

Student Name: \_\_\_\_\_

**Part I: Multiple Choice Questions: (40 marks)**

**Directions:** Each of the numbered items or incomplete statements in this section is followed by answers or by completions of the statement. Select the ONE lettered answer or completion that **BEST** in each case.

1. Renal autoregulation is influenced to a great extent by

- a. Acetylcholine.
- b. Angiotensin II.
- c. Epinephrine
- d. None of the above.

2. Glomerular filtration will decrease when there is

- a. Constriction of the efferent arterioles.
- b. Dilatation of the afferent arterioles.
- c. Decrease in plasma protein.
- d. Obstruction in the urinary system.
- e. All of the above.

3. Sodium can be transported across the luminal membrane of tubular cells by all of the following mechanisms, EXCEPT

- a. Co-transport with organic solutes.
- b. Sodium-Potassium ATPase system.
- c. Through sodium channels.
- d. All of the above.

4. The potassium in renal tubule

- a. Only filtered and secreted.
- b. Only filtered and reabsorbed.
- c. Filtered, reabsorbed and secreted.
- d. Only secreted.

5. The amount of air that remain in lung after forceful expiration is called

- a. Expiratory reserve volume.
- b. Functional residual capacity.
- c. Residual volume.
- d. Dead space.

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**6. Alveolar ventilation means the amount of air flowing through**

- a. Bronchus.
- b. Only alveoli.
- c. Gas exchange area
- d. Entire respiratory tract.

**7. In normal healthy person**

- a. Anatomical and alveolar dead space are nearly equal
- b. Anatomical dead space is more than alveolar dead space.
- c. Alveolar dead space is more than the anatomical dead space.
- d. None of the above.

**8. The main barrier precluding the free passage of albumin across the glomerular walls is formed by**

- a. The fenestrated glomerular endothelium.
- b. Anionic proteoglycan clusters within the glomerular basement membrane.
- c. The filtration slits in between podocytes.
- d. None are correct.
- e. All are correct.

**9. Concerning the measurement of renal plasma flow (RPF) and glomerular filtration (GFR)**

- a. Inulin is a good GFR marker because it is freely filtered in the glomeruli and it is not reabsorbed, or secreted, by the renal tubules.
- b. Inulin concentration in the proximal tubule's lumen increases progressively as water is reabsorbed in the segment of the nephron.
- c. PAH (para-amino-hippuric acid) is a good marker of RBF because it is freely filtered and rapidly secreted by the proximal tubule.
- d. a and c are correct.
- e. All are correct.

**10. Concerning water reabsorption by the proximal tubule**

- a. The main driving force for water reabsorption in the proximal tubule is a compartment hypertonicity in the lateral spaces between tubular cells.
- b. Water passively flows from the tubular lumen into the lateral spaces, either through the intercellularly through leaky tight junctions.
- c. Aquaporins-1 (water channels) are abundantly present in the luminal membranes of proximal tubule cells.
- d. a and c are correct
- e. All are correct.

**11. Concerning the macula densa**

- a. The macula densa senses the amount of sodium chloride of tubular urine being delivered by the loop of Henle into the distal convoluted tubule.
- b. If the delivery of sodium chloride is lower than normal, the macula densa signals the afferent arteriole to release renin.
- c. Renin release causes angiotensin I formation and indirectly aldosterone release.
- d. a and c are correct.
- e. All are correct.

**12. Concerning angiotensin II**

- a. The renin-angiotensin-aldosterone system includes angiotensinogen production by the liver, renin secretion by the juxtaglomerular apparatus and angiotensin-converting enzyme present at the luminal surface of endothelial cells.
- b. Aldosterone, but not angiotensin II, stimulates thirst and salt appetite.
- c. Angiotensin II induces marked increases in sodium reabsorption by the loop of Henle and the collecting duct.
- d. a and c are correct.
- e. All are correct.

**13. Concerning the function of the proximal tubule**

- a. Most of the glomerular filtrate is reabsorbed in the proximal tubule.
- b. The concentration of PAH doesn't change much along the length of the proximal tubule.
- c. Under normal conditions, all of the filtered glucose is reabsorbed in the proximal tubule.
- d. a and c are correct.
- e. All are correct.

**14. Atrial natriuretic peptide**

- a. Increased water reabsorption.
- b. Decreased sodium reabsorption.
- c. Increased angiotensin II formation.
- e. Increased sodium reabsorption.

**15. When ADH levels in the blood are high, the collecting ducts are**

- a. Very impermeable to water.
- b. Very permeable to protein molecules.
- c. Very permeable to water.
- d. Very permeable to sodium and chloride ions.
- e. None of the above.

