Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2022

Centre Number

Candidate Number

Life and Health Sciences

Assessment Unit AS 2
assessing
Human Body Systems

SZ021

[SZ021]
MONDAY 30 MAY, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

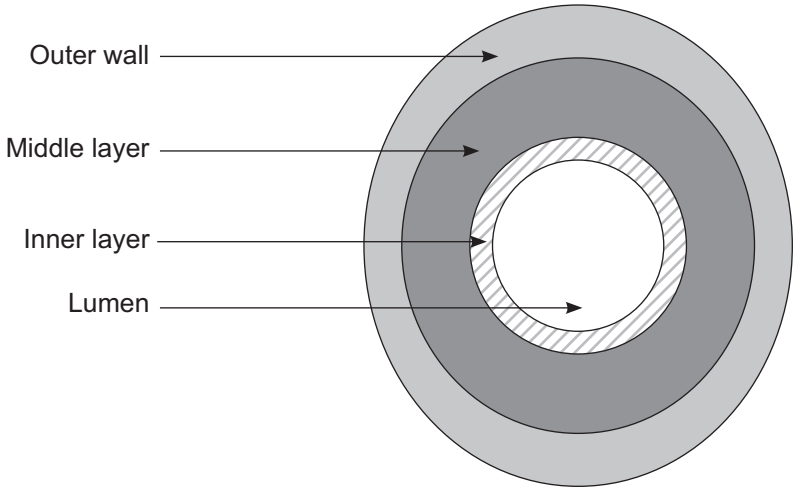
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all seven** questions.
Write your answers in the spaces provided in this question paper.

INFORMATION FOR CANDIDATES

The total mark for this paper is 75.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You may use an electronic calculator.
Quality of written communication will be assessed in Question **5(b)**.

12761

1 The diagram below shows a cross section of an artery.



Source: Principal Examiner

(a) (i) State and explain **one** visible feature in the diagram which enables the artery to carry blood from the heart to the body.

_____

_____

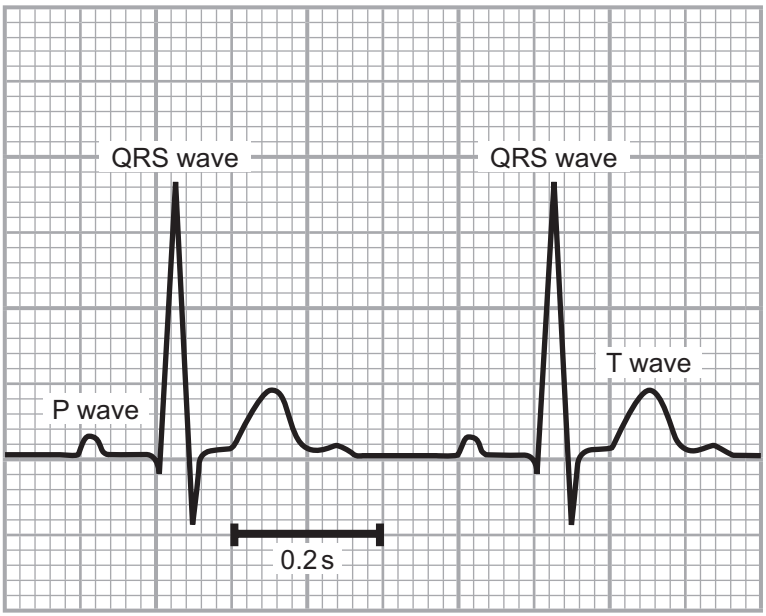
_____

_____ [2]

(ii) State the pulse rate of a healthy person at rest.

_____ to _____ beats per minute [1]

The diagram below shows an enlarged electrocardiogram (ECG) trace from a heart. The P wave represents contraction of the atria.



(b) (i) Explain why the QRS peak is larger than the P peak.

_____

_____

_____

_____ [2]

(ii) Calculate the heart rate of the person whose ECG trace is shown in the diagram.

