

# Exchange Surfaces

## Multiple Choice

### Question Paper 1

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Exchange and transport
Topic	Exchange surfaces
Booklet	Question Paper 1

**Time allowed:** 14 minutes

**Score:** /10

**Percentage:** /100

**Grade Boundaries:**

A*	A	B	C	D	E
>69%	56%	50%	42%	34%	26%

## Question 1

Which of the following statements, **A** to **D**, correctly explains a feature of an efficient gaseous exchange surface?

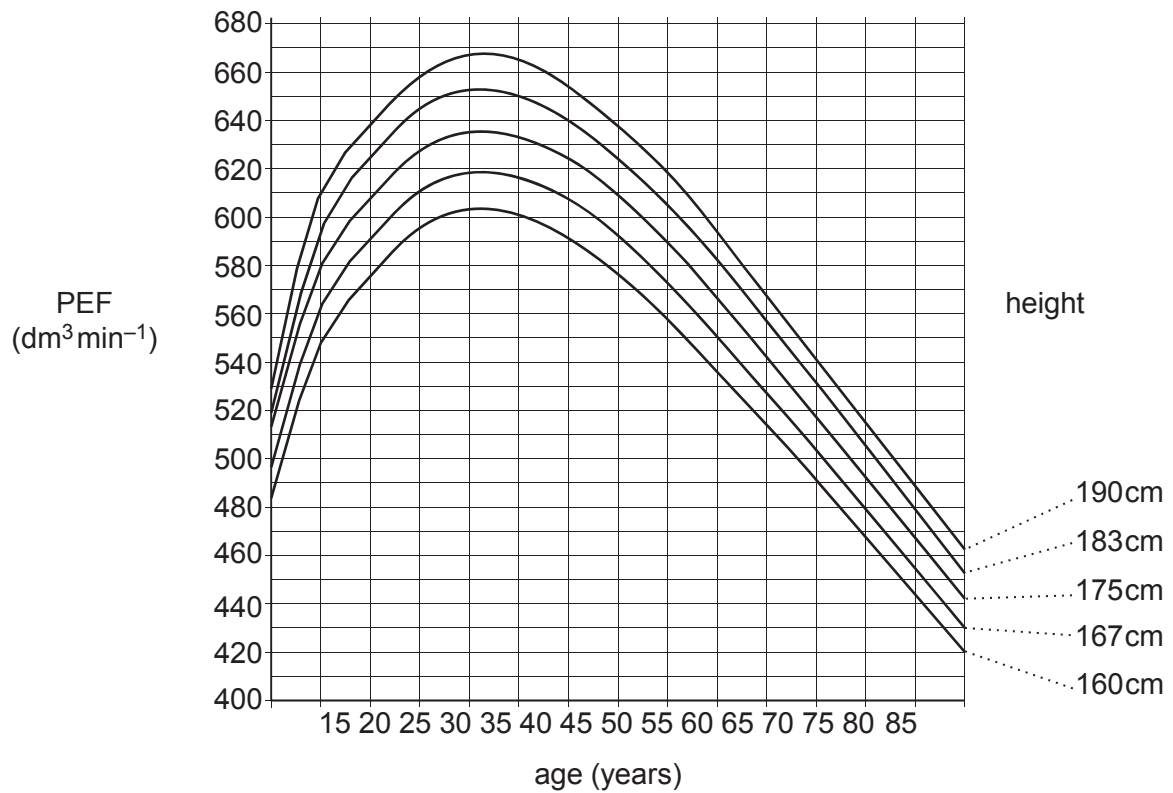
- A. The layers are thin for a short diffusion distance.
- B. There is a good blood supply, so the system reaches equilibrium quickly.
- C. There is an increased surface area to reduce surface area to volume ratio.
- D. Ventilation takes place to reduce concentration gradient of dissolved gases.

**[1]**

## Question 2

Peak expiratory flow (PEF) is a measure of the maximum rate at which a person can exhale.

The graph below shows the typical PEF values for men of different ages and heights.



