1. The molecular weight of calcium is 40 and chloride is 36. How many milligrams of CaCl$_2$ is required to give 2 mEq of calcium?

   a) 40  
   b) 72  
   c) 112  
   d) 224

2. The extracellular volume of a 40 kg patient is about

   a) 3.2 liters  
   b) 8 liters  
   c) 16 liters  
   d) 24 liters

3. Ingestion of 2 liters of hypertonic NaCl would do which of the following?

   a) Increase intracellular volume  
   b) Decrease intracellular osmolarity  
   c) Increase extracellular volume  
   d) Decrease extracellular osmolarity.

4. Which Starling pressure is physiologically controlled to regulate glomerular filtration rate.

   a) Plasma colloid osmotic pressure  
   b) Glomerular capillary hydrostatic pressure  
   c) Proximal tubule hydrostatic pressure  
   d) Tubular fluid colloid osmotic pressure

5. The osmolarity of tubular fluid at the end of the proximal tubule is

   a) the same as plasma  
   b) less than plasma  
   c) greater than plasma  
   d) the same as urine
6. Your patient has a 24 hour urine output of 2 liters and the urine concentration of creatinine 100 mg%. What is the glomerular filtration rate if the plasma concentration of creatinine is 4 mg%?

a) 40 liters/day  
b) 50 liters /day  
c) 100 liters/day  
d) 180 liters/day

7. Normally the proximal tubule reabsorbs

a) about 2/3 of the filtered glucose  
b) about 2/3 of the filtered bicarbonate  
c) about 2/3 of the filtered sodium  
d) about 2/3 of the filtered amino acids

8. Aquaporins are located in the luminal membrane of all of the following nephron segments EXCEPT:

a) The proximal tubule.  
b) The thin descending limb of the loop of Henle.  
c) The thick ascending limb of the loop of Henle.  
d) The collecting tubule in the presence of ADH.

9. Which one of the following statements is INCORRECT’?

a) Countercurrent multiplication occurs in the loop of Henle.  
b) Loop diuretics will inhibit the countercurrent multiplication process.  
c) Urea reabsorption occurs along the entire collecting tubule system.  
d) Increases in plasma osmolality as well as decreases in plasma volume can stimulate ADH secretion.

10. Which one of the following statements is INCORRECT?

a) Atrial natriuretic peptide increases glomerular filtration rate.  
b) An increase in renal sympathetic nervous system activity will increase renin release.  
c) Aldosterone increases Na' reabsorption in the cortical collecting tubule.  
d) Conversion of angiotensin I to angiotensin II is the rate-limiting step in the renin-angiotensin-aldosterone system.
1. The rate limiting step in the generation of angiotensin II is the
   a) rate of renin secretion by the kidney
   b) amount of substrate made by the liver
   c) concentration of angiotensinases in the blood
   d) activity of converting enzymes in the lung

2. The starling pressure most responsible for the formation of edema in congestive heart failure is
   a) increased interstitial hydrostatic pressure
   b) decreased plasma colloid osmotic pressure
   c) increased capillary hydrostatic pressure
   d) decreased interstitial colloid osmotic pressure

3. A 50 kilogram patient probably has a total body water of
   a) 10 liters
   b) 20 liters
   c) 30 liters
   d) 50 liters

4. The most potent stimulus for the release of aldosterone by the adrenal gland is
   a) increased angiotensin II
   b) decreased plasma potassium concentration
   c) increased plasma sodium concentration
   d) decreased adrenocorticotropic hormone

5. Which of the following is NOT an action of angiotensin II?
   a) increased arteriolar constriction
   b) increased venous tone
   c) increased aldosterone secretion by the adrenal gland
   d) increased collecting duct permeability to water
6. Antidiuretic Hormone release from the pituitary is stimulated by
   a) increased plasma osmolarity
   b) increased blood volume
   c) decreased angiotensin II
   d) decreased plasma sodium concentration

7. Pressure natriuresis refers to the observation that
   a) increased sodium in the blood increases blood pressure
   b) decreased blood pressure increases renin release by the kidney
   c) increased blood pressure increases sodium excretion
   d) increased angiotensin II increases blood pressure

