

HUMAN Exam III Study Guide

Urinary System – CH. 10

- Approx. # of questions on exam: 12-14

Basic functions of the urinary system:

- Controlling chemical composition of the blood
 - Excretion of metabolic wastes
 - Maintenance of water-salt balance & acid base-balance
 - Reabsorb filtered nutrients
- Hormone Secretion: **Renin & Erythropoietin (EPO)**
- Converts Vitamin D to active Form

Organs of the urinary system:

- Kidneys (2): bean-shaped, fist-sized organ: urine is formed
- Ureters (2): small, muscular tubes made of smooth muscle fibers that propel urine from the kidneys to the urinary bladder
- Bladder: expandable organ that stores urine until it is expelled from the body
- Urethra: tube (longer in men) that carries urine from bladder to outside of body

The parts of the Kidney: 3 Regions

- *Renal Cortex*: an outer granulated layer
- *Renal Medulla*: contains cone-shaped tissue masses called renal pyramids
- *Renal Pelvis*: central cavity that is continuous with the ureter

The parts of the Nephron (microscopic functional unit of the kidney)

- **Glomerulus**: a knot of capillaries inside the glomerular capsule where pores produce a blood filtrate
- **Proximal Convoluted Tubule**: epithelial layer with a brush border of microvilli to allow reabsorption of filtrate components
- **Loop of Nephron**: U-Shaped structure that has a descending limb to allow water to leave & an ascending limb that pushes out salt
- **Distal Convoluted Tubule**: made of epithelial cells rich in mitochondria & thus is important for movement of molecules from the blood to tubule (tubular secretion)
- **Collecting Ducts**: several nephrons share a collecting duct which serve to carry urine to the renal pelvis

The 3 basic processes occurring in the nephron

- **Glomerular filtration**
 - water & small molecules move from the glomerulus (blood) to glomerular capsule (urine) while large molecules & formed elements remain in blood

- **Tubular reabsorption**
-many molecules & ions are reabsorbed from the nephron into the blood
- **Tubular Secretion**
-a 2nd way to remove substances such as drugs, H⁺ & Creatinine from blood

Water Balance & the Kidneys

- **Facts:**
 - body is roughly 2/3 water
 - it's vital the amount of water in your blood be kept @ constant level!
 - your kidneys have control of how much water is lost in urine
- **Basic Mechanism:**
 - When you're dehydrated: kidneys reabsorb water from the urine back into blood (urine becomes concentrated)
 - When you become overhydrated: Kidneys release more water (less reabsorption) into the urine (urine becomes diluted)

Urinary System Disorders

- **Kidney Failure** - failure of kidney to perform functions
 - many causes: infections, toxins, genetic diseases, diabetes, other, etc.
 - can be detected by: abnormal amounts of nitrogenous waste products into blood, too much Water in urine (over dilute urine), protein in urine
 - treated with Hemodialysis or Kidney Replacement
 - Hemodialysis: uses an artificial kidney machine to subtract & add substances into the blood as needed
 - Kidney Replacement: single kidney transplant with a high success rate
- **Cystitis** - infection in the urinary bladder
- **Kidney Stones** - hard stone-like granules formed in the renal pelvis

Nervous System – CH. 13

- Approx. # of questions on exam: 14-16

Neurons & Information Types

3 Types of Neurons

- **Sensory** - takes impulses from sensory receptor to CNS
- **Motor** - takes impulses from the CNS to an effector (i.e. gland or muscle fiber)
- **Interneurons** - receive information in the CNS & send it to a motor neuron

Neuron Structure

- **Cell Body:** main cell where organelles & nuclei reside
- **Dendrite:** many short extensions that carry impulses to a cell body
- **Axon (nerve fiber):** single, long extension that carries impulses away from the cell body

- **Myelin Sheath:** a lipid covering on long axons that act to increase the speed of nerve impulse conduction, insulation and regeneration in the PNS

The Nerve Impulse -for this section is important to know the role of sodium and potassium, where they are in high and low concentration, and how they move during a nerve impulse

- **Action Potential:** Rapid change in the electrical potential of an axon membrane that allows a nerve impulse to occur
 - **Depolarization:** Sodium gates open letting Na⁺ in interior of axon loses negative charge (+40mV)
 - **Repolarization:** Potassium gates open letting K⁺ out, interior of axon regains negative charge (-70mV)
 - = **Nerve Impulse!**: wave of depolarization/repolarization travels down axon
 - *Resting Potential is restored by moving potassium inside & sodium outside
- **Resting Potential:** When the axon is not conducting a nerve impulse
 - more positive ions outside than inside the membrane
 - there is a negative charge of -70 mV inside the axon
 - more Na⁺ outside than inside
 - more K⁺ inside than outside

How impulses travel from one neuron to another: moves across a *synapse*

- **Synapse:** a “small gap” between the sending neuron (presynaptic membrane) & the receiving neuron (postsynaptic membrane)
- Transmission accomplished across this gap by a chemical (the neurotransmitter: e.g. Ach, dopamine, serotonin)
- **Neurotransmitters** are stored at the end of axons in synaptic vesicles

Parts of the central nervous system (CNS): consists of brain & spinal cord

-both are protected by:

- Bones- skull & vertebral column
- Meninges - 3 protective membranes that wrap around CNS
- Cerebral Spinal Fluid (CSF) - space between meninges is filled with this fluid that cushions & protects the CNS
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CNS: The Brain

- **The Brain: Cerebrum-** the lobes
 - initiation of movement (skeletal muscle)
 - integration & perception of the senses
 - Conscious Thought: “higher” brain functions - reasoning, problem solving, motivation, short term memory
- **Cerebral Cortex-** Outer layer composed of grey matter (many nerve cell bodies)
 - * Dived into 4 lobes/hemispheres:
 1. Frontal Lobe - primary motor area & conscious thought