

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

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

NURS 112: MEDICAL PHYSIOLOGY 1

STREAMS: Y1S1

TIME: 2

HOURS

DAY/DATE : FRIDAY 17 /09/ 2021

8.30 AM – 10.30 AM

INSTRUCTIONS:

INSTRUCTIONS:

1. Do not write anything on the question paper.
2. Mobile phones and any other reference materials are NOT allowed in the examination room.
3. The paper has three sections. Answer ALL questions in Sections I and II and ONE question in section III.
4. All your answers for Section I (MCQs) should be on one page.
5. Number ALL your answers and indicate the order of appearance in the space provided in the cover page of the examination answer booklet.
6. Write your answers legibly and use your time wisely

Section A: Multiple Choice Questions (20 Marks)

1. Metabolism is best described as:
 - a) The ability to transform substances into energy for the body
 - b) The sum of the chemical reactions that occur in the body
 - c) How the human body uses the food we eat
 - d) How fast the body uses energy
2. Extracellular fluid differs from intracellular fluid in that its:
 - a) Volume is greater
 - b) Osmolarity is lower
 - c) pH is lower
 - d) Anions are mainly inorganic
3. The following cellular component is the sorting and packaging centre of the cell:

- a) Golgi apparatus
 - b) Lysosome
 - c) Nucleus
 - d) Rough endoplasmic reticulum
4. The following is true concerning the plasma membrane:
- a) It is selectively permeable to substances in the body
 - b) It is made up entirely of proteins
 - c) It does not contain lipids
 - d) It is made up entirely of carbohydrates
5. Increased sympathetic drive to the heart:
- a) Increases coronary blood flow
 - b) Decreases rate of depolarization in the sinoatrial node
 - c) Decreases the rate of conduction in the Purkinje fibers
 - d) Decreases the ejection fraction of the left ventricle
6. 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
7. Oxygen unloading:
- a) Increases with increased PaCO₂
 - b) Decreases with increase in temperature
 - c) Decreases with increase in 2,3 DPG
 - d) Increases with increased PaO₂
8. In primary active transport, energy is derived from:
- a) Ionic differences across the inside and outside of the plasma membrane
 - b) ATP breakdown
 - c) Co-transport of glucose and amino acids
 - d) Smooth endoplasmic reticulum
9. The blood plasma is:
- a) Interstitial fluid
 - b) Extracellular fluid
 - c) Intracellular fluid
 - d) None of the above
10. In a cell, movement of molecules from an area of low concentration to an area of high concentration
- a) Uses facilitated diffusion
 - b) Requires cellular energy
 - c) Needs associated (peripheral) proteins

- d) Uses its concentration gradient to move
11. Concerning cholinergic transmission:
- All preganglionic neurons are cholinergic
 - All parasympathetic postganglionic neurons are cholinergic
 - Both a and b are correct
 - None of the above is correct
12. 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
13. An excitatory post-synaptic potential:
- Is the depolarization of a post-synaptic nerve cell membrane that occurs when a pre-synaptic neuron is stimulated
 - Involves reversal of polarity across the post-synaptic nerve cell membrane
 - Is propagated at the same time as action potential
 - Is caused by the electrical field induced by activity in the pre-synaptic nerve terminals
14. The non-polar tails of phospholipids of the plasma membrane are:
- Hydrophilic
 - Hydrophobic
 - Permeable to water soluble molecules
 - Impermeable to fat soluble molecules
15. Some cells secrete chemicals into the extracellular fluid that act on cells in the same tissue. Which of the following refers to this type of regulation?
- Neural
 - Endocrine
 - Neuroendocrine
 - Paracrine
16. The following transport process will be affected directly if the mitochondria in a cell are not functioning properly:
- The movement of glucose into a cell
 - The movement of water into and out of the cell
 - The movement of oxygen across the cell membrane
 - The movement of sodium out of the cell
17. Indicate in which compartment you would find a low concentration of both K^+ ions and proteins
- Intracellular fluid
 - Plasma

- c) Interstitial fluid
 - d) Extracellular fluid
18. The resting membrane potential of a mammalian cell:
- a) Occurs when there is an action potential
 - b) Gives a negative voltage to the cell membrane
 - c) Is largely dependent on movement of proteins across the cell membrane
 - d) Gives a positive charge to the cell membrane
19. An action potential in a nerve fiber:
- a) Occurs when its membrane is hyperpolarized to a critical level
 - b) Is associated with a transient increase in membrane permeability to sodium
 - c) Is associated with a transient decrease in membrane permeability to potassium
 - d) Has an amplitude which varies with the strength of stimulus
20. 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

Short Answer Questions (40 Marks)

1. Briefly describe how the following transport processes occur across the plasma membrane:
 - a) Facilitated (3 marks)
 - b) Primary active transport (3 marks)
 - c) Secondary active transport (3 marks)
2. Explain the homeostatic functions of the following cellular organelles:
 - a) Smooth endoplasmic reticulum (3 marks)
 - b) Golgi complex (3 marks)
3. State five (5) properties of action potentials (5 marks)
4. Explain how the following factors affect the affinity of hemoglobin for oxygen:
5. Ph (2 marks)
6. Partial pressure of carbon dioxide (2 marks)
7. Describe three (3) physiological properties that enable neurons perform their physiological function (6 marks)
8. Describe the functions of white blood cells (6 marks)
9. Explain the difference between internal respiration and external respiration (4 marks)

Long Answer Questions (40 Marks)

1. The main physiological function of the respiratory system is to facilitate gas exchange:
 - a) Describe how the exchange of oxygen and carbon dioxide occurs across the respiratory membrane (6 marks)
 - b) Explain three (3) factors that affect the rate of pulmonary and systemic gas exchange (9 marks)
 - c) Briefly explain how the following factors influence respiration:
 - i. Pain (1 mark)
 - ii. Temperature (1 mark)
 - iii. Airway irritation (1 mark)
 - iv. Blood pressure (1 mark)
 - v. Limbic system (1 mark)

 2. The heart contracts from the intrauterine life until death:
 - a) State the components of the cardiac conduction system in the order traveled by signals from the pacemaker cells (5 marks)
 - b) Describe three (3) factors that determine the stroke volume (6 marks)
 - c) Explain how the following hormones contribute to regulation of arterial pressure:
 - i. Renin-angiotensin-aldosterone system (3 marks)
 - ii. Epinephrine (3 marks)
 - iii. Antidiuretic hormone (3 marks)
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