

**UNIVERSITY OF BOLTON**

**FACULTY OF HEALTH AND WELLBEING**

**BSc (Hons) BIOMEDICAL SCIENCE**

**SEMESTER ONE EXAMINATION 2023/24**

**ANATOMY AND PHYSIOLOGY**

**MODULE NO: BIO4011**

Date: Wednesday 10<sup>th</sup> January 2024

Time: 2:00 – 4:00pm

---

**INSTRUCTIONS TO CANDIDATES:**

There are 62 questions.

Answer all questions.

Marks for parts of questions are shown in brackets.

There are a total of 100 marks available

The pass mark is 40%

---

PAST EXAMINATION

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

1. 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)**
2. Which circuit is responsible for re oxygenating blood?
- a. Closed loop system
  - b. Pulmonary circuit
  - c. Systemic circuit
  - d. Aortic arch
- (1 mark)**
3. The connective tissue sheath that surrounds an individual skeletal muscle fibre is called the
- a. perimysium
  - b. sarcolemma
  - c. epimysium
  - d. endomysium
- (1 mark)**
4. Which of these blood vessels feeds blood into the right atrium?
- a. Aorta
  - b. Pulmonary vein
  - c. Hepatic artery
  - d. Superior vena cava
- (1 mark)**
5. During 60 minutes of submaximal exercise, the body temperature reaches a plateau after 35 – 45 minutes. This is an example of
- a. homeostasis
  - b. effector centre
  - c. steady state
  - d. changing internal environment
- (1 mark)**

**Please turn the page**

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

6. 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)**
7. The thick filaments of a myofibril are composed mainly of
- a. sarcoplasm
  - b. tropomyosin
  - c. actin
  - d. myosin
- (1 mark)**
8. What is the name of the valve that separates the right atrium from the right ventricle?
- a. Aortic valve
  - b. Semi lunar valve
  - c. Bicuspid valve
  - d. Tricuspid valve
- (1 mark)**
9. The precision with which a biological control system maintains homeostasis is termed
- a. positive feedback
  - b. negative feedback
  - c. set point
  - d. gain
- (1 mark)**
10. The smallest functional unit of a muscle is the
- a. myofilament
  - b. sarcomere
  - c. Z disc
  - d. neuromuscular junction
- (1 mark)**

**Please turn the page**

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

11. 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)

12. Where is most of the blood distributed at rest?

- a. Arterial system
- b. The lungs
- c. Venous system
- d. The heart

(1 mark)

13. Which of the following components of a control system detects the stimulus

- a. Integrating centre
- b. Stimulus
- c. Receptor
- d. Effector

(1 mark)

14. 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

- a. 60 watts
- b. 90 watts
- c. 120 watts
- d. none of the above

(1 mark)

15. Which blood vessels contain one- way valves to prevent backflow?

- a. Arteries
- b. Veins
- c. Capillaries
- d. Pulmonary arteries

(1 mark)

Please turn the page

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

16. The A band of a sarcomere contains

- a. actin and myosin filaments
- b. actin filaments only
- c. myosin filaments only
- d. neither actin nor myosin

(1 mark)

17. Blood returning to the heart from the lungs enters which chamber?

- a. Left atrium
- b. Left ventricle
- c. Right atrium
- d. Right ventricle

(1 mark)

18. What is the name of the small air filled sacks within the lungs?

- a. Pores of Kohn
- b. Bronchioles
- c. Alveoli
- d. Pulmonary capillaries

(1 mark)

19. 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)

20. The movement of air in and out of the lungs is called

- a. Pulmonary ventilation
- b. Pulmonary diffusion
- c. Capillary diffusion
- d. Gas exchange

(1 mark)

**Please turn the page**

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

21. Acetylcholine (Ach) is

- a. one of the major waste products generated by muscle contraction
- b. the neurotransmitter that is released from motor nerves
- c. the chemical energy source for muscle contraction
- d. the enzyme that catalyses the splitting of ATP in a muscle fibre