8. The most important renal action of aldosterone is to
   a) increase collecting duct permeability to water
   b) increase glomerular filtration rate
   c) increase renal renin release
   d) increase renal tubular sodium reabsorption

9. The physiologic variable which is controlled to regulate glomerular filtration rate is
   a) plasma colloid pressure
   b) glomerular capillary hydrostatic pressure
   c) bowman's space hydrostatic pressure
   d) tubular colloid osmotic pressure

10. The normal mechanism by which the kidney regulates sodium excretion is by
    a) altering the filtered amount of sodium
    b) altering proximal tubule reabsorption of sodium
    c) altering distal nephron reabsorption of sodium
    d) altering the collecting duct reabsorption of urea.
1. The rate limiting step in the formation of angiotensin II is
   a) the amount of angiotensinase in the blood
   b) the rate of renin substrate (angiotensinogen) release by the liver
   c) the amount of converting enzyme in the lungs
   d) the rate of renin release by the kidney

2. Ingestion of salt tablets without water will decrease which of the following volumes
   a) plasma volume
   b) interstitial volume
   c) extracellular volume
   d) intracellular volume

3. The variable most responsible for physiologically regulating glomerular filtration rate is
   a) pressure in Bowman's space
   b) plasma colloid osmotic pressure
   c) glomerular capillary pressure
   d) efferent arteriole resistance

4. The mechanism of edema formation in congestive heart failure is
   a) decreased blood pressure
   b) decreased colloid osmotic pressure
   c) increased capillary pressure
   d) decreased interstitial pressure

5. Severely diminished renal function (as in the clinical case) results in loss of the ability to regulate
   a) water balance
   b) potassium balance
   c) calcium balance
   d) acid/base balance
   e) all of the above

6. The concentration of creatinine at the end of the proximal tubule is
   a) greater than plasma concentration of creatinine
   b) less than plasma concentration of creatinine
   c) the same as the plasma concentration of creatinine
   d) less than the urine concentration of creatinine
7. A patient with a high circulating ADH concentration would have a
   a) high urine output and a high urine concentration
   b) high urine output and a low urine concentration
   c) low urine output and a high urine concentration
   d) low urine output and a low urine concentration

8. Aldosterone act on the kidney to
   a) increase water reabsorption in the collecting duct
   b) increase the conversion of CO₂ + H₂O to H + HC₀₃ in the proximal tubule
   c) constrict the afferent arteriole
   d) increase the reabsorption of sodium in the collecting tubule

9. The greatest amount of the filtered sodium is reabsorbed in
   a) the proximal tubule
   b) the ascending loop of Henle
   c) the distal tubule
   d) the collecting tubule

10. Atrial natriuretic peptide is released by
    a) atrial myocytes
    b) the adrenal gland
    c) the juxtaglomerular apparatus
    d) the pituitary
1. Reabsorption of water occurs in all of the following nephron segments except:
   a) The proximal tubule.
   b) The thin descending limb of the loop of Henle.
   c) The thick ascending limb of the loop of Henle.
   d) The collecting tubule during antidiuresis.

2. Select the one INCORRECT statement:
   a) Countercurrent exchange occurs in the vasa recta.
   b) Loop diuretics will inhibit the countercurrent multiplication process.
   c) The cortical collecting tubule is highly permeable to urea.
   d) Both increased plasma osmolality and decreased plasma volume can stimulate ADH secretion.

3. Which one of the following statements is INCORRECT?
   a) The effect of antidiuretic hormone has a faster onset time than the effect of aldosterone.
   b) The stimulatory effect of aldosterone on both Na⁺ reabsorption and K⁺ secretion is due in part to increased Na⁺-K⁺-ATPase activity.
   c) Aldosterone can regulate the reabsorption of up to 50% of the filtered toad of Na⁺.
   d) ADH secretion is primarily regulated via hypothalamic osmoreceptors.

4. Select the one INCORRECT statement:
   a) Atrial natriuretic peptide decreases glomerular filtration rate.
   b) A decrease in afferent arteriolar pressure will increase renin release.
   c) Aldosterone increases Na⁺ reabsorption in the cortical collecting tubule.
   d) Angiotensin II can increase ADH release.

