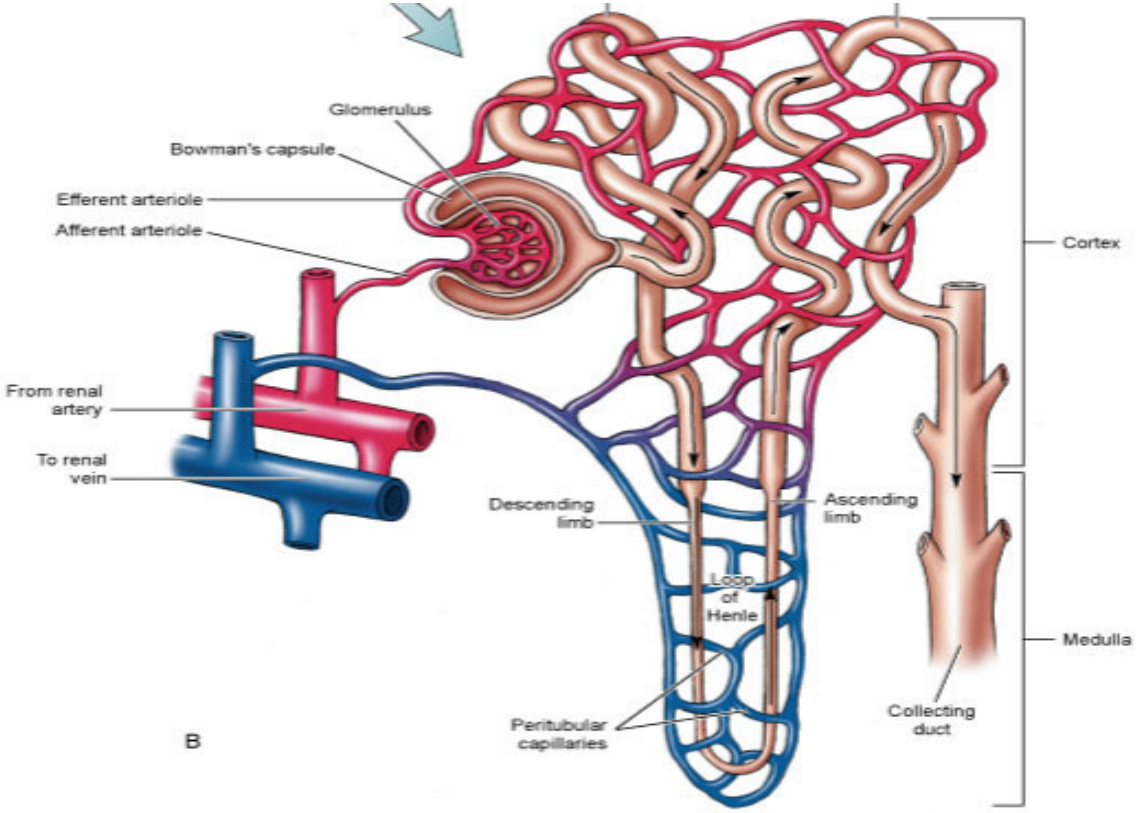
Filtrate Resulting fluid filtered from the blood in the nephron of the kidney. After processing it becomes urine.

Renal tubule Small tube within the nephron through which filtrate flows as it is being processed. Subdivided into proximal and distal tubule and the loop of Henle.



