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**UNIVERSITY EXAMINATIONS**

**FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR  
OF SCIENCE IN NURSING**

**NURS 112A: MEDICAL PHYSIOLOGY I**

**STREAMS: BSC (NURS) Y1S1**

**TIME: 2 HOURS**

**DAY/DATE: MONDAY 02/12/2019**

**2.30 P.M. – 4. 30 P.M.**

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**INSTRUCTIONS:**

- Do not write anything on the question paper.
- The paper has three sections. Answer ALL questions
- All your answers for Section I (MCQs) should be on one page.
- Number ALL your answers and indicate the order of appearance in the space provided in the cover page of the examination answer booklet.

**SECTION A (MULTIPLE CHOICE QUESTIONS) – 20 MARKS**

1. The following statement is TRUE concerning the plasma membrane:
  - (a) Plasma membranes contain relatively few protein molecules
  - (b) Plasma membranes have a stable composition throughout the life of the cell
  - (c) Plasma membranes contain mostly carbohydrate molecules
  - (d) Plasma membranes have variable protein and lipid contents depending on their location in the cell
2. Endocytosis is a form of vesicular transport mechanism that uses cellular energy: The following statement describes the process of endocytosis:
  - (a) Endocytosis refers to the invagination of the plasma membrane to take up extracellular contents into the cell
  - (b) Endocytosis refers to vesicular trafficking between Golgi stacks

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- (c) Endocytosis includes phagocytosis and pinocytosis, but not clathrin-mediated or caveolae-dependent uptake of extracellular contents
- (d) Endocytosis refers to the merging of an intracellular vesicle with the plasma membrane to deliver intracellular contents to the extracellular environment.
3. Increased conductance of cardiac  $K^+$  channels occurs in which of the following phases of the cardiomyocyte action potential?
- (a) Phase 1
- (b) Phase 2
- (c) Phase 3
- (d) Phase 4
4. The following transport process will be affected directly if the mitochondria in a cell are not functioning properly:
- (a) The movement of glucose into a cell
- (b) The movement of water into and out of the cell
- (c) The movement of oxygen across the cell membrane
- (d) The movement of sodium out of the cell
5. The following statement distinguishes facilitated diffusion from simple diffusion:
- (a) Facilitated diffusion is saturable, simple diffusion is not
- (b) Facilitated diffusion requires ATP, simple diffusion does not
- (c) Facilitated diffusion is dependent on concentration gradient, simple diffusion is not
- (d) Facilitated diffusion is not chemically specific, simple diffusion is
6. A group of nursing students from Mombasa, where the sea level barometric pressure is 760 mm Hg traveled to the summit of Mt. Kenya, where the barometric pressure is about 320 mm Hg. Before leaving Mombasa, the students measured the partial pressure of  $O_2$  and they again measured the at the top of Mt. Kenya. Assuming they were measuring “dry air”, what is the difference in at the two sites?
- (a) 160 mm Hg
- (b) 21%
- (c) 67.2 mm Hg
- (d) 92.4 mm Hg

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7. Antibodies belong to a class of plasma proteins called
  - (a) Albumins
  - (b) Gamma globulins
  - (c) Beta globulins
  - (d) Agglutinins
8. Oxygen unloading:
  - (a) Increase with increased PaCO<sub>2</sub>
  - (b) Decreases with increase in temperature
  - (c) Decreases with increase in 2, 3 DPG
  - (d) Increases with increased PaO<sub>2</sub>
9. A nurse in the chest clinic administered respiratory tests on an 18 year old female student. After speaking with the student, he reported to her that the FVC measured at 4 L. The following statement best describes what the nurse measured:
  - (a) The amount of air that normally moves into (or out of) the lung with each respiration
  - (b) The amount of air that enters the lung but does not participate in gas exchange
  - (c) The amount of air expired after maximal expiratory effort
  - (d) The largest amount of gas that can be moved into and out of the lungs in 1 min
10. The following transport process occurs during the movement of gases across the alveolar capillary membrane:
  - (a) Primary active transport
  - (b) Filtration
  - (c) Simple diffusion
  - (d) Facilitated diffusion
11. The following statement best describes the function of Na<sup>+</sup>/K<sup>+</sup> ATPase?
  - (a) It uses the energy in ATP to extrude 3 Na<sup>+</sup> out of the cell in exchange for taking two K<sup>+</sup> into the cell
  - (b) It uses the energy in ATP to extrude 3 K<sup>+</sup> out of the cell in exchange for taking two Na<sup>+</sup> into the cell
  - (c) It uses the energy in moving Na<sup>+</sup> into the cell or K<sup>+</sup> outside the cell to make ATP

