



**AMREF INTERNATIONAL UNIVERSITY**  
**SCHOOL OF MEDICAL SCIENCES**  
**DEPARTMENT OF REHABILITATIVE MEDICINE**  
**BACHELOR OF SCIENCE IN PHYSIOTHERAPY**

**END OF SEPTEMBER-DECEMBER TRIMESTER 2022 EXAMINATIONS**

**PHT 117: HUMAN PHYSIOLOGY**

**DATE: 30<sup>TH</sup> NOVEMBER 2022**

**TIME: 2 Hours                      Start: 9:00am                      Finish: 11:00am**

**INSTRUCTIONS**

1. All students will have two (2) hours to complete the examination
2. Attempt all questions as per the instruction
3. It is the student's responsibility to report any page and number missing in this paper.
4. Check that the paper is complete
5. Total number of pages is 8 including the cover.
6. Read through the paper quickly before you start
7. Do Not write anything on the question paper -use the back of your booklet for rough work if need be

## Multiple choice questions

1. In a healthy adult, ECF volume constitutes what fraction of body weight?
  - a. 10%
  - b. 20%
  - c. 30%
  - d. 40%
  - e. 5%
  
2. Which of the following is not a type of a muscle fibre?
  - a. smooth muscle
  - b. rough muscle
  - c. striated muscle
  - d. cardiac muscle
  - e. none
  
3. Which of the following characteristics is shared by simple and facilitated diffusion of glucose?
  - a. Occurs down an electrochemical gradient
  - b. Is saturable
  - c. Requires metabolic energy
  - d. Is inhibited by the presence of galactose
  - e. Requires a  $\text{Na}^+$  gradient
  
4. Facilitated diffusion:
  - a. Involves a carrier molecule
  - b. Requires energy expenditure.
  - c. is how glucose enters the cells
  - d. Both (a) and (c) above.
  - e. All of the above
  
5. Osmosis is the:
  - a. Passive transmembrane diffusion of water.
  - b. Active transmembrane transport of water.
  - c. Flux of water due to a transmembrane hydrostatic pressure gradient.
  - d. Passive transmembrane diffusion of solute.
  - e. Active transmembrane transport of solute.

6. Which of the following transport processes is affected if transport of glucose from the intestinal lumen into a small intestinal cell is inhibited by abolishing the usual  $\text{Na}^+$  gradient across the cell membrane?
- Simple diffusion
  - Facilitated diffusion
  - Primary active transport
  - Cotransport
  - Countertransport
7. The cross-bridges of the sarcomere in skeletal muscle are made up of:
- Actin
  - Myosin
  - Troponin
  - Tropomyosin
  - Myelin
8. Gap junctions:
- Are absent in cardiac muscle
  - Are present but of little functional importance in cardiac muscle
  - Are present and provide the pathway for rapid spread of excitation from one cardiac muscle fiber to another
  - Are absent in smooth muscle
  - Connect the sarcotubular system to individual skeletal muscle cells
9. The principal intracellular cation is:
- $\text{Na}^+$
  - $\text{Cl}^-$
  - $\text{K}^+$
  - $\text{Ca}^{2+}$
  - $\text{Mg}^+$
10. The carbohydrate moiety on the cell surface has all of the following functions, EXCEPT:
- Give the cell a charge (polarity)
  - Attach cells to one another
  - Act as a receptor
  - Are involved in immune reactions
  - Provide ion channels

11. Chemical messengers bind to protein receptors in all of the following, EXCEPT:
- On the surface of the cell
  - In the cytoplasm
  - In the nucleus
  - On the cell membrane
  - On the cilia
12. The Golgi complex is:
- an organelle that participates in the breakdown of proteins and lipids
  - an organelle that participates in posttranslational processing of proteins
  - an organelle that participates in energy production
  - an organelle that participates in transcription and translation
  - a sub cellular compartment that stores proteins for trafficking to the nucleus
13. A Nernst or equilibrium potential:
- is always negative to the resting voltage
  - is due to diffusion
  - Is equal to the resting voltage
  - Is always positive to the resting voltage
  - Depends on the membrane capacitance.
14. The relative refractory period is mostly due to:
- An elevated  $K^+$  conductance
  - An elevated  $Na^+$  conductance
  - An inactivated  $K^+$  conductance
  - An increase in membrane capacitance
  - An influx of  $Ca^{2+}$
15. Membrane potential:
- Refers to a separation of charges across the membrane or to a difference in the relative number of +ve and -ve charges in the ECF and ICF.
  - Is measured in units of millivolts with the sign always designating the charge on the outside.
  - Is less at the equilibrium potential for  $K^+$  than at resting membrane potential.
  - Cannot be measured easily.
  - All the above are true

