



Additional Assessment Materials  
Summer 2021

Pearson Edexcel GCE (Biology A)

Resource Set Topic 7: Run for your life

Question Paper

(Public release version)

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## General guidance to Additional Assessment Materials for use in 2021

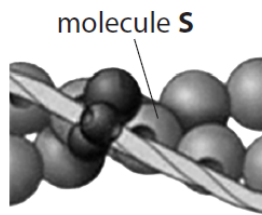
### Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

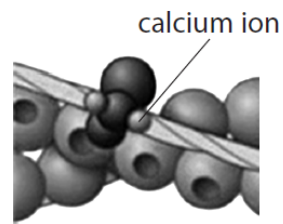
### Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

7 Muscle cells contain myofibrils. The diagrams show the arrangement of some of the molecules present in a myofibril when calcium ions are absent and when they are present.



calcium ions absent



calcium ions present

(a) Which of the following is molecule **S**?

(1)

- A** actin
- B** myosin
- C** tropomyosin
- D** troponin

(b) (i) Describe the changes caused when calcium ions bind to the molecules shown in the diagram.

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(ii) Explain how these changes cause muscles to contract.

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(c) Describe how the concentration of calcium ions around the myofibrils is controlled.

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**(Total for Question 7 = 10 marks)**

- 7 When scientists visit Antarctica, they need appropriate clothing to help with thermoregulation.

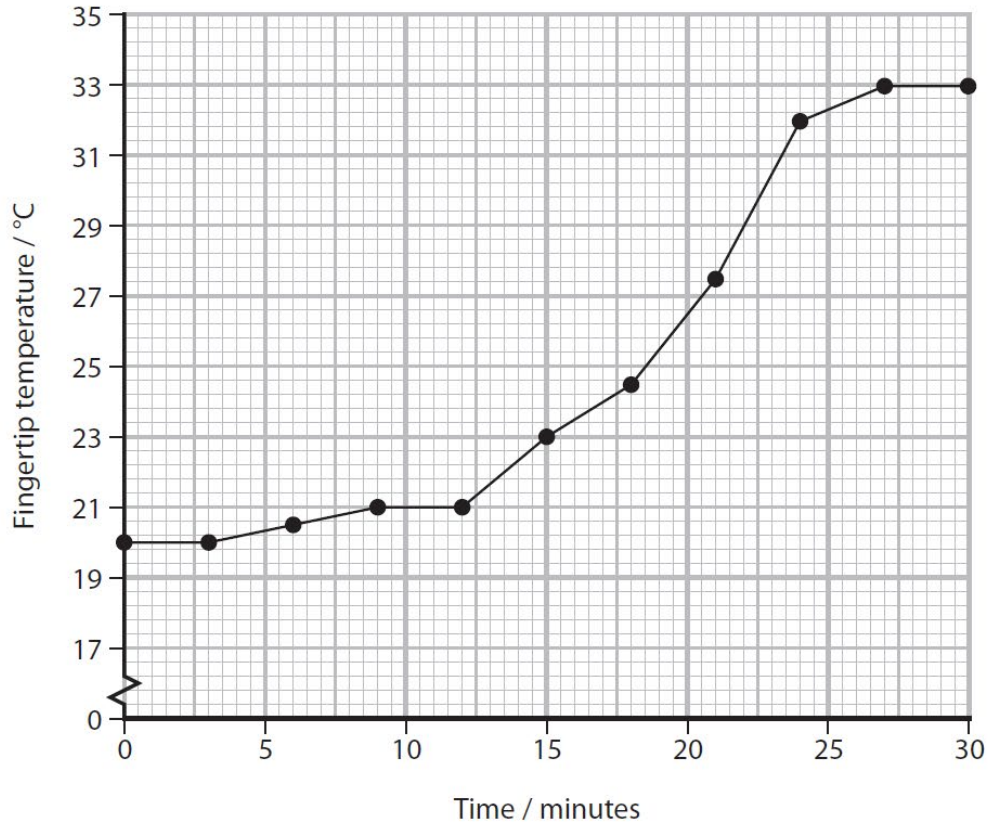


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- (a) An investigation was carried out to study thermoregulation in humans.

A woman was wrapped in blankets and her feet were put in hot water for 30 minutes. During this time, the temperature of the skin at the end of one of her fingertips was recorded.

The graph shows the results of this investigation.



