**Review questions for Urinary system lecture**

**Multiple choice review questions**

1) The return of filtered molecules from the nephron tubules back into the blood is called

 A) filtration.

 B) reabsorption.

 C) secretion.

 D) excretion.

2) The liver detoxifies ammonia by converting it to

 A) bilirubin.

 B) urea.

 C) uric acid.

 D) nothing. Ammonia is processed by the kidneys and not the liver.

3) Which statement about the renal pyramids is false?

 A) They are located in the medulla

 B) They contain glomeruli

 C) They contain collecting ducts

 D) They empty into the renal pelvis

4) The portion of the nephron responsible for filtering the blood is the...

 A) glomerular capsule.

 B) proximal convoluted tubule.

 C) nephron loop.

 D) distal convoluted tubule.

5) Most reabsorption occurs in the

 A) glomerular capsule.

 B) proximal convoluted tubule.

 C) nephron loop.

 D) distal convoluted tubule.

6) The blood vessel delivering blood directly to the kidney is the

 A) renal artery.

 B) peritubular artery.

 C) renal vein

 D) afferent arteriole.

7) Which of the following are too large to be filtered by the glomerulus and thus are not normally found in the filtrate?

 A) red and white blood cells

 B) glucose

 C) amino acids

 D) electrolytes

8) Filtration is driven by

 A) Osmosis

 B) Diffusion

 C) Blood pressure

9) If a substance is neither filtered, reabsorbed, nor secreted, where would you expect to find it?

 A) filtrate

 B) blood in the renal vein

 C) urine

 D) All of the above.

10) If a substance is filtered and also secreted but not reabsorbed, where would you NOT expect to find it?

 A) glomerular filtrate

 B) blood in the renal vein

 C) urine

 D) All of the above.

11) Blood leaving the glomerulus goes into the efferent arteriole, then next to the

 A) peritubular capillary.

 B) renal artery

 C) collecting duct

 D) renal vein.

12) Monosaccharides will enter the glomerular filtrate because of...

 A) their size.

 B) their use as an energy source by the nephron

 C) their attraction to receptor proteins in the collecting duct

 D) All of the above

13) Examining the structure of the kidney reveals that the...

 A) medulla contains the most nephrons

 B) cortex contains renal pyramids.

 C) medulla contacts the renal pelvis

 D) urethra transports urine to the urinary bladder.

14) Which of the following statements about the micturition reflex is true?

 A) The reflex is under voluntary control

 B) Only the internal urethral sphincter is under voluntary

 control.

 C) The reflex causes urine to exit the urethra (urination).

 D) The reflex causes the urge to urinate.

16) Which of the following is filtered but not reabsorbed?

 A) K+

 B) Sodium

 C) urea

 D) glucose

19) The kidney regulates all of the following except

 A) volume of blood plasma.

 B) concentrations of certain electrolytes and waste products in

 the blood.

 C) absorption of substances from the gastrointestinal tract.

 D) acid-base balance (pH) of the blood plasma.

20) When the concentration of antidiuretic hormone rises in the blood,

 A) The urine becomes more dilute and has increased volume

 B) The urine becomes more dilute and has decreased volume

 C) The urine becomes more concentrated and has increased volume

 D) The urine becomes more concentrated and has decreased volume

21) Which statement about antidiuretic hormone (ADH) is false?

 A) ADH is secreted from the posterior pituitary gland.

 B) ADH binds to receptors on the nephron cells

 C) ADH secretion is increased during body dehydration

 D) ADH is secreted when osmoreceptors in the hypothalamus sense a decrease in

 the blood osmolarity.

22) When ADH \_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_ water moves \_\_\_\_\_ of the filtrate.

 A) increases; more, out

 B) increases; less, out

 C) decreases, more, into

 D) decreases, more, out

25) Aldosterone

 A) is the major hormone secreted by the kidney.

