

1 A student investigated three different cells: an animal cell, a bacterial cell and a plant cell. She made several observations.

(a) Read through the following passage describing the student's observations. Write the most appropriate word or words on the dotted lines to complete the passage.

(7)

The plant cell and the cell possess a nucleus containing chromosomes.

Only the cell and the plant cell have a cell wall but all three cells have a cell

Centrioles are present only in the cell and amyloplasts are found only in the cell. Mitochondria and rough endoplasmic reticulum are not present in the cell. All these cells contain structures called which are involved in the synthesis of protein.

(b) The cell wall of the plant cell contains cellulose molecules.

Complete the table by placing a cross in the appropriate box (☒) to indicate if each statement is true or false.

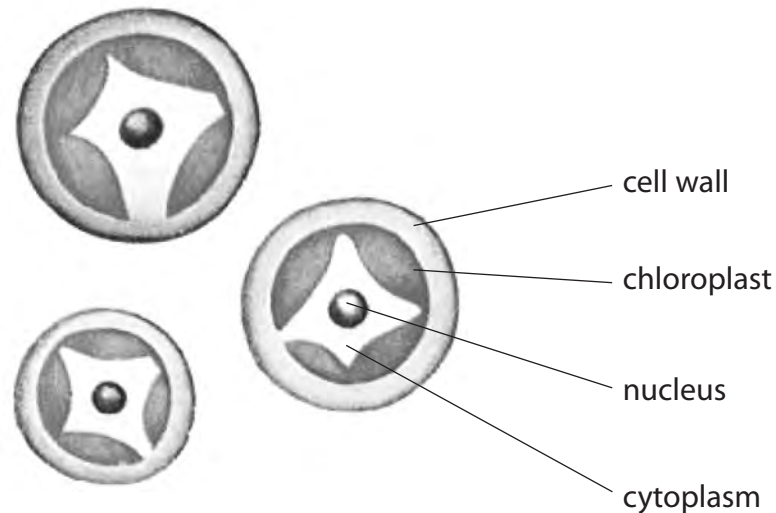
(4)

A cellulose molecule contains	True	False
Beta (β) glucose	<input type="checkbox"/>	<input type="checkbox"/>
1,4-glycosidic bonds	<input type="checkbox"/>	<input type="checkbox"/>
1,6-glycosidic bonds	<input type="checkbox"/>	<input type="checkbox"/>
Magnesium atoms	<input type="checkbox"/>	<input type="checkbox"/>

(Total for Question 1 = 11 marks)

- 2 *Pleurococcus* is a unicellular organism that can be found on the bark of trees. Where *Pleurococcus* is growing, it appears as green patches on the bark. Each of the patches is a colony of genetically-identical cells of *Pleurococcus*, formed from a single original cell.

The diagram below shows some of the individual cells of *Pleurococcus* as they might appear using a light microscope.



- (a) Place a cross ☒ in the box next to the names of the two structures that show that *Pleurococcus* would be classified as a eukaryotic organism.

(1)

- A cell wall and chloroplast
- B cell wall and cytoplasm
- C chloroplast and nucleus
- D cytoplasm and nucleus

- (b) Explain how a colony of genetically-identical *Pleurococcus* cells could develop from a single original cell.

(2)

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- (c) The distribution of *Pleurococcus* on 20 trees was investigated. The percentage cover of *Pleurococcus* was measured using a quadrat measuring 10 cm × 10 cm, divided into 100 small squares.

This quadrat was placed at eight points around the trunk of each tree. Each point on the tree faced a different direction. At each point, light intensity and moisture content were measured at mid-day.

The mean results are shown in the table below.

Point	Direction	Mean percentage cover (%)	Mean light intensity / arbitrary units	Mean moisture content / arbitrary units
1	North	89	6.6	8.8
2	North-east	86	6.4	8.6
3	East	84	6.9	8.7
4	South-east	67	7.3	7.5
5	South	46	8.7	5.2
6	South-west	51	8.4	5.1
7	West	60	8.1	7.0
8	North-west	78	7.6	8.2

- (i) Suggest how this 10 cm × 10 cm quadrat was used to obtain the percentage cover of *Pleurococcus* at each point.

(2)

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(ii) Place a cross ☒ in the box next to the best conclusion that can be drawn from these results, about the distribution of *Pleurococcus*.

(1)

- A** it is affected by both light intensity and moisture content
- B** it is affected by light intensity more than moisture content
- C** it is affected by moisture content more than light intensity
- D** it is not affected by either light intensity or moisture content

(iii) Suggest how more evidence for the relationship between light intensity and the distribution of *Pleurococcus* could be obtained.