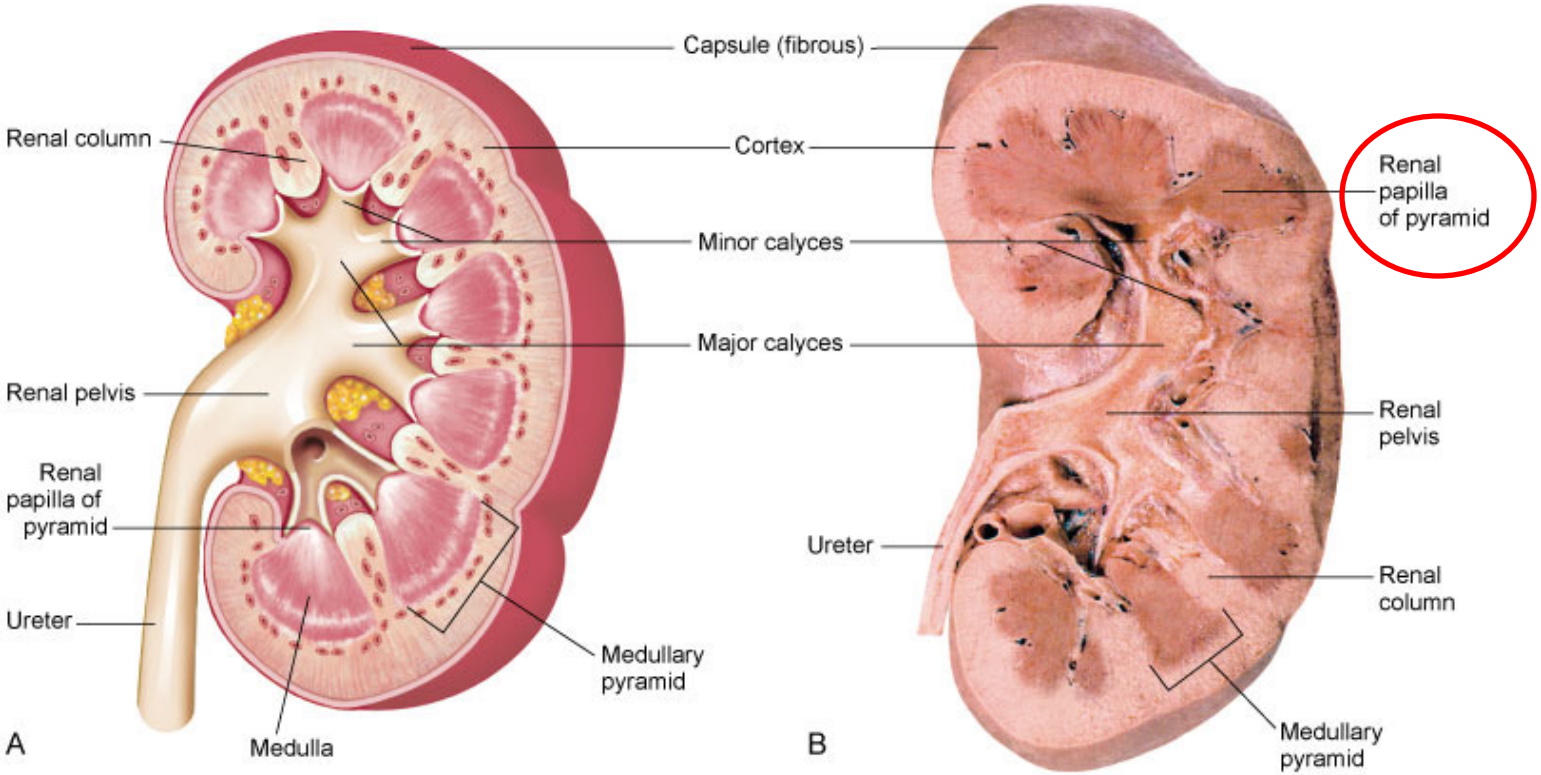
Nephron

Collecting duct Structure made up of the distal tubules of several nephrons. Joins several larger ducts to become the renal papilla.



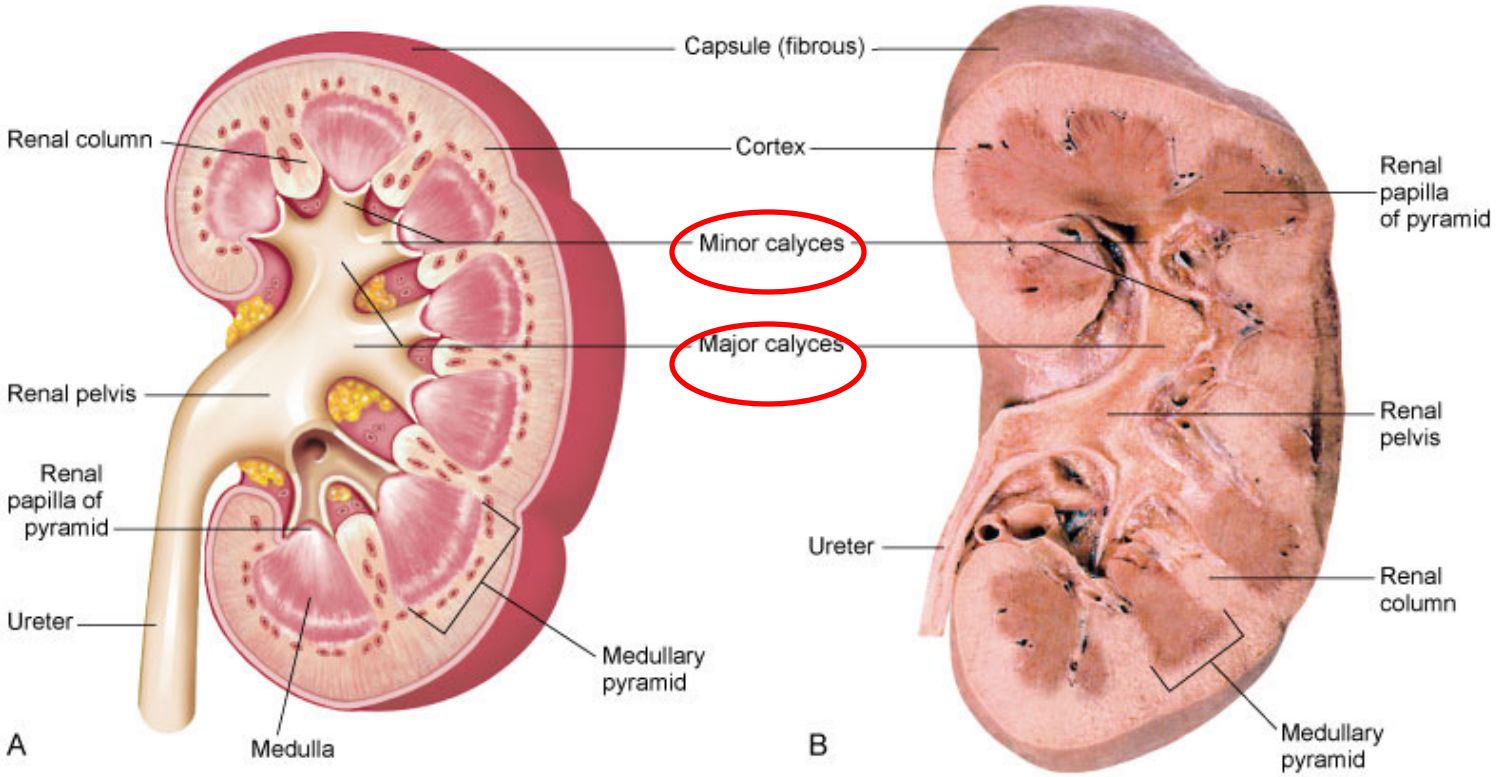
Nephron

Renal papilla Structure made up of multiple collecting ducts that join together.