 B) promotes the secretion of Na+ into the nephron

 C) stimulates the secretion of K+ from the peritubular blood into the nephron

 D) is a protein hormone secreted by the pituitary gland

26) If a diuretic inhibits sodium reabsorption, then (because of osmosis) urinary volume will \_\_\_\_\_\_\_\_\_\_\_ and blood volume will \_\_\_\_\_\_\_\_.

 A) increase; increase

 B) increase; decrease

 C) decrease; increase

 D) decrease; decrease

27) Excess blood potassium (hyperkalemia) is removed by increasing secretion of the hormone \_\_\_\_\_\_ which stimulates an increase in secretion of potassium by cells within the \_\_\_\_\_\_.

 A) aldosterone; collecting duct

 B) aldosterone; nephron

 C) anti-diuretic hormone (ADH); collecting duct

 D) anti-diuretic hormone (ADH); nephron

28) Which action listed below could be used by the body to lower high blood volume (and therefore to lower high blood pressure)?

 A) increased renin secretion.

 B) increased aldosterone secretion.

 C) decreased sweat gland activity.

 D) increased urinary Na+.

29) Which statement about the role of the kidneys in the regulation of plasma blood pH is false?

 A) Bicarbonate ion is too large to enter the nephron.

 B) Hydrogen ion (H+) enters the filtrate in two ways: by glomerular filtration and

 by secretion into the nephron tubule.

 C) H+ reabsorption increases during alkalosis.

 D) During acidosis, more bicarbonate is reabsorbed and less bicarbonate is

 excreted in the urine.

30) The two organs most responsible for acid-base balance are the

 A) heart and kidneys.

 B) liver and lungs.

 C) kidneys and lungs.

 D) lungs and heart.

**Answers to multiple choice review questions**

1) B 11) A 21) D

2) B 12) A 22) A

3) B 13) C

4) A 14) D

5) B 25) C

6) A 16) C 26) B

7) A 27) B

8) C 28) D

9) B 19) C 29) A

10) B 20) D 30) C

**Fill-in-the-blank review questions**

1) The kidneys’ major role is to \_\_\_\_\_ the blood (which means to remove waste products) and to \_\_\_\_\_\_ the blood (which means to adjust the blood’s water and nutrient concentrations to their correct levels).

2) The most abundant waste molecule that the kidneys clean from the blood is \_\_\_\_\_. This nitrogen-containing waste product is made by the liver from ammonia that it detoxifies.

3) The kidney forms \_\_\_\_\_ out of the wastes, excess solutes, and excess water that it has removed from the blood.

4) Blood reaches the kidney via the \_\_\_\_\_\_ (a blood vessel). In the kidney, this artery branches into smaller arteries that pass through the medulla region in areas called renal \_\_\_\_\_\_, which are located between the renal pyramids.

5) The region of the kidney where the blood is cleaned and balanced is the \_\_\_\_\_.

6) The tube that drains urine from the urinary bladder to the outside of the body is called the \_\_\_\_\_.

7) In the blank in each phrase, write the most correct and specific anatomical direction term (such as Superior, Inferior, Anterior, Posterior, Medial, Lateral, Superficial, or Deep).

 a) The kidneys are \_\_\_\_\_\_\_\_\_ to the bladder

 b) The renal pelvis is \_\_\_\_\_\_\_\_ to the ureter

 c) The kidney is \_\_\_\_\_\_\_ to the adrenal gland

 d) The medulla is \_\_\_\_\_\_\_ to the renal pelvis

8) What substance passes through the renal pyramids? \_\_\_\_\_\_\_\_\_. What substance passes through the renal columns? \_\_\_\_\_\_\_\_. What substance passes through the renal pelvis? \_\_\_\_\_\_\_\_\_\_\_\_.

9) What structure in the kidney is where the final water and NaCl is reabsorbed from the filtrate? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10) One of the most important functions of the kidney is the return of specific filtered molecules from the filtrate back into the blood. This returning process is known as \_\_\_\_\_.

