



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2023

Centre Number

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Candidate Number

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Life and Health Sciences

Assessment Unit AS 2
assessing
Human Body Systems



[SZ021]

SZ021

THURSDAY 25 MAY, MORNING

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.

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 **6(b)**.



1 Capillaries are the smallest type of blood vessel in the cardiovascular system.

(a) (i) State and explain **two** adaptations of capillaries which enable them to carry out their function.

Adaptation _____

Explanation _____

Adaptation _____

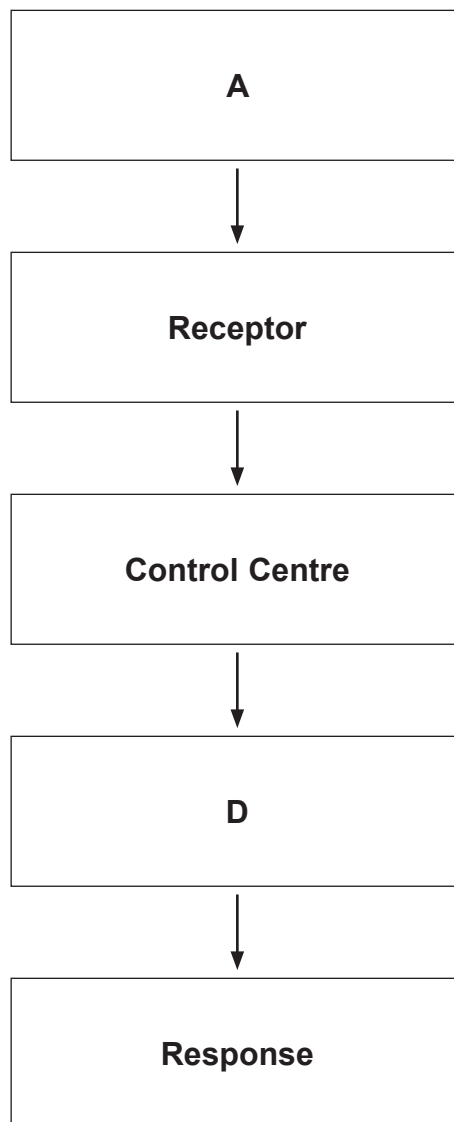
Explanation _____

[4]



2 Homeostasis is the maintenance of a constant internal environment in the body.

The diagram below shows the components of the homeostatic mechanism.



(a) Identify components **A** and **D** shown on the diagram.

A _____

D _____ [2]



The response in the homeostatic mechanism uses **corrective mechanisms** to return the factor to its normal level (**set point**).

When blood glucose levels rise above their set point, insulin is produced.

(b) State two ways in which insulin acts to correct blood glucose levels to their set point.

1. _____

2. _____

_____ [2]

(c) Explain how this corrective mechanism is turned **off** when blood glucose levels return to their set point.

_____ [2]

(d) Suggest why this corrective mechanism is turned off when the set point is reached.

_____ [1]

[Turn over



- 3 (a) Vitamins are micronutrients.
Small amounts of these are essential for a healthy body.
Vitamins are either fat-soluble or water-soluble.

(i) State **one** fat-soluble vitamin.

_____ [1]

(ii) Suggest **one** reason why it is necessary to have a daily intake of water-soluble vitamins in the diet.

_____ [1]

- (b) The table below gives information from a UK dietary survey on the daily intake of vitamin B2, folate and iron from food sources for adults aged 20–29, 30–39, 40–49 and 50–59 years old.

The daily intake of these micronutrients is expressed as a percentage of **reference nutrient intake (RNI)** where 100% RNI represents the amount of a nutrient which should be taken in daily.

Age /years	Percentage of the RNI taken in		
	Vitamin B2 (Riboflavin)	Folate	Iron
20–29	112	108	84
30–39	120	115	91
40–49	122	117	88
50–59	128	125	113

Source: Derbyshire E (2018) *Micronutrient Intakes of British Adults Across Mid-Life: A Secondary Analysis of the UK National Diet and Nutrition Survey*. *Front. Nutr.* 5:55.doi: 10.3389/fnut.2018.00055



(c) (i) State **one** dietary source of vitamin B2.

_____ [1]

(ii) State the daily recommended level of folate supplement for pregnant women.

_____ $\mu\text{g/day}$ [1]

(iii) State why it is important that women take a folate supplement during pregnancy.

_____ [1]



4 Most cells of the body are bathed in tissue fluid, which provides a moist environment.

(a) (i) State the main function of tissue fluid.

[1]

Gas exchange occurs between alveoli in the lungs and blood capillaries when there is a high concentration gradient for the gas.

(ii) State two ways in which a high concentration gradient for **oxygen** is achieved between the alveoli and the blood capillaries.

1. _____

2. _____

[2]

[Turn over



- (b) Severe lung infections may lead to damage of the respiratory system and can result in patients needing to be given oxygen or mechanical help with their breathing, a process called ventilation.

During a study a new drug (Drug A) was given to patients, in addition to usual medical care, to find out if it would be effective in treating damage to the respiratory system, allowing it to recover.

The table below shows the effects of Drug A compared to usual medical care only on recovery of the respiratory system in patients needing oxygen and those needing ventilation.