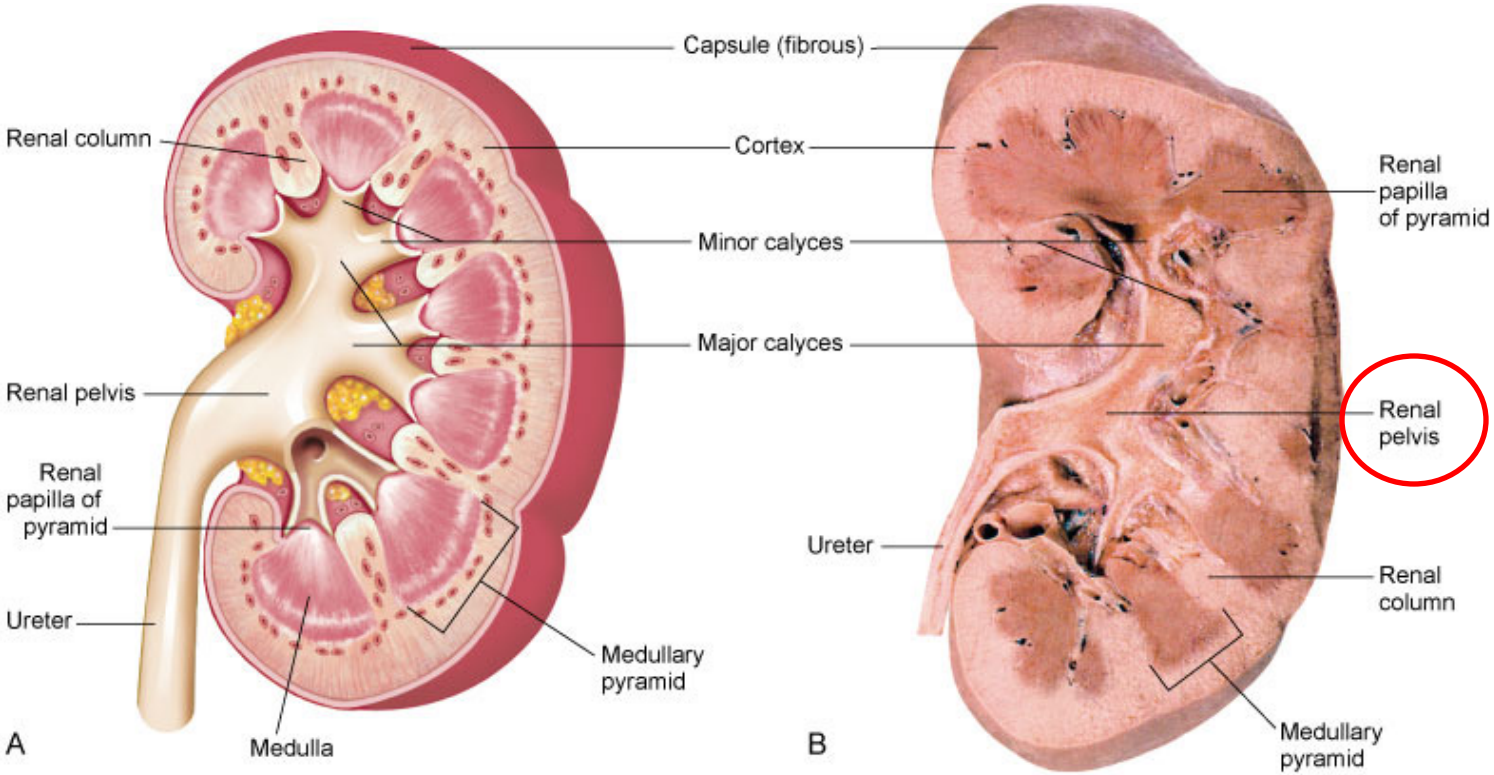
Nephron

Calyx (pl. calyces) Cup-like structure protruding from the renal papilla in the kidney. Minor calyces join to form a major calyx that leads to the renal pelvis.

