

**UNIVERSITY OF BOLTON**

**SPORT AND BIOLOGICAL SCIENCES**

**SPORT AND EXERCISE SCIENCE PATHWAY**

**SEMESTER TWO EXAMINATIONS 2018/2019**

**INTRODUCTION TO SPORT AND EXERCISE  
PHYSIOLOGY**

**MODULE NO: SPS4002**

Date: Thursday 23 May 2019

Time: 2.00 pm – 4.00 pm

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**INSTRUCTIONS TO CANDIDATES:**

There are 64 questions on this paper.  
There are 60 questions in section A  
and 4 questions in section B.

Answer all question in section A and  
2 questions from section B.

Write your answers in the answer  
book provided NOT on the question  
paper.

The examination carries a total of 100  
marks

Electronic calculators may be used  
provided that data and programme  
storage memory is cleared prior to  
the examination.

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**Section A: Answer all questions in this section.**

1. A normal resting cardiac output would be
- a. 60 L/min
  - b. 5 L/min
  - c. 1.2 L/min
  - d. 80 L/ min
- (1 mark)**
2. The rate limiting enzyme in glycolysis is
- a. lactate dehydrogenase
  - b. pyruvate kinase
  - c. cytochrome oxidase
  - d. phosphofructokinase
- (1 mark)**
3. Approximately how much energy does one gram of fat contain
- a. 4 kcal
  - b. 18 kcal
  - c. 12 kcal
  - d. 9 kcal
- (1 mark)**
4. Which of the following would occur in response to elevated blood glucose to maintain homeostasis?
- a. decreased insulin secretion from the pancreas
  - b. increased uptake of glucose by cells
  - c. continued elevation of blood glucose
  - d. all of the above
- (1 mark)**
5. The lactate threshold is defined as the work rate or oxygen uptake where ...
- a. there is a systematic rise in blood levels of lactic acid.
  - b. there is a systematic rise in aerobic metabolism.
  - c. there is a systematic decrease in blood lactic acid concentration.
  - d. all of the above are correct.
- (1 mark)**
6. Reduction reactions refer to
- a. the loss of hydrogen ions
  - b. the addition of oxygen
  - c. the gain of hydrogen ions
  - d. the loss of oxygen
- (1 mark)**

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7. The thick filaments of a myofibril are composed mainly of
- a. sarcoplasm
  - b. tropomyosin
  - c. actin
  - d. myosin
- (1 mark)**
8. The speed of chemical reactions that occur within the body are regulated by
- a. exergonic reactions
  - b. endergonic reactions
  - c. entropy
  - d. enzymes
- (1 mark)**
9. A respiratory quotient (RQ) of 0.95 during steady state exercise is suggestive of.,
- a. a high rate of carbohydrate metabolism.
  - b. a high rate of fat metabolism.
  - c. an equal rate of fat and carbohydrate metabolism.
  - d. a high rate of protein metabolism.
- (1 mark)**
10. How is most of the oxygen transported in the blood?
- a. bound to hemoglobin
  - b. bound to carbohydrates
  - c. dissolved in blood plasma
  - d. bound to fats
11. The direct ATP yield for each Krebs cycle is
- a. 1 ATP
  - b. 3 ATP
  - c. 11 ATP
  - d. 22 ATP

**(1 mark)**

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12. The simplest and most rapid method to produce ATP during exercise is through
- glycolysis.
  - the ATP – CP system.
  - aerobic metabolism.
  - glycogenolysis.
- (1 mark)**
13. What is the function of the cardiovascular system?
- delivery
  - removal
  - transport
  - all of the above
- (1 mark)**
14. The precision with which a biological control system maintains homeostasis is termed
- positive feedback
  - negative feedback
  - set point
  - gain
- (1 mark)**
15. The food sources from which we derive most of our energy are composed mainly of
- carbon, calcium and nitrogen
  - carbon, hydrogen and oxygen
  - calcium, hydrogen and nitrogen
  - carbon, hydrogen and nitrogen
- (1 mark)**
16. Aerobic production of ATP occurs in
- the mitochondria in a process called glycolysis.
  - the mitochondria in a process called oxidative phosphorylation.
  - the mitochondria in a process called beta oxidation.
  - the cytoplasm.
- (1 mark)**
17. On a Monark cycle ergometer a pedalling cadence of 50 revolutions per minute against a resistance of 2kg would result in a work rate of
- 100 watts
  - 90 watts
  - 120 watts
  - none of the above
- (1 mark)**