11) Blood that needs to be cleaned and balanced arrives at each kidney via the \_\_\_\_\_ (a blood vessel). Blood that has been cleaned and balanced exits the kidney via the \_\_\_\_\_ (a blood vessel).

12) \_\_\_\_\_ are the microscopic tubular structures within the kidney that clean and balance the blood.

13) The blood that has entered the kidney flows through afferent arterioles, which bring the blood to \_\_\_\_\_ (which are ball-shaped capillary beds in the \_\_\_\_\_\_\_ region of the kidney) where it is filtered into the nephron.

14) The liquid from the blood that enters the nephron is called the \_\_\_\_\_\_.

15) Each kidney contains roughly this many nephrons: \_\_\_\_\_.

16) The first region of the nephron is called \_\_\_\_\_\_\_. It surrounds the glomerulus and together with the glomerulus forms the blood filtering apparatus.

17) The correct term for one blood filtering apparatus (a glomerular capsule and a glomerulus together) is a \_\_\_\_\_\_\_\_.

18) After the glomerular capsule, the next region of the nephron is called the \_\_\_\_\_.

19) Most reabsorption of water and solutes from the filtrate takes place in the \_\_\_\_\_ region of the nephron.

20) The proximal and distal tubules of the nephron are connected by a hairpin-like loop called the \_\_\_\_\_, which extends toward or into the renal pyramids. Its primary function is reabsoption of \_\_\_\_\_ and \_\_\_\_\_.

21) The \_\_\_\_\_\_\_ receives the filtrate from the distal convoluted tubules of several adjacent nephrons and conducts this fluid from the cortex to the renal pelvis via the renal pyramid. The filtrate that exits the renal pyramids is called the urine. The urine pools in a hollow space in the kidney called the \_\_\_\_\_, then it exits the kidney in through the \_\_\_\_\_, which is a tube that carries it to the bladder.

22) Each renal pyramid is striated. The striations extend from the cortex to the renal pelvis and are actually \_\_\_\_\_ (a tubule connected to the nephrons).

23) Blood leaves the glomerulus via the \_\_\_\_\_ arteriole which takes it to a capillary bed that surrounds the entire nephron, called the \_\_\_\_\_\_\_\_\_\_.

24) \_\_\_\_\_ is the force that makes liquid from the blood filter into the nephron.

25) The process of \_\_\_\_\_ in the kidney means when the small molecules of the blood (such as water and small solutes) are separated from the larger blood components (such as blood cells and proteins) by passing through small openings in the glomerulus and the glomerular capsule.

26) The process of \_\_\_\_\_ in the kidney means when glucose, amino acids, water, ions, and other nutrient molecules are transported from the filtrate back into the blood.

27) To summarize the previous two review questions, the process of small molecules entering the nephron from the blood by passing through the renal corpuscle (the “filter”) is called \_\_\_\_\_. The process of molecules from the filtrate being returned by the nephron to the blood is called \_\_\_\_\_.

28) Water and solutes that have been reabsorbed are returned to the blood in the \_\_\_\_\_ capillary bed and eventually exit the kidney in the \_\_\_\_\_ (a blood vessel).

29) In addition to their function of collecting and transporting filtrate from nephrons, collecting ducts in the kidney also help balance the blood by reabsorbing \_\_\_\_\_ and \_\_\_\_\_ from the filtrate.

30) Urine is formed in the two \_\_\_\_\_ (organs). From each of these organs, a tube called the \_\_\_\_\_ propels the urine downward to the \_\_\_\_\_ where it is stored until its release is convenient, at which time it flows out of the body through the \_\_\_\_\_.

31) Urine is prevented from leaving the bladder prematurely by two rings of muscle: The \_\_\_\_\_\_ (which is the one closer to the bladder) and the \_\_\_\_\_\_ (which is the one farther from the bladder) .

32) The \_\_\_\_\_ urethral sphincter is composed of smooth muscle and is under autonomic (involuntary) control; The \_\_\_\_\_ urethral sphincter is composed of skeletal muscle and is therefore under voluntarily controlled.