(i) Explain why there was no change in fingertip temperature between 0 and 3 minutes.

(2)

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(ii) Calculate the greatest rate of increase in fingertip temperature.

(2)

Answer .....

(iii) Explain the role of the nervous system in bringing about the increase in temperature of the fingertip as shown in this investigation.

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(b) Sweating is a thermoregulatory mechanism.

A student stated that loss of heat when sweating is related to the dipole nature of water molecules.

Justify this statement.

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**(Total for Question 7 = 12 marks)**



3 Cystic fibrosis is a condition that affects breathing.

(a) Explain why cystic fibrosis affects the rate of oxygen uptake in the lungs.

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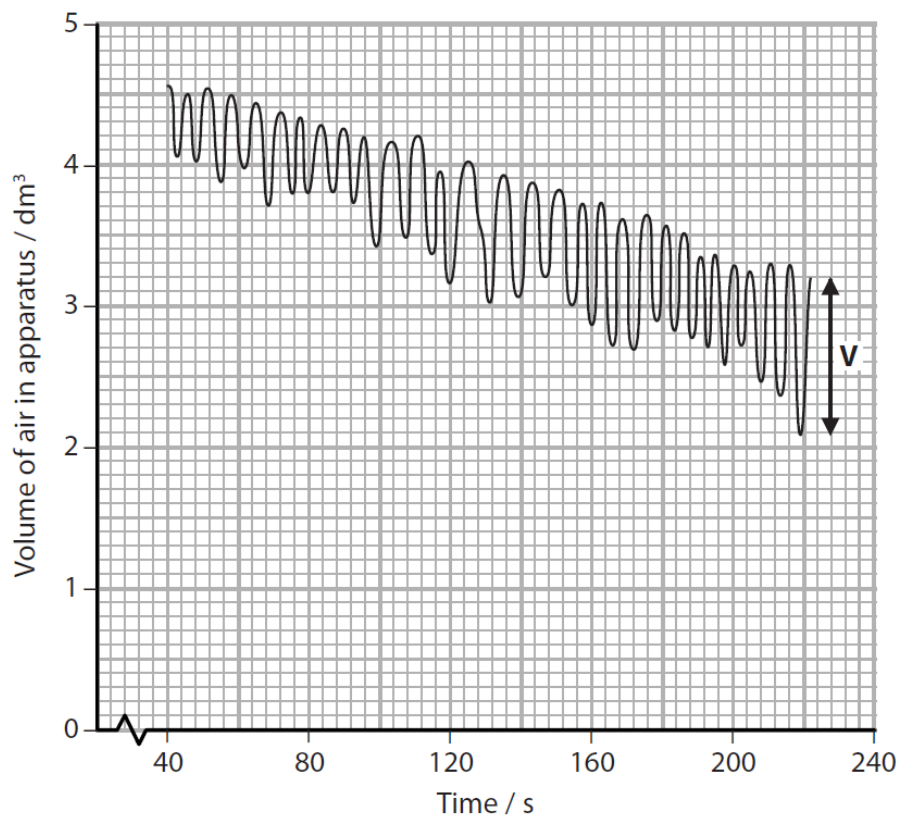
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(b) A person breathed air in and out of the air chamber of a piece of apparatus.

Measurements were made of changes in the volume of air in the chamber. The carbon dioxide produced was removed from the chamber. The changes in volume were recorded on the trace shown in the diagram.



(i) Which of the following is the name of this piece of apparatus? (1)

- A colorimeter
- B potometer
- C respirometer
- D spirometer

(ii) Which of the following is shown by the label **V** on the trace? (1)

- A alveolar volume
- B tidal volume
- C total lung volume
- D ventilation rate

(iii) Which of the following is the breathing rate in breaths per minute between 80 and 120 seconds? (1)

- A 6 breaths  $\text{min}^{-1}$
- B 9 breaths  $\text{min}^{-1}$
- C 12 breaths  $\text{min}^{-1}$
- D 16 breaths  $\text{min}^{-1}$

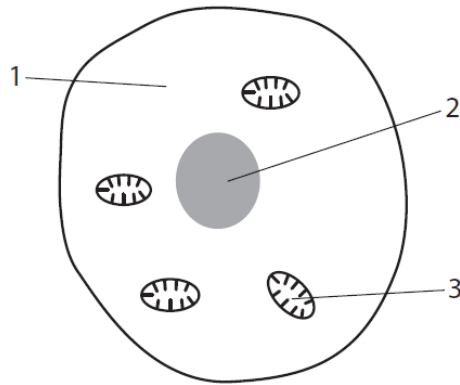
(iv) Calculate the rate of oxygen uptake between 80 and 120 seconds. (3)

Answer ..... $\text{cm}^3 \text{min}^{-1}$

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**(Total for Question 3 = 9 marks)**

7 (a) The diagram shows some of the features of a human liver cell.



