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2002

XVIII

1583

Time allowed
49 Minutes

Score

/41

Percentage

%

Biology

**AQA
AS & A LEVEL**

Topic Questions

3.3 Organisms exchange substances with their environment

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- 1 (a) The oxygen dissociation curve for haemoglobin shifts to the right during vigorous exercise. Explain the advantage of this shift.

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(3)

- (b) Weddell seals are diving mammals that live in cold environments. A Weddell seal is shown in **Figure 1**.

Figure 1



By Jerzystrzelecki (own work) [CC BY 3.0] via Wikimedia Commons

- (i) Explain how the body shape of a Weddell seal is an adaptation to living in a cold environment.

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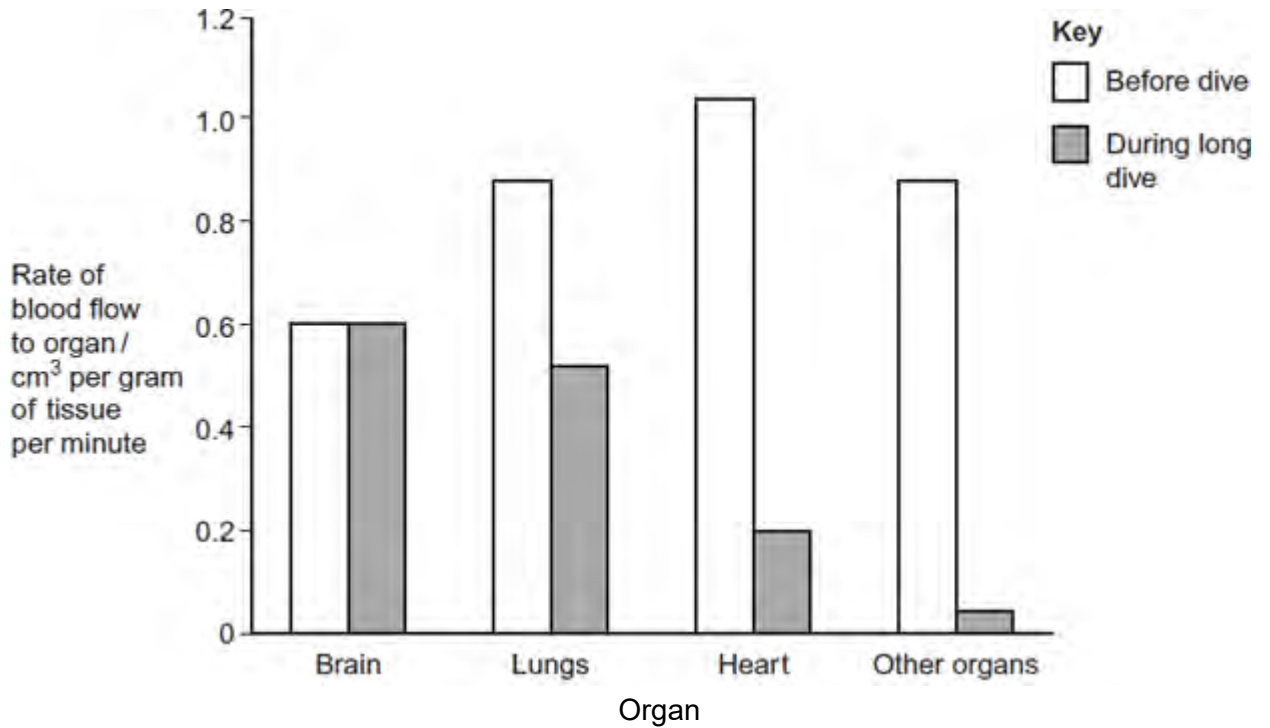
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- (ii) Weddell seals can remain underwater for long periods of time. **Figure 2** shows the rate of blood flow to different organs of a Weddell seal before a dive and during a long dive.

Figure 2



Describe and explain the changes in the rate of blood flow to the different organs during a long dive.

