Exchange Surfaces Multiple Choice

Model Answers 1

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Exchange and transport
Topic	Exchange Surfaces
Booklet	Model Answers 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.

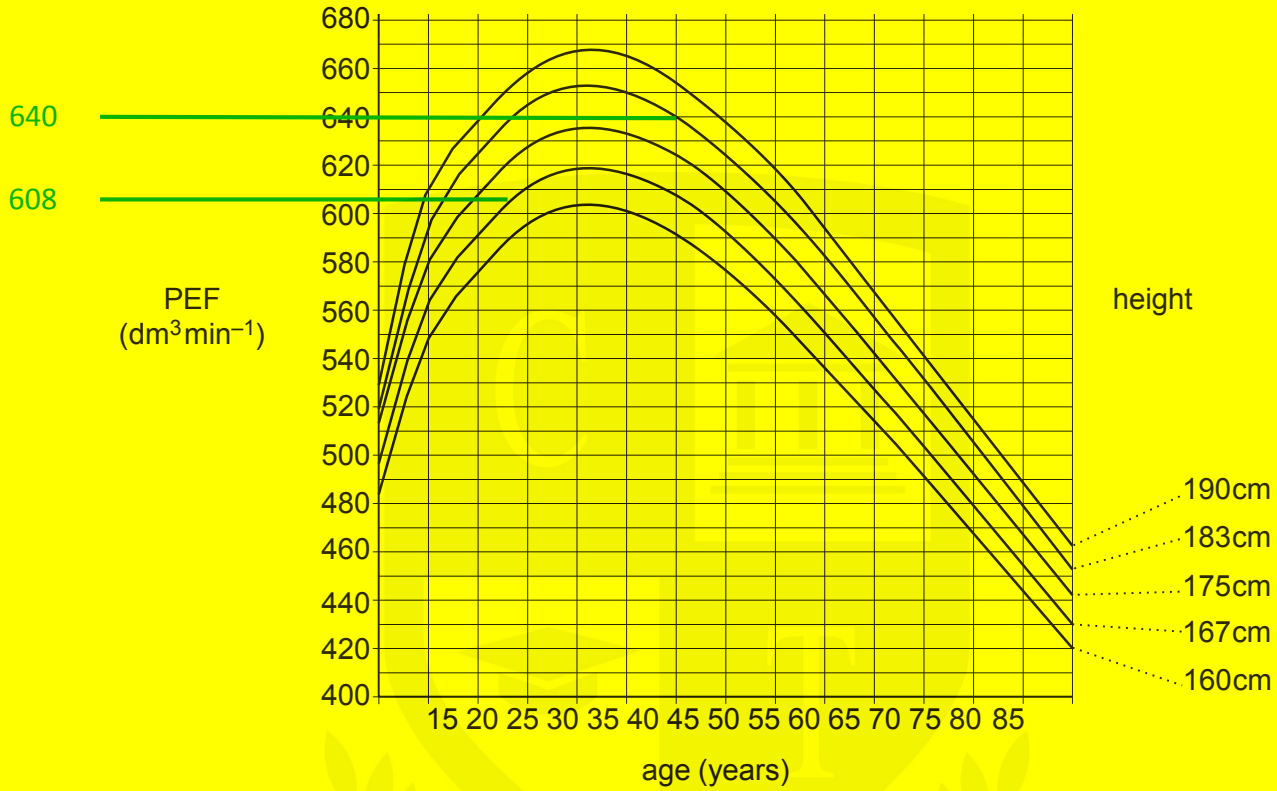
D. Ventilation takes place to reduce concentration gradient of dissolved gases. **[1]**

All gas exchange surfaces are thin with flattened cells which are a single layer, this provides a short distance for **rapid** diffusion