You are advised to show your working.

_____ beats per minute [2]

[Turn over

(iii) Using your answer to **(b)(ii)**, state what condition the person whose ECG trace is shown may have. Explain your answer.

Condition: _____

Explanation: _____

_____

_____ [2]

BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

[Turn over

2 The results from a dietary survey of older adults aged >65 in the United Kingdom are shown in the table below.

Dietary Component	Daily Intake of older adults aged >65	Recommended Daily Intake
Fruit and vegetables (portions eaten per day)	4.3	5
Total Fat (% food energy)	36.4	less than 35
Saturated Fat (% food energy)	14.6	less than 11
Sugar (% food energy)	11.2	less than 5
Sugar ($gday^{-1}$)	212.0	less than 30
Fibre ($gday^{-1}$)	17.5	30

Source: National Diet and Nutrition Survey (2014/2015 to 2015/2016) © Crown copyright 2018. Used under the terms of the Open Government Licence v3.0

(a) (i) Calculate the percentage that 17.5 g represents of the **recommended daily fibre intake** for older adults aged >65.

You are advised to show your working.

_____ % [1]

(ii) State **one** food that contains fibre.

_____ [1]

(b) Using the data in the table, analyse for each dietary component the **daily intake** for older adults (aged >65) compared to the **recommended daily intake**.

[5]

[Turn over

(c) (i) What are normal vitamin D levels in the blood for a healthy adult?

_____ nmol L^{-1} [1]

(ii) Describe how an adult might achieve normal vitamin D levels by making changes to diet and lifestyle.

Diet: _____

_____ [1]

Lifestyle: _____

_____ [1]

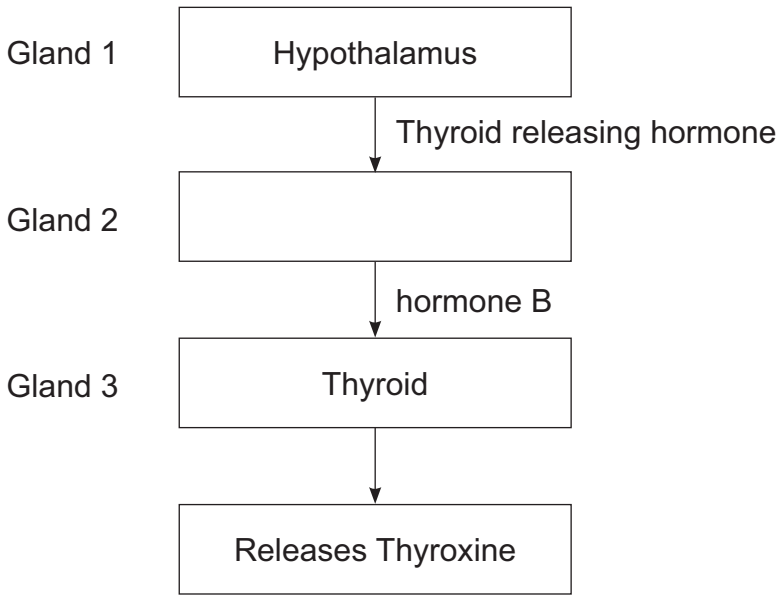
BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

[Turn over

3 The flow chart below shows some of the steps in controlling the level of thyroxine in the blood.



(a) State the name of **gland 2** and the **hormone B** it produces.

Gland 2 _____ [1]

Hormone B _____ [1]

Homeostasis is defined as the body maintaining a constant internal environment.

One of the components of homeostasis is negative feedback.

(b) (i) Explain what is meant by negative feedback.

_____

_____

_____

_____

_____

_____

_____

_____ [3]

(ii) Insert an arrow in the flow chart on the opposite page to show how high thyroxine levels are controlled by negative feedback. [1]

(iii) State **two** effects of high levels of thyroxine.

1. _____

2. _____ [2]

(iv) Choose one of these effects and explain how it is caused by high levels of thyroxine.

