



UNIVERSITY OF EMBU

2017/2018 ACADEMIC YEAR

TRIMESTER EXAMINATION

**FIRST YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE
(NURSING)**

HNS 132: MEDICAL PHYSIOLOGY III

DATE: AUGUST 2, 2018

TIME: 2:00-5:00PM

INSTRUCTIONS :

Answer:

All MCQs in Section A;

All Short-answer Questions in Section B

All Long-answer Questions in Section C

Cancelled work should be done neatly by crossing with a single line in the essay and by use of X in the MCQs

SECTION A: MULTIPLE CHOICE QUESTIONS (20 MARKS)

1. Concerning the transport of oxygen in the blood:
 - a) Oxygen and hemoglobin bind in an irreversible reaction to form oxyhemoglobin
 - b) About 98.5% of blood O₂ is bound to hemoglobin in RBCs
 - c) The concentration of oxygen in arterial blood, by volume, is about 20 mL/dL
 - d) Oxygen does not dissolve easily in water

2. The following nephron segment reabsorbs the highest amount of water under normal conditions:
 - a) Proximal convoluted tubule
 - b) Ascending limb of the loop of Henle
 - c) Distal convoluted tubule
 - d) Collecting ducts

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3. Pulmonary surfactant increases:
 - a) The surface tension of the fluid lining alveolar walls
 - b) Lung compliance
 - c) In effectiveness as the lungs are inflated
 - d) In amount when the pulmonary blood flow is interrupted

4. Concerning water reabsorption by the proximal tubule:
 - a) The main driving forces for water reabsorption in the proximal tubule are solute uptake and oncotic pressure in peritubular capillaries
 - b) A significant amount of water uptake in the proximal tubule is dependent on sodium uptake by the Na/H antiporters present in their luminal membrane
 - c) Aquaporin-I (water channels) are abundantly present in the cellular membranes of proximal tubule cells
 - d) All are correct

5. The following is involved in the regulation of the glomerular filtration rate (GFR):
 - a) Tubuloglomerular feedback
 - b) Sympathetic nervous system
 - c) Angiotensin II
 - d) All of the above

6. In the normal menstrual cycle:
 - a) The proliferative phase depends on estrogen secretion
 - b) Cervical mucus becomes more fluid around the time of ovulation
 - c) Ovulation is followed by a surge in blood luteinizing hormone
 - d) Basal body temperature is higher after ovulation

7. The following would cause an increase in the glomerular filtration rate (GFR):
 - a) Constriction of the afferent arteriole
 - b) Constriction of the efferent arteriole
 - c) Increased plasma protein concentration
 - d) Constriction of the ureter

8. Oxygen unloading:
- Increases with increased PaCO_2
 - Decreases with increase in temperature
 - Decreases with increase in 2,3 DPG
 - Increases with increased PaO_2
9. Carbon dioxide:
- Is carried as carboxyhemoglobin on the hemoglobin molecule
 - Uptake by the blood increases its oxygen-binding power
 - Uptake by blood increases in H^+ and HCO_3^- ion concentrations
 - Content is greater than oxygen content in arterial blood
10. In controlling aldosterone secretion, angiotensin II acts on the following tissue:
- Zona glomerulosa
 - Zona fasciculata
 - Zona reticularis
 - Adrenal medulla
11. Concerning the function of the proximal tubule:
- Most of the glomerular ultrafiltrate is reabsorbed in the proximal tubule in an iso-osmotic fashion
 - The concentration of PAH doesn't change much along the length of the proximal tubule
 - Under normal conditions, most of the filtered glucose and bicarbonate are reabsorbed in the proximal tubule
 - A and C are correct
12. Fertilization of ovum normally occurs in:
- Uterus
 - Cervix of uterus
 - Fallopian tube
 - None of the above

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13. The cotransport of glucose derives energy from
- Na⁺ concentration gradient
 - The glucose molecule being transported
 - Ca²⁺ gradient
 - The membrane voltage
14. Estrogen is responsible for development of female secondary sex characteristics, including:
- Narrow shoulders
 - Broad hips and wider carrying angle
 - Divergent arms
 - Convergent thighs and wider pelvic inlet
15. Gastric emptying is slowest after consuming:
- High protein meal
 - High fat meal
 - Alcohol
 - High carbohydrate meal
16. Follicle stimulating hormone:
- Helps in maturation and growth of follicles
 - In the presence of LH, facilitates release of estrogen by the theca interna of the graafian follicle
 - Facilitates spermatogenesis
 - All of the above
17. Concerning the function of the glomerular mesangial cells:
- Mesangial cells can contract and cause some decrease in total glomerular filtration area
 - Mesangial cells play a major role in systemic angiotensin II production
 - Mesangial cells are phagocytic and play a role in the clearing of proteins and immune-deposits entrapped in the mesangium
 - A and C are correct

18. The salivary secretion:

- a) Is stimulated by most GIT hormones specially gastrin
- b) Is essential for complete digestion of starch
- c) Increases more by sweet than by bitter substances
- d) Markedly is increased by parasympathetic stimulation

19. The following is most likely to produce the greatest increase in insulin secretion:

- a) Amino acids
- b) Amino acids and glucose
- c) Amino acids and somatostatin
- d) Glucose and somatostatin

20. The main barrier precluding the free passage of albumin across the glomerular capillary walls is formed by:

- a) The fenestrated glomerular endothelium
- b) Anionic proteoglycan clusters within the glomerular basement membrane
- c) The filtration slits in between visceral epithelial cells (podocytes)
- d) All are correct

SECTION B: ANSWER ALL THE QUESTIONS IN THIS SECTION (40 MARKS; USE THE ANSWER BOOKLET PROVIDED)

- 1. State five functions of liver in lipid metabolism (5 marks)
- 2. Explain the influence of the following hormones on pregnancy:
 - a) Human chorionic gonadotrophin (3 marks)
 - b) Estrogens (3 marks)
- 3. Describe the absorption of monosaccharides in the small intestine (6 marks)
- 4. Explain the effect of the following factors on the affinity of hemoglobin for oxygen:
 - a) pH (3 marks)
 - b) Partial pressure of CO₂ (3 marks)
- 5. State five functions of Sertoli cells (5 marks)
- 6. Explain the influence of antidiuretic hormone on urine formation in the kidneys (6 marks)

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7. Describe the main stimulants of hydrochloric acid secretion in the stomach (6 marks)

SECTION C: ANSWER ALL THE QUESTIONS IN THIS SECTION (40 MARKS; USE THE ANSWER BOOKLET PROVIDED)

1. The respiratory system provides for gaseous exchange among other roles:
- a) Explain how external respiration occurs in the body (4 marks)
 - b) Describe the factors that affect the rate of pulmonary and systemic gas exchange (16 marks)
2. Filtration of the plasma in the glomerulus is the first step in renal processing of urine:
- a) Define glomerular filtration rate (2 marks)
 - b) Describe the main pressures that regulate the rate of glomerular filtration (6 marks)
- c) Explain the hormonal regulation of the glomerular filtration rate (12 marks)

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