

**Exchange of Substances - Questions by Topic**

Q1.

Fick's Law of Diffusion can be used to calculate the rate of diffusion across gas exchange surfaces.

Use Fick's Law of Diffusion to explain the adaptations of mammalian gas exchange surfaces.

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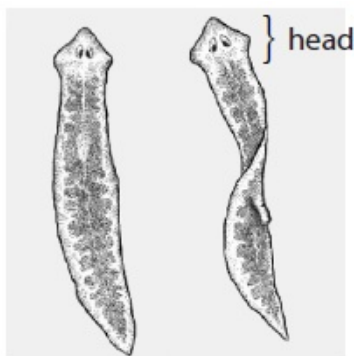
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Q2. Some species of flatworm are found in freshwater streams. Flatworms obtain oxygen from the water through the surface of their bodies. The diagram below shows the structure of flatworms.



Flatworms

Magnification  $\times 10$

(a) Using the diagram and your knowledge of gas exchange surfaces, explain how the structure of a flatworm is adapted to obtain oxygen from the water.

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(b) The table below shows the relationship between the temperature of water and the solubility of oxygen in water.

Temperature of water / °C	Solubility of oxygen in water / $\text{mg dm}^{-3}$
0	14.6
5	12.8
10	11.3
15	10.2
20	9.2
25	8.6
30	7.5
35	6.9
40	6.4

(i) Describe the relationship between the temperature of the water and the solubility of oxygen in water.

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(ii) Using the information in the table and your knowledge of gas exchange and enzymes, suggest why flatworms are often found in water at a temperature of about 15 °C .

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(c) Flatworms do not have a heart or a circulatory system

Explain why many animals need a heart and a circulatory system.

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**(Total for Question = 11 marks)**

Q3.

The movement of materials into and out of a cell needs to be controlled.

Describe what is meant by the term **fluid mosaic** with reference to cell membranes.

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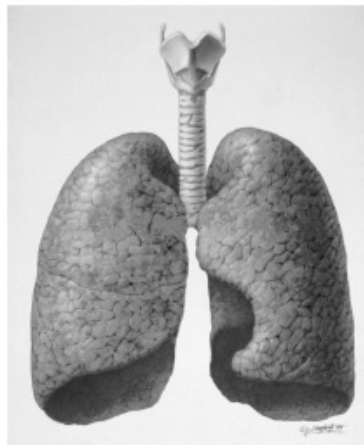
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Q4. Many animals have specialised organs for gas exchange and transport.

\*(a) The diagram below shows the lungs of a mammal.



Describe and explain how the lungs of a mammal are adapted for rapid gas exchange.

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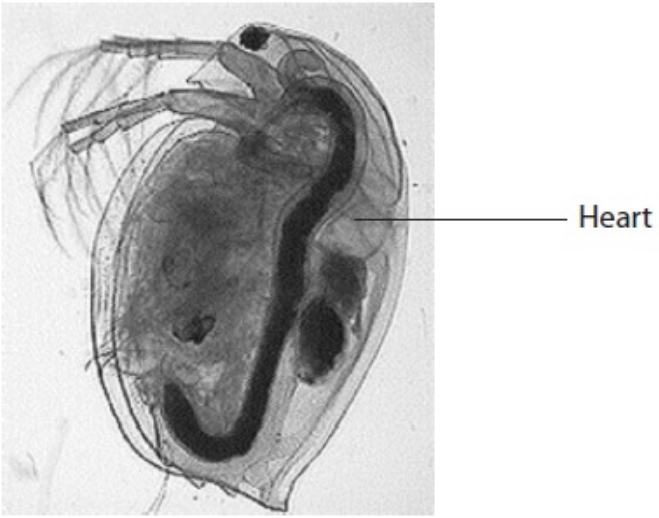
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(b) *Daphnia* have a circulatory system with a heart that pumps blood into cavities surrounding their organs.

The photograph below shows the location of the heart in a *Daphnia*.



Magnification  $\times 25$

(i) Suggest how the heart of a *Daphnia* enables organs to carry out effective gas exchange.

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(ii) In mammals, blood passes through the heart twice for each circulation of the body. Suggest how this type of circulation enables mammals to carry out effective gas exchange.

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**(Total for Question = 10 marks)**

Q5. The fluid mosaic model has been developed from the knowledge of the structure and properties of cell membranes. It can explain how molecules can enter and leave a cell.

(a) Describe the structure of a cell membrane. (You may use a labelled diagram to support your answer).

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(b) Suggest **two** properties of molecules that enable them to enter a cell by diffusion.

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(c) Facilitated diffusion and active transport are two ways in which molecules are transported across cell membranes.

Describe **one** similarity and **one** difference between facilitated diffusion and active transport.

(i) Similarity

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(ii) Difference

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**(Total for Question = 9 marks)**

Q6.

The consistency of the mucus is determined by the movement of water, by osmosis, from the cells lining the bronchi.

Explain how the partial permeability of the surface membrane of the cells lining the bronchi allows osmosis to take place.

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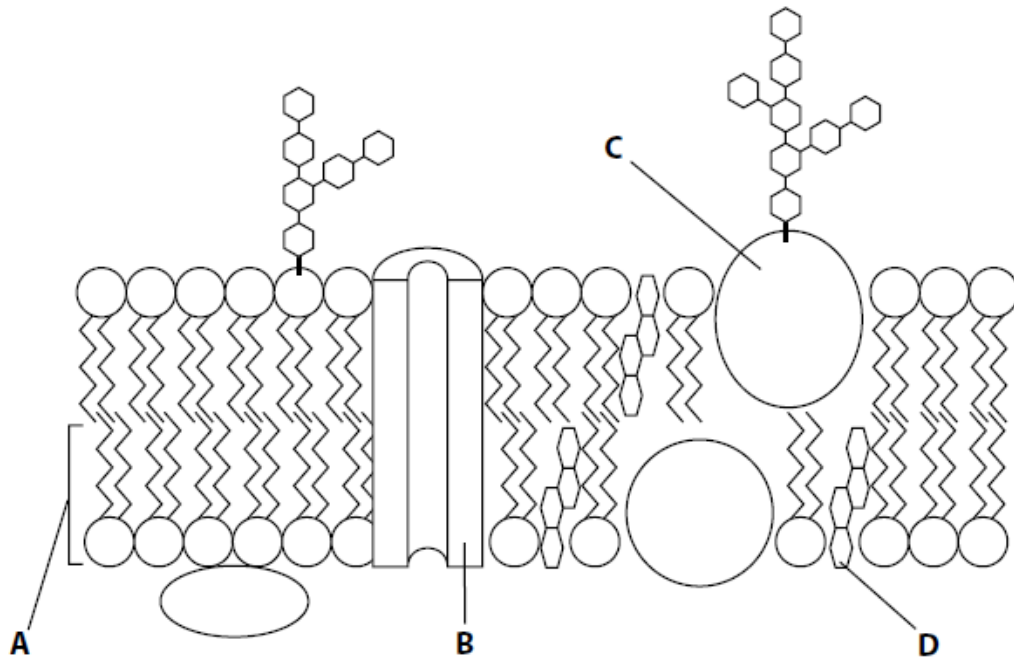
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Q7.

Cell membranes are involved in the transport of molecules.

The diagram shows the structure of a cell membrane.



Describe how the structure labelled **B** is involved in passive transport.

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**(Total for question = 3 marks)**