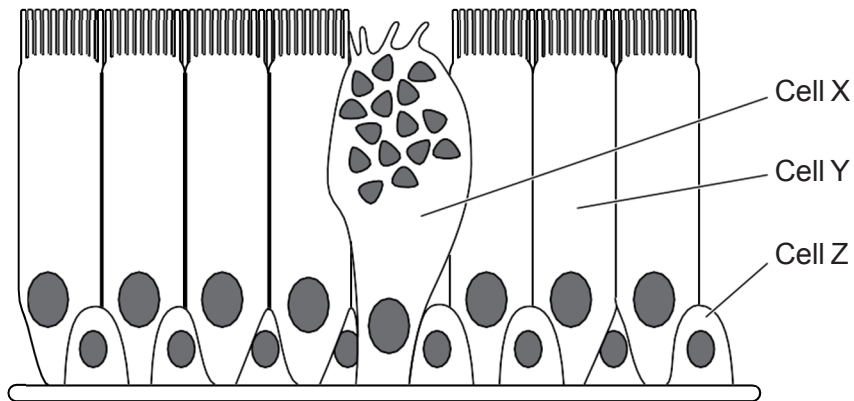
Which of the following is the percentage increase from the PEF of a 20 year old man of 175 cm to the PEF of a 45 year old man of 183 cm?

- A 19.4%
- B 10.9%
- C 12.3%
- D 8.1%

[1]

### Question 3

Air moves in and out of human lungs through the trachea, which is lined with cells. The diagram below shows a section containing these cells.



Which of the following statements about tracheal cells is correct?

- A. Cells X, Y and Z are all columnar epithelial cells.
- B. Cells X and Y move mucus and trapped bacteria out of the trachea.
- C. Cell X releases mucus into the trachea.
- D. Cell Z is a goblet cell.

[1]

## Question 4

Bony fish absorb dissolved oxygen from the water using gills. Water is passed through the buccal cavity and over the gill lamellae. The oxygen saturation of the blood and water changes as the water passes over the gills.

Which of the statements, **A** to **D**, correctly describes the way oxygen is transferred into the blood at the gills?

- A. Blood and water flow in a concurrent system with a constant concentration gradient between them.
- B. Blood and water flow in a countercurrent system with a constant concentration gradient between them.
- C. Blood and water flow in a concurrent system with a greater concentration gradient between them at the start of the gill lamella.
- D. Blood and water flow in a countercurrent system with a greater concentration gradient between them at the start of the gill lamella.

[1]

## Question 5

Different sized mammals have different surface area to volume ratios.

The table shows the surface areas and volumes of four different groups of mammals.

Mammal genus	Surface area (m <sup>2</sup> )	Volume (m <sup>3</sup> )
<i>Oryctolagus</i>	0.48	$2.0 \times 10^{-2}$
<i>Equus</i>	18.26	2.24
<i>Mus</i>	$1.9 \times 10^{-3}$	$7.2 \times 10^{-5}$
<i>Rattus</i>	0.32	$1.6 \times 10^{-2}$

Which of the options, **A** to **D**, is the correct order of surface area to volume ratios for the different mammals, arranged from the largest to the smallest?

- A** *Oryctolagus, Rattus, Equus, Mus*
- B** *Mus, Rattus, Oryctolagus, Equus*
- C** *Mus, Oryctolagus, Rattus, Equus*
- D** *Equus, Mus, Oryctolagus, Rattus*

[1]

## Question 6

Ventilation involves various parts of the mammalian respiratory system.