(3)

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(iv) Name **one** biotic factor and suggest how this factor might affect the distribution of *Pleurococcus* on the trees.

(2)

Biotic factor

Effect

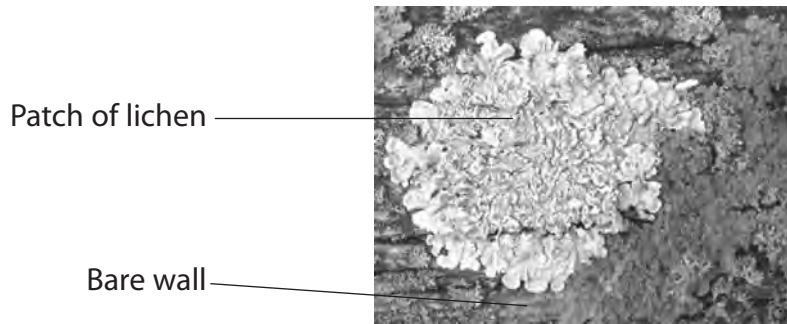
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(Total for Question 2 = 11 marks)

- 3 Lichen consists of two organisms, an alga and a fungus, growing together. The alga photosynthesises producing carbohydrate for the two organisms and the fungus absorbs and retains water so that the lichen does not dry out.

The photograph below shows a patch of lichen growing on a wall.



Magnification $\times 1$

Algae and fungi are eukaryotic organisms.

- (a) Place a cross in the box next to the names of cell structures that would be used to classify algae and fungi as eukaryotic organisms.

(1)

- A** cytoplasm and large (80S) ribosomes
- B** cytoplasm and small (70S) ribosomes
- C** nucleus and large (80S) ribosomes
- D** nucleus and small (70S) ribosomes

- (b) Place a cross in the box next to one difference in cell structure between these two eukaryotic organisms.

(1)

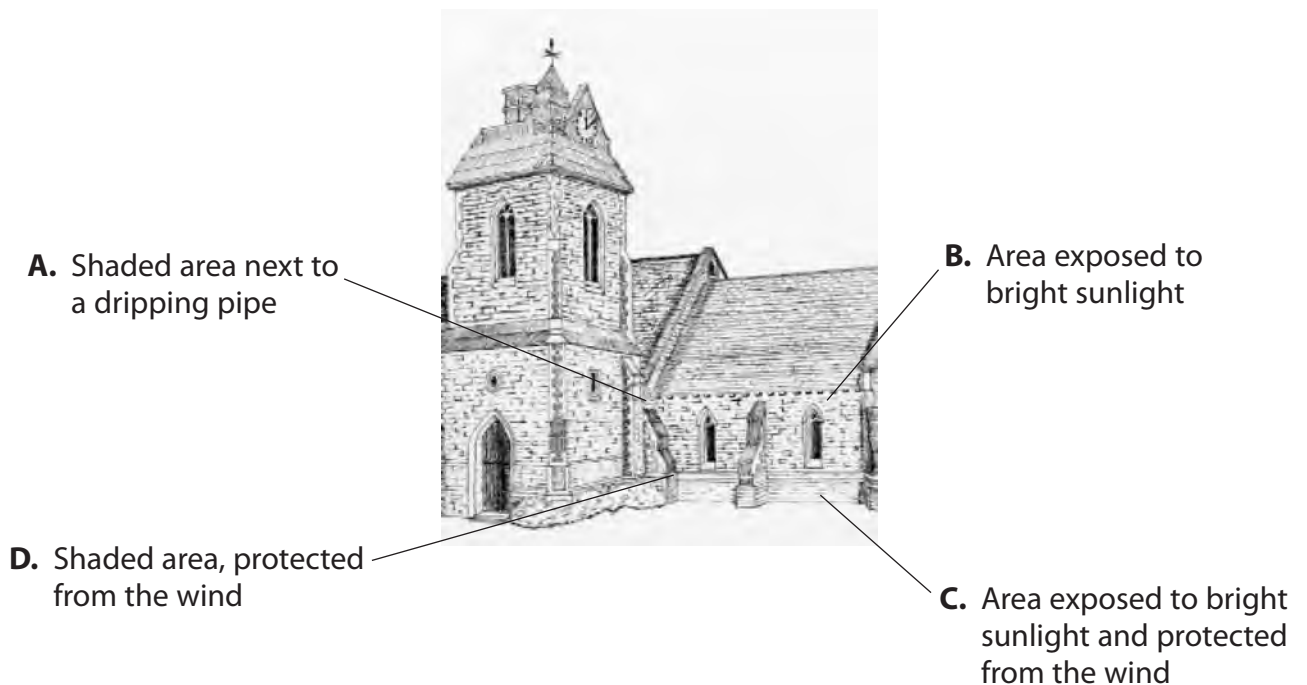
- A** algae have chloroplasts, fungi do not
- B** algae have circular DNA, fungi have linear DNA
- C** fungi have chloroplasts, algae do not
- D** fungi have circular DNA, algae have linear DNA

