

Transport across cell membranes

5 questions · 52 marks

Answer all questions. The marks available are shown against each part. Every question is taken unaltered from a past paper; the source is noted beneath it.

1. 1 Describe the processes of facilitated diffusion and active transport. 7 marks
[3 marks]

Facilitated diffusion

Active transport

- 2 What are microvilli? [1 mark]

- 3 Vitamin A is a fat-soluble substance.
Micelles are involved in the process of vitamin A absorption.
Describe the process of vitamin A absorption into cells lining the ileum.

[3 marks]

2.

Anthocyanins are coloured pigments found in the cell vacuole of some plant cells.
 Anthocyanins cannot move across undamaged cell membranes.

10 marks

A student investigated how to extract anthocyanins from blueberries.

She mixed 10 g of crushed, fresh blueberries with 100 cm³ of extraction solvent for 1 hour.

She investigated three different extraction solvents:

- **E** – Ethanol, water and acid
- **F** – Ethanol and water
- **G** – Water

1

When making up extraction solvent **E**, the student used a volume ratio of 70:30:1 ethanol:water:acid.

Tick (✓) **one** box that shows the most appropriate volumes she would use to make up 100 cm³ of extraction solvent **E**.

[1 mark]

63.6 cm³ ethanol, 27.3 cm³ water, 9.1 cm³ acid

☐

69.3 cm³ ethanol, 29.7 cm³ water, 1.0 cm³ acid

☐

70.0 cm³ ethanol, 30.0 cm³ water, 1.0 cm³ acid

☐

70.7 cm³ ethanol, 30.3 cm³ water, 1.0 cm³ acid

☐

2

The student kept constant:

- the mass of fresh blueberries
- the volume of extraction solvent
- the time for the mixture to stand.

Name **two** other variables the student should have kept constant during this investigation.

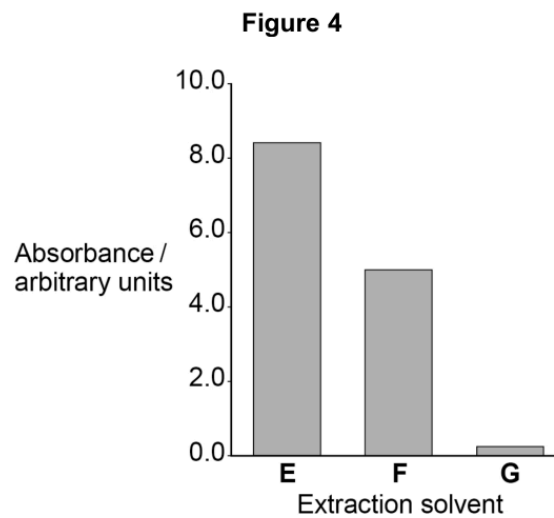
[2 marks]

1

2

After 1 hour, the student filtered the samples.
She placed the filtrate in a colorimeter and measured the light absorbance.

Her results are shown in **Figure 4**.



Use your knowledge of membrane structure to explain the results in **Figure 4**.
[4 marks]

4

A different student did this investigation. He did **not** have a colorimeter.

Describe a method this student could use to prepare colour standards and use them to give data for the total anthocyanin extracted.

[3 marks]

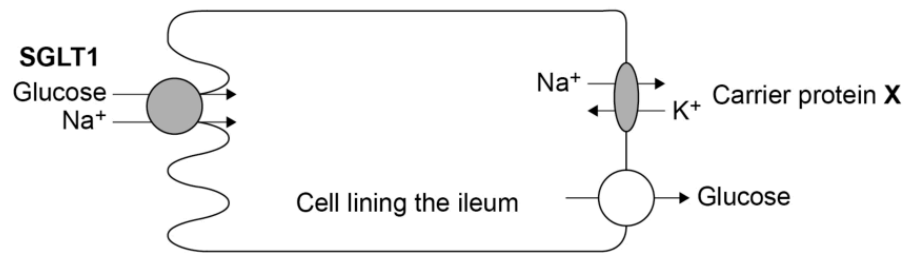
[illegible]

3.