(1 mark)

22. The volume of air expired on each breath is called

- a. Pulmonary ventilation rate
- b. Maximum voluntary ventilation
- c. Tidal volume
- d. Stroke volume

(1 mark)

23. Most control systems operate via what type of action?

- a. Negative feedback
- b. Thermostatic control
- c. Positive feedback
- d. Stimulus response

(1 mark)

24. The energy required for muscle contraction is supplied by

- a. inorganic phosphate (Pi)
- b. ADP
- c. ATP
- d. ATPase

(1 mark)

25. The respiratory membrane allows the diffusion of oxygen from the alveoli to

- a. pulmonary capillaries
- b. veins
- c. small bronchioles
- d. the heart

(1 mark)

Please turn the page

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

26. Which of the following is NOT a factor that determines gas exchange rate through the respiratory membrane

- a. surface area
- b. pressure differential
- c. acidity
- d. thickness

(1 mark)

27. What is a typical minute ventilation rate at rest?

- a. 8 litres
- b. 18 litres
- c. 80 litres
- d. 180 litres

(1 mark)

28. Which muscle fibres are best suited for glycolytic energy production?

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

(1 mark)

29. The amount of air left in the lungs after a maximal expiration is called

- a. total lung capacity
- b. residual volume
- c. expiratory volume
- d. forced ratio volume

(1 mark)

30. Muscle contraction is dependant on

- a. the interaction of calcium ions with troponin
- b. the interaction of ATP with myosin
- c. the formation of cross bridges
- d. all of the above.

(1 mark)

Please turn the page

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

31. 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)

32. Healthy individuals can exhale approximately how much of their lung volume in 1 second

- a. 30%
- b. 50%
- c. 60%
- d. 85%

(1 mark)

33. Which of these is a normal blood pressure at rest

- a. 140/92
- b. 135/95
- c. 121/72
- d. 99/58

(1 mark)

34. Low oxidative capacity, high glycolytic capacity, fast contraction speed and a low resistance to fatigue are characteristics of

- a. FTa fibres
- b. FTx fibres
- c. FTc fibres
- d. ST fibres

(1 mark)

35. Which of these gives information about blood pressure throughout the cardiac cycle

- a. Systolic blood pressure
- b. Mean arterial pressure
- c. Heart rate
- d. Diastolic blood pressure

(1 mark)

Please turn the page



Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

36. An eccentric muscle contraction is one in which

- a. the muscle lengthens as contractile force is generated
  - b. the muscle shortens as contractile force is generated
  - c. the muscle stays the same length as contractile force is generated
  - d. the muscle shortens but no contractile force is generated
- (1 mark)

37. On each breath approximately how much of the inspired volume is dead space

- a. 50 ml
  - b. 100 ml
  - c. 150 ml
  - d. 500 ml
- (1 mark)

38. The process of moving gases between the lungs and the blood is called

- a. Pulmonary diffusion
  - b. Pulmonary ventilation
  - c. Capillary diffusion
  - d. Oxygen transport
- (1 mark)

39. Where is the atrioventricular node located

- a. Right atrium
  - b. Right ventricle
  - c. Left atrium
  - d. Left ventricle
- (1 mark)

Please turn the page

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

40. What is the inherent heart rate as established by the SA node

- a. 70 bpm
- b. 80 bpm
- c. 90 bpm
- d. 100 bpm

(1 mark)

41. What is the name of the bundle of fibres connecting the AV node to the left and right bundle branches

- a. bundle of His
- b. Purkinje fibres
- c. interventricular septum
- d. sinoatrial node

(1 mark)

42. What does the large QRS complex on an ECG trace indicate

- a. atrial contraction
- b. atrial relaxation
- c. ventricular contraction
- d. ventricular relaxation

(1 mark)

