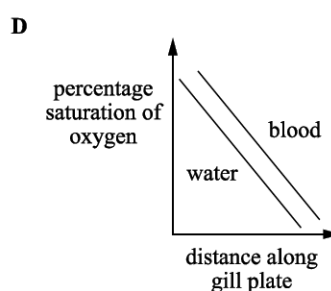
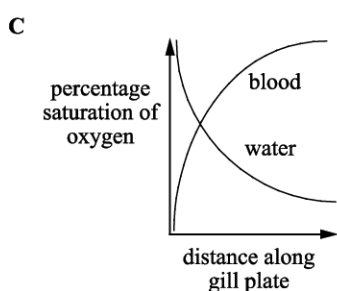
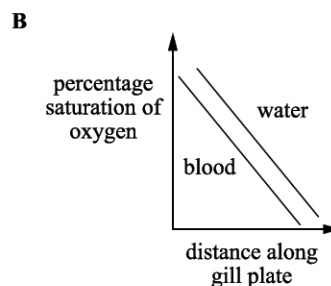
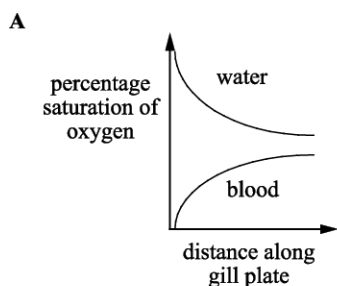


## Exchange Surfaces

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



Your answer

[1]

2. Which structure, **A** to **D**, is **not** an example of a surface that is specialised for the purpose of gas exchange?

- A** alveolus of a mammal
- B** plasma membrane of a unicellular protocista
- C** leaf of a tobacco plant
- D** trachea of an insect

Your answer

[1]

3. 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.

Your answer

[1]

4. 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*

Your answer

[1]

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

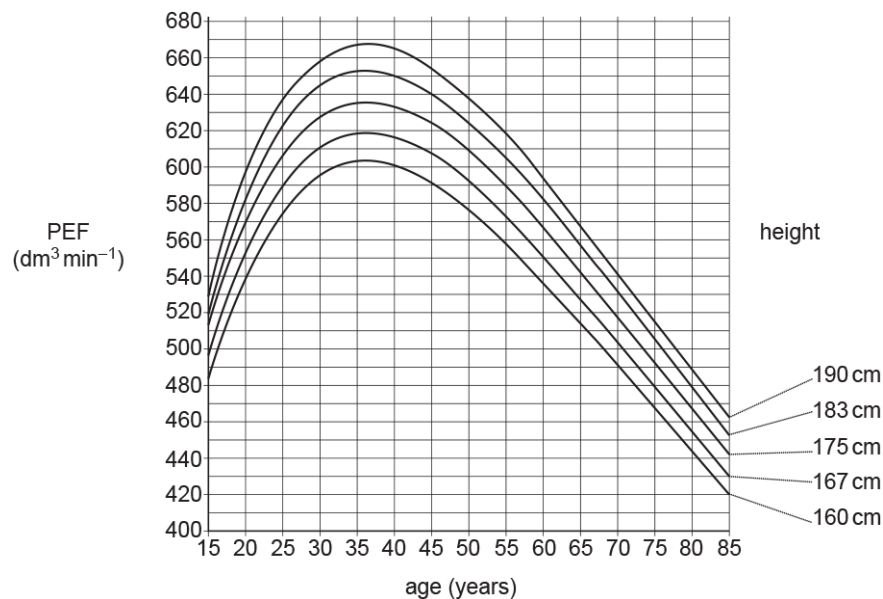
- A** The layers are thin for a short diffusion distance.
- B** There is a good blood supply, so the system reaches equilibrium quickly.
- C** There is an increased surface area to reduce surface area to volume ratio.
- D** Ventilation takes place to reduce concentration gradient of dissolved gases.

