Module Title: Introduction to Physiology

Level: Four

Time Allowed: Two hours

Instructions to students:

- Enter your student number not your name on all answer books.
- Answer all questions from Section A on the examination paper.
- Answer one question from Section B in a separate answer book.
- Where a question is in parts the weightings are indicated.
- Students are not permitted to remove this examination paper from the examination room. For all purposes the examination paper remains the property of the University of Northampton.
- Insert your student number in the space below:

  Student Number ..............................

No. of Pages 9

No. of Questions 19
Section A
Answer all questions in this section

1. The diagram below is a portion of a Lobule of Lung

Label the items A – E

A. 
B. 
C. 
D. 
E. 

(1 mark for each correct answer)
2. The diagram shows an Oxygen – haemoglobin Dissociation curve at normal body temperature.

Briefly explain what the labelled lines indicate about the blood in the body.

(6 marks)

A.

B.

C.
3. Briefly explain why the resting membrane potential of a neurone is negative. 

(5 marks)

4. During an action potential why does the potential return to negative values and overshoot the resting membrane potential? 

(5 marks)

5. With reference to the Action potential, what is a refractory period? 

(3 marks)
6. In the following sentences fill in the missing words.
   (1 mark for each correct answer)

   The heart chamber with the thickest myocardium is the ___________
   The phase of relaxation during the cardiac cycle is called ___________
   The pulmonary artery carries _____________ blood
   The Frank–Starling law of the heart equalises the output from the right
   and left ventricles to keep the same _____________ of blood flowing in
   both systemic and _____________ circulations

7. With reference to the cardiac cycle, define Stroke Volume.
   (2 marks)

8. What factors can regulate Stroke Volume?
   (4 marks)
Circle the letter which corresponds to your answer for each question.

9. Which of the following would not increase stroke volume?
   a. Increased Ca\(^{2+}\) in the interstitial fluid
   b. Adrenaline
   c. Increased K\(^+\) in the interstitial fluid
   d. Increased venous return
   e. Slowing of the heart rate  
   (1 mark)

10. Hyposecretion of which of the following hormones leads to Addison’s disease?
    a. Adrenaline
    b. Aldosterone
    c. Cortisol
    d. T3/T4
    e. Vasopressin  
    (1 mark)

11. In respiration, which of the following best describes the vital capacity?
    a. The volume of air that can be inspired after a normal expiration
    b. Maximal volume of air that can be expelled from the lungs after normal expiration
    c. The volume of air that can be forced out taking a deep breath
    d. The greatest volume of air that can be expelled from the lungs after taking the deepest breath
    e. The volume of air still remaining in the lungs after the most forcible expiration possible  
    (1 mark)

12. Which of the following combination of ionic concentrations for K\(^+\), Na\(^+\) and Cl\(^-\) inside a nerve, is correct?
    a. K\(^+\) 150 mM, Na\(^+\) 15 mM, Cl\(^-\) 9 mM
    b. K\(^+\) 150 nM, Na\(^+\) 150 mM, Cl\(^-\) 125 mM
    c. K\(^+\) 6 mM, Na\(^+\) 150 mM, Cl\(^-\) 125 mM
    d. K\(^+\) 6 mM, Na\(^+\) 15 mM, Cl\(^-\) 9 mM
    e. None of the above  
    (1 mark)
13. What is a baroreceptor? (2 marks)

14. Where in the body are baroreceptors located? (2 marks)

15. Why does the femoral artery have a thicker wall than the femoral vein? (3 marks)
16. Briefly explain how skeletal muscle contractions return blood to the heart? (3 marks)
Section B

Answer one of the following essay questions (50 marks)

17. Explain the roles of actin, myosin, tropomyosin, troponin, and Ca^{2+} in skeletal muscle contraction.

18. Describe how the sympathetic nervous system and parasympathetic nervous system affect the heart, arterioles, and veins. Include in your answer the effect this has on blood pressure.

19. Imagine you are a blood cell in the superior vena cava. Describe your journey as you move through the cardiovascular system until you get to the aortic arch.

End of Section B

End of Paper