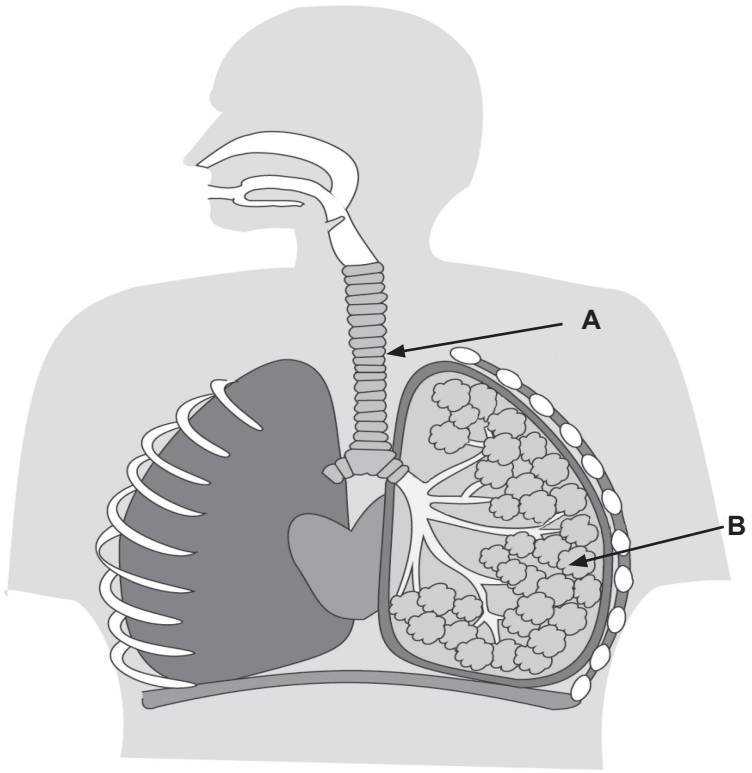
_____

_____

_____ [1]

[Turn over

4 A diagram of the human respiratory system is shown below.



Source: CCEA

(a) (i) Name the parts labelled **A** and **B**.

A _____ [1]

B _____ [1]

(ii) State and explain how the structure of part **A** is adapted for its function.

[3]

Red blood cells contain haemoglobin which binds oxygen.

(b) State **and** explain **one additional** way in which the red blood cells increase oxygen transport.

[2]

(c) **(i)** Describe the function of a buffer in the blood.

_____ [1]

(ii) Explain why this function is important in the blood.

_____ [1]

(iii) Name **two** biological buffers in the blood.

1. _____

2. _____ [2]

(iv) Describe how the body detects an increase in carbon dioxide levels in the blood and brings about carbon dioxide removal.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [5]

BLANK PAGE

DO NOT WRITE ON THIS PAGE

(Questions continue overleaf)

[Turn over

5 It is recommended that older adults aged >65 should do at least 150 minutes of moderate intensity aerobic physical activity spread throughout the week.

It is also recommended that older adults undertake physical activities to improve muscle strength on at least two days per week and balance/coordination on at least two days per week.

(a) Suggest **one** reason why **older adults in particular** would benefit from physical activities which would improve muscle strength and balance/coordination.

[1]

A 70-year-old man goes swimming for 30 minutes three times each week. He also attends a weight-lifting session once per week and a yoga class once per week.

(b) Analyse and evaluate the man's present level of physical activity with respect to these recommendations.

