Physiology Final Exam

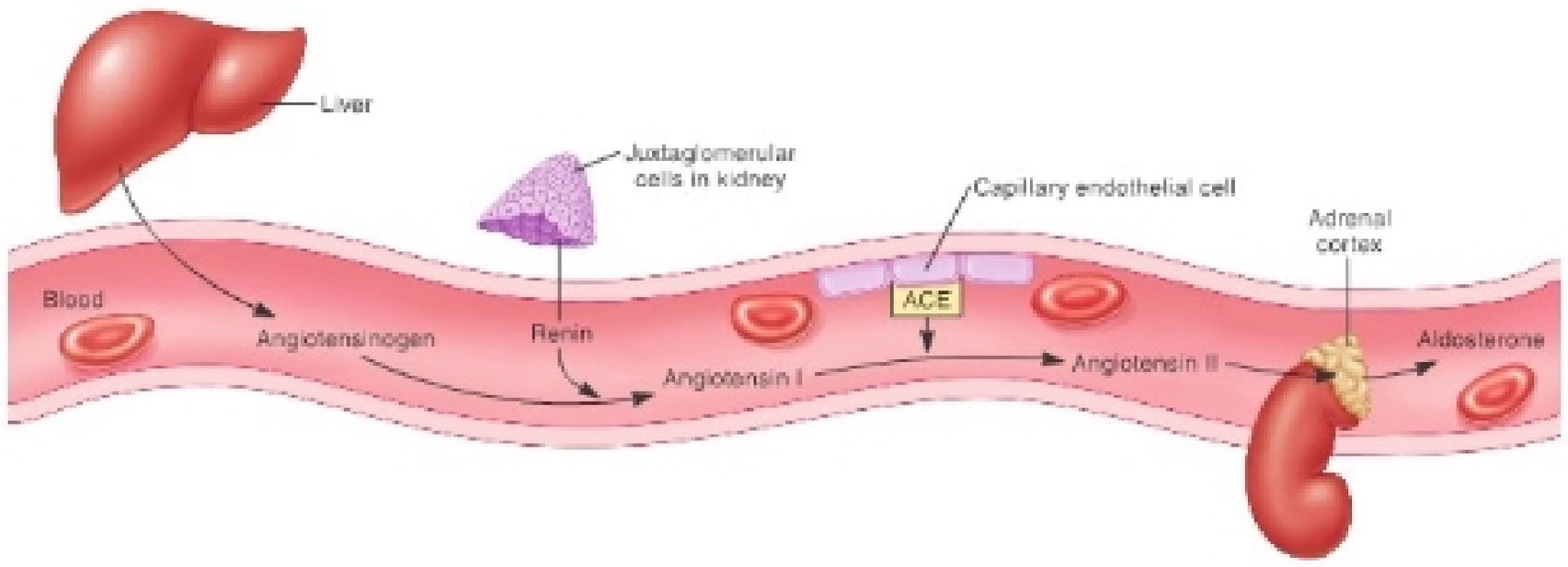
Urinary System

1. Describe the gross anatomy of the Urinary System.
    a. The Urinary System consists of 2 kidneys, 2 ureters, the urinary bladder and the urethra.
    b. Once formed by the kidneys, the urine is conducted to the bladder by the ureters. The bladder stores the urine until it is time to excrete it. At this time the urine moves through the urethra and out of the body. Sometimes, crystals in the kidneys from into stones, which also may pass down the ureter to the urethra.
    c. The kidneys are paired organs lying at the rear wall of the abdominal cavity just above the waistline, at about the level of the 12th rib.
    d. Kidneys, renal artery drains blood out of the kidneys, urine drains into the ureters and then the urine exits the body through the urethra.
2. Trace a drop of urine from the renal pelvis to the urethra
    a. Distal tubule → drains into the renal pelvis → then to the ureter → then to the bladder → then exiting the body via the urethra.
3. Describe the functions of the urinary system.
    a. Fluid balance
    b. Excretion of metabolic waste
    c. pH balance
    d. Endocrine functions
    e. Regulation of mineral content
    f. Tonocity
4. Describe the anatomy of the nephron, including the vascular portion and the tubular portion.
    a. The nephron is the function unit of the kidney
    b. Capillaries surround the tubular portion of the kidney
    c. The proximal tubule empties into the loop of Henle, the portion of the tubule that makes up the hairpin loop of the nephron.
5. Describe the process of glomerular filtration and what pressure favors filtration and what pressure oppose filtration.
    a. Glomerular capillary hydrostatic pressure- favors filtration and is = to the BP in the glomerular capillaries (55mm Hg)
    b. Plasma- Colloid osmotic pressure – opposes filtration (30 mm Hg)
    c. Bowman's capsule hydrostatic pressure- opposes filtration (15 mm Hg)
    d. Net filtration pressure (difference between force favoring filtration and forces opposing filtration- favors filtration (55-30+15= 10 mm Hg)
6. Describe how a drop in BP, by constricting the afferent arterioles of the nephrons, affects the glomerular filtration rate.
    a. Decrease BP causes an increase in sympathetic activity → gen vasoconstriction of the arterioles. This could also include the afferent arterioles in the nephron. This will lead to decreased glomerular filtration rate which will decrease urine volume which will increase the fluid retained.