Treatment	Percentage of respiratory system that recovers after treatment	
	Patients needing oxygen	Patients needing ventilation
Usual medical care		
Day 0	73	59
Day 2	75	60
Day 4	77	62
Day 6	80	65
Usual medical care plus Drug A		
Day 0	73	59
Day 2	75	63
Day 4	80	69
Day 6	89	85

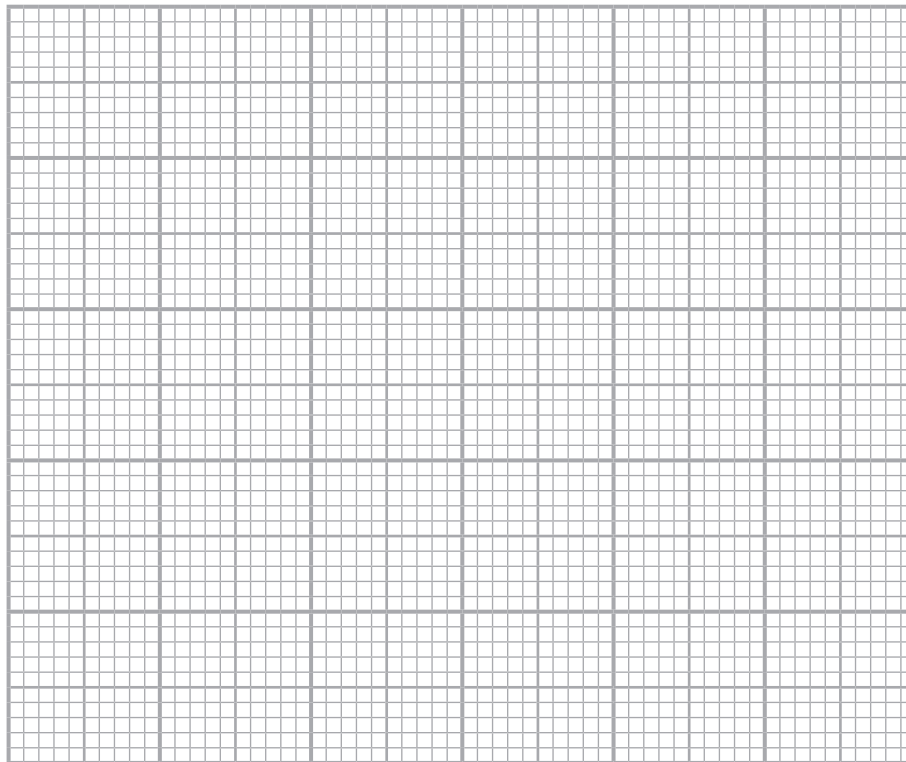
Source: Principal Examiner

- (i) What evidence is there from the table that patients beginning ventilation treatment have more serious lung damage than patients needing oxygen only?

[1]



- (ii) On the grid below, **construct and clearly label four line graphs** using the results from the table with percentage of respiratory system that recovers after treatment on the y-axis and time on the x-axis. [6]



- (iii) Using the data provided, state one trend that is true for **all** groups in the study.

_____ [1]



(iv) The biggest increase in the percentage of the respiratory system that recovers is between days 4 and 6.

Which group has the biggest percentage increase?

Calculate the **increase** for this group.

Group _____

Increase _____ [2]

(v) **Using the data in the table**, compare the effect of usual medical care plus Drug A and usual medical care only for **patients needing oxygen**.

[2]





(vi) Using the data in the table, analyse how usual medical care plus Drug A affected the percentage of the respiratory system that recovers in patients needing oxygen compared to patients needing ventilation.

[1]

(vii) What evidence is there that scientists still need to develop other drugs to treat patients with severe lung infections?

[1]



5 A peak flow meter measures respiratory system function.

Peak expiratory flow rate (PEFR) is a measurement of how quickly a person can blow air out of their lungs.

A sports scientist carried out an investigation to compare the effect of two exercise programmes (Programme **A** and Programme **B**) on PEFR in a group of male university students.

The normal value for mean PEFR for males aged 21 is 580 L min^{-1} .

The sports scientist divided 20 students, aged 21, all with the same physical activity levels, into two groups.

Group 1: Ten male students trained using programme **A**.

Group 2: Ten male students trained using programme **B**.

The students trained for twelve weeks.

PEFRs were measured in all 20 male students before the beginning of the investigation (week 0) and in weeks 4, 8 and 12.

The results are shown in the table below.

	Mean PEFR / L min^{-1}			
	Week 0	Week 4	Week 8	Week 12
Group 1	580	610	620	630
Group 2	580	580	610	620

(a) State **one** factor, not already mentioned in the investigation, which could have affected the PEFR of the students.

_____ [1]



(b) Calculate the percentage (%) increase from the normal value for mean PEFR for Group 1 at week 4.

**You are advised to show your working.
Give your answer to one decimal place.**

% increase _____ [2]





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7 Aerobic respiration is composed of four stages.

The word equation for aerobic respiration is shown below.



(a) (i) State the stage of aerobic respiration in which glucose undergoes phosphorylation and where this occurs in the cell.

Stage _____

Location _____ [2]

(ii) Name the stage of aerobic respiration which requires oxygen and state where this occurs in the cell.

Stage _____

Location _____ [2]

The overall equation for aerobic respiration is given above.

(b) Write a word equation for the **first** of the four stages.

_____ [4]



(c) Individuals who have **McArdle's disease (MD)** can undertake low or moderate intensity exercise, but their muscles become tired very quickly when undertaking high intensity exercise.

It has been shown that if individuals with MD are provided with glucose drinks, they are able to perform high intensity exercise without their muscles becoming tired quickly.

(i) **Using the information provided**, suggest a reason why MD leads to muscles becoming tired quickly when undertaking high intensity exercise.

[2]

(ii) Explain why glucose drinks would allow individuals with MD to perform high intensity exercise without their muscles becoming tired quickly.

[1]

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For Examiner's use only	
Question Number	Marks
1	
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Examiner Number

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