



**AMREF INTERNATIONAL UNIVERSITY
SCHOOL OF MEDICAL SCIENCE
DEPARTMENT OF REHABILITATION MEDICINE
BACHELOR OF SCIENCE IN PHYSIOTHERAPY
END OF SEPT-DECEMBER 2024 TRIMESTER EXAMINATIONS**

UNIT CODE: PHT 215 UNIT NAME: Exercise Physiology (Special Exam)

DATE: Day/ Date/ AUGUST

TIME: TWO HOURS

START: 0:00 STOP : 0:00

INSTRUCTIONS (physical exams)

- 1. Do not write on this question paper**
(Marks and questions distribution as per program curriculum.)

INSTRUCTIONS (Online examinations)

1. This exam is marked out of 70 marks
2. This Examination comprises 3 Sections
3. This online exam shall take 2 Hours
4. Late submission of the answers will not be accepted
5. Ensure your web-camera is on at all times during the examination period
6. No movement is allowed during the examination
7. Idling of your machine for 5 min or more will lead to lock out from the exam
8. The Learning Management System (LMS) has inbuilt integrity checks to detect cheating
9. Any aspect of cheating detected during and or after the exam administration will lead to nullification of your exam
10. In case you have any questions call the invigilator for this exam on Tel. 0705833434 and or the Head of Department on Tel 0720491032
11. For adverse incidences please write an email to: amiu.examinations@amref.ac.ke

Section 1

1. Which part of the ATP molecule is broken down to release energy?
 - A. Adenine base
 - B. Ribose sugar
 - C. Phosphate bond
 - D. Deoxyribose sugar
2. Under which conditions might the body experience protein breakdown faster than resynthesis?
 - A. Consuming a high-protein diet
 - B. Engaging in intense exercise
 - C. Starvation or a very low-calorie diet
 - D. Taking supplements
3. A sedentary individual begins a new exercise regimen. Their resting heart rate increases from 70 beats per minute to 85 beats per minute, and their stroke volume increases from 70 milliliters per beat to 85 milliliters per beat. Calculate their new cardiac output.
 - A. 5,950 ml/min
 - B. 6,825 ml/min
 - C. 7,225 ml/min
 - D. 8,125 ml/min
4. What is the significance of the triphosphate group in ATP?
 - A. It provides structural stability
 - B. It stores potential energy
 - C. It acts as a catalyst
 - D. It binds to proteins
5. The net ATP production from one molecule of glucose in glycolysis is:
 - A. 1 ATP.
 - B. 2 ATP.
 - C. 3 ATP.
 - D. 4 ATP.
6. What is the role of troponin and tropomyosin in muscle contraction?
 - A. They directly bind to myosin and actin.
 - B. They regulate the exposure of actin binding sites for myosin.
 - C. They prevent the muscle from relaxing.
 - D. They increase the length of the sarcomere.
7. Which of the following is the primary source of calcium ions that trigger muscle contraction?
 - A. The sarcoplasmic reticulum
 - B. The mitochondria
 - C. The extracellular fluid

D. The Golgi apparatus

8. Which of the following statements accurately describes the relationship between the motor neuron and muscle fiber at the neuromuscular junction (NMJ)?
 - A. The motor neuron and muscle fiber directly touch each other.
 - B. A neurotransmitter bridges the gap between the motor neuron and muscle fiber.
 - C. The motor neuron's electrical signal is transmitted directly to the muscle fiber.
 - D. The muscle fiber's electrical signal is transmitted to the motor neuron.

9. Which of the following events occurs immediately after a nerve impulse reaches the end of the motor neuron at the NMJ?
 - A. Calcium is released from the sarcoplasmic reticulum.
 - B. The muscle fiber contracts.
 - C. Acetylcholine is released into the synaptic cleft.
 - D. Sodium channels on the sarcolemma close.

10. A muscle with a high percentage of type IIx fibers would be expected to:
 - A) Exhibit a high degree of fatigue resistance
 - B) Generate low levels of force
 - C) Have a slow rate of contraction
 - D) Be well-suited for explosive power activities

11. Which type of muscle fiber would have the highest maximal shortening velocity (V_{max})?
 - A. Slow oxidative fibers
 - B. Fast oxidative glycolytic fibers
 - C. Fast glycolytic fibers
 - D. Intermediate fibers

12. Regular exercise training can potentially result in:
 - A. The conversion of slow fibers into fast fibers
 - B. The conversion of fast fibers into slow fibers
 - C. No change in muscle fiber type
 - D. The conversion of all fiber types into intermediate fibers

13. The slow portion of Excess Post-Exercise Oxygen consumption (EPOC) is primarily attributed to:
 - A. The resynthesis of stored ATP and PC.
 - B. The replacement of tissue stores of oxygen.
 - C. The oxidative conversion of lactate to glucose.
 - D. The elevated heart rate and breathing rate.

14. The limited regeneration capacity of cardiac muscle is primarily due to:
 - A. The lack of satellite cells in cardiac muscle.
 - B. The presence of intercalated discs, which inhibit cell division.
 - C. The high metabolic demands of cardiac muscle, which limit cell repair.