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- (d) It uses the energy in moving  $\text{Na}^+$  outside of the cell or  $\text{K}^+$  inside the cell to make ATP

12. The second heart sound is caused by:
- (a) Closure of the aortic and pulmonary valves
  - (b) Vibrations in the ventricular wall during systole
  - (c) Ventricular filling
  - (d) Closure of the mitral and tricuspid valves
13. The following ionic change would make the membrane potential of a cardiac muscle more positive:
- (a) Increased conductance to potassium
  - (b) Increased conductance to calcium
  - (c) Decreased conductance to sodium
  - (d) Decreased conductance to calcium

The following clinical data were obtained from a middle-aged man: Use the data to answer questions 14 and 15

Respiration 30/minute

Pulse rate 200 beats/minute

End-diastolic volume 120 ml

End-systolic volume 20 ml

14. The cardiac output of the above man is:
- (a) 2 L/min
  - (b) 10 L/min
  - (c) 20 L/min
  - (d) 25 L/min
15. The estimated ejection fraction of the above man is:
- (a) 0.45
  - (b) 0.6
  - (c) 0.8
  - (d) 1.0

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16. Resistance in the airways of the lungs decreases:
- (a) In response to sympathetic nervous system activation
  - (b) In response to parasympathetic nervous system activation
  - (c) As the diameter of the air tubes decreases
  - (d) As the secretion of the surfactant decreases
17. The following will decrease the oxygen carrying capacity of blood:
- (a) Increased temperature
  - (b) Increased PCO<sub>2</sub>
  - (c) Decreased hemoglobin level
  - (d) Decrease in pH
18. Concerning the transport of gases in the blood the following statement is true:
- (a) Oxygen and hemoglobin bind in a reversible reaction to form oxyhemoglobin
  - (b) Most of the CO<sub>2</sub> is transported as carbamino compounds
  - (c) Oxygen does readily dissolves in water
  - (d) About 78.5% of blood O<sub>2</sub> is bound to hemoglobin in RBCs
19. The following blood cell has prominent cytoplasmic granules?
- (a) A monocyte
  - (b) A lymphocyte
  - (c) A macrophage
  - (d) An eosinophil
20. When the radius of the resistance vessels is increased, the following will also be increased:
- (a) Systolic blood pressure
  - (b) Diastolic blood pressure
  - (c) Capillary blood flow
  - (d) Viscosity of the blood

**SHORT ANSWER QUESTIONS (40 MARKS)**

1. Explain how the following transport processes occur across the plasma membrane:
  - (a) Endocytosis [3 marks]
  - (b) Facilitated diffusion [3 marks]
2. State two (2) homeostatic functions for each of the following cellular organelles:
  - (a) Smooth endoplasmic reticulum [2 marks]
  - (b) Golgi complex [2 marks]
3. Describe the origin and functions of plasma proteins giving specific examples [6 marks]
4. Explain how the following factors affecting the affinity of hemoglobin for oxygen:
  - (a) pH [3 marks]
  - (b) Partial pressure of carbon dioxide [3 marks]
5. Describe the ionic changes that occur during the following phases of the cardiac action potential:
  - (a) Phase 0 [2 marks]
  - (b) Phase 1 [2 marks]
  - (c) Phase 2 [2 marks]
6. Explain the meaning of the following in regard to the cardiac cycle:
  - (a) End-diastolic volume [2 marks]
  - (b) End-systolic volume [2 marks]
  - (c) Ejection fraction [2 marks]
7. Explain any two (2) factors that influence the rate of gas exchange in the lungs and the systemic tissues [6 marks]

**LONG ANSWER QUESTIONS (40 MARKS)**

1. The respiratory system facilitates gas exchange:
  - (a) Explain how the exchange of oxygen and carbon dioxide occurs across the respiratory membrane and describe any two factors that promote the process  
[8 marks]
  - (b) Describe the neural control of breathing [12 marks]

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2. The cardiovascular system transports and distributes oxygen and other essential substances to body tissues:

(a) Define cardiac output and explain its physiologic regulatory mechanisms

[8

marks]

(b) Describe the hormonal control of the arterial pressure

[12 marks]

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