- 16. The process of micturition or urination**
- a. Involves relaxation of the detrusor muscle
  - b. Requires contraction of the external urethral muscle.
  - c. Is a reflex involving sacral segments of the spinal cord.
  - d. All of the above.

**17. Which of the following is INCORRECT?**

- a. Aldosterone stimulates the reabsorption of sodium.
- b. Aldosterone stimulates the secretion of potassium.
- c. Aldosterone affects water reabsorption.

Aldosterone is made in the hypothalamus and released from the anterior pituitary

**18. Which of the following would NOT be secreted from the interstitial fluid into the**

- a. Organic acids
- b. Amino acids
- c. Organic bases
- d. Creatinine

**19. The most important function of the juxtaglomerular apparatus is to**

- a. Secrete water and sodium into the filtrate .
- b. Reabsorb sodium.
- c. Secrete renin in response to decreased renal blood pressure or blood flow.
- d. Constrict the afferent arterioles and decrease sodium reabsorption.

**20. Which process is most affected by blood pressure?**

- a. Tubular secretion
- b. Tubular reabsorption
- c. Glomerular filtration .
- d. All of the above.

**21. Stool of a person is whitish grey coloured due to malfunction of which organ?**

- a. Liver.
- b. Kidney.
- c. Spleen
- d. Pancreas.

**22. What will happen if the secretion of parietal cells of gastric glands is blocked with an inhibitor?**

- a. Enterokinases will not be released from the duodenal mucosa and so trypsinogen is not converted to trypsin.
- b. Gastric juice will be deficient in pepsinogen.
- c. Pepsinogen is not converted to pepsin.
- d. None of the above.

23. Bile salts act as activator of which enzyme?

- a. Pepsinogen.
- b. Trypsinogen.
- c. Lipase.
- d. Pancreatic amylase.

24. Stores the liver's digestive juices until they are needed by the intestine

- a. Pancreas.
- b. Gall bladder.
- c. Small intestine.
- d. Stomach.

25. What is removed from undigested food when it is in the large intestine?

- a. Nutrients.
- b. Sugar.
- c. Water.
- d. Digestive juices.

26. Which one of the following is true about the digestive system?

- a. All the digestive enzymes are synthesized in glands located out of the digestive system.
- b. The digestive system throughout its length is covered by a single type of epithelial cells.
- c. The digestive system is made up of voluntary fibers.
- d. The digestive enzymes do not digest the organs of the digestive system.

27. Which one of the following digestive organs does not secrete the enzyme amylase?

- a. Salivary glands.
- b. Pancreas.
- c. hepatic cells.
- d. Intestinal glands.

28. Which one of the digestive organs does not contribute a digestive enzyme?

- a. Stomach.
- b. Liver.
- c. Pancreas.
- d. Intestine.

29. Which one of the following juices is important for lipase activity?

- a. Salivary juice.
- b. Gastric juice.
- c. Pancreatic juice.
- d. Biliary juice.

30. Which one of the following nerves is mainly concerned with exocrine and endocrine secretions in the digestive system?

- a. Somatic nerves.
- b. Cranial nerves.
- c. Enteric nerves.
- d. Autonomic nerves.

31. Which one of the following secretions is not influenced by the migrating motility complex?

- a. The salivary secretion.
- b. The gastric secretion.
- c. The liver secretion.
- d. The pancreatic secretion.

32. The term: "pulmonary ventilation" means

- a. The expansion of alveoli due to pressure differences .
- b. Breathing due to movements of the ribs.
- c. Breathing using the diaphragm only .
- d. The movement of atmospheric air into the lungs
- e. Gas exchange between the atmosphere and lung alveoli

33. Carbon dioxide and oxygen are exchanged in the lungs by

- a. Osmosis.
- b. Active transport mechanisms.
- c. Filtration.
- d. Diffusion.

34. The center for control of normal respiration is located in

- a. Carotid sinus.
- b. Spinal cord.
- c. Cerebellum.
- d. Medulla.

35. How do you calculate how much inspired air actually ventilates the alveoli during a minute?

- a. Subtract the volume of dead space from the tidal volume.
- b. Subtract both the dead space volume that was already in the lungs plus the dead space of the inspired air that won't reach the alveoli from the tidal volume.
- c. Subtract the volume of dead space from the tidal volume and multiply it by the number of breaths per minute.
- d. It is equal to the tidal volume times the frequency of breathing.

36. Which of the following is **INCORRECT** concerning the  $O_2 / CO_2$  movement and processing through the lungs and tissues?