Your answer

[1]

6. 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%

Your answer

[1]

7. Ventilation is a process that involves various parts of the body.

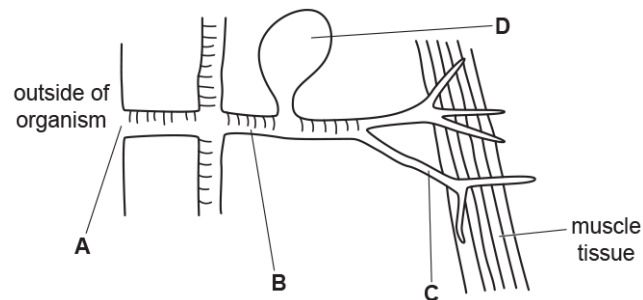
Which of the following options, **A** to **D**, describes **exhalation** in a mammal?

- 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 relaxes
- D** ribcage moves downwards and inwards; external intercostal muscles contract; diaphragm contracts

Your answer

[1]

8. The diagram shows part of the gas exchange system of an insect.

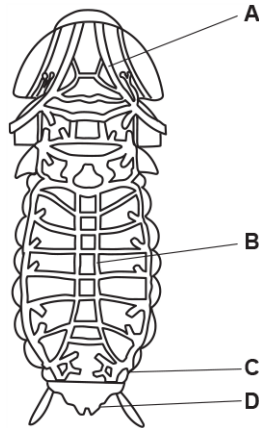


Which of the labels, **A** to **D**, indicates the trachea?

Your answer

[1]

9. The drawing below shows the respiratory system of an insect.



Which of the letters, **A** to **D**, shows a spiracle?

Your answer

[1]

10. Which of the following muscles in the mammalian ventilation system contract to force air out of the lungs?

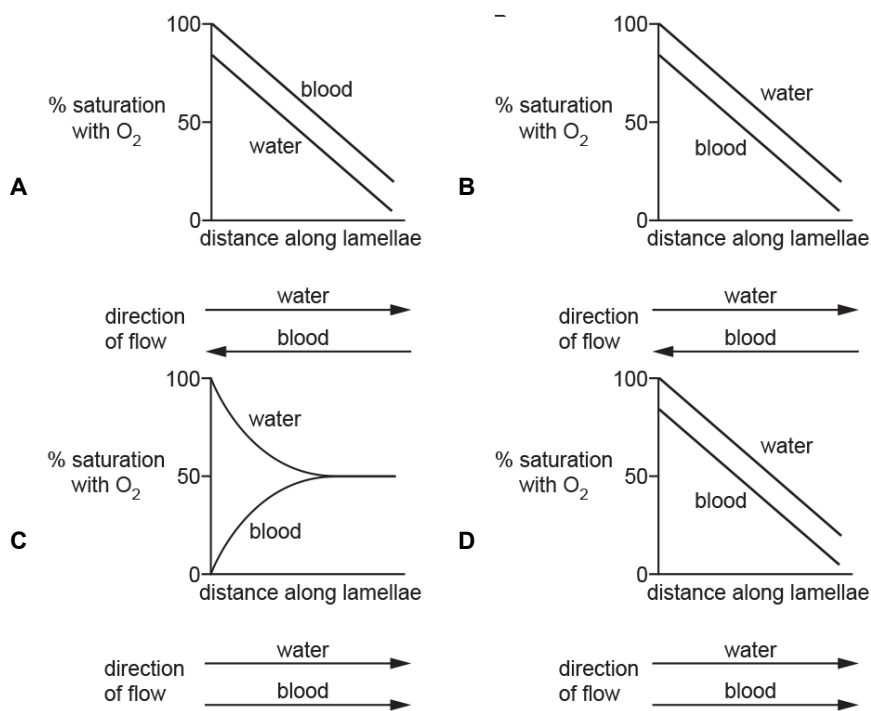
- A** all of the muscles in the mammalian ventilation system
- B** the external intercostal muscles
- C** the diaphragm
- D** the internal intercostal muscles

Your answer

[1]

11. 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.

