

# Biological Membranes

## Question Paper 3

Level	A Level
Subject	Biology
Exam Board	OCR
Module	Foundations in Biology
Topic	Biological Membranes
Booklet	Question Paper 3

**Time allowed:** 45 minutes

**Score:** /33

**Percentage:** /100

### Grade Boundaries:

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

## Question 1

Cut pieces of agar jelly can be used to investigate the factors affecting diffusion rates in cells.

Four pieces of agar jelly containing universal indicator were soaked in the same concentration of hydrochloric acid for one minute.

The cubes were then removed and blotted dry.

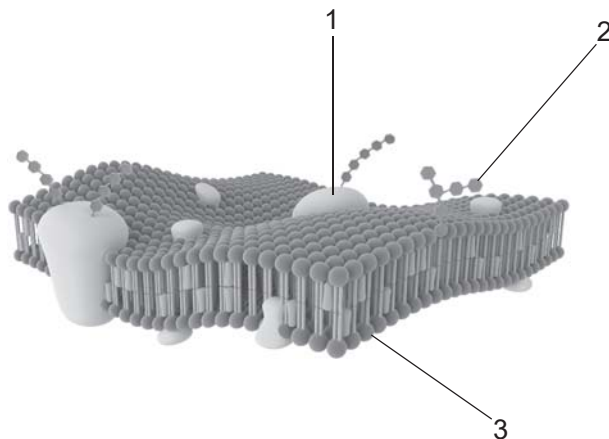
Which of the following pieces of agar jelly would be the first to turn entirely red?

- A. a cube with edges 4 cm each
- B. a cuboid with edges 2 cm, 4 cm and 6 cm
- C. a cuboid with edges 3 cm, 3 cm and 5 cm
- D. a sphere with diameter 4 cm

[1]

## Question 2

The diagram below shows part of a plasma membrane.



Which of the label lines points to a structure that could contain a sulfur atom?

- A. 1, 2 and 3
- B. Only 1 and 2
- C. Only 2 and 3
- D. Only 1

[1]

### Question 3

Membranes are found both at the surface of cells and within cells.

(a) State **two** functions of membranes **within** cells.

[2]

(b) Describe the arrangement and functions of **two** named components of a cell surface membrane.



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

[5]

(c) (i) Which component of a cell membrane becomes more fluid as temperature increases? [1]

(ii) Which component of a cell membrane denatures as temperature increases? [1]

(iii) Liver cells contain membrane-bound organelles called peroxisomes. These organelles contain catalase, an enzyme that breaks down hydrogen peroxide to release oxygen gas.

A student carried out an investigation on catalase using the following procedure:

- two identical sized cubes were cut from a piece of fresh liver
- one cube was frozen overnight and then defrosted
- the other cube was stored in the refrigerator
- both cubes were returned to room temperature and were placed in separate test tubes containing equal volumes of 2% hydrogen peroxide solution.

The student observed that the cube of liver that had been frozen and defrosted, bubbled significantly more than the cube that had been refrigerated.

Suggest an explanation for this result.

[2]

[Total: 11]

## Question 4

- (a) The structure of cell membranes can be described as 'proteins floating in a sea of lipids'. This membrane structure allows certain substances to pass through freely whereas other substances cannot.

State the term used to describe a membrane through which some substances can pass freely but others cannot. [1]

- (b) Complete the following paragraph about cell membranes, using the most appropriate terms. [4]

The model of cell membrane structure is called the ..... model. Phospholipid bilayers with specific membrane proteins account for the ability of the membrane to allow both passive and ..... transport mechanisms. Ions and most polar molecules are insoluble in the phospholipid bilayer. However, the bilayer allows diffusion of most non-polar molecules such as ..... Protein channels, which may be gated, and ..... proteins enable the cell to control the movement of most polar substances.

- (c) One function of membranes that is not mentioned in (b) is cell signalling.

(i) State what is meant by *cell signalling*. [1]

(ii) Explain how cell surface membranes contribute to the process of cell signalling.



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

[4]

[Total: 10]

## Question 5

The cell surface membrane allows different substances to enter and leave the cell.

(a) List **three** components of a cell surface membrane. [3]

(b) (i) Explain what is meant by the term *active transport*. [2]

(ii) State **two** examples of active transport in cells.

For each example, you should name the substance that is transported **and** the cell involved.

[2]

(c) In addition to active transport, substances can pass through cell surface membranes by:

- diffusion
- facilitated diffusion
- osmosis
- bulk transport (endocytosis / exocytosis)

[3]

For each example described in Table 2.1 below, state how the substance crosses the cell surface membrane. The first one has been done for you.

**Table 2.1**

example	mechanism of movement across cell surface membrane
release of enzymes into the gut	bulk transport
a plant cell taking up water	
calcium ions entering a nerve cell down a concentration gradient	
oxygen entering a red blood cell	

[Total: 10]