33) Urine leaves the bladder through the \_\_\_\_\_. This tube is much longer in males than

in females.

34) \_\_\_\_\_ is another word for urination.

35) The type of muscle that makes up the muscular wall of the urinary bladder is \_\_\_\_\_ muscle.

36) Bladder distension is sensed by stretch receptors in the bladder walls. When about \_\_\_\_\_ ml of urine has accumulated in the bladder, the stretch receptors cause the smooth muscle in the bladder to \_\_\_\_\_. This causes the urge to urinate.

38) You have an empty bladder. Then you drink a very large amount of water. Within a short time you feel the urge to urinate, so you walk to the restroom and urinate. Write the numbers 1 – 6 to show what order the following events occurred in your urinary system.

 The urine passes through your internal urethral sphincter: \_\_\_\_\_

 The bladder contracts \_\_\_\_\_

 The volume of urine in your bladder reaches 200 ml \_\_\_\_\_

 The urine passes through your external urethral sphincter: \_\_\_\_\_\_

 The external urethral sphincter relaxes: \_\_\_\_\_

 The internal and external urethral sphincters are closed: \_\_\_\_\_

39) What effect do general anesthetics have on the urinary system? (Your answer must be the proper term for this effect): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Which organ of the urinary system and which tissue of that organ is affected?

 Organ =

Tissue =

40) Anesthetics are one common cause of urinary retention. Another common cause is \_\_\_\_\_\_\_\_, which affects many male senior citizens.

41) Involuntary urination is called \_\_\_\_\_.

42) All the substances listed below can been found in urine. Some of these substances, however, are not present in normal healthy urine.

 Water

Red blood cells

Bicarbonate ion

Cl-

 Uric acid

Na+

K+

H+

 Put a + next to the substance(s) that are not normally found in the urine.

 Put a \* next to the substance(s) that are reabsorbed most strongly when the hormone aldosterone is present.

Circle the substance(s) that are reabsorbed most strongly when the hormone ADH (anti-diuretic hormone) is present.

51) What are the four routes that water is regularly lost to the body?

 a)

 b)

 c)

 d)

52) Insufficient water concentration in the plasma is called \_\_\_\_\_. Common causes are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

53) Over-hydration (too much water in the blood) is generally caused by \_\_\_\_\_.

54) Osmoreceptors within the \_\_\_\_\_ region of the brain monitor the osmolarity of the blood to regulate the secretion of \_\_\_\_\_ hormone from the pituitary gland. This hormone promotes the reabsorption of \_\_\_\_ from the filtrate.

55) ADH is secreted from the anterior/posterior (circle one) pituitary gland.

56) ADH is secreted when the hypothalamus senses an increase/decrease (circle one) in blood osmolarity. Another way of saying the same thing is that ADH is secreted when the hypothalamus senses an increase/decrease (circle one) in the water concentration of the blood. (Note: These same conditions also result in the sensation of thirst).

57) Antidiuretic hormone (ADH) causes \_\_\_\_\_ (what action?) by the \_\_\_\_\_ organ.

58) When ADH levels are high, more filtered water is reabsorbed, resulting in urine that is low/high (circle one) volume.

59) When ADH levels are low, less filtered water is reabsorbed, resulting in urine that is low/high (circle one) volume.

61) The hormone \_\_\_\_\_ controls sodium and potassium levels in the blood.

62) Aldosterone is secreted by the \_\_\_\_\_ gland (name the gland and the region of the gland).

63) Aldosterone is secreted in response to low blood levels of \_\_\_\_\_ ion or high blood levels of \_\_\_\_\_ion.

64) Most molecules enter the nephron through the glomerulus and the glomerular capsule (this process is called “filtration”) and exit the nephron by being transported back into the blood (this process is called “reabsorption”). But there is a third type of transport process that takes place in the neprhon: Some molecules enter the nephron by moving from the peritubular capillaries into the nephron. This process is called \_\_\_\_\_\_.