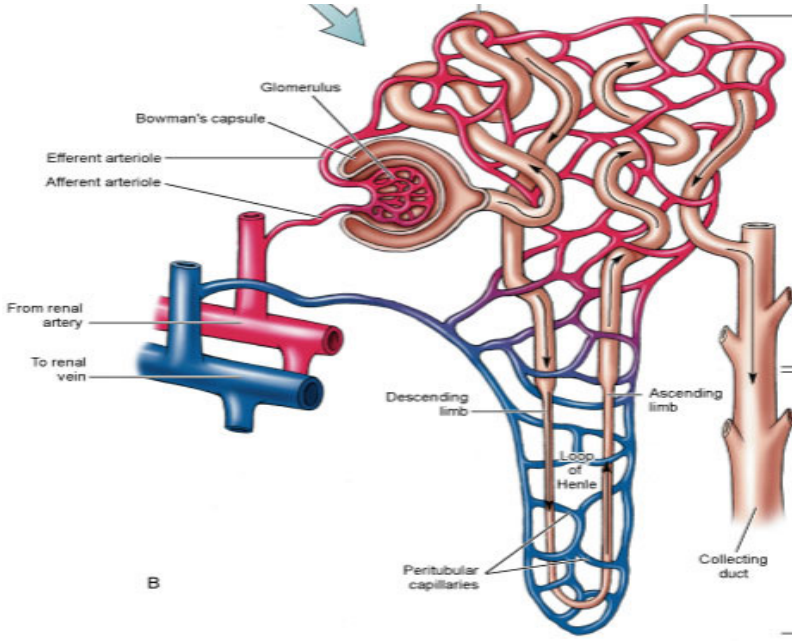


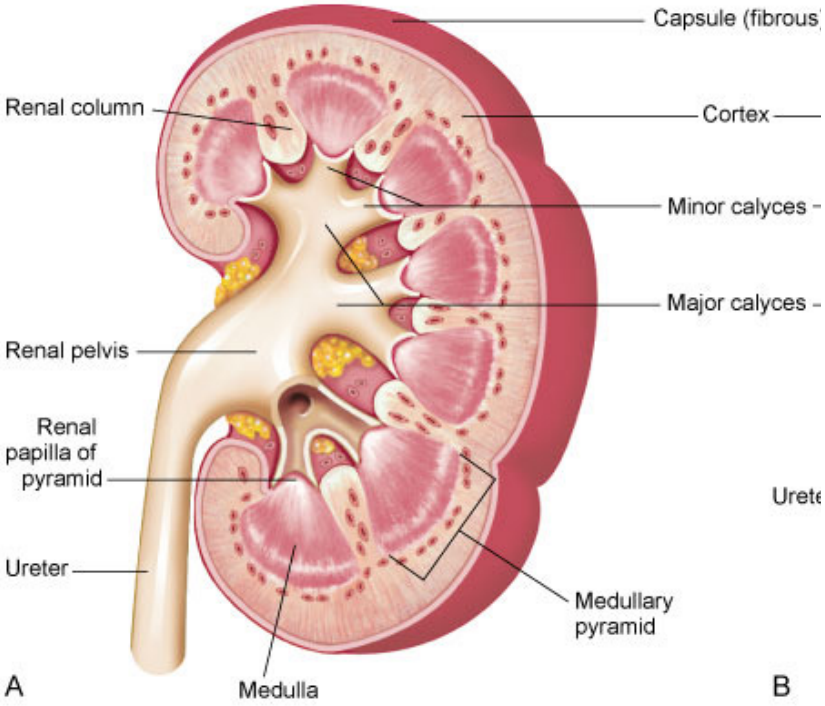
Nephron

Renal pelvis Large urine collection reservoir within the kidney. Forms the upper region of the ureter.



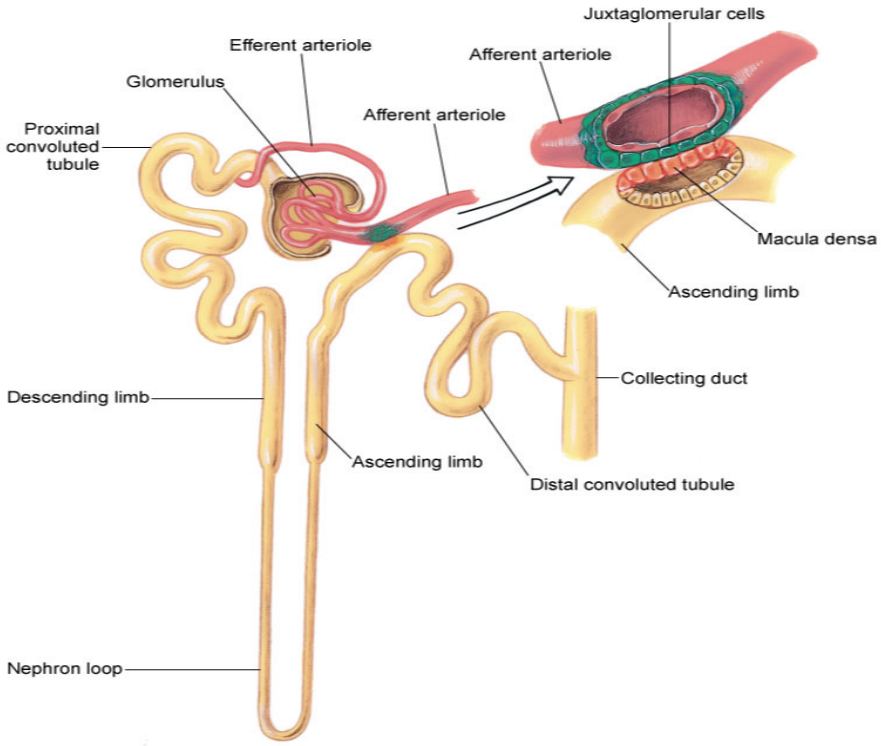
Bowman's capsule → Renal tubule → Collecting duct → Renal papilla → Minor calyx → Major calyx → Renal pelvis → Ureter





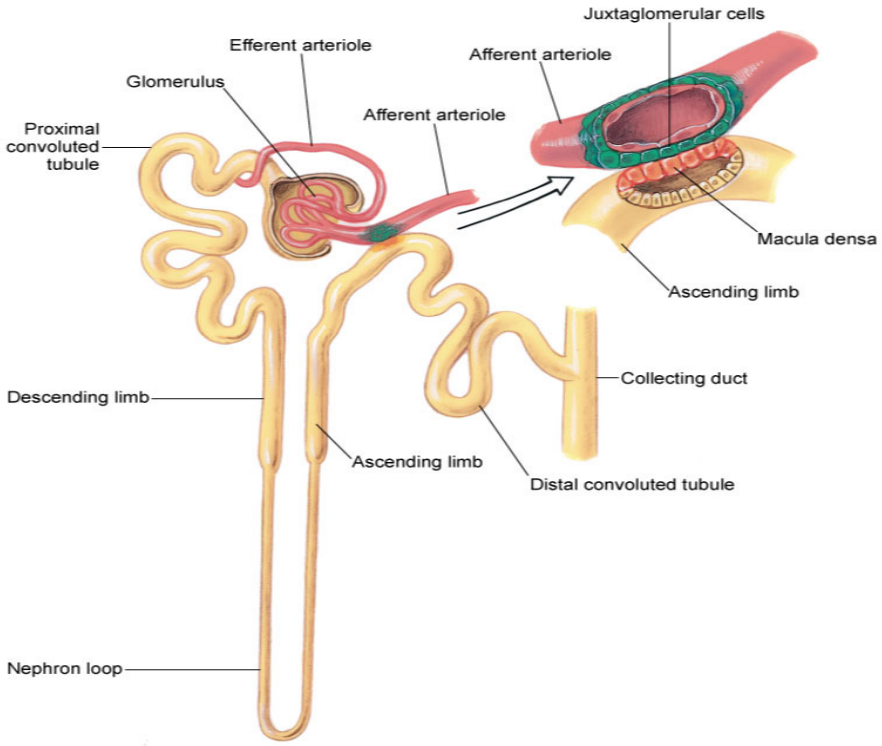
Juxtaglomerular Apparatus

Juxtaglomerular apparatus Structure within the kidney that assists in maintaining blood pressure. Consists of juxtaglomerular cells and macula densa.



