Gas exchange – AS 9700 June 2022

1. June/2023/Paper_9700/11/No.34

A person with no breathing conditions rests for an hour. Their breathing in this time is shallow and slow, so little air from outside the body reaches the alveoli. The person's heart rate remains constant.

Which statement is correct?

A The carbon dioxide concentration in the blood in the pulmonary vein will be higher than in the pulmonary artery.

B Carbon dioxide molecules in the air of the alveoli move out of the blood by active transport.

C The air in the alveoli has a lower concentration of oxygen than the blood in the pulmonary vein.

D Oxygen molecules diffuse from the air in the alveoli into the blood at a slower rate than when the person is active.

2. June/2023/Paper_9700/11/No.35

Which statements about **all** bronchioles are correct?

1 They have epithelium.

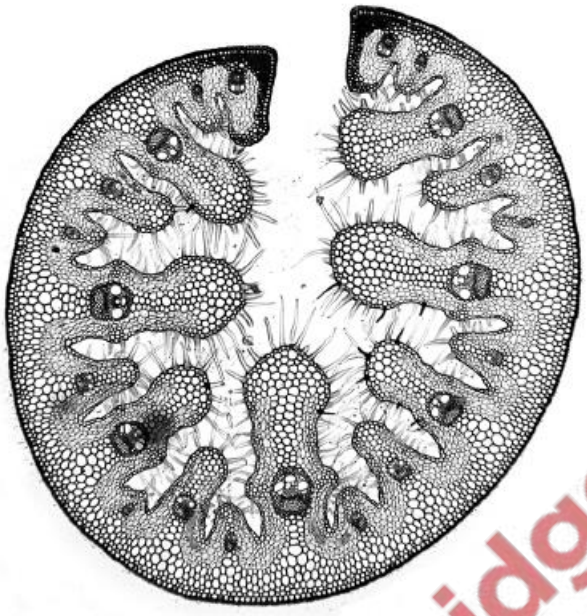
2 They have goblet cells.

3 They have muscle tissue.

A 1, 2 and 3 **B** 1 and 3 only **C** 2 only **D** 3 only

3. June/2023/Paper_9700/12/No.30

The photomicrograph shows a transverse section of the leaf of a species of grass.



The grass is specially adapted to grow in a dry habitat.

Which row correctly explains how the features help the grass to grow in this habitat?

	hair-like structures	leaf shape
A	increase internal humidity	decrease external humidity
B	decrease external humidity	increase internal humidity
C	increase internal humidity	increase internal humidity
D	decrease external humidity	decrease external humidity

4. June/2023/Paper_9700/12/No.35

Where are squamous epithelial cells found in the human gas exchange system?

	trachea	bronchus	alveolus
A	✓	✓	✓
B	✓	✗	✓
C	✗	✓	✗
D	✗	✗	✓

key

✓ = found

✗ = not found

5. June/2023/Paper_9700/12/No.36

Which statement about gas exchange between air in the alveoli and blood in the pulmonary capillaries is correct?

A The oxygen concentration in the capillaries leaving the pulmonary artery is higher than the oxygen concentration in the alveoli.

B Gases must diffuse across the endothelium of the pulmonary capillaries and the endothelium of the alveoli.

C The elastic fibres in the alveoli walls allow the alveoli to expand to increase the surface area available for diffusion into the pulmonary capillaries.

D Breathing out reduces the carbon dioxide concentration gradient between the blood in the pulmonary capillaries and the air in the alveoli.

6. June/2023/Paper_9700/12/No.37

The average thicknesses for some structures in the human respiratory system are shown.

structure	average thickness of structure / nm
human cell membrane	5
cytoplasm of alveolar wall cells	190
cytoplasm of capillary wall cells	90
tissues between alveolar wall and capillary wall	300

A molecule of oxygen is in the alveolar air space next to the wall of the alveolus.

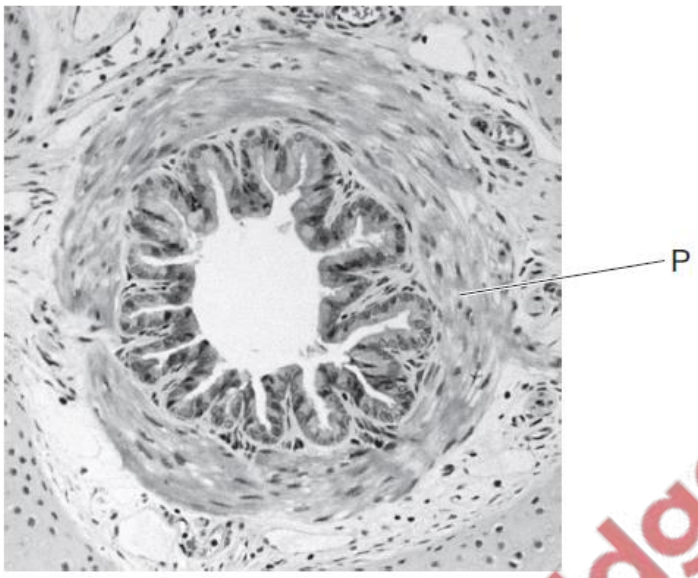
What is the shortest distance that the molecule needs to diffuse from its current position to the haemoglobin that completely fills a red blood cell in the nearest capillary?

(Assume that the red blood cells touch the walls of a capillary.)

A 595 nm **B** 600 nm **C** 605 nm **D** 610 nm

7. June/2023/Paper_9700/13/No.37

The photomicrograph shows a part of the human gas exchange system with one tissue labelled P.



Which row is correct?

	part of gas exchange system	function of tissue P
A	bronchus	regulates the amount of air reaching the lungs
B	bronchus	provides support and prevents collapse
C	bronchiole	regulates the amount of air reaching the lungs
D	bronchiole	provides support and prevents collapse

8. June/2023/Paper_9700/13/No.38

How many times must a molecule of oxygen pass through a cell surface membrane as it diffuses from the airspace inside an alveolus, through a cell in the capillary wall, to bind to a molecule of haemoglobin?

A 3 **B** 4 **C** 5 **D** 10

9. March/2023/Paper_9700/12/No.34

Scientists have shown that the oxygen dissociation curves for haemoglobin of smaller mammals are to the right of those of larger mammals.

What does this suggest about the haemoglobin of smaller mammals?

A At low partial pressures of oxygen, it binds to oxygen more strongly than the haemoglobin of larger mammals.

B It saturates with oxygen at lower partial pressures of oxygen than the haemoglobin of larger mammals.

C It releases oxygen more easily than the haemoglobin of larger mammals.

D When the partial pressure of oxygen is high, it carries more oxygen than the haemoglobin of larger mammals.

10. March/2023/Paper_9700/12/No.35

What is an effect of an increased concentration of carbon dioxide in the blood?

A increased movement of chloride ions out of red blood cells

B increased concentration of haemoglobinic acid

C decreased concentration of hydrogencarbonate ions in blood plasma

D decreased concentration of carbaminohaemoglobin

11. March/2023/Paper_9700/12/No.36

Two of the requirements of an efficient gas exchange system are a large surface area and a short diffusion distance.

Which row correctly describes how alveoli are adapted to meet these requirements?

	large surface area	short diffusion distance
A	elastin fibres prevent the alveolus wall from collapsing	an extracellular layer inside the alveolus wall contains blood capillaries
B	gases dissolve in a layer of liquid to speed up diffusion	alveolar walls are next to capillaries
C	alveoli are folded and interconnected	walls of alveoli are only one cell thick
D	walls of alveoli are formed of squamous epithelial cells	red blood cells are very close to capillary walls