65) K+ secretion into the nephron is caused by the same hormone (aldosterone) that causes Na+ to be reabsorbed out of the nephron. Therefore, if the body increases aldosterone because blood K+ is high, the blood’s Na+ concentration will \_\_\_\_\_.

66) When blood pressure is low, the kidney secretes a protein called \_\_\_\_\_ into the blood, which indirectly causes an increase in blood pressure because it leads to the activation of the protein \_\_\_\_\_ which in turn raises blood pressure by causing vasoconstriction.

67) The concentration of sodium and potassium are the major triggers of aldosterone secretion. But aldosterone is also secreted in response to increased/decreased (circle one) blood pressure.

68) When aldosterone is secreted in response to low blood pressure, it is because the protein \_\_\_\_\_\_ (which is a potent vasoconstrictor) has activated the adrenal gland to release aldosterone.

69) Aldosterone increases blood pressure in this way: Aldosterone increases the blood concentration of \_\_\_\_, which raises the osmolarity of the blood. The high osmolarity blood attracts \_\_\_\_\_ from the tissues of the body, which increases blood volume and pressure.

70) Since aldosterone secretion is controlled by angiotensin II, which is in turn controlled by renin, aldosterone secretion is indirectly controlled by the \_\_\_\_\_ (organs), the organs which produce the renin.

71) When blood pressure is low, a series of events that lead to an increase in the kidney’s reabsorption of sodium occur. These events are outlined below. Fill in the missing terms in the blanks. Some blanks require more than one word answers. Hints appear next to some blanks.

 When blood pressure is, the kidney

 Releases…

 \_\_\_\_\_\_\_\_\_\_\_\_\_ (a protein)

 which activates the blood protein…

 \_\_\_\_\_\_\_\_\_\_\_\_\_

 which activates the gland…

 \_\_\_\_\_\_\_\_\_\_\_\_\_ (a gland)

 which secretes…

 \_\_\_\_\_\_\_\_\_\_\_\_\_ (a hormone)

 which increases sodium reabsorption by the kidney,

 which increases the blood pressure.

72) pH is a measure of the concentration of \_\_\_\_\_ ion.

73) The normal pH of blood is \_\_\_\_\_ to \_\_\_\_\_ (state the normal pH range). If the blood pH is greater than \_\_\_\_\_, the person has the blood condition \_\_\_\_\_; if the blood pH is less than \_\_\_\_\_, the person has the blood condition \_\_\_\_\_.

74) A \_\_\_\_\_ is a substance which, when in solution, is able to stabilize the solution's pH.

75) Blood pH can be regulated by three of the body's systems: the \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

76) The blood contains two molecules that buffer to help keep blood pH within the normal range. Write the chemical formulas and names of the two blood buffer molecules (hint: Both contain carbon):

 Circle the molecule above that lowers the pH of the blood.

 Write the chemical equation that shows the circled molecule above lowering the pH (hint: It releases an H+ ion to lower the blood pH)

77) When excess hydrogen ions are added to the blood’s buffer system, they bind to \_\_\_\_\_ to form \_\_\_\_\_.

78) When hydrogen ions are removed from the blood’s buffer system, \_\_\_\_\_ releases hydrogen ions to replace those that were removed.

80) When blood pH decreases, breathing rate must increase/decrease (circle one) to help return the pH to its normal value.

81) When blood pH increases, breathing rate must increase/decrease (circle one) to help return the pH to its normal value.

82) Accelerating the breathing rate removes \_\_\_\_\_ from the blood, and therefore counteracts the blood pH imbalance called \_\_\_\_\_.

83) Lowering the breathing rate adds \_\_\_\_\_ to the blood, and therefore counteracts the blood pH imbalance called \_\_\_\_\_.

84) The kidneys help counteract acidosis is by secreting \_\_\_\_\_ into the filtrate and by reabsorbing \_\_\_\_\_\_ from the filtrate.