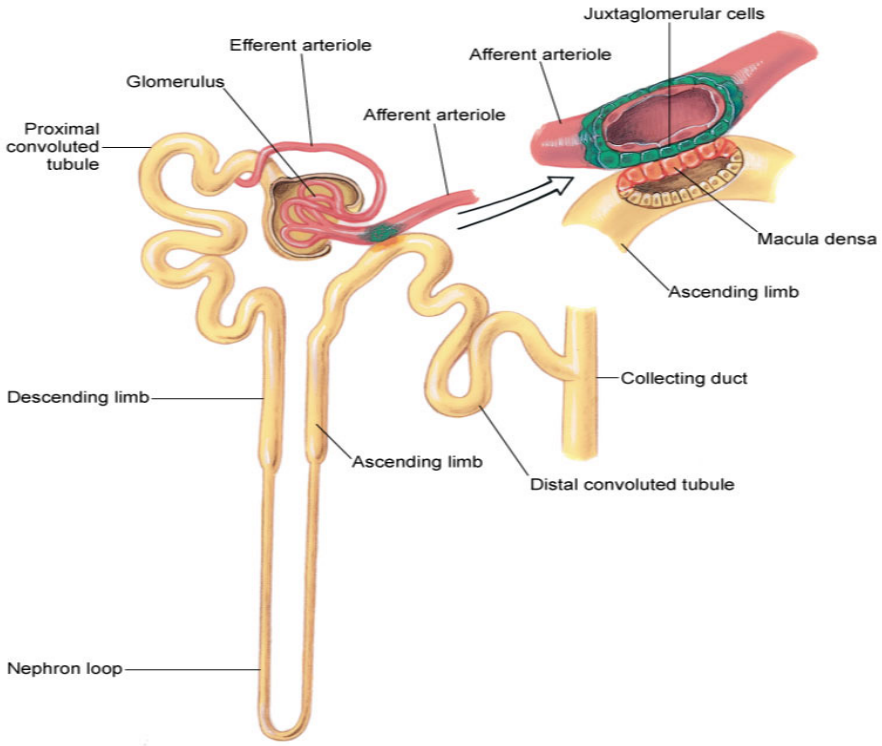
Juxtaglomerular Apparatus

Juxtaglomerular cells Structure in the nephron that monitors blood pressure and secretes <u>renin</u> when blood pressure drops.



Juxtaglomerular Apparatus

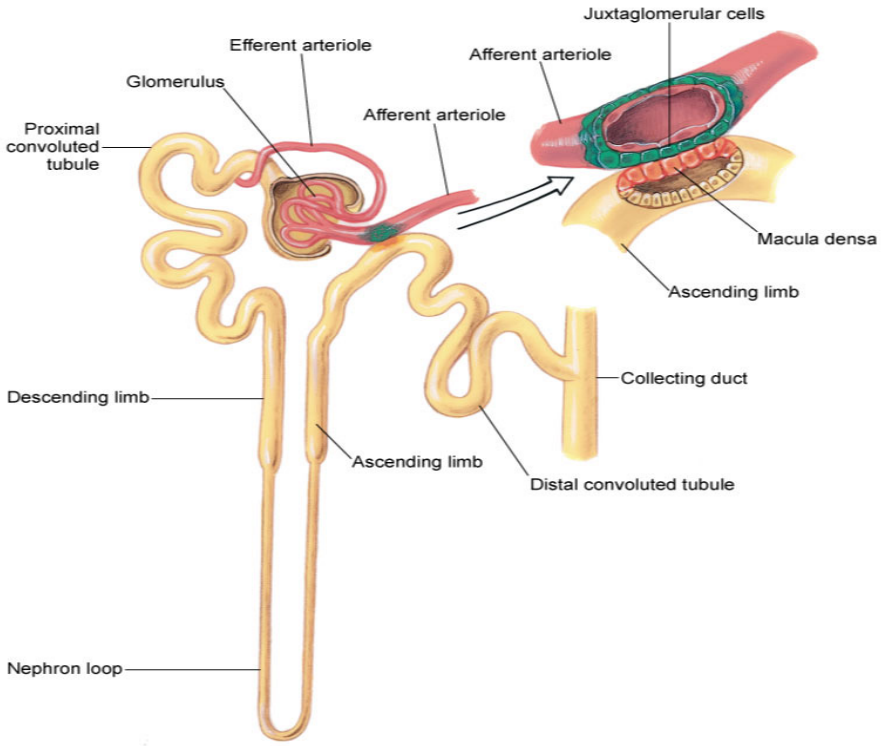
Macula densa Structure in the nephron that senses the concentration of filtrate and responds to a decrease in sodium by releasing prostaglandins, which also stimulate renin secretion.



Juxtaglomerular Apparatus

Renin Enzyme which initiates a process which ultimately increases sodium and water resorption, increasing blood volume and pressure.

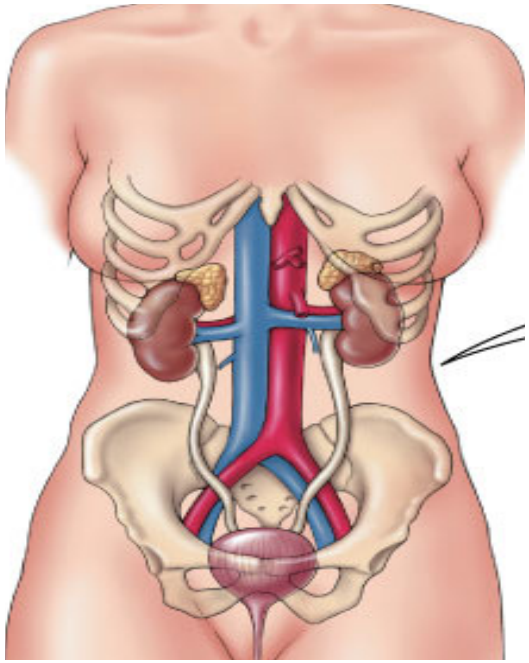
NOTE: Resorption basically means the same thing as reabsorption, "to swallow or suck in again".

