Multiple Choice
1. The inner or visceral layer of Bowman’s capsule is made up of
   a. podocytes
   b. pedicles
   c. endothelium
   d. simple squamous epithelial tissue
   e. smooth muscles
2. Microvilli are found in the
   a. thin segment of Loop of Henle
   b. proximal convoluted tubules
   c. thick segment of Loop of Henle
   d. distal convoluted tubule
   e. walls of minor and major calices
3. Tracing the path of urine thru the urinary system, the urine goes from the renal pelvis to the _____
   a. calyces
   b. Henle’s loop
   c. Urethra
   d. Ureter
   e. Collecting duct
4. Glomerular filtrate is similar to plasma in composition except that the filtrate lacks significant amounts of:
   a. H+ ions
   b. Protein
   c. Bicarbonate ions
   d. Water
   e. Urea
5. Which of the following is generally not filtered through glomeruli?
   a. glucose
   b. sodium
   c. albumin
   d. insulin
   e. c and d
6. The regulation of urine volume is done mainly through tubular
   a. secretion
   b. filtration
   c. excretion
   d. reabsorption
   e. a and c are correct
7. Place the structures below in the proper sequence as the blood filtrate would pass through them

   1. Loop of Henle
   2. distal convoluted tubule
   3. proximal convoluted tubule
   4. Bowman’s capsule
   5. collecting ducts

   a. 3, 2, 1, 4, and 5
   b. 3, 4, 1, 2, and 5
   c. 4, 3, 1, 2, and 5
   d. 4, 3, 2, 1, and 5
   e. 2, 3, 1, 4, and 5
8. Damage to the renal medulla would interfere first with the functioning of the:
   a. collecting tubules
   b. Bowman’s capsule
   c. PCT
   d. DCT
   e. Glomerulus

9. Which of the following structures listed is passed thirdly by a drop of blood entering the kidney?
   a. glomerulus
   b. arcuate artery
   c. efferent arteriole
   d. interlobar artery
   e. interlobular artery

10. Which of the following mechanisms, if any, exerts the greatest influence towards maintaining homeostasis of total fluid volume?
    a. Glomerular filtration rate
    b. Renal tubular water reabsorption
    c. Tubular secretion of urea
    d. Amount of water intake
    e. Reabsorption of water in the large intestine

11. Whenever the plasma glucose concentration exceeds the renal threshold for glucose
    a. the glomerular filtration rate increases
    b. glucose will appear in urine
    c. the volume of urine decreases
    d. glucose will be secreted into the peritubular capillary bed
    e. none of the above

12. Active reabsorption of glucose appears to occur in the
    a. PCT
    b. Loop of Henle
    c. DCT
    d. Collecting duct
    e. None of the above

13. Urine leaving the DCT passes through which of the following structures in what sequence?
    1. Collecting ducts (tubules)
    2. Renal sinus
    3. Major calyx
    4. Ureter
    5. Urinary bladder
    6. Minor calyx

    a. 1, 2, 3, 4, 5, and 6
    b. 1, 6, 3, 4, 5, but never 2
    c. 2, 6, 4, 5, 3, but never 1
    d. 2, 3, 5, 4, 1, but never 6
    e. 3, 6, 4, 5, 1, but never 2

14. The epithelial tissue that permits distension of the urinary bladder is
    a. Stratified squamous
    b. Transitional
    c. Simple squamous
    d. Pseudostratified
    e. Simple cuboidal
15. Which of the following statements concerning the urethra is NOT true?
   a. It opens to the posterior wall of vagina
   b. In males, it is both excretory and reproductive
   c. Possesses a sphincter muscle which can halt urination mid-stream
   d. Its walls are composed of mucous membrane and epithelium
   e. All are true
16. Which has as its main function the reabsorption of Na, Cl, amino acids and about 80% of water reabsorption?
   a. Bowman’s capsule
   b. DCT
   c. Ascending Loop of Henle
   d. Collecting tubule
   e. PCT
17. Interpretation of sensory impulses from stretch receptors in the urinary bladder is/are performed in the;
   a. Spinal cord
   b. Hypothalamus
   c. Cerebral cortex
   d. All of the above
   e. None of the above
18. All of the following substances are actively reabsorbed in the PCT of the nephron EXCEPT;
   a. Glucose
   b. Amino acids
   c. Water
   d. Protein
   e. a and b are correct
19. The following is a hypothetical example of pressures in the glomerulus and Bowman’s capsule of a typical NVCC nursing student’s kidney. Glomerular blood pressure = 70mmHg Glomerular osmotic pressure = 28mmHg; Capsular hydrostatic pressure = 13mmHg; Capsular osmotic pressure = 2mmHg. What is the effective filtration pressure for our student?
   a. 31mmHg
   b. 64mmHg
   c. 35mmHg
   d. 23mmHg
   e. 75mmHg
20. A chemical which does NOT originally appear in the glomerular filtrate may appear in the urine if:
   a. It cannot appear in the blood
   b. A diuretic medicine is taken
   c. Tubular secretion into the filtrate takes place
   d. Tubular reabsorption occurs
   e. It is impossible to be found in urine
21. Because about 20% of the water in the glomeruli is filtered into Bowman’s capsule, the___ osmotic pressure of the blood entering the peritubular capillary bed is ____?
   a. Relative ; increased
   b. Absolute ; increased
   c. Relative ; decreased
   d. Absolute ; decreased
   e. None of the above
22. Water leaves the tubules and enters the peritubular capillary bed
   a. by active transport
   b. by filtration into capillary bed
   c. by osmosis
   d. by hydrostatic pressure combined with active transport
   e. b and d only