- (c) Lichens can reproduce sexually and asexually. Sexual reproduction involves meiosis and asexual reproduction involves mitosis.

Suggest advantages to lichens of being able to reproduce both sexually and asexually.

(2)

- (d) The diagram below shows the conditions at four positions, A, B, C and D, on a building.



- (i) Place a cross ☒ in the box next to the position where the lichen is likely to be most abundant.

(1)

- A**
- B**
- C**

(ii) The abundance of lichen on the walls of this building can be measured by determining the percentage cover of lichen.

Suggest how the percentage cover of lichen could be determined.

(3)

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(iii) Explain how light intensity could be measured at the surface of the wall.

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(iv) Suggest how the data collected could be used to show whether there is a relationship between the abundance of lichen and light intensity.

(3)

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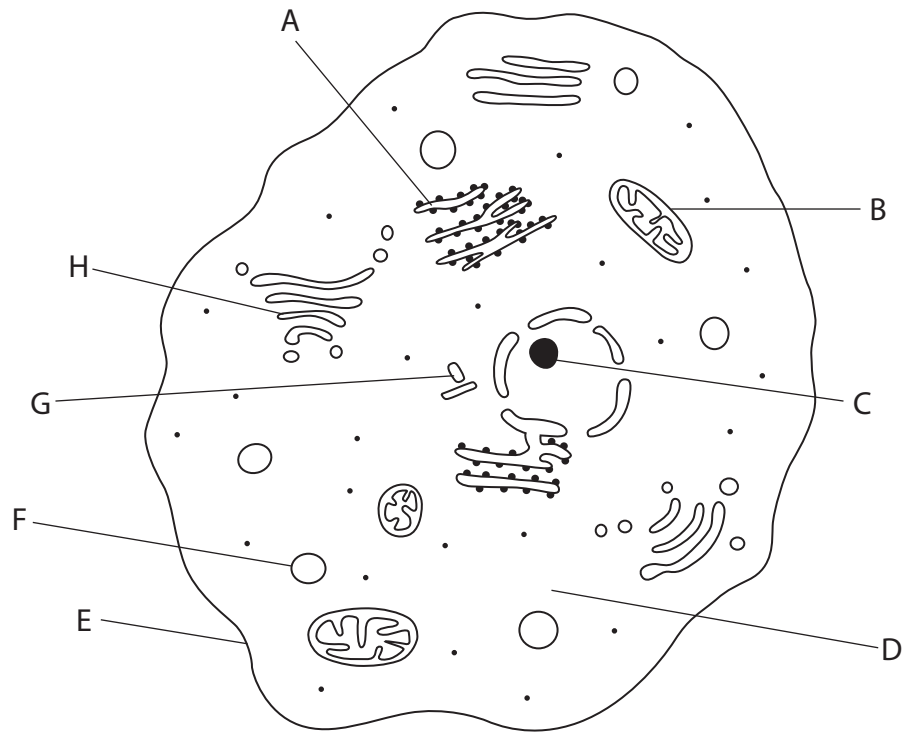
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(Total for Question 3 = 13 marks)

4 The diagram below shows a typical animal cell as seen using an electron microscope.



(a) Name the organelles labelled A, B and C shown on the diagram.

(3)

A

B

C

(b) Give the letter of the organelle that doubles just before mitosis and then separates to opposite poles of the cell during mitosis.

(1)

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(c) Give the letter of the organelle that would **not** be present when this cell is undergoing mitosis.

(1)

(d) Place a cross (☒) in the correct box next to the following statements.

(2)

Statement	Yes	No
The structure labelled D is present in both animal and plant cells.	<input type="checkbox"/>	<input type="checkbox"/>
The structure labelled E is the outermost layer in both animal and plant cells.	<input type="checkbox"/>	<input type="checkbox"/>

(Total for Question 4 = 7 marks)