3.1 Exchange Surfaces

Total mark – 18

Question: 1

16. The Titicaca water frog, *Telmatobius culeus*, is an aquatic amphibian found in Lake Titicaca in sub-tropical South America. The water frog has an unusual appearance with large folds of skin as shown in Fig. 21.1.

Fig. 21.1

Like all amphibians, frogs are able to absorb oxygen through the skin as well as their lungs.

i. Suggest why the Titicaca water frog has evolved the unusually large folds of skin seen in Fig. 21.1.

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[2]

ii. When out of the water, the Titicaca water frog is able to use its lungs to absorb oxygen.

Lungs contain specialised gaseous exchange surfaces.

Describe and explain how **one** feature of the lungs provides an efficient gas exchange surface.

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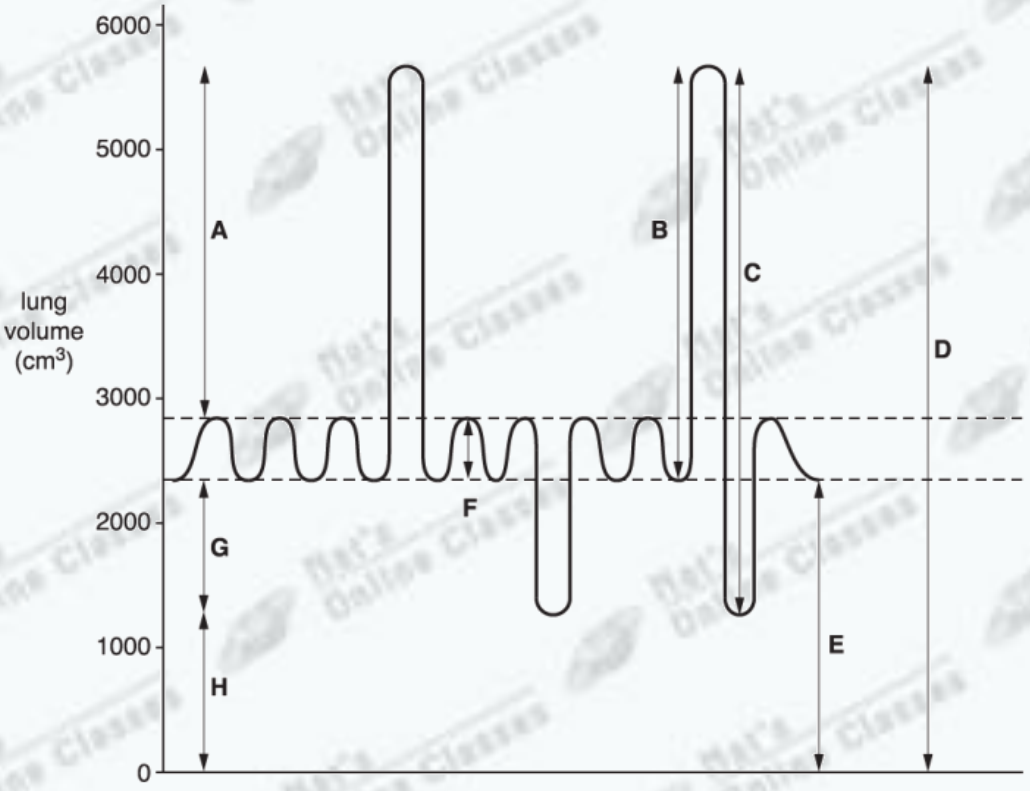
[2]

Question: 2

17. The figure represents the volume changes in the lung of a human.



i. Select the letter, **A** to **H**, that corresponds to each of the following lung volumes.

The first one has been done for you.

Lung volume	Letter
Inspiratory reserve volume	*A*
Residual volume	
Total lung capacity	
Tidal volume	
Vital capacity	

[4]

ii. Volume **C** can be measured using an instrument such as a spirometer.

What **breathing** instructions would be given to a person whose volume **C** was being measured?

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[2]

Question: 3

18(a). Termites are highly social insects. They are thought to have evolved from earlier forms of insect at least 150 million years ago, in the Jurassic geological period. They are related to cockroaches.

i. How might scientists a century ago have known that termites evolved in the Jurassic geological period?

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[1]

ii. What new source of evidence might help today's scientists to find out how closely related termites are to cockroaches?

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[1]

(b). Fig. 5.1 shows a termite mound, the nest of approximately one million individuals. The photograph was taken in Queensland Australia, about 3000 kilometres south of the equator.

i. **Fig. 5.1** shows that the interior of the termite mound is full of interconnecting chambers. At the top of the mound some of these chambers open to the air outside.

Worker termites spend all their time working in brood chambers low in the mound, where eggs and larvae develop.

Explain how carbon dioxide produced in the respiring body cells of worker termites is removed to the air outside the termite mound.

Fig. 5.1

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[4]

ii. In Africa, closer to the equator, the mounds built by some species of termite are blade-shaped, with the long axis pointing North–South. **Fig. 5.2** shows an example of a termite mound in Africa.

Suggest why the African termites need to build mounds in this shape and orientation.

Fig. 5.2

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[2]