- a. Binding of  $O_2$  to Hb changes its configuration so that  $CO_2$  and  $H^+$  ions are more likely to dissociate.
- b. When  $CO_2$  diffused into the alveoli, the  $PCO_2$  is lowered.
- c. Carbonic acid is an intermediate in the reaction combining  $H^+$  with  $HCO_3^-$  to form  $H_2O$  and  $CO_2$ .
- d. Arterial blood flows to the tissues where  $H^+$  ions combine with  $HCO_3^-$  to form  $H_2O$  and  $CO_2$ .

37. If you blocked the blood supply to an alveolus, which of the following would

- a. The ventilation perfusion ratio would be zero.
- b. The  $PO_2$  would be greater than normal.
- c. The  $PCO_2$  would be zero.
- d. All of the above are true.

38. Which of the following is the primary regulating variable of the central chemoreceptors?

- a.  $PO_2$ .
- b.  $PCO_2$ .
- c. arterial pH.
- d. Input from stretch receptors.

39. Which of the following is not a stimulus for breathing?

- a. Rising carbon dioxide levels.
- b. Rising blood pressure.
- c. Arterial  $PO_2$  below 60 mm Hg.
- d. Arterial pH resulting from  $CO_2$  retention.

40. The respiratory membrane is a combination of \_\_\_\_\_

- a. Respiratory bronchioles and alveolar ducts.
- b. Alveolar and capillary walls and their fused basement membranes.
- c. Atria and alveolar sacs.
- d. Respiratory bronchioles and alveolar sacs.

**Part II True or False:** Place (T) in front of the True statement and (F) in front of the False statement. Correct the False statement. Marks will not be given for the statements that are not corrected. (20 Marks)

1. As a basic process involved in the formation of urine by the kidneys, glomerular filtration is a discriminating movement of protein-free plasma from blood into the tubules.
2. The net filtration pressure is caused by three balanced physical forces: glomerular capillary blood pressure, plasma-colloid osmotic pressure and Bowman's capsule hydrostatic pressure.
3. The GFR can be deliberately altered by changing the glomerular capillary blood pressure by sympathetic influence on the afferent arterioles and efferent arterioles.
4. Tubular reabsorption involves transepithelial transport from the tubular lumen into the peritubular capillary plasma by an active transport.
5. The net reabsorption of sodium from the tubular lumen to the peritubular capillary plasma depends on an energy-dependent  $\text{Na}^+ - \text{K}^+$  ATPase carrier located in the luminal membrane of almost all tubular cells transport  $\text{Na}^+$ .
6. Urea and other waste products are partially reabsorbed as a result of a concentrating effect due to the extensive reabsorption of water from the tubular fluid.
7. By tubular secretion, the kidney tubules can non-selectively add some substances to the quantity already filtered. Secretion of substances hastens their excretion in urine.
8. Both hydrogen ion and organic acids are secreted by the secretory system of the kidney which is located throughout different segments of the tubules.
9. The bladder can accommodate up to 1 liter of urine before stretch receptors within its wall initiate the micturition reflex.



10. The micturition reflex causes voluntary emptying of the bladder by simultaneous bladder contraction and opening of both the internal and external urethral sphincter.
11. Foodstuffs not absorbed by the small intestine are absorbed by the large intestine.
12. Pancreatic secretions include potent digestive enzymes from the duct cells and aqueous  $\text{NaHCO}_3$  solution from the acinar cells.
13. During meals, bile is stored and concentrated in the gallbladder.
14. The two substances absorbed by specialized transport mechanisms located only in the terminal ileum are glucose and amino acids.
15. The most potent choleretic is secretin.
16. The work of breathing normally requires about 20-25% of total energy expenditure.
17. The ventral respiratory group (VRG) is called to act during normal quiet breathing.
18. Rhythmicity of breathing is brought about by pacemaker activity displayed by the respiratory muscles.
19. Ventilation is mechanically accomplished by alternately shifting the direction of the pressure gradient for airflow between the atmosphere and the alveoli through the cyclical expansion and recoil of the lungs.
20. The only point of electrical contact between the atria and ventricles is the fibrous skeletal rings.

**Part III: Answer the following questions: (40 marks)**

1. Define Haldane effect and chloride shift, indicating the role of each in gas transfer

2. Mention the factors other than the partial pressure gradient that influence the gas transfer?

Define tubular maximum (Tm), renal threshold for a substance. Give their importance?

GoodLuck!!!!!!!!!!!!  
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6. How the stomach lining is protected from gastric secretions?

7. Mention the major control mechanisms regulate glomerular filtration rate! their importance?

3. What are the effects of the following breathing patterns on pulmonary and alveolar ventilation: deep, slow breathing and shallow rapid breathing?

4. Mention the absorptive mechanisms for carbohydrate, protein and fat.

5. Discuss the role of bile salts in digestion of fats?