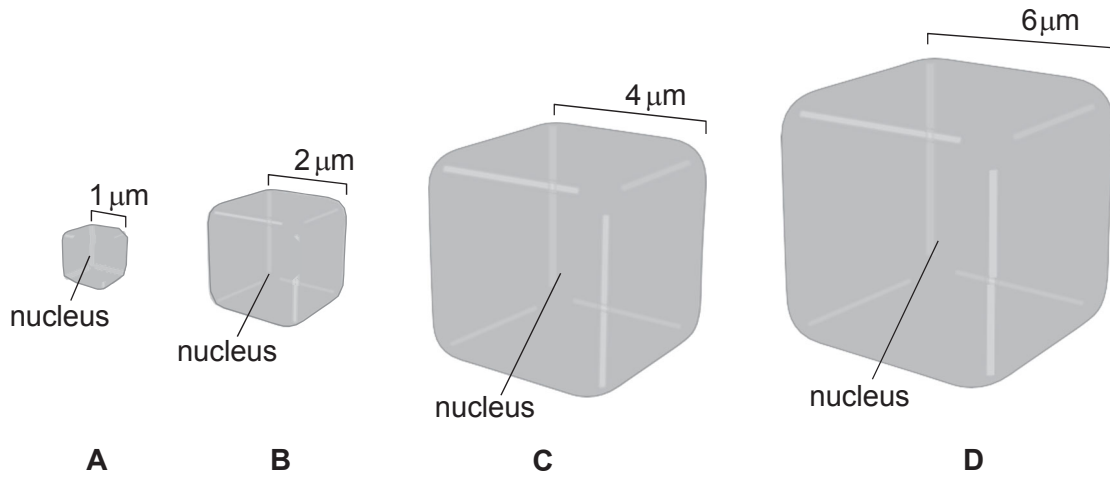
Which of the following statements, **A** to **D**, describes **inhalation**?

- A** ribcage moves upwards and outwards; external intercostal muscles relax; diaphragm relaxes
- B** ribcage moves downwards and inwards; external intercostal muscles relax; diaphragm relaxes
- C** ribcage moves upwards and outwards; external intercostal muscles contract; diaphragm contracts
- D** ribcage moves downwards and inwards; external intercostal muscles contract; diaphragm contracts

**[1]**

## Question 7

Which of the cells below, represented by cubes **A** to **D**, has a surface area to volume ratio of 3:1?



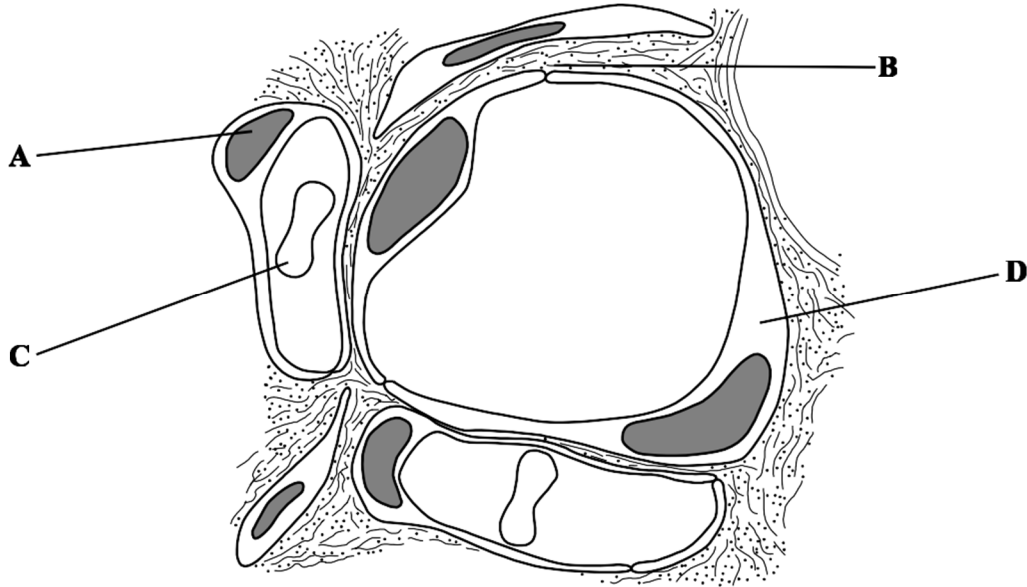
[1]



## Question 8

Emphysema is a chronic respiratory disease where elastase is produced by phagocytes in the lungs, which breaks down lung tissue. This means that a person with emphysema cannot fully exhale.

