Urinary System – Worksheet

- What are the functions of the urinary system?
- What are the structures that make up the urinary system? Where are they located within the peritoneal cavity? What covers each structure?
- Blood leave the heart by the aorta. The aorta turns sharply downward to form the abdominal aorta. What branches off the abdominal aorta to feed the kidneys? What volume is sent to the kidneys every minute?
- Just before the hilum of the kidney is reached, what happens to the renal artery?
- Segmental arteries enter the kidney and then branch to form what? What space do these arteries run through? Is this area part of the cortex or the medulla? What lies adjacent to this area?
- How many renal pyramids are there per kidney? How are they shaped? What region of the kidney are they in?
- What happens to the interlobar arteries as they reach the base or top of the renal pyramids?
- The arcuate arteries run along the base of the medullary pyramids in the cortex region. They then branch into the cortex region. What are these arteries called?
- Interlobular or cortical radiate arteries have many tiny arteries branching off of it called afferent arterioles. Where do the afferent arterioles go?
- What is the glomerulus? What is the tissue structure of the glomerulus? What is the function of the glomerulus? Is gas exchanged in the glomerulus?
- How is the glomerulus drained of blood? What is the composition of this blood as it leaves the glomerulus?[1]
- How does the afferent and efferent arteriole differ and how does that help control filtration in the glomerulus?
- Something is left behind in the glomerulus. What is the structure of the filtration membrane? What leaves the blood and travels through the filtration membrane?
- What pressure is required to allow these substances to be filtered?[2]
- What is a nephron? How many types of nephrons are there? Which type of nephron does what?
- The glomerulus is the only site in the urinary system where something is filtered. As it is pushed across the filtration membrane, the filtrate enters a space between the glomerulus and a surrounding cup. What is this space called? What is the structure of the surrounding cup and what is its name?
- The parietal layer of the Bowman's capsule drains into a tubing system. What is the first part, originating from the Bowman's capsule, of this tube?
- What is the structure of the Proximal Convoluted Tubule (PCT) from lumen to the surrounding blood vessels? Where, in the kidneys, is the proximal convoluted tubule located?
- What is the structure and function of the cells of the proximal convoluted tubule?
- What is reabsorption? Secretion? What solutes are absorbed by the PCT? Secreted? How are they reabsorbed or secreted by cells?
- The PCT turns into the medulla and transitions into the thin descending limb of the loop of Henle (nephron). What part of the solution can exit the filtrate and enter the medullary pyramid. How and why does this happen?
- What is osmolarity? What is the osmolarity of the blood in the capillaries? How does the osmolarity of the filtrate and medullary pyramid change as the descending limb plummets further into the medullary pyramid? How does osmolarity function with respect to urine formation?
- The loop of Henle reaches the bottom and then turns upward again. The cells transition from simple squamous to cuboidal to columnar to form the thick limb of the loop of Henle. What part of the remaining solution is now able to leave the filtrate and enter the medullary pyramid? How and why does this occur?
- [1]The efferent arteriole can become either the peritubular capillaries surrounding the PCT or the vasa recta surrounding the loop of Henle.
    - When does either situation occur? Does gas exchange happen in either of these two capillaries?
    - How is the vasa recta organized with respect to the loop of Henle?
    - What is the path that blood follows back to the inferior vena cava?

- When solutes or solvent enters the medullary pyramids, does reabsorption occur? Why or why not?
- [2]What happens to the tube system as it reaches the top of the ascending limb of the loop of Henle?
    - What is the structure of the juxtaglomerular apparatus (JGA)? The function?
    - What cells play prominent roles in the JGA? What is the function of each cell?
    - How does solute concentration of the JGA affect the filtration pressure in the glomerulus?[2]
- What is the structure and function of the late distal convoluted tubule (DCT)? What cells are present to alter the composition or concentration of the filtrate? Why or when might these need to be altered?
- How is acidity of the urine/filtrate managed? The concentration?
- What might be reabsorbed in the DCT? Secreted? How are these items reabsorbed or secreted?
- How do the collecting ducts differ in structure and function from the late distal convoluted tubule?
- How many nephrons are attached to a single collecting duct?
- How is urine/filtrate altered as it passes through the collecting ducts? Where does the collecting duct terminate?
- Papillae drain filtrate/urine into a collecting cup called the minor calyces, what are collections of minor calyces? The major calyces converge to form what structure?
- The Renal pelvis drains into what structure?
- What are the tissue layers of the ureters from the lumen outward? How does the mucosa change along its journey? How is fluid transported along this tube?
- How does fluid enter and exit the bladder? What are the tissue layers of the bladder from the lumen out? What is the function of the bladder?
- What factors are involved in allowing micturition?
- What are the tissue layers of the urethra, from the lumen out? How does the mucosa change from the bladder to the external environment? How does the urethra differ between men and women?
- [2]What is the net filtration pressure? How is it established?
- What is the glomerular filtration rate (GFR)? What factors affect the glomerular filtration rate?
- How does smooth muscle in the afferent arteriole affect GFR? How about the juxtaglomerular apparatus?
- How does the nervous system aid in maintaining GFR?
- What is the renin-angiotensin-aldosterone system (RAA or RAS) and how does it affect urine formation and composition?
- What role does erythropoietin production play in regulation of urine formation? What cells produce it? What is the result?
- What is the role of parathyroid hormone and calcidiol in the kidneys for the maintenance of blood-calcium levels? What other systems or cells are also affected?
- What are diuretics and how do they alter urine production and composition?
- What are the physical and chemical characteristics of normal urine?
- What is renal clearance and how can it be used to determine kidney function?
- What are the following alterations in the renal system? Renal ptosis? Pyelitis? Pyelonephritis? Anurea? Chronic renal disease? Renal Failure? Renal calculi? Glomerulonephritis? Bacterial infections?
- Overview: What is the flow of circulation to and from the kidneys?
- Overview: What is the structural and functional unit of the kidneys?
- Overview: What is the structure and flow of the nephron?
- Overview: What modifications occur to the filtrate as it moves through the nephron?
- Overview: What factors control the net filtration pressure in the glomerulus?
- Overview: What diseases or disorders occur as a result of renal dysfunction throughout the urinary system?