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18. Systole refers to
- a. the contraction phase of the cardiac cycle
  - b. the relaxation phase of the cardiac cycle
  - c. the entire duration of the cardiac cycle
  - d. the time in between consecutive heart beats
- (1 mark)**
19. The active binding sites to which myosin cross-bridges attach during muscle contraction are found
- a. on the myosin filaments
  - b. on the actin filaments
  - c. on the Z discs
  - d. on the thick filaments
- (1 mark)**
20. Which of the following is also referred to as voluntary muscle?
- a. skeletal muscle
  - b. smooth muscle
  - c. visceral muscle
  - d. cardiac muscle
- (1 mark)**
21. How long would it take for most individuals to reach a steady state heart rate?
- a. 3 mins
  - b. 7 mins
  - c. 10 mins
  - d. 40 mins
- (1 mark)**
22. Which of these occurs in response to exercise in the heat?
- a. sweat rate increases
  - b. blood is directed towards the core of the body
  - c. stroke volume gradually increases
  - d. all of the above
- (1 mark)**

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23. Typically blood plasma makes up how much of total blood volume?
- a. 10%
  - b. 25%
  - c. 55%
  - d. 85%
- (1 mark)**
24. Which of these circuits transports oxygenated blood away from the heart?
- a. systolic circuit
  - b. venous circuit
  - c. ventricular circuit
  - d. systemic circuit
- (1 mark)**
25. Which of these fuels is preferred during moderate to high intensity exercise?
- a. fats
  - b. carbohydrates
  - c. proteins
  - d. vitamins
- (1 mark)**
26. In a 30 second Wingate sprint test, the fatigue ratio is defined as
- a. the lowest power achieved during the test
  - b. the time taken to drop below 500 watts on the test
  - c. the pedal speed during the last 5 seconds of the test
  - d. the percentage drop off from peak power to the end of the test
- (1 mark)**
27. Most homeostatic control systems operate via the principle of
- a. steady state
  - b. negative feedback
  - c. positive feedback
  - d. thermodynamics
- (1 mark)**
28. The physiological factors that influence maximum oxygen uptake are
- a. the delivery of oxygen to the muscle
  - b. the uptake of oxygen by the muscle
  - c. genetics and exercise training
  - d. all of the above
- (1 mark)**

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29. A single motor nerve and all of the muscle fibres that it innervates is referred to as a
- synapse
  - neuromuscular system
  - motor impulse
  - motor unit
- (1 mark)**
30. How is cardiac output calculated?
- stroke volume divided by heart rate
  - stroke volume multiplied by heart rate
  - heart rate divided by stroke volume
  - none of the above
- (1 mark)**
31. The thin filament of a sarcomere is comprised of
- myosin, actin and troponin
  - myosin, troponin and tropomyosin
  - actin, troponin and tropomyosin
  - troponin only
- (1 mark)**
32. The amount of carbon dioxide in expired air would be
- the same as the inspired air
  - less than the inspired air
  - greater than the inspired air
  - impossible to measure
- (1 mark)**
33. Acetylcholine (Ach) is...
- one of the major waste products generated by muscle contraction
  - the neurotransmitter that is released from motor nerves
  - the chemical energy source for muscle contraction
  - the enzyme that catalyses the splitting of ATP in a muscle fibre
- (1 mark)**
34. Which lines separate one sarcomere from the next?
- A-line.
  - Z-line.
  - I-line
  - H-line.
- (1 mark)**