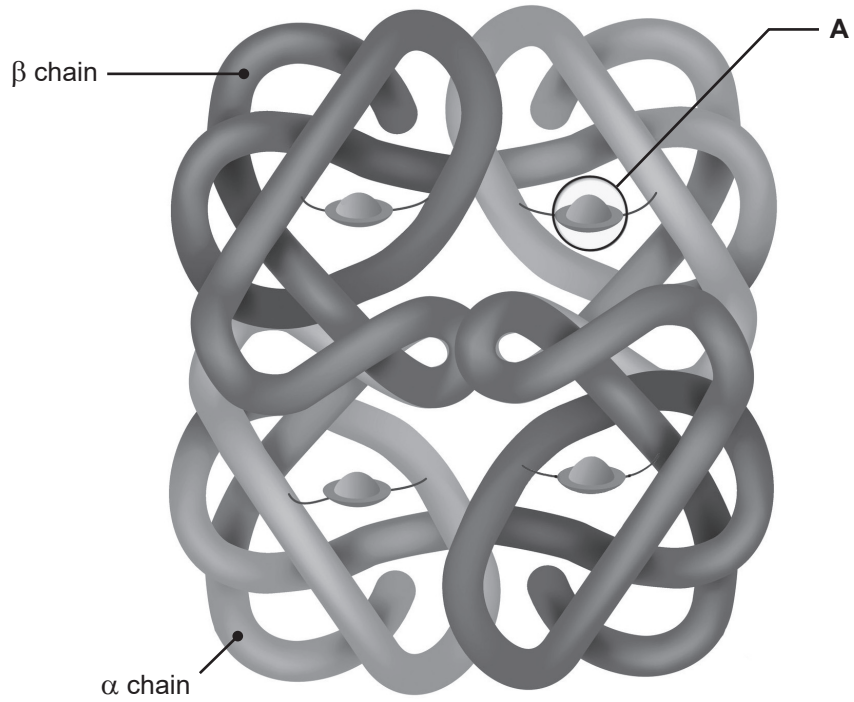
Your answer should include a discussion of how the man could increase his physical activity to the recommended level.

Quality of written communication will be assessed in this question.

[6]

[Turn over

6 The diagram below shows the haemoglobin molecule.



© Getty Images

(a) (i) Name the type of molecule that the α and β chains are composed of.

_____ [1]

(ii) Name part **A** and state the **mineral** it contains.

A _____ [1]

Mineral _____ [1]

(iii) What name is given to the molecule formed when oxygen binds with haemoglobin?

_____ [1]

(iv) How many molecules of oxygen bind to each molecule of haemoglobin when fully saturated?

_____ [1]

The binding of oxygen to haemoglobin is cooperative.

(v) Explain what this statement means.