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(3)
(Total 8 marks)



- 2 (a) Describe how oxygen in the air reaches capillaries surrounding alveoli in the lungs. Details of breathing are **not** required.

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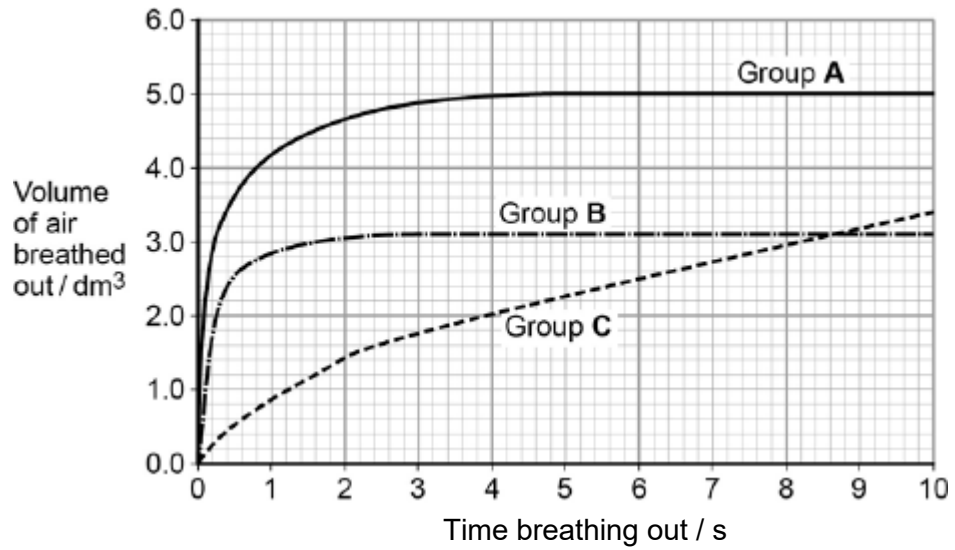
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Forced expiratory volume (FEV) is the greatest volume of air a person can breathe out in 1 second.

Forced vital capacity (FVC) is the greatest volume of air a person can breathe out in a single breath.

The figure below shows results for the volume of air breathed out by three groups of people, **A**, **B** and **C**. Group **A** had healthy lungs. Groups **B** and **C** had different lung conditions that affect breathing.



- (b) Calculate the percentage drop in FEV for group C compared with the healthy people.

Answer =

(1)

- (c) Asthma affects bronchioles and reduces flow of air in and out of the lungs. Fibrosis does not affect bronchioles; it reduces the volume of the lungs.

Which group, B or C, was the one containing people with fibrosis of their lungs? Use the information provided and evidence from the figure above to explain your answer.

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(Total 8 marks)

3 Organic compounds synthesised in the leaves of a plant can be transported to the plant's roots.

This transport is called translocation and occurs in the phloem tissue of the plant.

- (a) One theory of translocation states that organic substances are pushed from a high pressure in the leaves to a lower pressure in the roots.

Describe how a high pressure is produced in the leaves.

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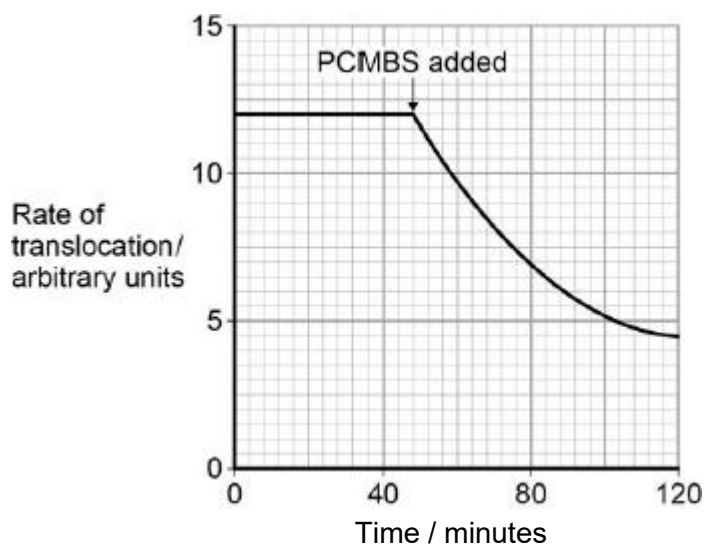
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PCMBS is a substance that inhibits the uptake of sucrose by plant cells.