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35. Which of the following statements is true
- a. blood passes from the right atrium to the left atrium
  - b. blood passes from the right atrium to the right ventricle
  - c. blood passes from the left atrium to the right ventricle
  - d. blood passes from the left ventricle to the right ventricle
- (1 mark)**
36. Which of these carries blood away from the heart?
- a. Veins
  - b. Venules
  - c. Capillaries
  - d. Arteries
- (1 mark)**
37. As exercise intensity increases there is a shift in metabolism of fuel from
- a. fat to carbohydrate
  - b. carbohydrate to fat
  - c. glucose to glycogen
  - d. protein to amino acids
- (1 mark)**
38. Calcium ions, responsible for turning on muscle contraction, are stored in the
- a. sarcolemma
  - b. T tubules
  - c. cross bridges
  - d. sarcoplasmic reticulum
- (1 mark)**
39. A single motor nerve and all of the muscle fibres that it innervates is referred to as a
- a. synapse
  - b. neuromuscular system
  - c. motor impulse
  - d. motor unit
- (1 mark)**
40. Slow-twitch muscle fibres are also sometimes referred to as
- a. type I fibres
  - b. type IIa fibres
  - c. type IIx fibres
  - d. type III fibres
- (1 mark)**

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41. Which muscle fibre type is most predominant in the non-trained population?

- a. Type I.
- b. Type IIa.
- c. Type IIx.
- d. Type IIc.

**(1 mark)**

42. The connective tissue sheath that surrounds an individual skeletal muscle fibre is called the

- a. perimysium
- b. sarcolemma
- c. epimysium
- d. endomysium

**(1 mark)**

43. The 3 different types of skeletal muscle fibres are termed?

- a. Types I, IIa, IIc
- b. Types I, II, III
- c. Types I, IIa, IIx
- d. Types I, IIa, IIb

**(1 mark)**

44. An estimation of maximal heart rate can be calculated using the formula

- a.  $220 - \text{age}$
- b.  $200 - \text{age}$
- c.  $180 + \text{age}$
- d.  $200 + \text{age}$

**(1 mark)**

45. Endergonic reactions refer to

- a. the storing of energy
- b. the control of bioenergetics
- c. the removal of oxygen
- d. the release of energy

**(1 mark)**

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46. Fats that are stored in muscle and other tissues and play an important role as an energy substrate are

- a. phospholipids.
- b. cholesterol.
- c. triglycerides.
- d. lipoproteins.

**(1 mark)**

47. VO<sub>2</sub> max can be defined as

- a. the amount of oxygen needed to maintain performance
- b. the amount of oxygen at exhaustive exercise
- c. the resting oxygen consumption over a 24 hour period
- d. the amount of oxygen contained within arterial blood

**(1 mark)**

48. Stores of ATP and PCr are sufficient to support maximum muscular effort for approximately

- a. 1 to 4 seconds
- b. 3 to 15 seconds
- c. 30 seconds to 2 minutes
- d. More than 10 minutes

**(1 mark)**

49. Before fat can be metabolised by the muscle cells, it must first be broken down into

- a. free fatty acids and glycogen
- b. free fatty acids and glycerol
- c. triglycerides and glucose
- d. amino acids and glycerol