_____

_____

_____

_____

_____

_____

_____

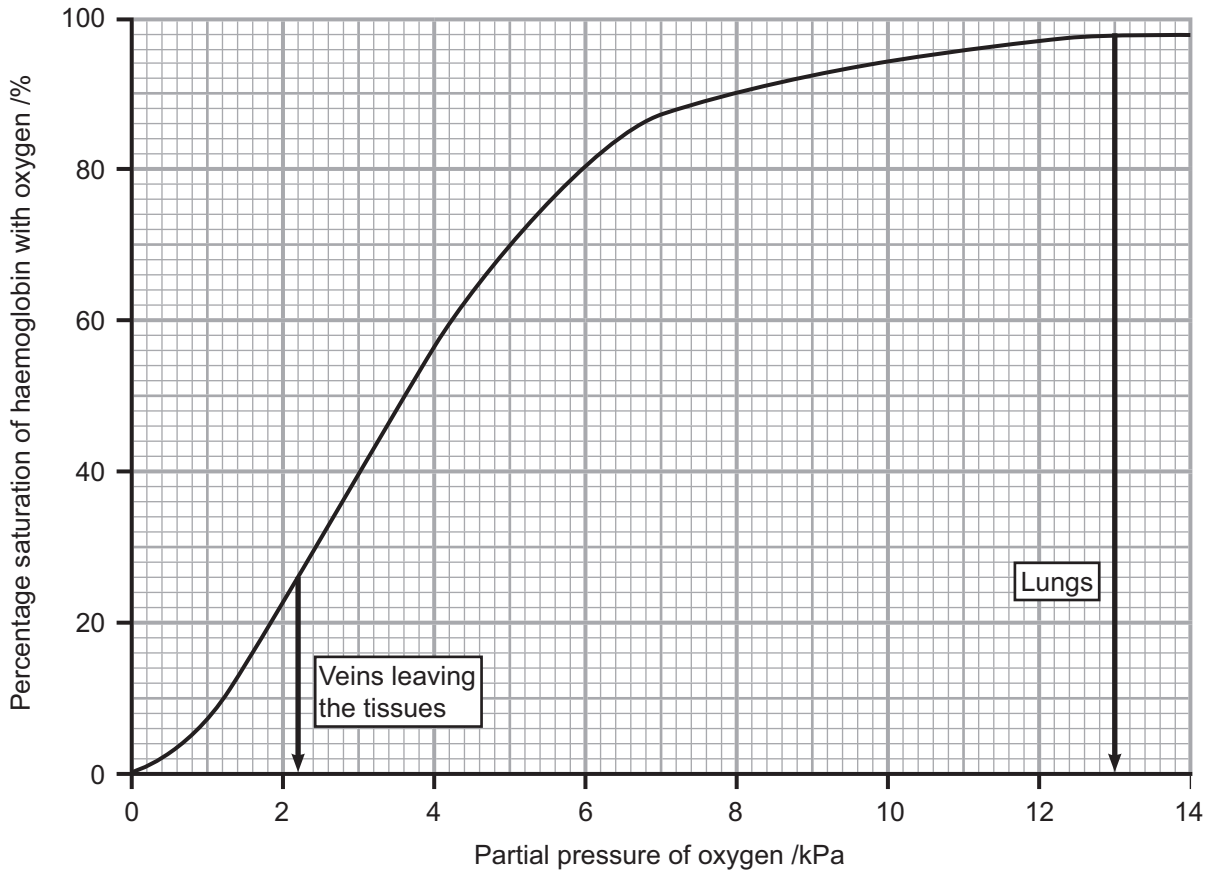
_____

_____

_____ [3]

[Turn over

The graph below shows how the percentage saturation of haemoglobin with oxygen changes with different partial pressures of oxygen (kPa).



Source: Principal Examiner

(b) (i) Using the graph, determine the percentage saturation of haemoglobin in the tissues when the partial pressure of oxygen is 5 kPa.

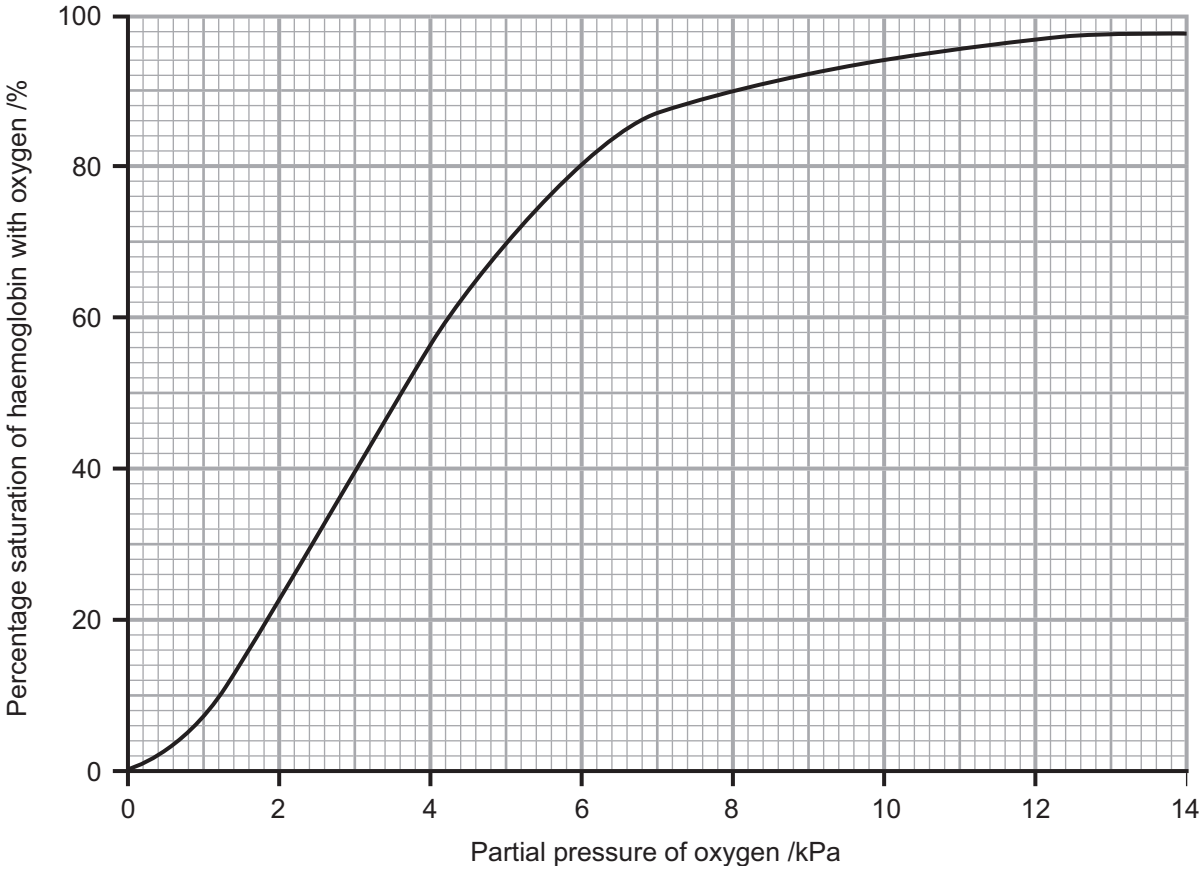
_____ % [1]

