



**AMREF INTERNATIONAL UNIVERSITY**  
**SCHOOL OF MEDICAL SCIENCES**  
**DEPARTMENT OF REHABILITATIVE MEDICINE**  
**BACHELOR OF SCIENCE IN PHYSIOTHERAPY**  
**END OF JAN-APRIL 2024 SEMESTER EXAMINATIONS**  
**SPECIAL EXAM**

**UNIT CODE: PHT 215 UNIT NAME: EXERCISE PHYSIOLOGY**

**DATE:**

**TIME: TWO HOURS**

**START: 9:00 AM STOP: 11:00AM**

**INSTRUCTIONS**

- 1. Attempt all questions as per the instructions in each section**
- 2. This exam is marked out of 70 marks**
- 3. This Examination comprises of Sections A, B and C**
- 4. It is the student's responsibility to report any page and number missing in this paper.**
- 5. Total number of pages are 6 including the cover page.**
- 6. Read through the instructions carefully before starting.**
- 7. Any aspect of cheating detected during and or after the exam administration will lead to nullification of your exam.**
- 8. Do not write on this question paper, use the provided booklet to write your answers**

## Section A

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. Which of the following statements is true about alveolar ventilation (VA)?
  - a) It represents the total volume of air moved in and out of the lungs per minute.
  - b) It refers to air flowing into the lungs during inspiration and expiration
  - c) It is calculated by multiplying the respiratory rate by the tidal volume.
  - d) It reflects the amount of air that actually participates in gas exchange.
3. Which of the following statements is NOT true about the electron transport chain?
  - a) It utilizes the high-energy electrons from NADH and FADH<sub>2</sub>.
  - b) It pumps protons across the inner mitochondrial membrane.
  - c) It directly produces ATP through substrate-level phosphorylation.
  - d) It contributes to the creation of a proton gradient for chemiosmosis.
4. What molecule is the primary product of glycolysis?
  - a) Glucose
  - b) Pyruvate
  - c) Acetyl CoA
  - d) ATP
5. Exercise induced asthma (EIA) also called exercise induced bronchoconstriction Usually peaks when?
  - a) First few minutes
  - b) About 15 minutes into exercises
  - c) About 5-10 minutes post the exercise work out
  - d) At 30 minutes after exercises
6. Which of the following statements describes a function of ATP in muscle contraction?
  - (a) It provides energy for the movement of myosin heads.
  - (b) It triggers the release of calcium ions from the sarcoplasmic reticulum.
  - (c) It initiates the action potential in the muscle cell.
  - (d) It maintains the resting potential of the muscle cell.
7. The specific heat capacity of a substance is the amount of heat required to raise the temperature of 1 gram of that substance by 1 degree Celsius.
  - a) True
  - b) False

8. Consuming carbohydrates during prolonged exercise can help to:
- (a) Increase muscle fatigue
  - (b) Deplete glycogen stores faster
  - (c) Maintain blood sugar levels and delay fatigue
  - (d) Decrease the body's ability to utilize fat for energy
9. Which of the following conditions is NOT commonly associated with central fatigue?
- a) Muscles appear to stop listening when fatigue sets in
  - b) No pain sensation or discomfort associated with the fatigue
  - c) Difficulty in maintaining cognitive vigilance
  - d) Individuals have sleep disturbances
10. Which of the following factors does NOT affect the rate of diffusion of gases across the alveolar membrane?
- (a) Surface area of the alveoli
  - (b) Thickness of the alveolar membrane
  - (c) Concentration gradient of gases
  - (d) The level of intrapleural pressure
11. What is the primary reason for the redistribution of blood flow during exercise?
- (a) To maintain blood pressure
  - (b) To deliver oxygen and nutrients to working muscles
  - (c) To regulate body temperature
  - (d) To remove waste products from muscles
12. Which zone of the respiratory system is responsible for the exchange of gases between the air and blood?
- a) Conducting Zone
  - b) Transitional Zone
  - c) Respiratory Zone
  - d) Anatomical dead zone
13. A professional cyclist is training for a high-altitude race by spending several weeks gradually ascending a mountain. As she climbs, her body starts producing more red blood cells. What is the MAIN benefit of this adaptation?
- a) Increased muscle strength
  - b) Improved cardiovascular endurance
  - c) Enhanced oxygen delivery to tissues
  - d) Reduced risk of injury