Scientists investigated the effect of PCMBS on the rate of translocation in sugar beet.

The figure below shows their results.





- (b) During their experiment, the scientists ensured that the rate of photosynthesis of their plants remained constant.
Explain why this was important.

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(2)

- (c) The scientists concluded that some translocation must occur in the spaces in the cell walls.
Explain how the information in the figure above supports this conclusion.

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(Total 7 marks)



4 Breathing out as hard as you can is called forced expiration.

(a) Describe and explain the mechanism that causes forced expiration.

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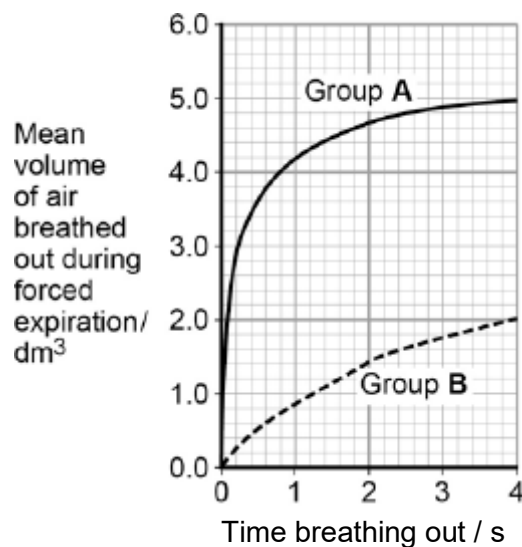
Two groups of people volunteered to take part in an experiment.

- People in group **A** were healthy.
- People in group **B** were recovering from an asthma attack.

Each person breathed in as deeply as they could. They then breathed out by forced expiration.

A scientist measured the volume of air breathed out during forced expiration by each person.

The graph below shows the results.



- (b) Forced expiration volume (FEV) is the volume of air a person can breathe out in 1 second.

Using data from the first second of forced expiration, calculate the percentage decrease in the FEV for group **B** compared with group **A**.

Answer = %

(1)

- (c) The people in group **B** were recovering from an asthma attack.
Explain how an asthma attack caused the drop in the mean FEV shown in the figure below.

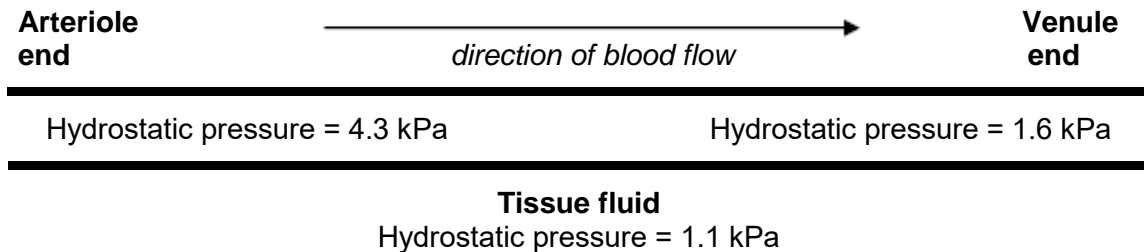
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(4)
(Total 9 marks)



5 The figure below represents a capillary surrounded by tissue fluid. The values of the hydrostatic pressure are shown.



(a) Use the information in the figure above to explain how tissue fluid is formed.

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(2)

(b) The hydrostatic pressure falls from the arteriole end of the capillary to the venule end of the capillary. Explain why.

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(1)

(c) High blood pressure leads to an accumulation of tissue fluid. Explain how.

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(Extra space)



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(3)

- (d) The water potential of the blood plasma is more negative at the venule end of the capillary than at the arteriole end of the capillary. Explain why.

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(Total 9 marks)