(ii) Calculate the difference in percentage saturation of haemoglobin between the lungs and the veins leaving the tissues.

You are advised to show your working.

_____ % [2]

[Turn over



Source: Principal Examiner

(c) (i) Draw a dashed line on the graph above to show how increased physical activity affects the percentage saturation of haemoglobin at different partial pressures of oxygen (kPa). [1]

(ii) State **one** way increased physical activity causes its effect on the percentage saturation of haemoglobin at different partial pressures of oxygen (kPa).

_____

_____ [1]

(iii) Describe how this change in the percentage saturation of haemoglobin with increased physical activity assists the body.

_____

_____

_____

_____ [2]

[Turn over

7 When one mole of glucose is burned in a calorimeter in a laboratory, 670 kcal of energy are released.

However, when one mole of glucose undergoes aerobic respiration in muscle cells, only 40% of the energy released is incorporated into ATP.

(a) (i) If each mole of glucose which undergoes aerobic respiration in a muscle cell produces 38 moles of ATP, calculate how much energy is incorporated into each mole of ATP.

You are advised to show your working.
Give your answer to **two decimal places**.

_____ kcal [2]

(ii) Suggest what happens to the energy which is **not** incorporated into ATP when glucose undergoes aerobic respiration in a muscle cell.

_____ [1]

(iii) How many molecules of ATP are produced when one molecule of glucose undergoes anaerobic respiration in a muscle cell?

_____ [1]

(iv) Explain why less energy is released in anaerobic respiration than aerobic respiration.

_____

_____ [1]

Lactate is the waste product of anaerobic respiration in muscles.

(b) (i) Describe the relationship between the intensity of exercise and the concentration of lactate in the blood.

_____

_____ [1]

At the end of an intense session of vigorous exercise, an athlete will continue to have an increased breathing rate for several minutes.
This allows conversion of lactate back to pyruvate.

(ii) State why more ATP molecules can now be produced.

_____

_____

_____

_____

_____ [3]

THIS IS THE END OF THE QUESTION PAPER

BLANK PAGE

DO NOT WRITE ON THIS PAGE

BLANK PAGE

DO NOT WRITE ON THIS PAGE

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
Total Marks	

Examiner Number