Exchange surfaces – 2021/20 GCE Biology A Component 01

1. Nov/2021/Paper_H420/1/No.20(c)

(c) The student carried out another investigation.

(i) The student wanted to estimate the total leaf surface area of the shoot.

At the end of the investigation they removed all the leaves from the shoot.

They placed the leaves on graph paper and then counted squares to obtain an estimate of leaf area.

State **two** things the student would have to do to ensure that the estimate of leaf area was accurate.

1 .....

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2 .....

.....

[2]

(ii) In this investigation, the student calculated the rate of transpiration to be $30\,mm^3\,min^{-1}$.

They estimated the total leaf surface area of the shoot to be $37\,cm^2$.

Calculate the rate of transpiration in $cm^3\,hr^{-1}\,cm^{-2}$.

Give your answer in standard form to **2** significant figures.

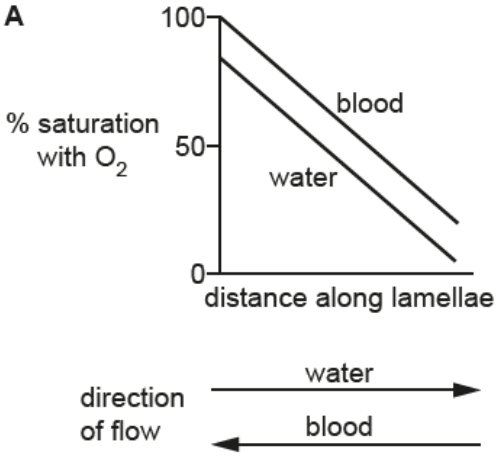
Rate = ... $cm^3\,hr^{-1}\,cm^{-2}$ **[2]**

2. Nov/2020/Paper_H420/1/No.8

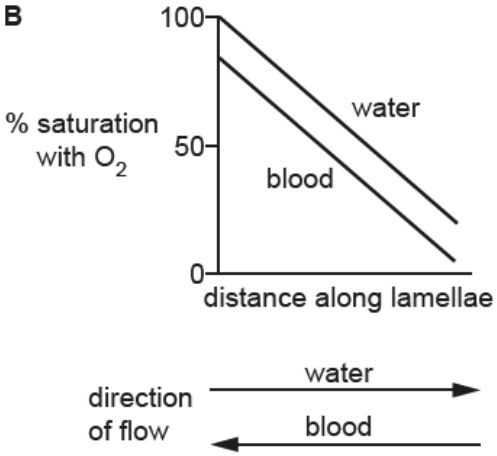
The graphs, **A** to **D**, represent gas exchange in bony fish.

The graphs show the oxygen saturation in blood in the lamellae and water flowing over the lamellae.

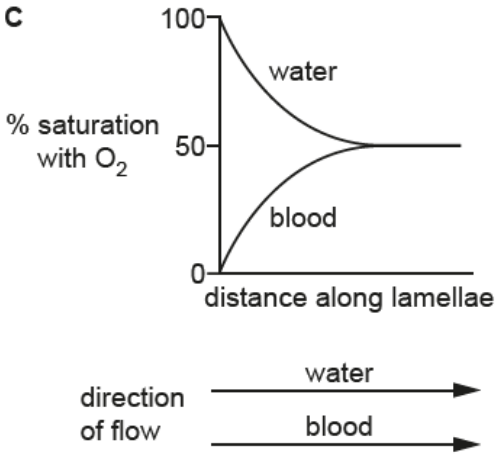
A



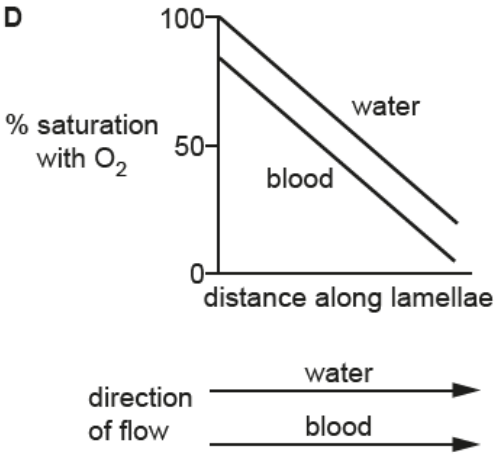
B



C



D



Which graph, **A** to **D**, shows the relationship between blood oxygen saturation and distance along the lamellae?

Your answer ☐ **[1]**

3. Nov/2020/Paper_H420/1/No.21(a_ d)

(a) The table compares the features of airways in the lungs.

Complete the table by putting a tick (✓) in each box if the feature is present and a cross (✘) if the feature is absent in each structure.

The first row has been completed for you.