- D. The involuntary nature of cardiac muscle contraction, which prevents controlled repair.
15. Which of the following factors primarily determines the plateau reached in heart rate during a submaximal exercise bout?
- A. The intensity of the exercise.
 - B. The duration of the exercise.
 - C. The individual's age and fitness level.
 - D. The balance between parasympathetic and sympathetic activity
16. The Fick equation demonstrates the relationship between:
- A. Cardiac output, stroke volume, and heart rate.
 - B. Oxygen uptake, arterial-mixed venous oxygen difference, and stroke volume.
 - C. Cardiac output, arterial-mixed venous oxygen difference, and oxygen uptake.
 - D. Heart rate, arterial-mixed venous oxygen difference, and oxygen uptake.
17. The primary factor influencing the redistribution of blood flow during exercise is:
- A. The type of exercise being performed
 - B. The duration of the exercise
 - C. The intensity of the exercise
 - D. The individual's fitness level
18. The higher heart rate observed during arm work compared to leg work at a given oxygen consumption level can be primarily attributed to:
- A. Increased blood flow to the muscles during arm exercise.
 - B. Greater activation of the sympathetic nervous system in arm work.
 - C. Higher metabolic demands of arm muscles compared to leg muscles.
 - D. Increased respiratory rate during arm work.
19. Which of the following factors contributes to the elevated heart rate during isometric exercise?
- A. Increased muscle tension without significant muscle shortening.
 - B. Decreased blood flow to the exercising muscles.
 - C. Reduced metabolic activity in the muscles.
 - D. Decreased sympathetic nervous system activity.

20. A cross-country skier is training in a high-altitude region with extremely cold temperatures and dry air. Despite being physically fit, the skier has noticed a decline in their performance, including difficulty breathing and muscle fatigue. Given the athlete's symptoms and the environmental conditions, which of the following statements best describes the potential physiological responses to the cold environment?
- A. Cold environments have minimal impact on athletic performance, as the body can effectively adapt to temperature changes.
 - B. Cold environments can enhance athletic performance by increasing muscle power and reducing fatigue.
 - C. Cold environments can impair athletic performance by affecting core temperature regulation, muscle function, and respiratory function.
 - D. The effects of cold environments on athletic performance are solely determined by the intensity of the exercise.
21. Which of the following is a secondary pollutant that can be formed from the reaction of primary pollutants in the atmosphere?
- A. Sulfur dioxide
 - B. Carbon monoxide
 - C. Nitrogen oxides
 - D. Ozone
22. Consider an athlete competing in a high-altitude marathon. Which of the following physiological responses would be expected to occur in order to compensate for the hypoxic environment?
- A. Decreased tidal volume
 - B. Decreased cardiac output
 - C. Increased alveolar ventilation
 - D. Reduced blood flow to peripheral tissues
23. Which of the following statements about DOMS is FALSE?
- A. DOMS typically peaks 24-48 hours after exercise.
 - B. DOMS can be prevented by gradually increasing the intensity and duration of exercise.
 - C. DOMS is a normal response to strenuous exercise.
 - D. DOMS is caused by a buildup of lactic acid in the muscles.
24. As a physiotherapist of a soccer team, you have discovered that the next soccer match in two days will be played in 5 degrees above the normal temperature. Which of following will you advise your players?
- A. Take water only when feeling thirsty
 - B. Sip water regularly throughout the match
 - C. Take energy drinks during the several breaks in the match
 - D. Wear tight fitting clothes to maintain core temperature of the body

25. What is the most important aspect of proper skinfold measurement technique?
- A. Using calipers with strong pressure
 - B. Pinching the skin at random locations
 - C. Following standardized protocols and landmarks
 - D. Taking multiple measurements without averaging
26. Which of the following anatomical sites is NOT considered for girth measurement?
- A. Abdomen: 1 inch above the umbilicus
 - B. Calf: widest girth midway between the ankle and knee
 - C. Upper arm: midpoint between the shoulder and the elbow
 - D. Pelvis: Anterior superior iliac spine
27. How does cortisol's action on carbohydrate metabolism oppose the effects of growth hormone?
- A. Cortisol stimulates glycogenolysis (breakdown of glycogen), while growth hormone promotes glycogen synthesis.
 - B. Cortisol increases glucose uptake by cells, while growth hormone reduces it.
 - C. Cortisol promotes gluconeogenesis (glucose production), while growth hormone inhibits it.
 - D. All of the above
28. You are a physiotherapist of a local hockey team and you have received a communication from your coach about a camp training which will take place on a higher altitude for 2 weeks. Which of the following exercises will you give the players to prepare them for altitude camp training?
- A. Strengthening exercises
 - B. High intensity interval training
 - C. Endurance exercises/activities
 - D. All the above
29. What type of exercise is most effective in mitigating the negative effects of microgravity on the human body?
- A. Cardiovascular exercise
 - B. Resistance training
 - C. Flexibility exercises
 - D. All the above
30. If you are experiencing persistent peripheral fatigue, it is advisable to:
- A. Self-diagnose and treat the condition
 - B. Consult a healthcare professional for proper diagnosis and treatment
 - C. Ignore the symptoms and hope they go away on their own
 - D. Increase your intake of sugary drinks

Section B. Answer all the questions

1. Define Stroke volume (2 Marks)
2. Distinguish between primary and secondary obesity (2 Marks)
3. Differentiate between pulmonary and systematic circuit (2 marks)
4. Explain Fick's equation for measuring cardiac output (4 Marks)
5. Discuss the sliding filament theory (5 Marks)
6. Discuss the oxygen deficit phenomenon during exercises (5 Marks)

Section C Choose one question from the following

1. Describe the full process of cellular respiration to account for all the 38 ATPs produced from one molecule of glucose (20 Marks)
2. Discuss the five theories of Delayed Onset of Muscle Soreness (DOMS) (20 Marks)