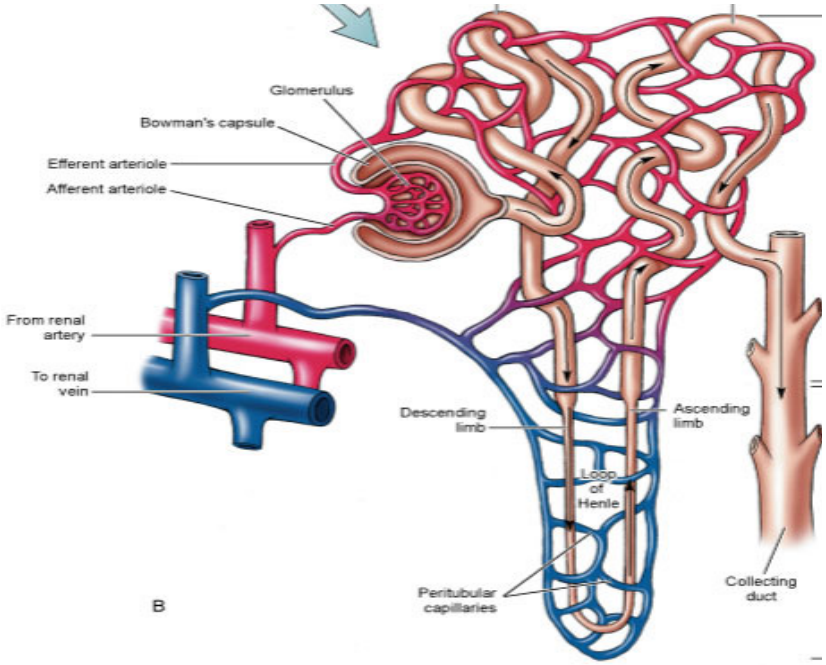


Blood Vessels and Blood Flow in the Kidneys

Renal artery → Afferent arteriole → Glomerulus → Efferent arteriole →

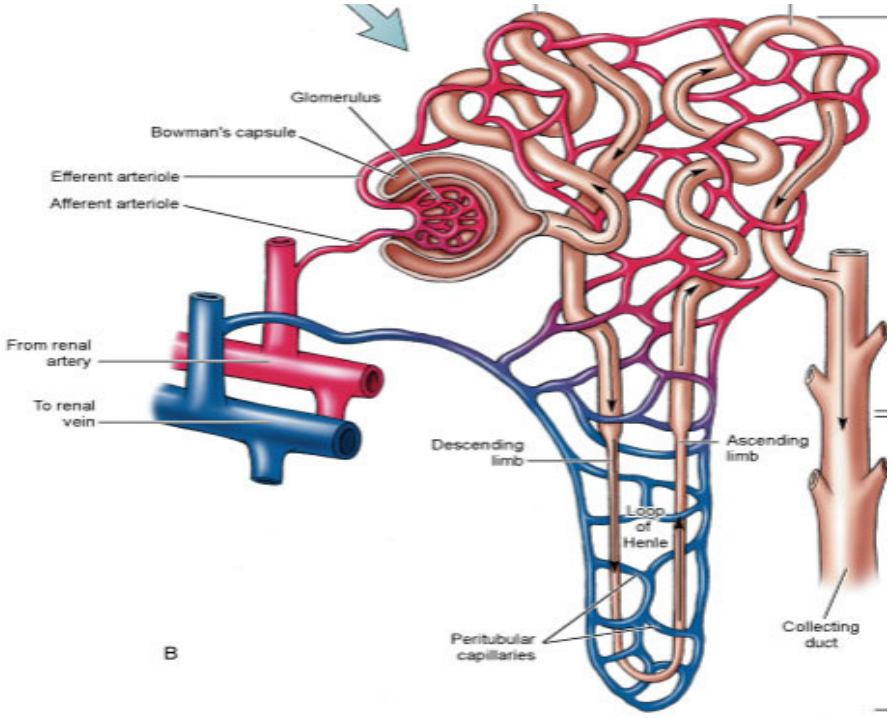
Peritubular capillaries → Renal venule → Renal vein → Inferior vena cava





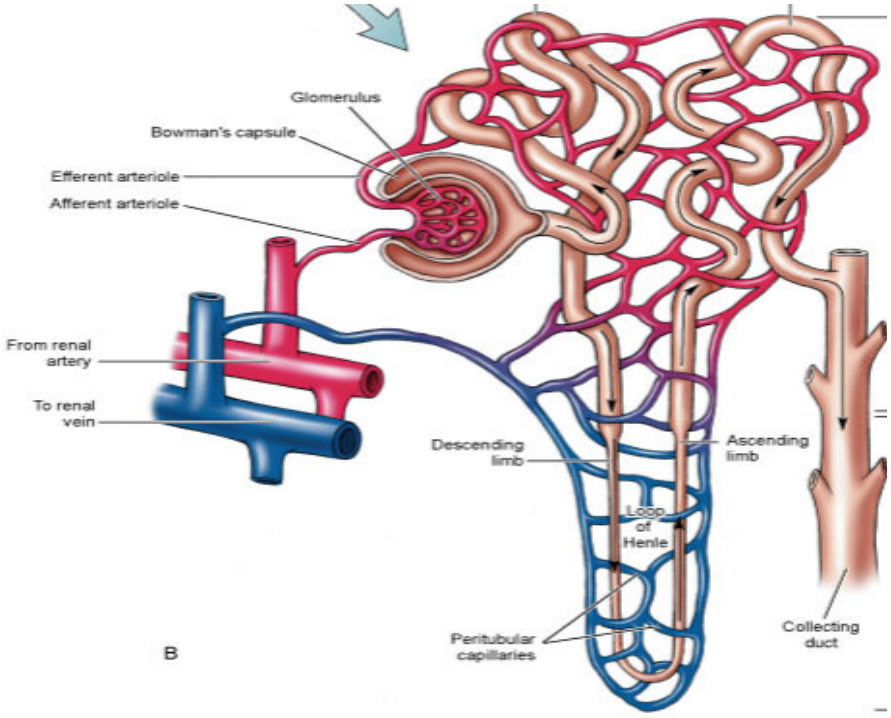
Filtration Process

Step 1: Filtration Water and small solids in the blood pass through the filtration membrane and enter the Bowman's capsule. Proteins and blood cells remain in the bloodstream.