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%

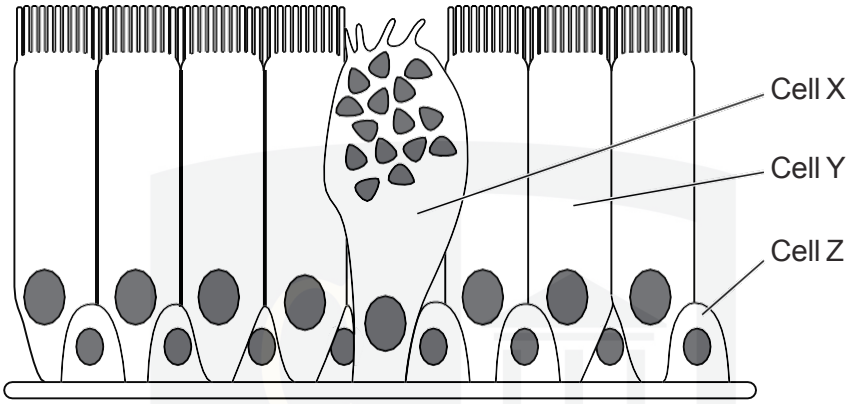
D 8.1%

[1]

Remember to get the percentage it's the difference divided by the original , in this case it's compared to the 20 year old man

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]**

Goblet cells secrete mucus which is sticky and traps bacteria, ciliated epithelium

(a type of columnar) the sweeps this out of the airways

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]

The counter current mechanism works because even when blood has taken on oxygen from the water, it flows in the opposite direction, so it continually meets water containing even more oxygen. The gradient between them stays the same.

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^2)	Volume (m^3)
Oryctolagus	0.48	2.0×10^{-2}
Equus	18.26	2.24
Mus	1.9×10^{-3}	7.2×10^{-5}
Rattus	0.32	1.6×10^{-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]

In order their surface area to volume ratios are

26, 24, 20 and 8

You could narrow it down to B or C as horses are pretty big! So their surface area to volume ratio must be smallest

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

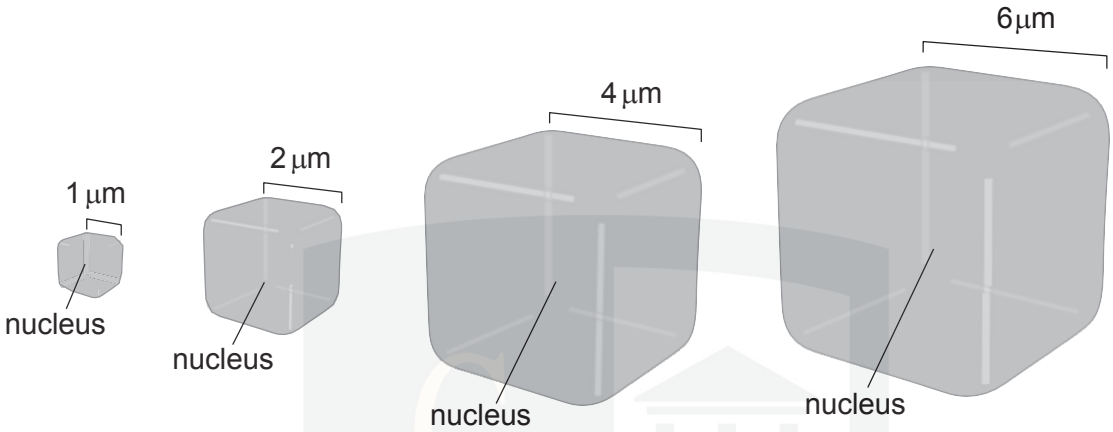
D ribcage moves downwards and inwards; external intercostal muscles contract; diaphragm contracts **[1]**

This combination increases the volume in the thorax which decreases the pressure inside and air rushes in. Ventilation is not the same as respiration, which a chemical process.

Ventilation exchanges air and maintains diffusion gradients

Question 7

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



[1]

Surface area of B is 2 x 2 = 4 per side and it has 6 sides so = 24

The volume is 2 x 2 x 2 = 8

Surface area 24 divided by volume 8, is 3 : 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