85) Hydrogen ions are secreted into the nephron if the blood has less than \_\_\_\_\_ pH, and they are reabsorbed if the blood has more than \_\_\_\_\_ pH.

86) Bicarbonate ions are reabsorbed if the blood has less than \_\_\_\_\_ pH.

**Answers to multiple choice review questions**

1) Clean

 Balance

2) Urea

3) Urine

4) Renal artery

 Columns

5) Cortex

6) Ureter

7) a) Superior (or lateral)

 b) Superior

 c) Inferior

 d) Lateral

8) Filtrate

 Blood

 Urine

9) The collecting ducts

10) Reabsorption

11) Renal artery

 Renal vein

12) Nephrons

13) Glomeruli

 Cortex

14) Filtrate

15) One million

16) Glomerular capsule

17) Renal corpuscle

18) Proximal convoluted tubule

19) Proximal convoluted tubule

20) Nephron loop

 NaCl

Water

21) Collecting duct

 Renal pelvis

 Ureter

22) Collecting ducts

23) Efferent

 Peritubular capillary bed

24) Blood pressure

25) Filtration

26) Reabsorption

27) Filtration

 Reabsorption

28) Peritubular

 Renal vein

29) NaCl

 Water

30) Kidneys

 Ureter

 Bladder

 Urethra

31) Internal urethral sphincter

 External urethral sphincter

32) Internal

 External

33) Urethra

34) Micturition

35) Smooth muscle

36) 200 ml

 Contract

38) 4

 3

 2

 6

 5

 1

39) Urinary retention

 The bladder

 Smooth muscle

40) Enlargement of the prostate gland

41) Incontinence

42) Water (circled)

Red blood cells +

Bicarbonate ion

Cl- \*

 Uric acid

Na+ \*

K+

H+

51) a) Sweating

 b) Urination

 c) Feces

 d) Breathing/lungs

52) Dehydration

 Excessive sweating

 Excessive diarrhea

 Not drinking enough water

53) Drinking too much water

54) Hypothalamus

 Antidiuretic hormone (ADH)

 Water

55) Posterior

56) Increase

 Decrease

57) Water reabsorption

 Kidney

58) Low

59) High

61) Aldosterone

62) Adrenal cortex

63) Na+

 K+

64) Secretion

65) Increase

66) Renin

 Angiotensin II

67) Decrease

68) Angiotensin II

69) Sodium

 Water

70) Kidneys

71) Renin

 Angiotensin II

 Adrenal gland

 Aldosterone

72) H+

73) 7.35

 7.45

 7.45

 Alkalosis

 7.35

 Acidosis

74) Buffer

75) Blood buffers

 Respiratory system

 Urinary system

76) H2CO3 (carbonic acid) [circled]

 HCO3- (bicarbonate ion)

H2CO3 -> HCO3- + H+

77) HCO3- (bicarbonate ion)

 H2CO3 (carbonic acid)

78) H2CO3 (carbonic acid)

80) Increase

81) Decrease

82) H+

 Acidosis

83) H+

 Alkalosis

84) H+

 HCO3-

85) 7.35

 7.45

86) 7.35

**Short answer review questions:**

1) Describe the purposes of the kidneys in a single sentence.

2) The kidneys make urine when they clean and balance the blood. Explain what “clean and balance” the blood means. Your answer should include the names of specific molecules in the blood as examples.

3) Name the kidney regions and tubes in the figure below.

 a) b)

 c)

 d)

 e)

 f)

 g)

 h) (Regions b and c together)

4) Trace the blood flow through the kidney, from the renal artery to the renal vein. Your answer should include a list of all the blood vessels (in the order that blood passes through them) that were named in this lecture.

5) The blood contains many organic molecules, such as proteins and glucose. Explain how proteins are excluded from the filtrate but glucose is not.