23. The ion that would have the greatest effect on water movement between body compartments is:
   a. Na ion
   b. K ion
   c. Cl ion
   d. Ca ion
   e. None of these

24. Which of the following is correct? Sympathetic stimulation of the kidneys:
   a. Dilates efferent arteriole
   b. Results in a lowered glomerular capillary blood pressure
   c. Results in an increased rate of blood flow into glomeruli
   d. Results in an increased glomerular filtration rate
   e. Two or more of the above are correct

25. Which of the following is NOT correct? Sympathetic stimulation of the kidneys;
   a. constricts the afferent arterioles
   b. lowers the glomerular capillary pressure
   c. constricts the efferent arterioles
   d. lowers the glomerular filtration rate
   e. all of the above are correct

26. If the glomerular hydrostatic pressure is 50mmHg and the Bowman’s capsule hydrostatic pressure is 20mmHg, while the glomerular osmotic pressure is 30mmHg and the Bowman’s capsule osmotic pressure is zero, what will be the effective filtration pressure?
   a. 100mmHg
   b. 25mmHg
   c. 30mmHg
   d. 40mmHg
   e. 0mmHg

27. The rate of glomerular filtration varies directly with the magnitude of pressure, which in turn is regulated by such factors as change in size of the arterioles of the kidney, and systemic blood pressure. (Hint: use cause and effect to figure out answer)
   a. Water
   b. Colloid osmotic
   c. Hydrostatic
   d. Simple osmotic
   e. Filtration

28. Which one of the following substances enters the tubules by tubular secretion?
   a. amino acids
   b. vitamins
   c. Na ions
   d. Ca ions
   e. H ions

29. Another means by which the kidneys control the pH of the blood is by:
   a. excreting CO₂ into the filtrate
   b. excreting the buffers which transport acids substances in blood, and putting them into the filtrate
   c. excreting Na⁺ into filtrate
   d. secreting ammonia so it can combine with H and Cl in the filtrate and then form ammonium chloride
30. Acidic products, that must be regulated if pH balance is to be maintained are derived principally from:
   a. Water absorption
   b. Normal metabolic activities in the body
   c. Sodium regulation
   d. Potassium secretion
   e. Chloride secretion

31. Which parts of the nephron are composed of simple squamous epithelium?
   a. Ascending and descending limbs of loop of Henle
   b. Glomerular capsule (parietal layer) and descending loop of Henle
   c. PCT and DCT
   d. DCT and collecting duct
   e. None of the above

32. Choose the one FALSE statement
   a. An increase in glomerular hydrostatic pressure (GBHP) causes a decrease in net filtration pressure (NFP)
   b. Glomerular capillaries have a higher blood pressure than other capillaries of the body
   c. Blood in glomerular capillaries flow into arterioles, not into venules
   d. Vasa recta pass blood from the efferent arteriole toward venules and veins
   e. All of the above are correct

33. Choose the one TRUE statement about nephron structure and function
   a. Afferent arterioles offer more resistance to flow than do efferent arterioles
   b. An efferent arteriole normally has a larger diameter than an afferent arteriole
   c. The juxtaglomerular apparatus (JGA) consists of cells of the PCT and the afferent arteriole
   d. Most water reabsorption takes place across the PCT
   e. All of the above are true

34. Which one of the hormones listed here causes increased urinary output?
   a. ANP
   b. ADH
   c. Aldosterone
   d. Angiotensin II
   e. Cortisol

