

Biological Membranes

Question Paper 2

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|------------|------------------------|
| Level | A Level |
| Subject | Biology |
| Exam Board | OCR |
| Module | Foundations in Biology |
| Topic | Biological Membranes |
| Booklet | Question Paper 2 |

Time allowed: 30 minutes

Score: /22

Percentage: /100

Grade Boundaries:

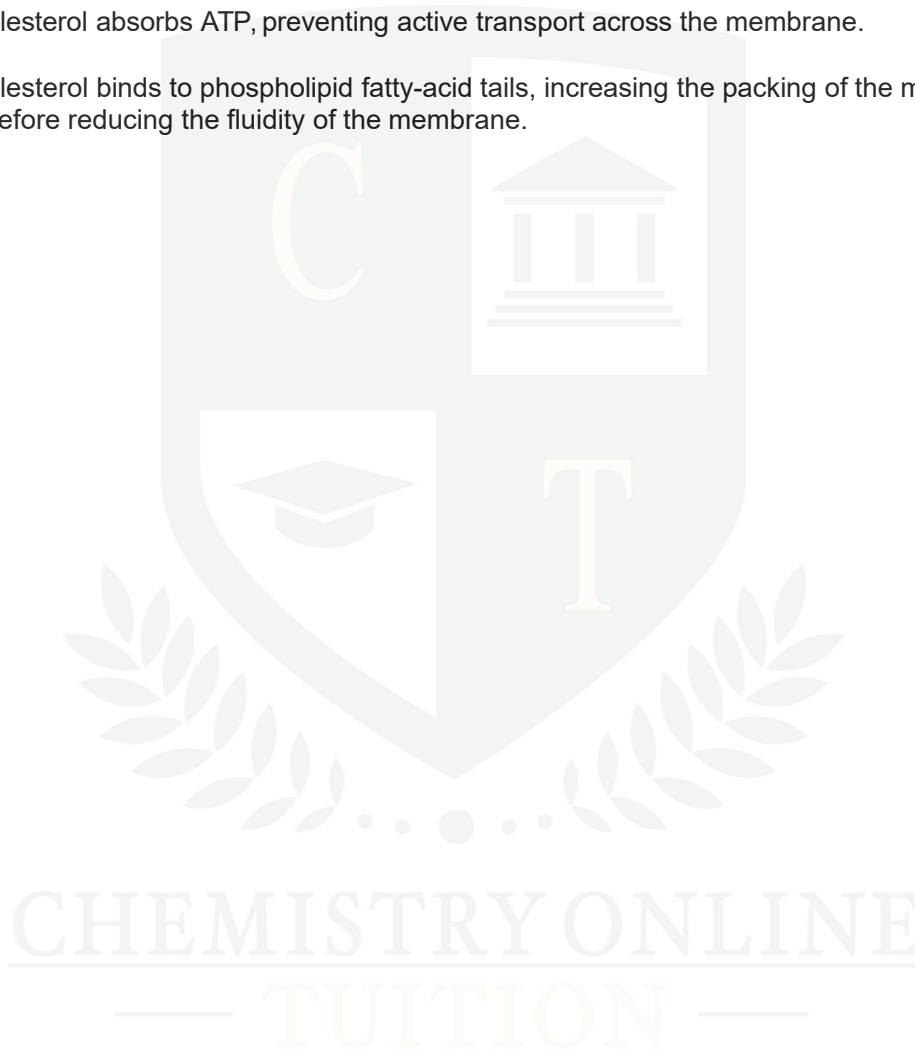
| A* | A | B | C | D | E |
|------|-----|-----|-----|-----|-----|
| >69% | 56% | 50% | 42% | 34% | 26% |

Question 1

Which option, **A** to **D**, describes the role of cholesterol in cell surface membranes in the human body?

- A. Cholesterol binds to phospholipid phosphate heads, increasing the packing of the membrane, therefore reducing the fluidity of the membrane.
- B. Cholesterol binds to phospholipid fatty-acid tails, reducing the packing of the membrane, therefore increasing the fluidity of the membrane.
- C. Cholesterol absorbs ATP, preventing active transport across the membrane.
- D. Cholesterol binds to phospholipid fatty-acid tails, increasing the packing of the membrane, therefore reducing the fluidity of the membrane.

[1]



Question 2

Membranes are found within and surrounding cells.

Which of the statements, **A** to **D**, is **not** a role of membranes in cells?