(i) Which of the labelled features in the liver cell contain RNA?

(1)

- A** 1 only
- B** 1 and 3 only
- C** 2 and 3 only
- D** 1, 2 and 3

(ii) Cells produce lactate during anaerobic respiration. Lactate travels in the blood to the liver.

Liver cells can absorb lactate from the blood.

Deduce what happens to the lactate in these cells.

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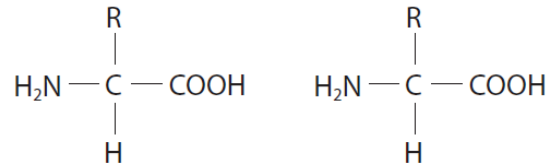
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(iii) During protein synthesis, two amino acids are joined together to form a dipeptide.

The diagram shows two identical amino acids.

Complete the diagram to show how the dipeptide is formed from these two amino acids.

(2)



(b) Explain why the liver is an organ and not a tissue.

(2)

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(c) Each liver cell carries out respiration.

During respiration, ATP is formed and broken down.

(i) During which of the following processes is ATP formed?

(1)

- A** glycolysis and the electron transport chain only
- B** glycolysis and the Krebs cycle only
- C** glycolysis, the Krebs cycle and the electron transport chain only
- D** glycolysis, the link reaction, the Krebs cycle and the electron transport chain

(ii) Explain why some ATP is broken down during glycolysis.

(2)

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(iii) The electron transport chain occurs in the cristae of mitochondria. The electron transport chain involves a number of carrier molecules.

Explain the role of these carrier molecules in the electron transport chain.

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**(Total for Question 7 = 13 marks)**

1 Many animals possess a heart and a circulatory system.

(a) Changes in the cardiac cycle can be observed by recording an electrocardiogram (ECG).

The ECG for a resting person is shown in the diagram.



Calculate the heart rate for this person.

(1)

Answer .....

(b) Anabolic steroids stimulate muscle development.

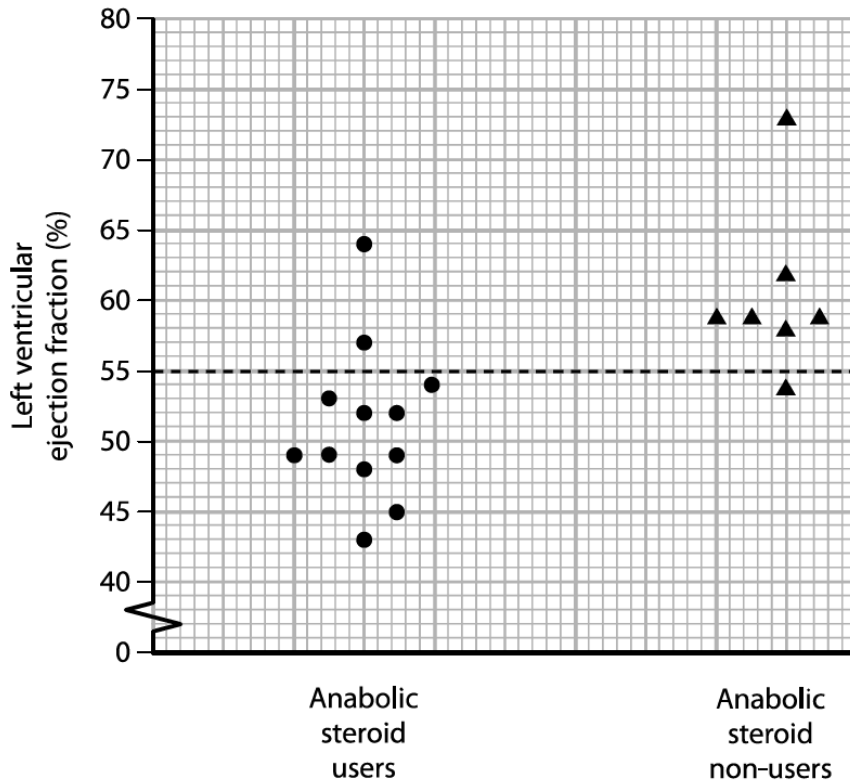
Some athletes use anabolic steroids in an attempt to improve their performance.