Questions 35 – 42 True (T) and False (F)

35. ADH decreases permeability of DCT and collecting duct to water, thus increasing urine volume
36. A ureter is a tube that carries urine from the bladder to the outside of the body
37. Diabetes insipidus is a condition caused by lack of insulin or lack of sensitivity to this hormone.
38. A person taking diuretics is likely to urinate less than a person taking no medication
39. Blood colloid osmotic pressure (BCOP) is a force that tends to push substances from the blood into the filtrate.
40. The thick portion of the ascending loop of Henle is permeable to Na⁺ and Cl⁻ but not to water
41. The countercurrent mechanism permits production of small volumes of concentrated urine.
42. In infants 2 years old and under, urinary retention is normal
43. Place the vessels in order that blood flows through them in the kidney
   1. Arcuate vein
   2. Interlobar vein
   3. Peritubular venules
   4. Interlobular veins
   5. Renal vein
   a. 3, 4, 1, 2, and 5
   b. 1, 3, 4, 2, and 5
   c. 3, 4, 2, 1, and 5
   d. 3, 4, 5, 1, and 2
   e. 1, 5, 2, 4, and 3

44. Metabolic alkalosis imbalances are indicated by a(n) ___ in arterial blood pH and altered ___ level
   a. Increase; PCO₂
   b. Decrease; PCO₂
   c. Increase; HCO₃⁻
   d. Decrease; HCO₃⁻

45. Which term refers to a lower than normal blood level of Na?
   a. Hyperkalemia
   b. Hypokalemia
   c. HyperNatremia
   d. HypoNatremia
   e. Hypercalcemia

46. Which two electrolytes are in greatest concentration in ICF?
   a. Na⁺ and Cl⁻
   b. Na⁺ and K⁺
   c. K⁺ and Cl⁻
   d. K⁺ and HCO₃⁻
   e. Ca²⁺ and Mg²⁺

Questions 47 – 55 T (true) F (false)
47. Hyperventilation tends to raise pH
48. Chloride is the major intracellular anion
49. During edema there is increased movement of fluid out of plasma and into interstitial fluid
50. Parathyroid hormone causes an increase in the blood level of Ca
51. When aldosterone is in high concentrations, Na is conserved in the blood and K is excreted in urine
52. About 2/3 of body fluids are found in ICF and 1/3 is found in ECF
53. Starch, glucose, Na⁺, K⁺, and HCO₃⁻ are all electrolytes
54. Protein is the most abundant buffer in the body
55. The pH of arterial blood is higher than that of venous blood because of a lower level of CO₂ and H⁺

56. Which of the following statements are true?
   1. Buffers prevent rapid changes in pH of a body fluid
   2. Buffers work slowly
   3. Strong acids lower pH more than weak acids because they have fewer H⁺
   4. Proteins can buffer both acids and bases
   5. Hemoglobin is an important buffer
   a. 1, 2, 3, and 5
   b. 1, 3, 4, and 5
   c. 1, 3, and 5
   d. 1, 4 and 5
   e. 2, 3, and 5
57. Concerning acid–base imbalances:
   1. Acidosis can cause of CNS through depression of synaptic transmission
   2. Renal compensation can resolve respiratory acidosis and alkalosis
   3. A major physiological effect of alkalosis is lack of excitability in CNS and PNS
   4. Resolution of metabolic acidosis and alkalosis occurs through renal compensation
   5. In adjusting blood pH, renal compensation occurs quickly whereas respiratory compensation takes days.
   a. 1, 2, and 5
   b. 1 and 2
   c. 2, 3, and 4
   d. 2, 3, and 5
   e. 1, 2, 3, and 5

58. Which of the following hormones regulate fluid loss?
   1. ADH
   2. Aldosterone
   3. Cortisol
   4. Natriuretic peptide
   5. Thyroxine
   a. 1, 3, and 5
   b. 1, 2, and 3
   c. 2, 4, and 5
   d. 2, 3, and 4
   e. 1, 3, and 4

59. Which of the following is correct?
   a. Regulation of Na content of the body is closely linked with control of the ECF volume
   b. The factors involved in regulation of Na content of the body are influenced by blood pressure
   c. Na has a direct influence on ECF
   d. Loss of Na tend to cause a decrease in plasma volume
   e. All of the above

60. An accumulation of the metabolic products of protein metabolism in the human is known as
   a. Cystitis
   b. Proteinuria
   c. Glycosuria
   d. Uremia
   e. Diabetes