5. The proximal tubule reabsorbs all of the following EXCEPT
   a) water
   b) sodium
   c) creatinine
   d) glucose

6. The path of blood flow through the kidney is
   a) afferent arteriole -> glomerular capillary -> efferent arteriole -> peritubular capillary
   b) glomerular capillary -> efferent arteriole -> peritubular capillary -> afferent arteriole
   c) efferent arteriole -> peritubular capillary -> afferent arteriole -> glomerular capillary
   d) peritubular arteriole -> afferent capillary -> glomerular arteriole -> efferent capillary
7. The path of fluid flow through the kidney is
   a) loop of Henle -> distal. tubule -> collecting duct -> glomerular capillary -> proximal tubule
   b) proximal tubule -> loop of Henle -> distal tubule -> collecting duct -> glomerular capillary
   c) glomerular capillary -> proximal tubule -> loop of Henle -> distal tubule -> collecting duct
   d) collecting duct -> glomerular capillary -> proximal tubule -> loop of Henle -> distal tubule

8. You have a bottle of unknown volume. Ott wants you to determine the volume of the fluid in the bottle. If you put 6 grams of substance X in the bottle and measure the concentration of substance X, after you shake the bottle up, you find that it is 2 gm/L. What is the volume of fluid in the bottle?
   a) 2 liters
   b) 3 liters
   c) 6 liters
   d) 12 liters

9. According to the tubuloglomerular feedback theory of renal autoregulation, an increase in NaCl delivery to the macula densa should
   a) increase blood flow and increase glomerular filtration rate
   b) decrease blood flow and decrease glomerular filtration rate
   c) increase the ultrafiltration coefficient
   d) increase proximal reabsorption

10. Your patient has the following laboratory values
    Plasma creatinine concentration  1.0 mg%
    Urine creatinine concentration  60.0 mg%
    Urine flow rate                1.5 ml/min

    The calculated glomerular filtration rate (GFR) is
    a) 1 ml/min
    b) 15 ml/min
    c) 60 ml/min
    d) 90 ml/min
1. Creatinine can be used to measure glomerular filtration rate because
   a) it is secreted by the kidney
   b) is reabsorbed by the kidney
   c) it is filtered and not reabsorbed
   d) it is metabolized by the muscles

2. Albumin does not cross the glomerular capillaries to any large extent because
   a) it is too big
   b) it has a negative charge
   c) the kidney reabsors filtered protein
   d) albumin is made in the liver

3. The kidney filters fluid along the entire length of the glomerular capillary because
   a) the hydrostatic pressure always exceeds the colloid osmotic pressure
   b) the colloid osmotic pressure always exceeds the hydrostatic pressure
   c) the blood flow is high
   d) Bowman's Space pressure is high

4. PAH can be used to measure renal plasma flow because
   a) it is actively secreted
   b) the clearance of PAH is equal to renal plasma flow
   c) PAH is bound to plasma proteins
   d) PAH is metabolized by the kidney

5. Use the following data to calculate glomerular filtration rate
   Plasma Creatinine = 2 mg%; Urine Flow = 1 ml/min; Urine Creatinine = 120 mg%
   a) 10 ml/min
   b) 20 ml/min
   c) 60 ml/min
   d) 120 ml/min
6. Input signals to the juxtaglomerular segment of the kidney can come from
   a) the renal nerves
   b) blood pressure
   c) the macula densa
   d) all of the above

7. Reabsorption refers to
   a) movement of solute from the glomerulus to bowman's space
   b) movement of solute from tubule lumen to peritubular capillary
   c) movement of solute from peritubule capillary to tubule lumen
   d) loss of solute in the urine

8. Your patient has the following laboratory values
   Plasma creatinine concentration 1.0 mg%
   Urine creatinine concentration 60.0 mg%
   Urine flow rate 1.5 ml/min

   The calculated glomerular filtration rate (GFR) is
   a) 1 ml/min
   b) 15 ml/min
   c) 60 ml/min
   d) 90 ml/min

9. You have a bottle of unknown volume. The mad Dr. Ott wants you to determine the volume of the fluid in the bottle. If you put 6 grams of substance X in the bottle and measure the concentration of substance X, after you shake the bottle up, you find that it is 2 gm/L. What is the volume of fluid in the bottle?
   a) 2 liters
   b) 3 liters
   c) 6 liters
   d) 12 liters