7. Describe the process of tubular reabsorption, including the steps in transepithelial transport.
    a. Fluid
    b. Sugar
    c. Salt
    d. Tubular reabsorption- solutes travel across 2 barriers- tubule epithelium- tight junctions molecules can move through in 2 ways, passive reabsorption with concentration gradient, active reabsorption- requires channels or carries, capillary endothelium- forms a barrier for macromolecules such as proteins or cells to pass through

8. Explain that 1/5 of the plasma that is filtered out of the glomerulus into Bowman's capsule and that this filtrate should not contain plasma proteins or blood cells.
    a. 1/5 of our plasma is filtered out. It is not exiting with out urine it will be reabsorbed.
    b. Because proteins are generally the only solute that cannot move between plasma and Bowman's capsule, these molecules generate the osmotic force.
9. Explanation of filtered fluid and NaCl
    a. 80% of the energy expensed by our kidneys is moving salt around. This is because when you move around salt, water follows. This has to do with urine.
    b. 67% of reabsorption of sodium takes place from the proximal tubule
    c. 25% of salt is reabsorbed from the loop of Henle
    d. 8% is by the distal tubules. This is under hormonal control
10. Describe tubular max and what it takes to reach it and what happens when it is reached for a particular substance
    a. When all the carries for a particular substance are occupied we can say we reached tubular maximum. To reach tubular maximum, you would have to have 3x the normal amount of sugar in your body.
11. Describe the renin- angiotensin -aldosterone system
    a. Once renin is released from the granular cells into the blood- stream it initiates a series of reactions that lead to the release of aldosterone. Renin acts on another protein, angiotensinogen, which is secreted by the liver. Renin cleaves off some amino acids from angiotensinogen, converting it to angiotensin 1. As angiotensin 1 molecules circulate in the bloodstream they encounter angiotensin converting enzyme (ACE), which is bound to the inner surfaces of capillaries throughout the body (abundant in lungs). ACE cleaves off some amino acids from angiotensin 1 converting it to angiotensin 2. In addition to acting as a vasoconstrictor that plays and important role in the regulation of mean arterial pressure, angiotensin 2 also stimulates aldosterone release from the adrenal cortex.

b.



12. Discuss the Na+ losing system and the role of ANP
    a. Atrial natriuretic peptide (ANP) is secreted by cells in the atria of the heart is response to distension of the atrial wall, which occurs when plasma volume increase. ANP increase sodium excretion by increasing the glomerular filtration rate and by decreasing sodium reabsorption.
13. Discuss the tubular secretion of k+ and its importance

Fluid Regulation

1. Describe the water distribution in the body, including in the 2 major fluid compartments: the ICF and the ECF
    a. Total body water is 60% of body weight
        i. ICF 40% total body weight
        ii. ECF 20% total body weight
2. Describe the 4 compartments of the ECF
    a. Plasma
    b. Lymph
    c. Inertisital Fluid
    d. Transcellular fluid

Acid-Base Balance

1. Describe what an acid does.
    a. 0-6pH
    b. increase in H+ concentration
2. Describe what a base does.
    a. 8-14 pH
    b. Decrease in H+ concentration
3. State the normal pH of the blood
    a. 7.35-7.45
4. Describe what is meant by acidosis and alkalosis in regards to the pH scale
    a. Acidosis
        i. When blood pH falls bellow 7.35
    b. Alkalosis
        i. When blood pH rises above 7.45
5. Describe why the pH of the venous blood is lower then the pH of the arterial blood
    a. Venous blood is deoxygenated, arterial blood is oxygenated