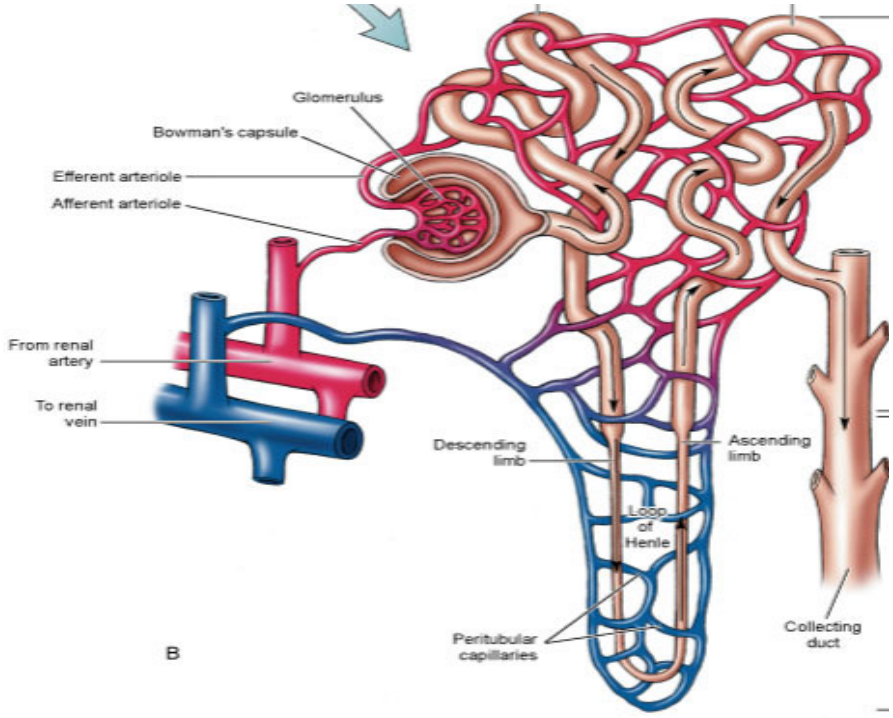
Filtration Process

Step 2: Reabsorption ___99___% of the filtrate is reabsorbed back into the blood stream.



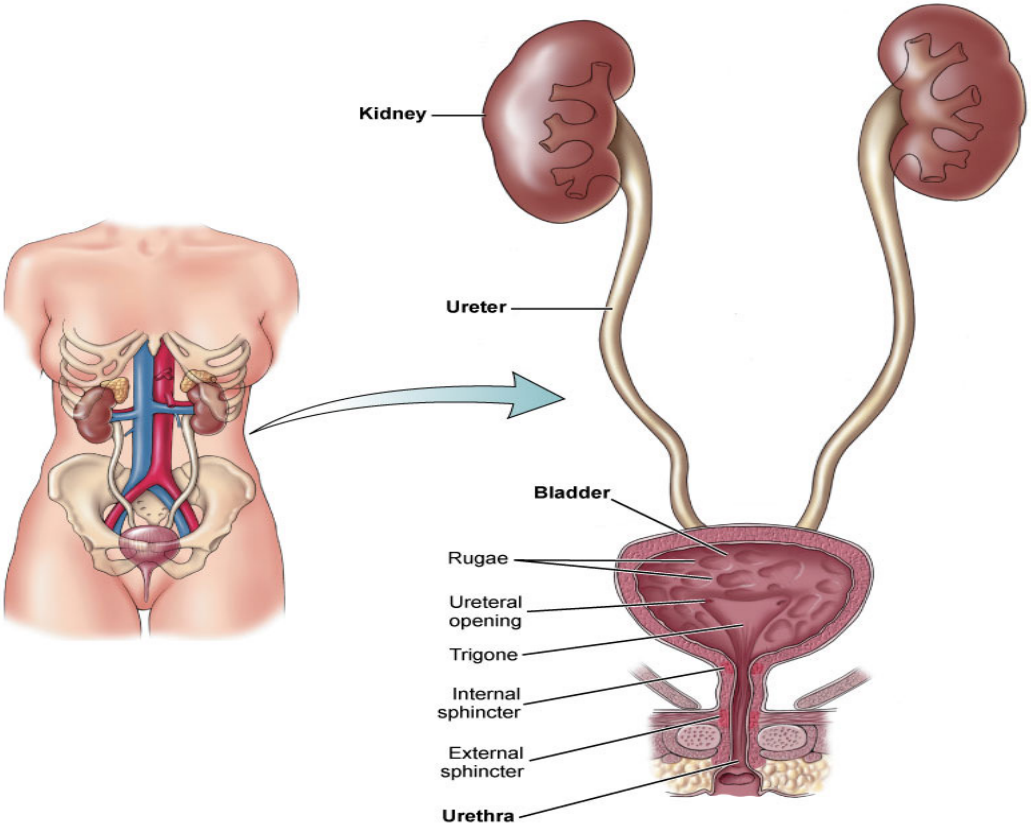
Filtration Process

Step 3: Tubular secretion Before filtrate leaves the body as urine, a final adjustment to the blood composition is made. These tubular secretions rid the body of toxic compounds to regulate blood __pH__.