**(1 mark)**

50. Improvements in aerobic capacity can be achieved by

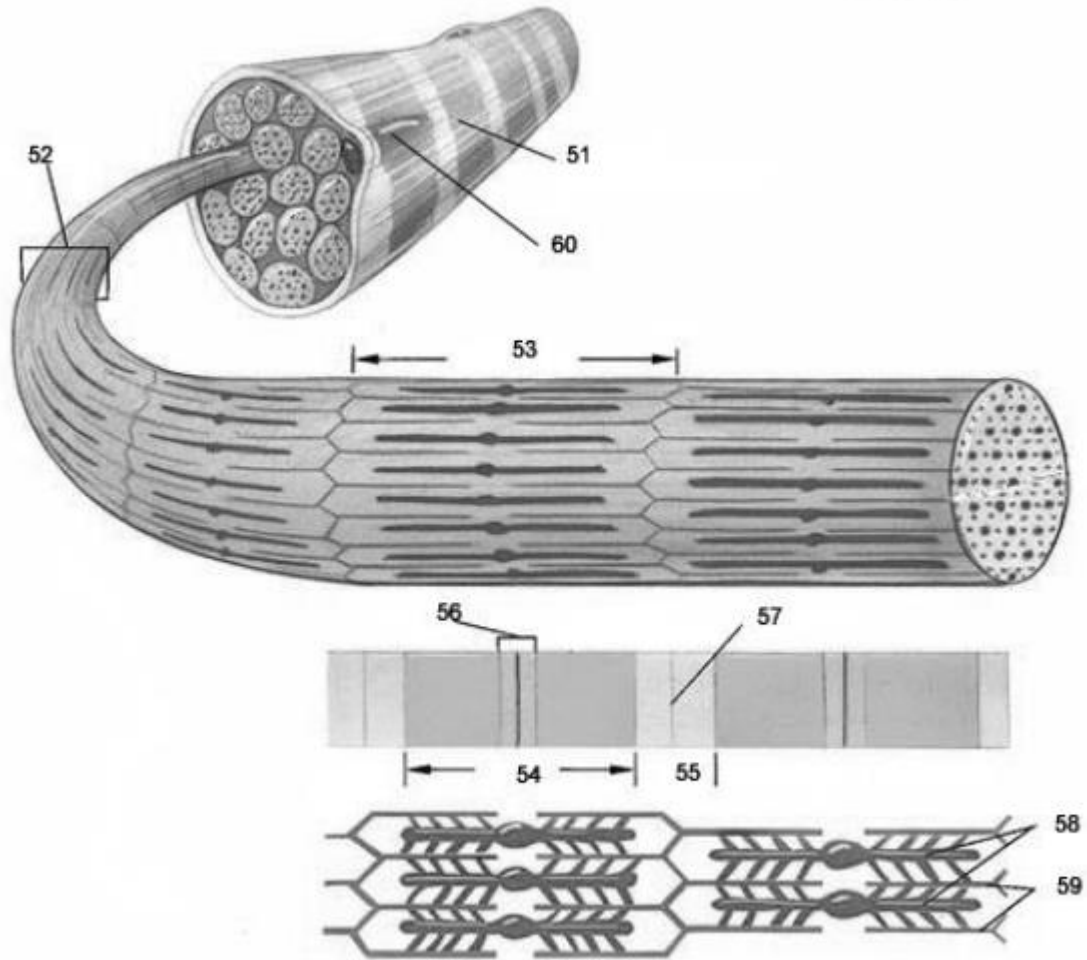
- a. increasing training volume alone
- b. increasing training intensity alone
- c. increasing both training volume and intensity
- d. all of the above

**(1 mark)**

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51 – 60 – Label the diagram below.



(10 marks)

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**Section B: Answer 2 questions from this section.**

1. Outline excitation contraction coupling in human skeletal muscle  

**(20 marks)**
  
2. Discuss the different types of human skeletal muscle fibres. Detail the differences between them.  

**(20 marks)**
  
3. a) What is the term most correctly used to describe the elevated oxygen consumption which continues for some time following a period of steady rate exercise?  

**(5 marks)**

b) What are the main factors which contribute to this elevated oxygen consumption?  

**(15 marks)**
  
4. a) Using the following data calculate the non-protein Respiratory Quotient (RQ) showing your calculations.  

Assume inspired volume and expired volume to be equal.  
Expired volume (collected for 1 minute) 44 L (STPD)  
Fraction O<sub>2</sub> in expired air 16.01%  
Fraction CO<sub>2</sub> in expired air 3.78%  
Fraction O<sub>2</sub> in inspired air 20.93%  
Fraction CO<sub>2</sub> in inspired air 0.03%

**(15 marks)**

b) What does this RQ indicate in terms of fuel substrate utilisation?  

**(5 marks)**

**END OF QUESTIONS**