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Level: HL IB in Biology
Subject: Biology
Topic: IB HL Biology
Type: Mark Scheme

All International Baccalaureate IB Topic Questions HL Biology

BIOLOGY

HL - IB

Key skills

Answer 1

The correct answer is B.

The volume of air breathed in can be calculated using pencil-and-paper calculations as below. This value serves as a proxy for oxygen intake because the question tells us that all these animals had the same efficiency of gas exchange so we don't need to take that into account. Similarly, we don't need to multiply by 5 for the 5-minute test because we can just calculate every value over 1 minute for simplicity.

EXAM PAPERS PRACTICE

Which animal absorbed most oxygen during five minutes of normal breathing?

Animal	Tidal volume / dm^3	Breathing rate / breaths per minute
A.	0.2	10
B.	0.6	20
C.	0.5	18
D.	0.33	24

Volume of air inhaled per minute = tidal volume × breathing rate

Four simple pencil-and-paper calculations can be carried out to work out the volume of air breathed in one minute – no need to work out five minutes' worth because all 4 would be multiplied by five.

A: $0.2 \times 10 = 2\ dm^3$

B: $0.6 \times 20 = 12\ dm^3$ (highest)
$\times 10$ $\div 10$ (*)
$6 \times 2 = 12$

C: $0.5 \times 18 = 9\ dm^3$
$\frac{1}{2}$ of 18 (*) $= 9$

D: $0.33 \times 24 = 8\ dm^3$
$\frac{1}{3}$ of 24 (*) $= 8$

(*) alternative ways to calculate with mental maths

Answer 2

The correct answer is B.

The ribs move down and in during expiration to reduce the volume, and therefore increase pressure, inside the thorax.

The upward movement of the diaphragm at the beginning of expiration is due to relaxation.

Pressure in the thorax has to increase in order for there to be high pressure inside the thorax compared to the outside air, so that air will flow outwards down its pressure gradient.

The external intercostal muscles relax during expiration; when they contract they move the ribs up and out.

It is incorrect to say that muscles recoil; muscles either relax or contract. The term recoil can be applied to elastic fibres such as those in the lining of the alveoli and blood vessels.

The internal intercostal muscles contract for a forced expiration, e.g. when blowing up a balloon, to reduce the thorax volume and provide extra pressure to force excess air out of the lungs. Note that the relaxation of the external intercostal muscles and diaphragm are enough on their own to reduce thorax volume during normal, unforced, expiration.

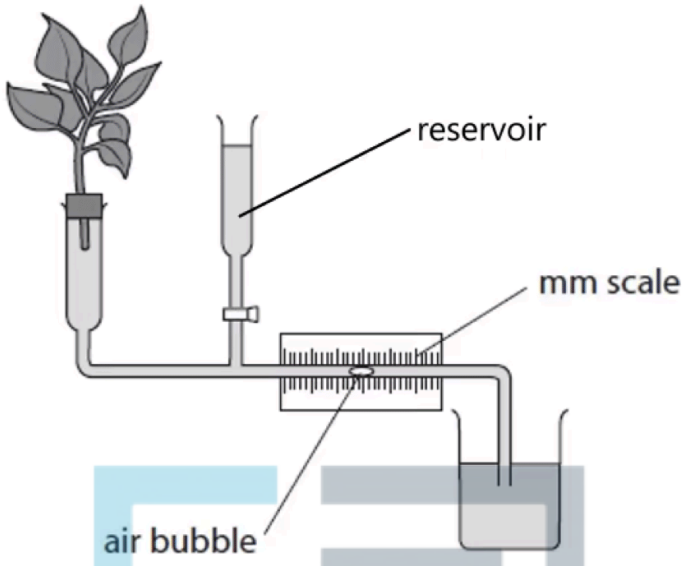
Answer 3

The correct answer is A because the correct measure of transpiration rate would be a value of volume per unit time. The volume comes from the volume of a cylinder ($\pi r^2 h$). In this example, we aren't given the radius but we know the diameter d, so radius = $d \div 2$. The volume of water taken up should be divided by the time value, *s*.

B is incorrect because it doesn't divide *d* by 2 to reach a value for the radius of the capillary tube.

C is incorrect because it multiplies by the time taken, whereas to achieve a rate figure, the progress of a reaction has to be *divided* by a time value.

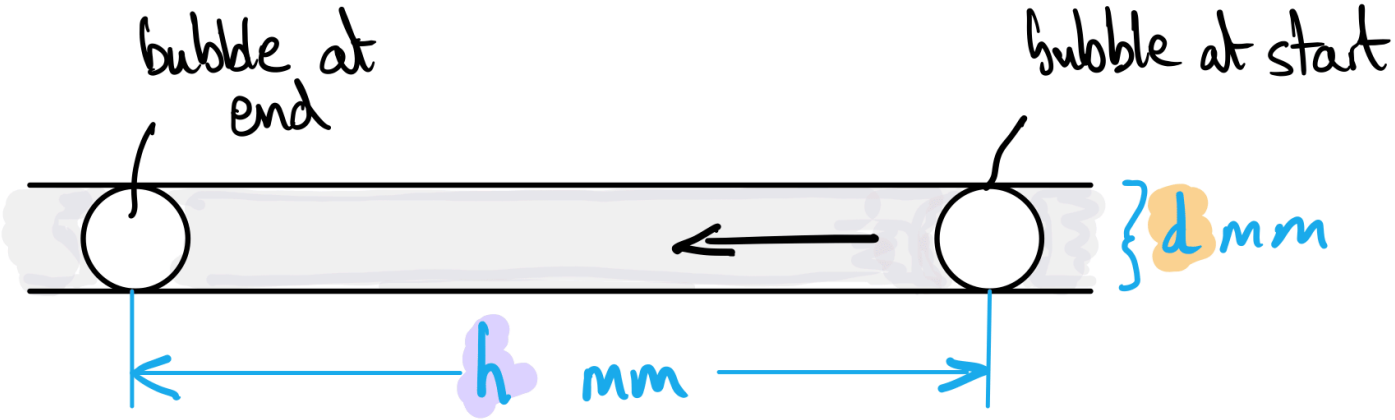
D is doubly incorrect because it combines the errors of both B and C.



For a potometer with a capillary of internal diameter of ***d*** mm, the bubble was measured to travel ***h*** mm in an experimental time of ***s*** seconds.

Which formula best represents the rate of transpiration as measured in this experiment?

Step ① Visualise a cylinder that the bubble has travelled along



(it will travel right-to-left, towards the piece of plant)

Step ② Record the time in seconds

Step (3) Volume of a cylinder

$= \pi r^2 h$ — height / length

radius i.e. $\frac{\text{diameter}}{2}$

$= \pi \left(\frac{d}{2}\right)^2 h$

Step (4) Divide by time taken to calculate rate

$= \dfrac{\pi \left(\frac{d}{2}\right)^2 h}{s}$ [1 mark]