**Fig. 15.1** is a diagram of a small section of a healthy lung.



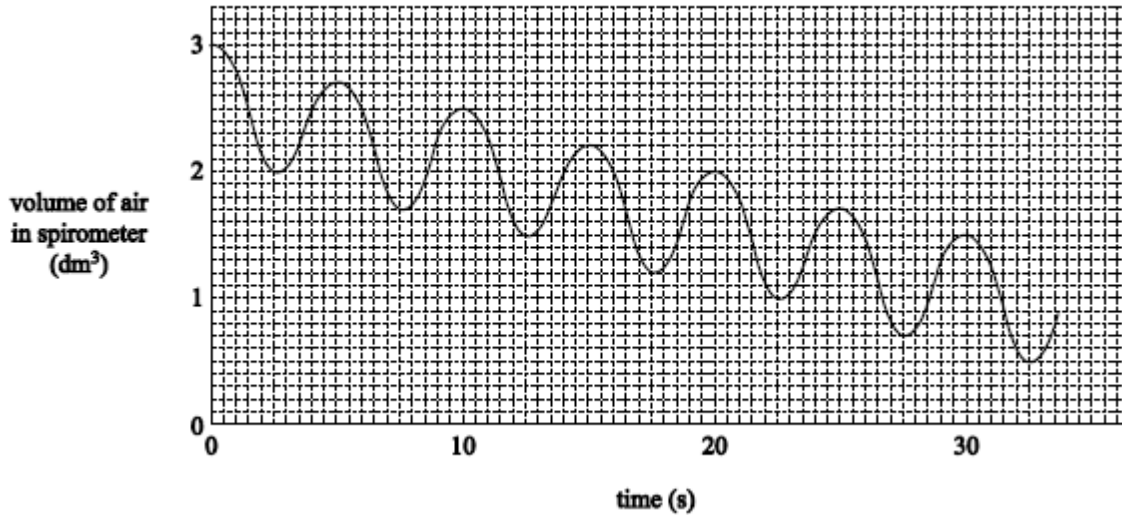
**Fig. 15.1**

Which label shows the area of lung tissue that is broken down by elastase?

[1]

## Question 9

The following spirometer trace shows the results of an experiment. Soda lime was used to extract carbon dioxide from exhaled air.



What is the rate of oxygen consumption in the experiment?

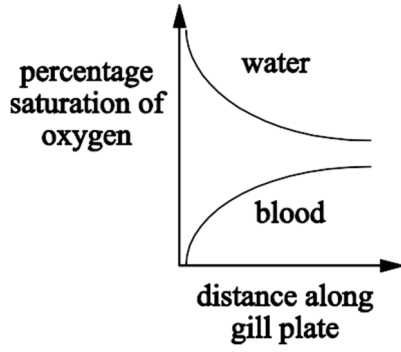
- A 1.0 dm<sup>3</sup>      B 3.0 dm<sup>3</sup> min<sup>-1</sup>      C 5.0 dm<sup>3</sup> min<sup>-1</sup>      D 12 breaths min<sup>-1</sup>

[1]

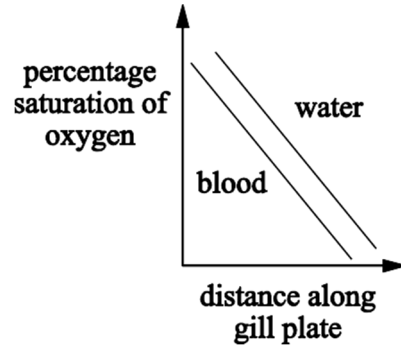
# Question 10

Which graph represents the counter-current exchange system in fish gills?

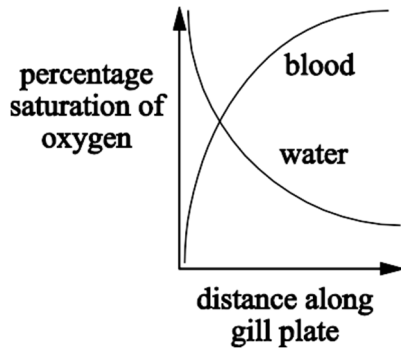
**A**



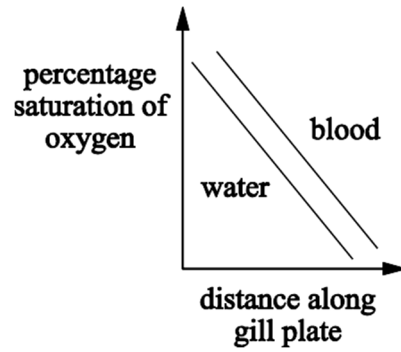
**B**



**C**



**D**



[1]