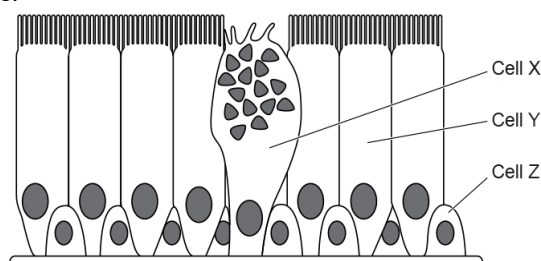


Which graph, **A** to **D**, shows the relationship between blood oxygen saturation and distance along the lamellae?

Your answer

[1]

12. 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.



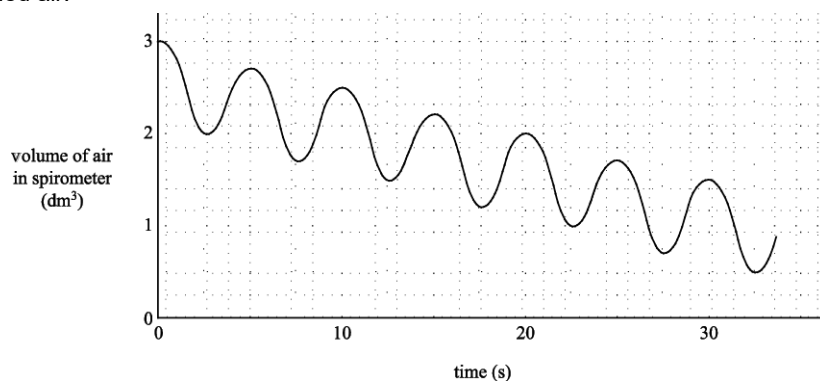
Which of the following statements about tracheal cells is correct?

- 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.

Your answer

[1]

13. 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.  $1.0 \text{ dm}^3$
- B.  $3.0 \text{ dm}^3 \text{ min}^{-1}$
- C.  $5.0 \text{ dm}^3 \text{ min}^{-1}$
- D. 12 breaths  $\text{min}^{-1}$

Your answer

[1]

14. 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.

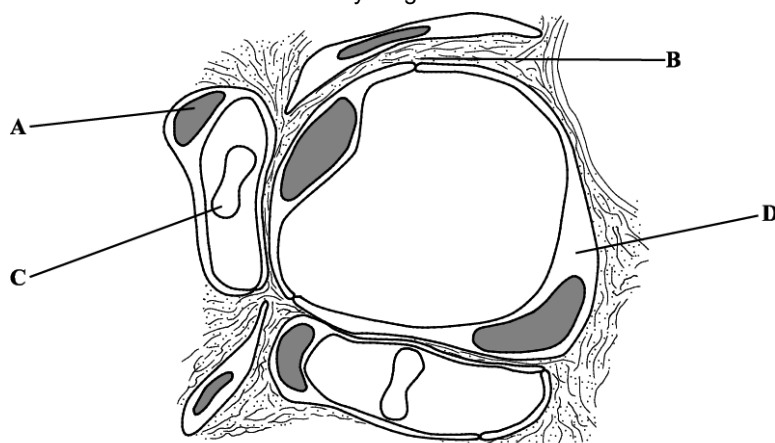


Fig. 15.1

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

Your answer

[1]

15. The graph in Fig. 8.1 shows a normal spirometer trace.

Which option correctly describes what is happening at point Z?

- A pressure inside lungs is low
- B volume of thorax is large
- C diaphragm is contracted
- D internal intercostal muscles are contracted

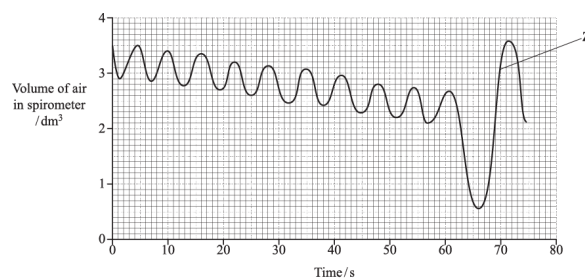


Fig. 8.1

Your answer

[1]