14. A person with asthma experiences bronchoconstriction, which is the tightening of the airways. How does this affect their airflow resistance?
- (a) No change in the airflow resistance
  - (b) Decreases airflow resistance
  - (c) Increases airflow resistance
  - (d) None of the above
15. The Frank-Starling Law of the heart states that the force of contraction is directly related to the \_\_\_\_\_
- a) Heart rate
  - b) Thickness of the heart muscle
  - c) Preload
  - d) All of the above
16. Dead space ventilation (VD) refers to the volume of air that:
- a) Reaches the alveoli for gas exchange.
  - b) Does not participate in gas exchange and remains in the conducting airways.
  - c) Is exhaled during forced expiration.
  - d) Contains high concentrations of oxygen and low concentrations of carbon dioxide.
17. The thermic effect of food typically contributes to what percentage of your daily calorie expenditure?
- a) 5%
  - b) 10%
  - c) 15%
  - d) 20%
18. During moderate exercise, which of the following is most likely to occur in the breathing pattern?
- a) Breathing rate decreases and depth increases.
  - b) Breathing rate and depth remain constant.
  - c) Breathing rate and depth increase.
  - d) Breathing becomes shallow and rapid.
19. Which of the following hormones stimulates the heart to contract more forcefully during exercise?
- a) Insulin
  - b) Epinephrine
  - c) Glucagon
  - d) Somatostatin

20. As exercise intensity increases, the percentage of total cardiac output directed to the working muscles can reach:
- (a) 10-20%
  - (b) 30-40%
  - (c) 50-60%
  - (d) 80-85%
21. During exercise, compared to rest, the heart muscle receives:
- a) The same amount of blood
  - b) More blood
  - c) Less blood
  - d) Blood with a different oxygen content
22. After 6 months in space, astronaut Mark notices his legs feel weaker and are slightly thinner. This is primarily due to:
- a) Increased muscle mass
  - b) Decreased muscle mass
  - c) Improved cardiovascular health
  - d) None of the above
23. Which of the following factors does NOT affect the sympatholysis?
- a) Percentage of nitric oxide in the blood
  - b) Level of calcium in the blood
  - c) Prostaglandins
  - d) Adenosine in the body
24. A patient's echocardiogram reveals an EF of 45%. This EF is most likely indicative of:
- (a) Normal heart function.
  - (b) Mildly reduced heart function.
  - (c) Severely reduced heart function.
  - (d) No change in heart function.
25. You're planning a recreational scuba diving trip to a tropical island. While researching the location, you discover that the average depth of the dive sites is 30 meters. You usually dive at local sites with depths of 10-15 meters.

Which of the following type of exercises will you NOT include in your preparation for the deeper dives, considering the potential effects of pressure on your body?

- a) Endurance and cardio exercise
- b) Flexibility exercise
- c) Resistance exercises
- d) Deep breathing exercises

26. During periods of stress or "fight-or-flight" response, which hormone would be expected to cause a rapid rise in blood glucose levels?
- a) Insulin
  - b) Glucagon
  - c) Epinephrine
  - d) Thyroid hormone
27. Sarah goes for a brisk jog on a sunny morning at 6°C without warming up first. During her run, she starts feeling tightness in her chest and has difficulty breathing. What is the MOST LIKELY explanation for her symptoms?
- a) Dehydration
  - b) Muscle strain
  - c) Cold-induced bronchoconstriction
  - d) Hypothermia
28. A person weighs 70 kg and is 1.8 meters tall. What is their BMI (rounded to the nearest whole number)?
- a) 17
  - b) 20
  - c) 23
  - d) 26
29. Which category of hormones typically has a slower onset of action and longer-lasting effects on blood glucose control?
- a) Fast-acting hormones like epinephrine
  - b) Permissive hormones like growth hormone
  - c) Slow-acting hormones like thyroid hormones
  - d) All of the above
30. BMR is a major component of what, accounting for roughly 60-70% of daily calorie expenditure?
- a) Total daily energy expenditure (TDEE).
  - b) Resting energy expenditure (REE)
  - c) Non-exercise activity thermogenesis (NEAT)
  - d) Thermic effect of food (TEF)

## Section B

31 Mary weighs 90Kg and she is 1,7M tall. Calculate her BMI (2 Marks)  
Using the BMI standard classification, categorize her BMI result (1 Mark)

BMI	Weight status
Below 18.5	Underweight
18.5- 24.9	Healthy weight (normal)
25.0 -29.9	Overweight
30 and above	Obesity

- 32 Explain the 2-step pumping action in the cardiac cycle (2 Marks)
- 33 Discuss the significance of ejection fraction (EF) to a physiotherapist? (5 Marks)
- 34 Describe each of the following 3 general categories of calorimetry:
- Direct calorimetry (3 marks)
  - Indirect calorimetry (3 Marks)
  - Noncalorimetric techniques (4 marks)

## Section C

35 Explain the process of cellular respiration and how the estimated yield of 32 ATP molecules per glucose molecule is calculated (20 Marks)