6) Label the parts of the nephron then follow the instructions below the drawing. Some blanks require more than one word answers.

 a)

 Blood

 b) c)

 Blood

 d) e)

 Which part(s) above (a – e)…

 Are in the medulla? \_\_\_\_\_\_\_\_

 Specialize in reabsorbing salt and water? \_\_\_\_\_\_\_\_

 Are where most reabsorption takes place? \_\_\_\_\_\_\_\_

The diagram above does not show the peritubular capillary bed. Draw it on the diagram or describe where

it is located.

7) Which regions of the nephron specialize in only water and NaCl reabsorption?

10) If you were injected with very large amounts of penicillin, vitamin C, or any other molecule that the kidney rapidly removes from the blood, would you expect your urine volume increase, decrease, or stay the same? Justify your answer. Hint: Consider osmosis effects on the urine.

11) The kidney responds to low blood pressure by a) Increasing the amount of water reabsorbed from the filtrate, and b) Increasing the amount of sodium reabsorbed from the filtrate. Describe briefly (2 –3 sentences) how reabsorbing more sodium from the filtrate leads to an increase in blood pressure.

**Answers to short answer review questions:**

1) The kidneys clean and balance the blood.

2) “Clean” means to remove wastes out of the blood. An example waste is the nitrogen containing molecule urea. “Balance” means to adjust the water and nutrient solutes to their proper concentrations.

Example molecules that are balanced by the kidney include water, Na+. K+, Ca2+, glucose, amino acids, and vitamins.

3) A = Renal artery

 B = Renal pyramid

 C = Renal column

 D = Renal pelvis

 E = Renal vein

 F = Renal cortex

 G = Ureter

 H = Renal medulla

4) Blood that needs to be cleaned and balanced arrives at each kidney in the renal artery. The renal artery branches into many smaller arteries as it moves to the cortex region of the kidney. In the cortex, the blood enters small blood vessels called afferent arterioles. Each afferent arteriole passes blood into a ball-shaped capillary bed called a glomerulus. Some liquid in the glomerulus blood filters into the nephron, but some blood in the glomerulus exits the glomerulus into an efferent arteriole, and then from there into the peritubular capillary bed. Blood from several peritubular capillary beds merges into small veins which merge into larger veins as they pass from the renal cortex to the renal vein, on the medial side of the kidney. The blood exits the kidney in the renal vein.

5) The cells of the glomerulus and the cells of the glomerular capsule have small gaps between neighboring cells. These two structures together are called a renal corpuscle. It acts as a filter that allows small molecules in the blood (such as glucose) to pass through the gaps into the filtrate inside the nephron. Large blood molecules (such as proteins) are too large to pass the gaps between the cells, and so proteins are not able to filter into the nephron.

6) A = The glomerular capsule

 B = Proximal convoluted tubule

C = Distal convoluted tubule

D = Glomerulus

 E = Nephron loop

 E The nephron loop is in the medulla

 E The nephron loop specializes in reabsorbing NaCl and water

 B The proximal convoluted tubule is where the most reabsorption occurs.

(The peritubular capillary bed should be added to the drawing. It begins at the efferent arteriole exiting the glomerulus and intertwines with all regions of the nephron)

7) The nephron loop is the only region of the nephron that specializes in only reabsorbing water and NaCl. Although the proximal and distal convoluted tubules of the nephron reabsorb water and NaCl, they also reabsorb many other substances in addition to NaCl and water. The collecting duct, although not considered part of the nephron, also specializes in reabsorbing only water and NaCl.

10) Urine volume will increase. When the kidney removes large amounts of solutes from the blood, those removed solutes become large concentrations of solutes in the filtrate. The principle of osmosis says that large concentrations of any solute will attract water molecules. Water will therefore move into the filtrate by osmosis, increasing the volume of urine. This increased urine volume effect occurs, for example, when the kidneys remove large amounts of glucose from the blood of diabetics.

11) Increased sodium reabsorption from the filtrate increases the blood’s sodium concentration. The principle of osmosis says that large concentrations of any solute will attract water molecules. Water will therefore move into the blood by osmosis, increasing the volume of blood. Increased blood volume causes increased blood pressure.