- A. acts as a barrier between areas
- B. cell signalling
- C. provides support for cell
- D. site of chemical reactions

[1]



Question 3

Amoeba proteus is a single-celled organism that lives in freshwater habitats. Fig. 1.1 is a drawing of *A. proteus*.

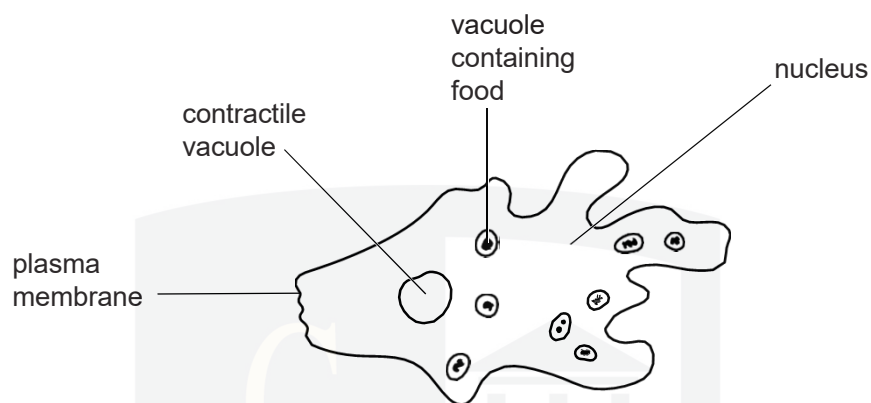


Fig. 1.1

(a) Explain why an *Amoeba* does **not** need a specialised surface for gaseous exchange. [2]

(b) State **one** feature shown in Fig. 1.1 that would **not** be present in a prokaryotic cell. [1]

(c) One role of the plasma membrane is to act as a barrier between the cell and its surroundings.

(i) Which component of the plasma membrane acts as a barrier to mineral ions entering the cell? [1]

(ii) Describe **two other** roles of membranes in an *Amoeba*. [2]

- (d) Water continually enters an *Amoeba* from its surroundings. The contractile vacuole is an organelle that collects water from inside the cell and expels it from the cell. The contractile vacuole expands as it collects water and then fuses with the plasma membrane to release the water from the cell.

(i) Name the process by which water is expelled from the *Amoeba*. [1]

(ii) What would happen to an *Amoeba* if it had no contractile vacuole? [1]

- (e) A student investigated the activity of the contractile vacuole when an *Amoeba* was placed in solutions of different water potential.

The student placed the *Amoeba* in each solution and counted the number of times the contractile vacuole filled and emptied in the first minute. The results are shown in Table 1.1.

| Water potential surrounding <i>Amoeba</i> (kPa) | Number of times the contractile vacuole filled and emptied in the first minute |
|---|--|
| 0 | 19 |
| -100 | 14 |
| -200 | 9 |
| -300 | 5 |
| -400 | 2 |
| -500 | 0 |

Table 1.1

Explain why the contractile vacuole emptied more frequently when the water potential surrounding the *Amoeba* was -100 kPa compared to when the water potential was -400 kPa.

[2]

[Total: 10]

Question 4

(a) Describe the structure of a plasma (cell surface) membrane.

[3]



(b) A student investigated the movement of substances through the cell surface membrane of yeast cells using an indicator.

- The student was supplied with a suspension of yeast cells in a slightly alkaline solution.
- The indicator used is yellow in alkaline conditions but turns red in acidic conditions.

The student mixed the indicator with the yeast suspension and labelled the tube containing this suspension **A**. The suspension was red/pink in colour.

(i) The student took a small sample from tube **A** and centrifuged this sample.

After centrifuging, the student observed that the liquid portion was colourless but the cells at the bottom were red/pink.

Suggest the mechanism by which the indicator enters the cells and suggest the component of the membrane involved.

mechanism

component

[2]

(ii) The student took a small sample from suspension **A** and added alkaline ammonia solution. There was no colour change.

What could the student conclude about the permeability of the yeast plasma membrane?

[1]

(iii) The student then took another sample from suspension **A** and boiled it. When this boiled suspension was centrifuged the liquid portion was yellow and the cells at the bottom were red/pink.

The student suggested that the liquid in the suspension was yellow because boiling the yeast had damaged the plasma membrane, allowing the indicator out of the cells.

Describe the effect of high temperature on the structure of the yeast cell membranes.



In your answer you should use appropriate technical terms, spelled correctly.

[4]

[Total: 10]