Figure 1 shows a cell from the lining of the ileum specialised for absorption of products of digestion.

10 marks

SGLT1 is a carrier protein found in the cell-surface membrane of this cell, it transports glucose and sodium ions (Na^+) into the cell.

Figure 1**1**

The action of the carrier protein **X** in **Figure 1** is linked to a membrane-bound ATP hydrolase enzyme.

Explain the function of this ATP hydrolase.

[2 marks]**2**

The movement of Na^+ **out** of the cell allows the absorption of glucose **into** the cell lining the ileum.

Explain how.

[2 marks]**3**

Describe and explain **two** features you would expect to find in a cell specialised for absorption.

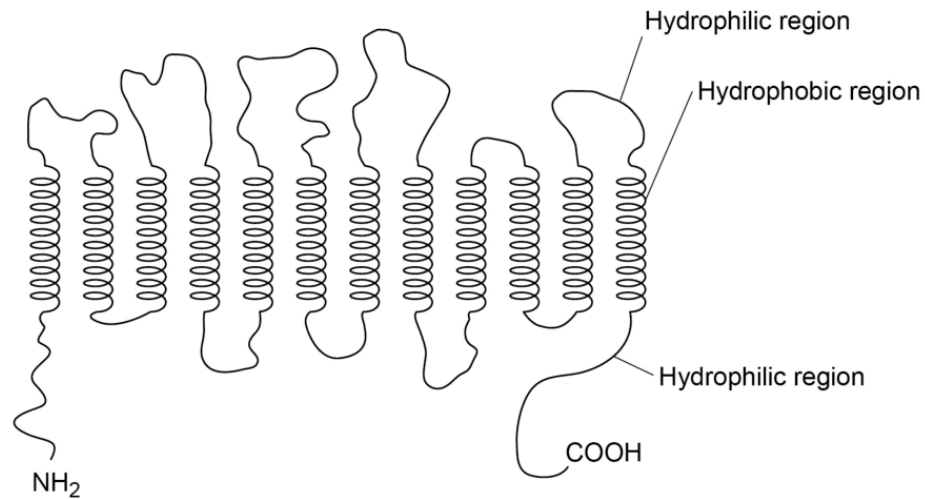
[2 marks]

1

2

Figure 2 is a diagram of one SGLT1 carrier protein.

Figure 2



4

Draw phospholipids on **Figure 2** to show how the carrier protein, SGLT1, would fit into the cell-surface membrane.

Do **not** draw more than eight phospholipids.

[2 marks]

5

Figure 2 shows the SGLT1 polypeptide with NH_2 at one end and COOH at the other end.

Describe how amino acids join to form a polypeptide so there is always NH_2 at one end and COOH at the other end.

You may use a diagram in your answer.

[2 marks]

Space for diagram:

4.

1

Molasses is a solution obtained from sugar beet plants. The sugars present in molasses are sucrose, glucose and fructose.

10 marks

Give the number of different types of monosaccharides present in molasses.

[1 mark]

2

A student used the biochemical test for reducing sugars on a clear sample of molasses.

Describe the biochemical test for a reducing sugar.

Explain the result expected from the test on the sample of molasses.

[3 marks]

Description of biochemical test

Explanation of expected result

3

'Free sugar' is the sugar in food and drinks released when food is crushed or when sugar is added to food at home or by manufacturers.

Scientists recommend that no more than 5% of the energy consumed per day should come from 'free sugar'.

The mean daily energy requirement for a 10-year-old child is 8100 kJ

The 'free sugar' in one tablespoon of molasses contains 250 kJ of energy.

Calculate the number of tablespoons of molasses required for a 10-year-old child to reach the recommendation for energy consumed in 'free sugar' per day.

