

**A Level Biology B**

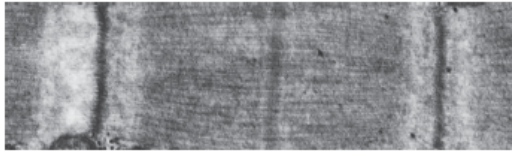
**H422/01** Fundamentals of biology

**Question Set 18**

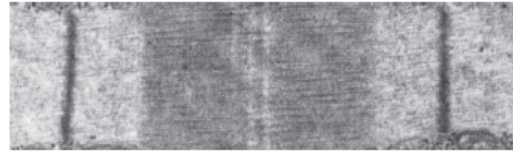
1. (a) (i)  $VO_2$  max is an indicator of cardiovascular fitness and a predictor of mortality risk.  
Describe what is meant by the term  $VO_2$  max. [1]
- (ii)  $VO_2$  max can be estimated from measurements of heart rate.  
Suggest **one** advantage of **estimating**  $VO_2$  max over taking a direct measurement. [1]
- (b)\* A study published in 2004 demonstrated that  $VO_2$  max can be estimated from an individual's maximum heart rate ( $HR_{max}$ ) and resting heart rate ( $HR_{rest}$ ), as follows:  
$$VO_2 \text{ max} = 15 \times (HR_{max} \div HR_{rest})$$
  
Outline a method to investigate the effect of a fitness training programme on estimated  $VO_2$  max in a group of school students. [6]
- (c) (i) Some athletes train at high altitude prior to participation in a sporting event. High altitude is defined as an elevation greater than 2000m above sea level.  
At high altitude, atmospheric air pressure is lower than at sea level, but the proportion of oxygen in the air remains the same.  
 $VO_2$  max is **immediately** decreased at high altitude. Suggest why. [2]
- (ii) Air temperature changes at higher altitudes.  
Suggest why air temperature can affect  $VO_2$  max. [1]
- (d) Excess post-exercise oxygen consumption (EPOC) is required for the regeneration of ATP and the replenishment of muscle glycogen stores.  
Give **two** other reasons why excess oxygen is required after exercise. [2]

- (e) The objective of training, particularly at high altitudes, is to increase the efficiency of oxygen delivery to muscle fibres.

The photomicrographs in Fig. 34, **a** and **b**, show sarcomeres in the relaxed and contracted state.



**Fig. 34a**



**Fig. 34b**

State which photomicrograph, **a** or **b**, shows a sarcomere in the relaxed state.

Give **two** pieces of evidence to justify your answer.

[2]

- (f) Table 34 shows some of the events of the sliding filament mechanism of muscle contraction. The events are lettered **A** to **E**.

<b>A</b>	ATP is hydrolysed to ADP and inorganic phosphate by the ATPase activity on the myosin head.
<b>B</b>	The myosin head binds to another myosin binding site on the actin filament.
<b>C</b>	ATP binds to the myosin head, causing the head to detach from the myosin binding site on the actin filament.
<b>D</b>	ADP and inorganic phosphate are released. The myosin head pushes the actin filament towards the centre of the sarcomere.
<b>E</b>	The angle of the myosin head changes into a new (cocked) position.

**Table 34**

Write the letters, **A** to **E**, in the correct order in the spaces below. The first space has been done for you.

**C**      .....      .....      .....      .....

[2]

**Total Marks for Question Set 18: 17**

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