10. The osmolality of fluid at the end of the proximal tubule is
    a) the same as plasma
    b) greater than plasma
    c) less than plasma
    d) the same as urine
1. The path of blood flow through the kidney is
   a) afferent arteriole -> glomerular capillary -> efferent arteriole -> peritubular capillary
   b) glomerular capillary -> efferent arteriole -> peritubular capillary -> afferent arteriole
   c) efferent arteriole -> peritubular capillary -> afferent arteriole -> glomerular capillary
   d) peritubular capillary -> afferent arteriole -> glomerular capillary -> efferent arteriole

2. The path of fluid flow through the kidney is
   a) loop of Henle -> distal tubule -> collecting duct -> glomerular capillary -> proximal tubule
   b) proximal tubule -> loop of Henle -> distal tubule -> collecting duct -> glomerular capillary
   c) glomerular capillary -> proximal tubule -> loop of Henle -> distal tubule -> collecting duct
   d) collecting duct -> glomerular capillary -> proximal tubule -> loop of Henle -> distal tubule

3. According to the tubuloglomerular feedback theory of renal autoregulation, an increase in solute delivery to the macula densa should
   a) increase blood flow and increase glomerular filtration rate
   b) decrease blood flow and decrease glomerular filtration rate
   c) increase the ultrafiltration coefficient
   d) increase proximal reabsorption

4. Infusion of 2 liters of a hypertonic solution such as 1500 mOsm/L of saline should
   a) increase extracellular volume and increase intracellular volume
   b) increase extracellular volume and decrease intracellular volume
   c) decrease extracellular volume and decrease intracellular volume
   d) decrease extracellular volume and increase intracellular volume

5. In the proximal tubule Sodium is co-transported with
   a) glucose
   b) phosphate
   c) amino acids
   d) all of the above
PGY 818 2nd Renal Quiz
May 31, 1996

1. The action of aldosterone on the renal tubule cell is to
   a) increase the permeability to sodium
   b) decrease hydrogen secretion
   c) increase the permeability to potassium
   d) both A and C

2. The rate limiting step in the formation of angiotensin II is
   a) the amount of angiotensinogen in the plasma
   b) the amount of converting enzyme in the lung
   c) the amount of antidiuretic hormone in the plasma
   d) the amount of renin secreted by the kidney

3. Which of the following is the most potent stimulator of aldosterone secretion by the Adrenal?
   a) increased plasma angiotensin II
   b) increased plasma potassium
   c) increased plasma sodium
   d) decreased adrenocorticotropic hormone (ACTH)

4. A long term pathologic increase in aldosterone secretion by the adrenal can lead to
   a) increased plasma sodium concentration
   b) increased plasma potassium concentration
   c) increased blood pressure
   d) increased plasma hydrogen concentration

5. Two weeks after going from a low sodium intake to a high sodium intake
   a) plasma sodium concentration is increased
   b) plasma angiotensin II concentration is increased
   c) plasma volume is increased
   d) plasma osmolality is increased

6. On a constant sodium intake the continued use of a diuretic will increase sodium excretion
   a) True
   b) False
7. In addition to stimulating aldosterone secretion by the adrenal gland angiotensin II can also
   a) increase blood pressure by constricting systemic arterioles
   b) decrease proximal tubule reabsorption
   c) increase cardiac output by increasing venous tone
   d) both A and C

8. If the kidney was perfect (it isn't but sometimes it is kind of amazing) and glomerular tubular
   balance was perfect an increase in the filtered load would lead to
   a) increased transport and decreased excretion
   b) decreased transport and increased excretion
   c) increased transport and increased excretion
   d) decreased transport and decreased excretion

9. Effective circulating volume is the volume of blood
   a) in the veins
   b) in the arteries
   c) in the extracellular space
   d) necessary for adequate perfusion of the tissues

10. The kidney attempts to monitor effective circulating volume by
    a) listening to the sympathetic nervous system
    b) measuring pressure at the afferent arteriole
    c) looking at solute delivery at the macula densa
    d) all of the above