16. The resting membrane potential is
- Much closer to the equilibrium potential for  $\text{Na}^+$  than to the equilibrium potential for  $\text{K}^+$
  - Much closer to the equilibrium potential for  $\text{K}^+$  than to the equilibrium potential for  $\text{Na}^+$
  - The same as the equilibrium potential for  $\text{Cl}^-$
  - Both (a) and (c) above.
  - Both (b) and (c) above.
17. At resting membrane potential:
- the membrane is more permeable to  $\text{K}^+$  than to  $\text{Na}^+$
  - the membrane is more permeable to  $\text{Na}^+$  than to  $\text{K}^+$
  - $\text{Cl}^-$  is at its equilibrium potential.
  - Both (a) and (c) above.
  - Both (b) and (c) above.
18. Mr. S experienced shivers on the sight of cold water on a cold day as he was preparing for a shower. What type of control mechanism explains the shivers?
- Positive Feedback
  - Negative feedback
  - Feed forward
  - Open loop
  - None of the above
19. A threshold potential is:
- The potential achieved when two opposing forces acting upon an ion (concentration and electrical gradients) achieve a state of equilibrium.
  - The peak potential achieved during an action potential.
  - The point at which there is a rapid increase in  $\text{Na}^+$  permeability.
  - The potential at which  $\text{P K}^+$  increases.
  - Always a positive potential.
20. Blood pressure
- Is increased in acute blood loss to compensate for the reduced oxygen carrying capacity
  - Falls when one takes vasodilator drugs thus a decrease in peripheral resistance
  - A rise in blood pressure should be controlled by infusing fluids to improve on volume
  - Is the force of contraction of the heart
  - Is largely controlled by the venous tone

21. Sinoatrial node cells are
- Found in both atria
  - Innervated by the vagus nerve
  - Unable to generate impulses when completely denervated
  - Connected to the AV node by fine bundles of Purkinje tissue
  - Able to generate impulses because of their stable membrane potential
22. After a mild hemorrhage, compensatory responses initiated by the baroreceptor reflex keeps blood pressure at or close to its normal value. Which one of the following values is less after compensation for the hemorrhage than it was before the hemorrhage?
- Venous compliance
  - Heart rate
  - Ventricular contractility
  - Total peripheral resistance
  - Coronary blood flow
23. At birth, changes that occur in the fetal circulation include
- Increased systemic arterial pressure
  - Increased pulmonary vascular resistance
  - Increased pulmonary arterial pressure.
  - Decreased left atrial pressure.
  - Decreased pulmonary blood flow
24. Blood flow through an organ would be increased by decreasing
- The diameter of the arterial vessels
  - The number of open arterial vessels
  - The arterial pressure
  - The diameter of the venous vessels
  - The hematocrit
25. Net filtration from capillaries will increase following
- Increased contraction of the precapillary sphincter
  - Decreased arterial pressure
  - Increased plasma protein concentration
  - Decreased capillary permeability
  - Increased post-capillary resistance
26. When the bundle of His is completely interrupted, the:
- ventricles contract at a rate of 30-40 beats / minutes
  - Atria beat irregularly
  - QRS complexes vary in shape from beat to beat.
  - P-R interval remains constant from beat to beat
  - S.A node stops discharging.

27. Joe had to have both of his kidneys removed and is now kept alive only by dialysis machines that remove waste molecules from his blood and adjust electrolyte levels. Because Joe has no remaining kidney tissue, he may also need
- Clotting proteins
  - Vitamin B12 to stimulate RBC production
  - Erythropoietin to stimulate RBC production
  - A bone marrow transplant
  - Iron supplements
28. In the clinical setting, ECG can be used to determine
- Mechanical performance of the heart:
  - Cardiac output.
  - Systolic and diastolic information.
  - Volume changes
  - Venous return to heart.
29. Cardiac chronotropism refers to:
- Rhythmicity.
  - Conductivity.
  - Excitability.
  - Contractility.
  - Automaticity
30. HR is increased by all except
- Hypoxia
  - Decreased activity of the baroreceptors
  - Fever
  - Bainbridge reflex
  - Expiration
31. Stimulation of the parasympathetic nerves to the heart will result in:
- Reduction of the blood pressure
  - Increase in heart rate
  - Vasodilation of the coronary arteries
  - Vasoconstriction of peripheral arteries
  - Increased contractility of cardiac muscle
32. Blood flow to the heart is maximum during
- Systole
  - Diastole
  - In both diastole and systole
  - None of the above
  - In part of diastole and part of systole.

33. The following statements are true regarding the sino atria node except
- Is located at the right border of the ascending aorta
  - It contains specialized nodal cardiac muscle
  - It is supplied by the atrial branches of the right coronary artery
  - It initiates cardiac contractions
  - Is located at the superior vena cava.
34. Which type of blood vessels carries blood away from the heart?
- Veins
  - Arteries
  - Capillaries
  - Arteries, veins and capillaries
  - None of the above
35. Increased Baroreceptor discharge acts via the medulla to
- Increase HR
  - Increase SV
  - Increase vessel diameter
  - Increase BP
  - Increase renin
36. Blood pressure
- Is increased in acute blood loss to compensate for the reduced oxygen carrying capacity
  - Falls when one takes vasodilator drugs thus a decrease in peripheral resistance
  - A rise in blood pressure should be controlled by infusing fluids to improve on volume
  - Is the force of contraction of the heart
  - Is largely controlled by the venous tone
37. During blood coagulation, thromboplastin is released by?
- Red blood cells
  - Plasma
  - Leukocytes
  - Damaged tissue and clumped platelet
38. The life span of WBC is approximately
- Less than 10days
  - 20 to 30 days
  - 2- 3 months
  - More than 3 months
39. Name the iron containing protein that gives RBC their color
- Hemoglobin
  - Hemocyanin
  - Pyrite
  - Myoglobin



40. Which of the following is the largest blood vessel in the body
- Aorta
  - Capillary
  - Pulmonary veins
  - Heart

**Short answer questions (10marks)**

- Differentiate Type 1 and Type 11 muscle fibers (5 marks)
- Outline the function of Red Blood Cells (5marks)

**Long answer questions (10marks)**

- Describe the transport across the cell membrane (10 marks)

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