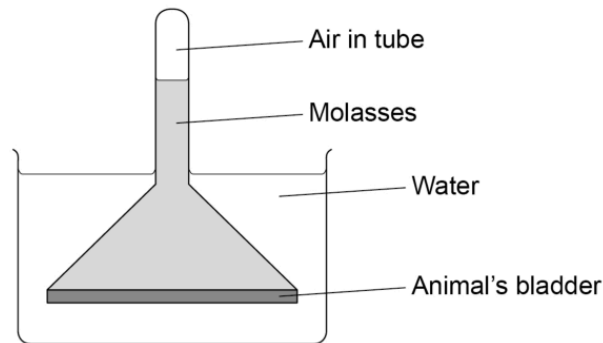
[1 mark]

Number of tablespoons

per day

4

A scientist used the apparatus in **Figure 3** to investigate osmosis.

Figure 3

Use your understanding of osmosis to explain why the air pressure in the tube increased.

[3 marks]

5

The scientist repeated the investigation, but made **one** change to the molasses. The scientist did **not** change the volume of molasses at the start of the investigation.

The scientist observed that the air pressure inside the tube increased by 160 kPa compared with 800 kPa in the first investigation.

Suggest the change the scientist made to the molasses to cause this smaller increase in air pressure.

Use the air pressure figures in a calculation to support your answer.

[2 marks]

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.....

.....

Suggested change

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.....

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.....

.....

— AQA 7402/1 Biology · June 2024 · Paper 1, Question 4

5.

1

Describe the structure of DNA.

15 marks

[5 marks]

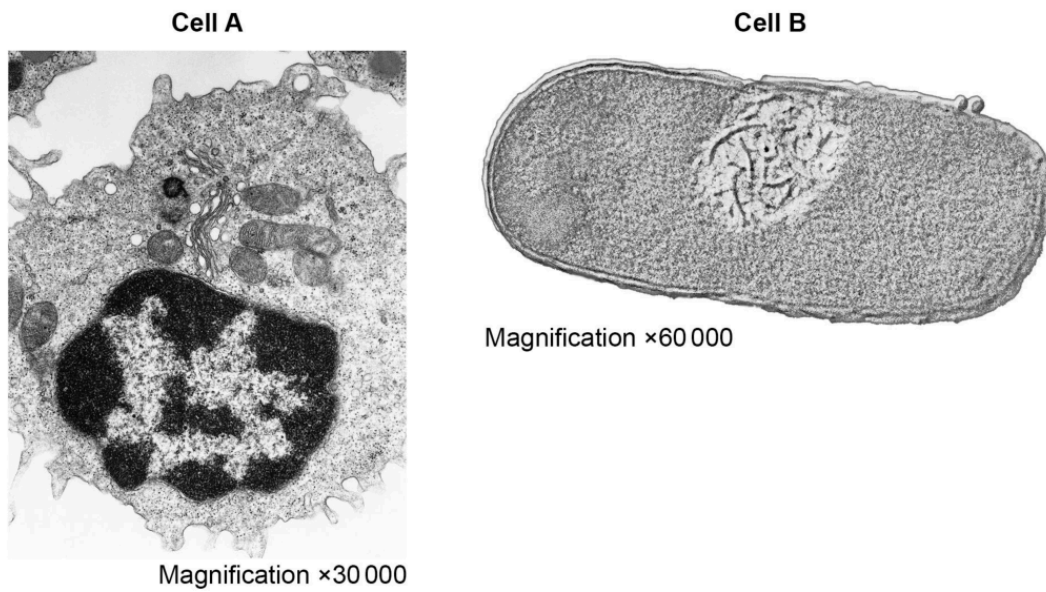
2

Name **and** describe **five** ways substances can move across the cell-surface membrane into a cell.

[5 marks]

Figure 14 shows transmission electron micrographs of two cells, one animal cell and one prokaryotic cell.

Figure 14



3

Contrast the structure of the two cells visible in the electron micrographs shown in **Figure 14**.

[5 marks]