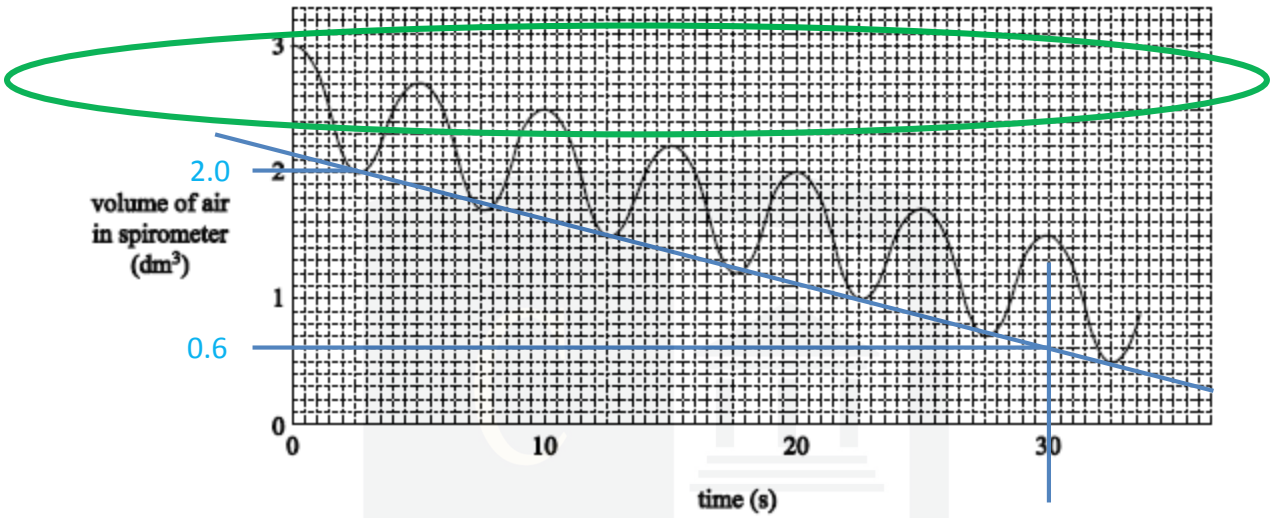
Which label shows the area of lung tissue that is broken down by elastase?

[1]

They are just asking you to label the elastic tissue

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^3 **B** 3.0 $dm^3\ min^{-1}$ **C** 5.0 $dm^3\ min^{-1}$ **D** 12 breaths min^{-1}

[1]

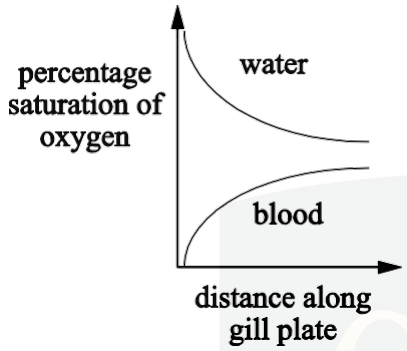
The volume drops from 2.0 to 0.6 over 30 seconds which is 1.4 in 30 seconds or 2.8 per minute. The nearest answer is B.

The fall in volume in the spirometer is the oxygen consumption

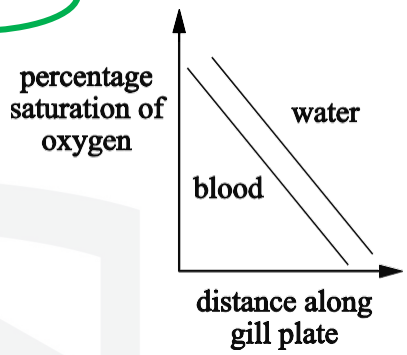
Question 10

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

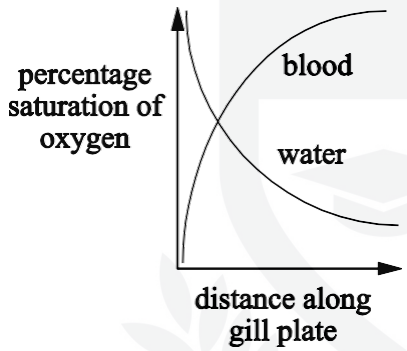
A



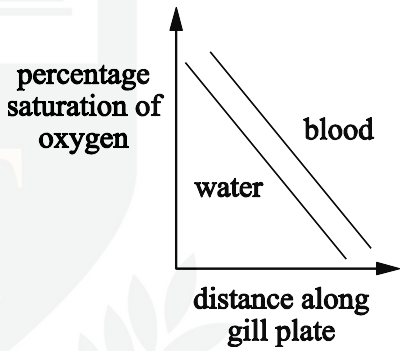
B



C



D



[1]

This is an example of counter current flow. The water flowing over the gills is in the opposite direction to the flow of blood, this helps to maintain diffusion gradients all the way across the gill plate