The effect of long-term anabolic steroid use on heart function has been investigated.

The left ventricular ejection fraction is the percentage of blood that leaves the left ventricle when it contracts.

The left ventricular ejection fraction for a healthy heart should be greater than 55%.

The results of a small study are shown in the graph.



(i) Analyse the data to determine the effect of anabolic steroid use on heart function.

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- (ii) Some drugs used to treat cancer have also been shown to reduce the ventricular ejection fraction.

Describe how the safe dose of a cancer drug could be determined.

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**(Total for Question 1 = 6 marks)**





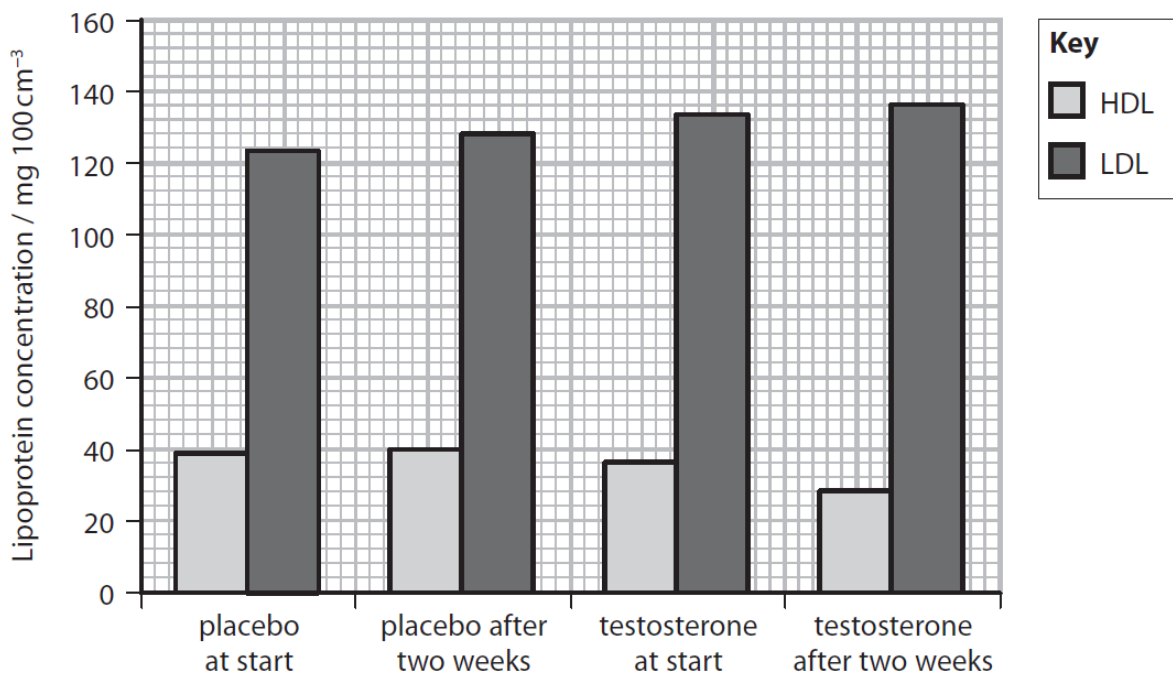
(ii) The purpose of the placebo is to

(1)

- A** increase the accuracy of the measurements
- B** increase the reproducibility of the data
- C** show that exercise has an effect
- D** show that testosterone has an effect

(b) In another investigation, groups of men were given either a placebo or 300 mg of testosterone per week for two weeks. The concentrations of different lipoproteins (HDL and LDL) in the blood were measured at the start of the investigation and after two weeks.

The results of the investigation are shown in the graph.



(i) The ratio of total cholesterol to HDL is used as an indicator of the risk of cardiovascular disease. The higher the ratio of total cholesterol to HDL, the greater the risk.

In this investigation, the men given the placebo had a total cholesterol to HDL ratio of 4.2:1 after two weeks.

Calculate the ratio of total cholesterol to HDL for those taking testosterone after two weeks.

(2)

Ratio of total cholesterol to HDL .....