Structure	Structural feature present		
	Cartilage	Elastic fibres	Goblet cells
Trachea	✓	✓	✓
Bronchi			
Bronchioles			
Alveoli			

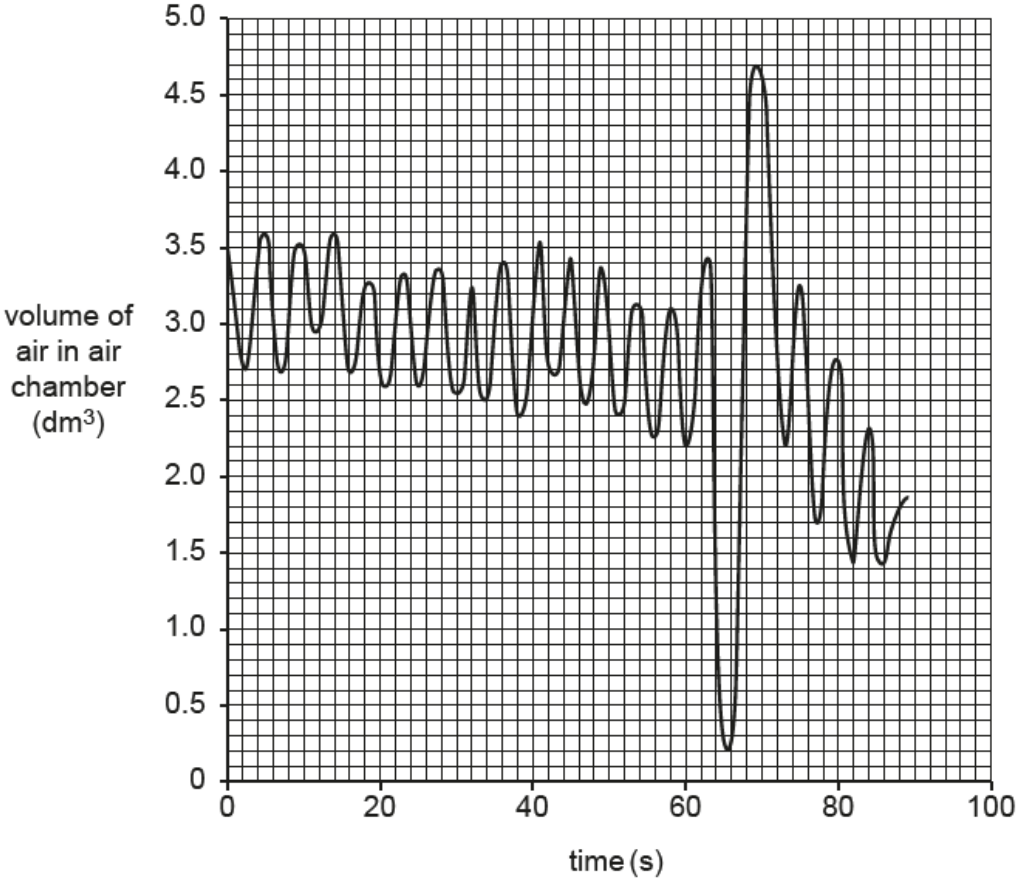
[3]

(b) Ventilation of the lungs creates air movements that can be measured and recorded.

(i) Name the apparatus used to measure and record these air movements.

..... **[1]**

(ii) The trace below shows a recording of ventilation movements from an individual subject.



Use the trace to estimate the **maximum** value for tidal volume during the first minute.

maximum tidal volume = ... dm^3 **[1]**

(iii) After 60 seconds, the subject was told to breathe in as deeply as possible and then breathe out fully.

Use the trace to calculate the vital capacity of the subject.

vital capacity = ...dm^3 **[2]**

(c)* Compare and contrast the mechanism of expiration during the first 60 seconds of the trace with the mechanism of expiration when the subject was told to breathe out fully.

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..... **[6]**

(d) Complete the following statements about exchange surfaces.

Use the correct terms selected from the list below.

circulatory system **concentration gradient** **diffusion pathway**

flow of air **lung capacity** **surface area**

surface area to volume ratio **ventilation**

Large organisms have a large ..... but they have a small ..... . This means they need a specialised exchange surface and a ..... .

Two features of an efficient exchange surface are:

1. A good blood supply to maintain the ..... .
2. A short ..... .

[5]

4. Nov/2021/Paper_H420/03/No.1(a)

(a) The figure below shows a light micrograph of an insect's gas exchange system.

Name the structures labelled **A** and **B** in the figure.

A .....

B .....

[2]

(b) Fish use gills as specialised gas exchange surfaces.

(i) In ventilation, water moves into the buccal cavity, across the gills and out of the opercular cavity.

Complete the table by placing ticks (✓) in the appropriate boxes to show which of the processes occur at each stage of ventilation.

	Mouth closes	**Buccal cavity floor lowers**	**Operculum opens**	**Highest rate of oxygen diffusion into the blood**
Water moves into the buccal cavity				
Water moves across the gills and out of the opercular cavity				

[2]

(ii) A student described how they dissected a fish to view the gills:

'I held the fish on a cutting board with one hand. I used scissors and a scalpel to carefully cut from the mouth to the tail, down the ventral side of the fish. I was able to split the fish into two halves and view the gills on the inside of the mouth.'

Suggest **one** improvement to the student's method that would allow them to observe the gills more easily.

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..... **[1]**