43. Ventricular systole makes up how much of the cardiac cycle at rest

- a. one half
- b. one third
- c. one quarter
- d. one fifth

(1 mark)

Please turn the page

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

44. What is the name given to the dilation of muscle arterioles and capillaries to override vasoconstriction

- a. cardiac drift
- b. autoregulation
- c. excitation coupling
- d. Frank Starling mechanism

(1 mark)

45. The P wave on an ECG trace indicates

- a. atrial contraction
- b. atrial relaxation
- c. ventricular contraction
- d. ventricular relaxation

(1 mark)

46. What is a typical breathing frequency at rest

- a. 4 breaths
- b. 12 breaths
- c. 20 breaths
- d. 35 breaths

(1 mark)

47. Which of the following is a typical cardiac output at rest

- a. 2 l/ min
- b. 5 l/ min
- c. 15 l/ min
- d. 75 l/ min

(1 mark)

Please turn the page

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

48. Parasympathetic nerves innervate which part of the heart

- a. atria
- b. ventricles
- c. atria and ventricles
- d. the coronary arteries

(1 mark)

49. Where is the majority of the blood flow during heavy exercise

- a. skin
- b. skeletal muscles
- c. lungs
- d. heart

(1 mark)

50. What is a typical resting oxygen consumption

- a. 0.25 l/ min
- b. 1.50 l/ min
- c. 12 l/ mn
- d. 80 l/ min

(1 mark)

51. During digestion saliva helps break down

- a. fats
- b. carbohydrates
- c. proteins
- d. minerals

(1 mark)

Please turn the page

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

52. How many calories does 5 grams of protein provide

- a. 2 kcal
- b. 5 kcal
- c. 20 kcal
- d. 38 kcal

(1 mark)

53. During digestion the stomach

- a. absorbs carbohydrate into the blood
- b. releases hydrochloric acid to kill bacteria
- c. releases insulin and glucagon
- d. absorbs vitamin B and K

(1 mark)

54. Excessive saturated fat in the diet has been implicated as a risk factor for

- a. heart disease
- b. eczema
- c. asthma
- d. arthritis

(1 mark)

55. Girls tend to have their growth spurt between

- a. 12 to 13, ending at 18
- b. 13 to 16, ending at 20
- c. 14 to 16, ending at 19
- d. 16 to 18, ending at 20

(1 mark)

Please turn the page

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

56. The body replaces around how much of its skeleton per year

- a. 1%
- b. 10%
- c. 20%
- d. 50%

(1 mark)

57. Which of the following statements about osteoporosis is NOT true

- a. it is a disease characterised by low bone mass and deterioration of bone tissue leading to enhanced bone fragility
- b. bones become brittle and more prone to fracture
- c. it is more common in women than men
- d. it can be avoided by drinking a lot of orange juice or milk

(1 mark)

58. Bone development is dependent on the presence of which hormones

- a. oestrogen and progesterone
- b. oestrogen and testosterone
- c. testosterone and progesterone
- d. oestrogen, testosterone, and progesterone

(1 mark)

59. Formation of bone is promoted by the activity of bone building cells called

- a. osteoblasts
- b. osteoclasts
- c. osteoporosis
- d. osteopenia

(1 mark)

Please turn the page

Faculty of Health and Wellbeing  
Biomedical Science  
Semester One Examination 2023/24  
Anatomy and Physiology  
BIO4011

60. How many stages to the life cycle are there

- a. 2
- b. 3
- c. 5
- d. 8

**(1 mark)**

61. Describe the physiological pathway for systemic and pulmonary circulation of blood flow beginning from the left ventricle. Make reference to the oxygenated status of the blood, structures through which the blood passes and how the blood is moved through the circulatory system.

**(20 marks)**

62. Explain the sliding filament theory of muscle contraction. Make reference to the structure of skeletal muscle and the events that lead to the contractile process.

**(20 marks)**

**END OF QUESTIONS**

PAST EXAMINATION