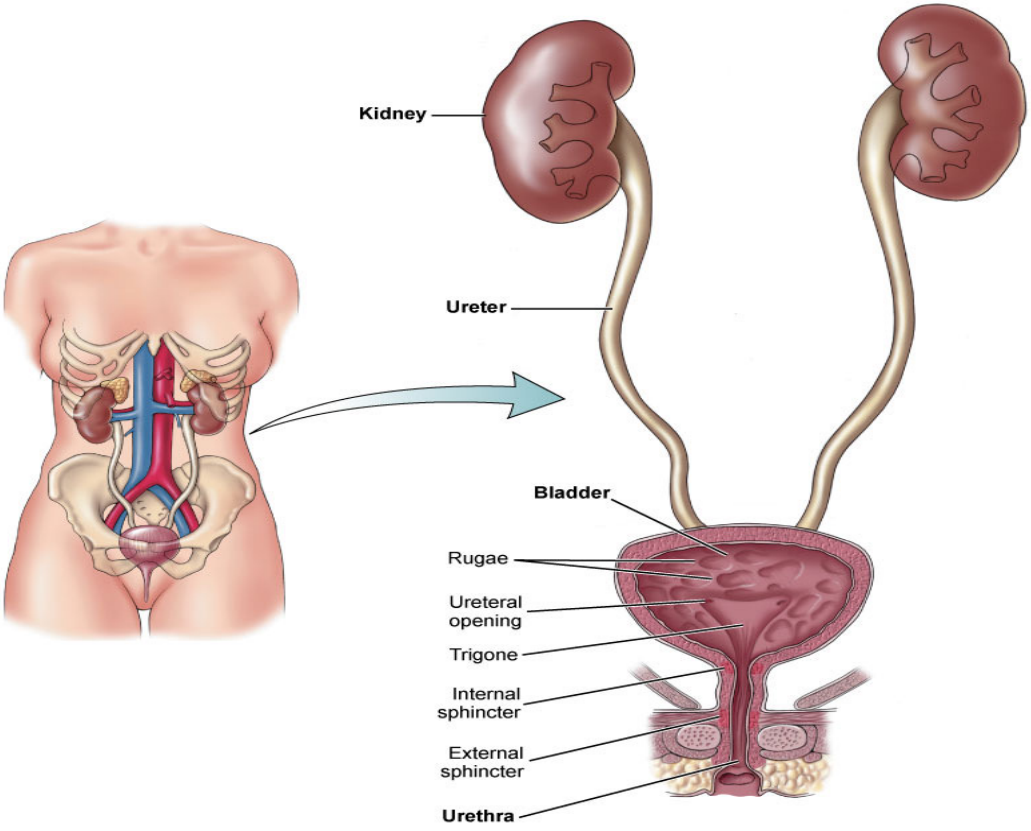
Ureters

Ureters Slender hollow tubes transporting urine formed by the kidney to the urinary __bladder__.



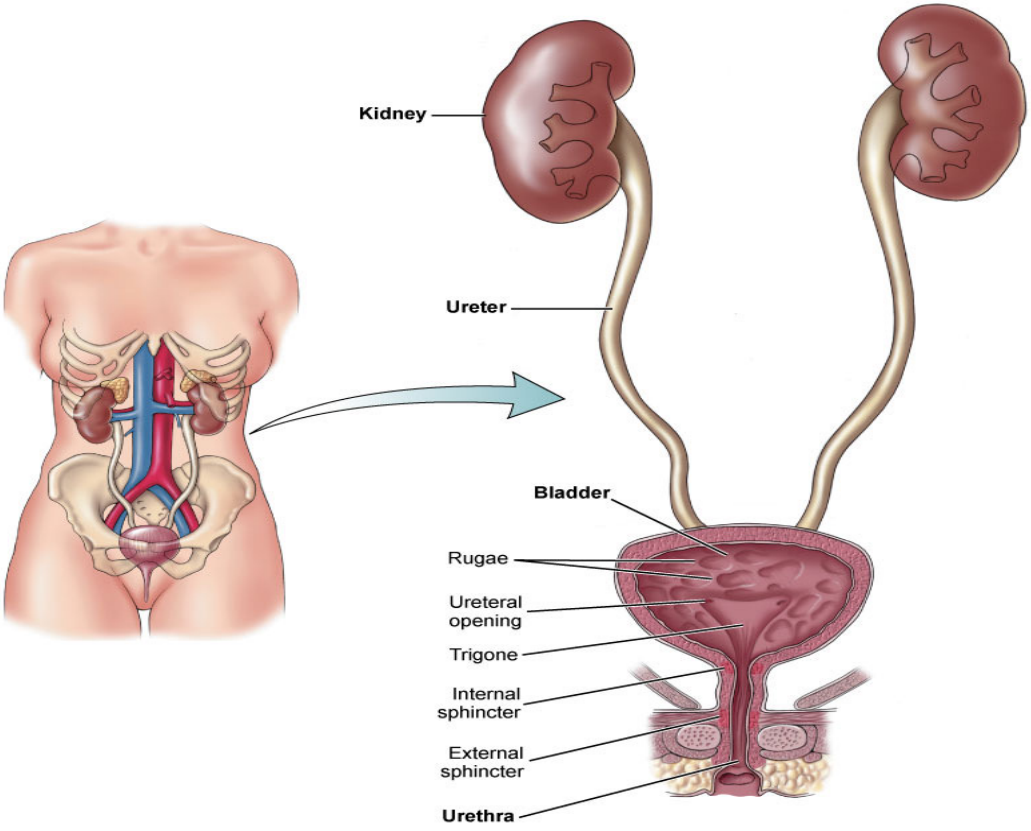
Urinary Bladder

Urinary bladder Hollow, organ that is a storage reservoir for urine. Located in the pelvis behind the pubic symphysis.



Urethra

Urethra Narrow ___tube___ that transports urine from the urinary bladder out of the body during urination.



Anatomy

Urine Concentrated filtrate from the kidneys that is 96% water and 4% dissolved wastes.

Micturition (AKA: voiding) The act of urination.

Fluid Balance and Imbalance

Fluid balance Antidiuretic hormone (secreted by the pituitary) and aldosterone (produced in the adrenal cortex) regulate the balance of water in the body.

Fluid imbalance Dehydration can occur when water is unavailable or with severe diarrhea or vomiting and excessive sweating.

Fluid Imbalance

Turgor Skin ___resiliency___, which decreases during dehydration.

Edema Abnormal ___accumulation___ of fluids in body tissue.

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