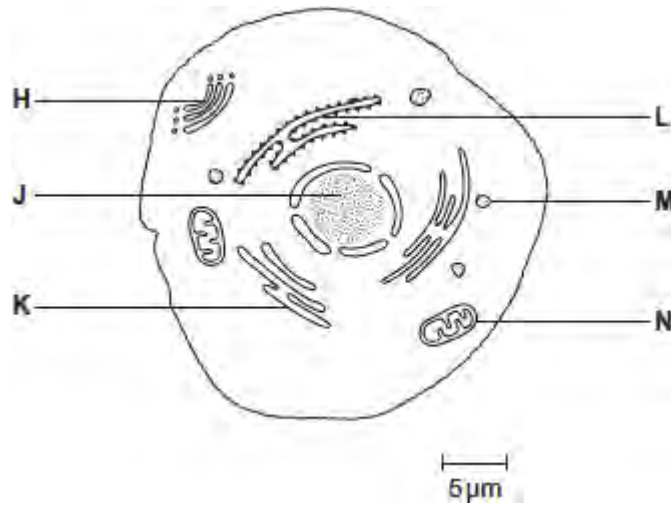


Q1. The diagram shows a eukaryotic cell.



(a) Complete the table by giving the letter labelling the organelle that matches the function.

Function of organelle	Letter
Protein synthesis	
Modifies protein (for example, adds carbohydrate to protein)	
Aerobic respiration	

(3)

(b) Use the scale bar in the diagram above to calculate the magnification of the drawing.  
Show your working.

Answer = .....

(2)  
(Total 5 marks)

**Q2.** A stomach ulcer is caused by damage to the cells of the stomach lining. People with stomach ulcers often have the bacterium *Helicobacter pylori* in their stomachs.

A group of scientists was interested in trying to determine how infection by *H. pylori* results in the formation of stomach ulcers.

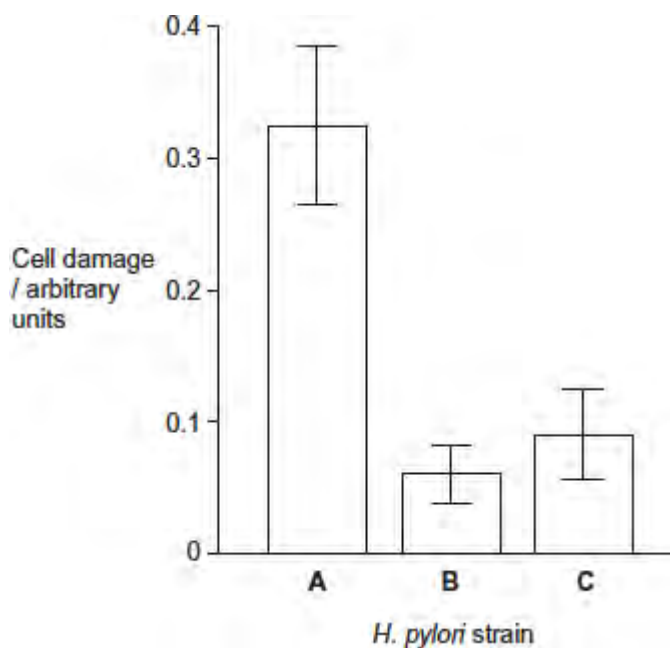
The scientists grew different strains of *H. pylori* in liquid culture.

The table below shows the substances released by each of these strains.

<i>H. pylori</i> strain	Substances released by the <i>H. pylori</i> cells	
	Toxin	Enzyme that neutralises acid
A	✓	✓
B	✗	✓
C	✓	✗

The scientists centrifuged the cultures of each strain to obtain cell-free liquids. They added each liquid to a culture of human cells. They then recorded the amount of damage to the human cells.

Their results are shown below. The error bars show  $\pm 1$  standard deviation.



- (a) Describe and explain how centrifuging the culture allowed the scientists to obtain a cell-free liquid.

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**[Extra space]** .....

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(3)

- (b) The scientists measured cell damage by measuring the activity of lysosomes. Give **one** function of lysosomes.

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.....

(1)

- (c) *H. pylori* cells produce an enzyme that neutralises acid. Suggest **one** advantage to the *H. pylori* of producing this enzyme.

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(2)

- (d) What do these data suggest about the damage caused to human cells by the toxin and by the enzyme that neutralises acid?  
Explain your answer.

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**[Extra space]** .....

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(3)

- (e) The scientists carried out a further investigation. They treated the liquid from **strain A** with a protein-digesting enzyme before adding it to a culture of human cells. No cell damage was recorded.  
Suggest why there was no damage to the cells.

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**[Extra space]** .....

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(3)

(Total 12 marks)

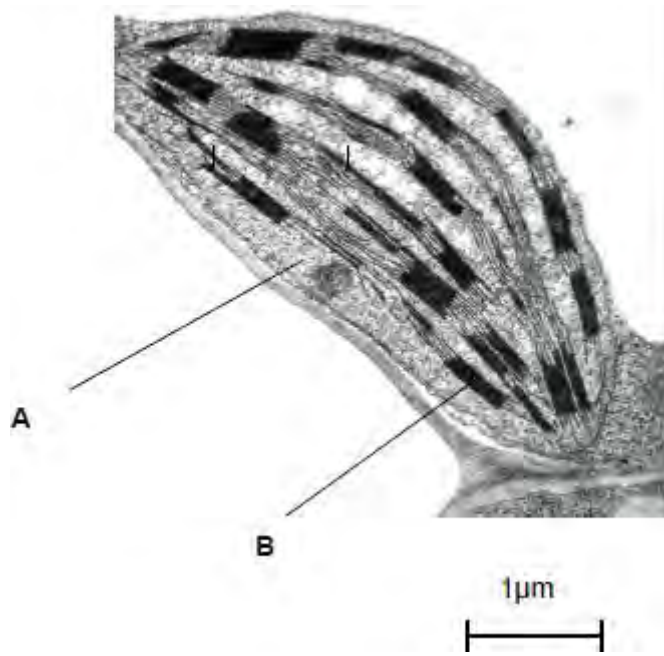
**Q3.(a)** Describe how you could use cell fractionation to isolate chloroplasts from leaf tissue.

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**(Extra space)** .....  
.....

**(3)**

The figure below shows a photograph of a chloroplast taken with an electron microscope.



© Science Photo Library

**(b)** Name the parts of the chloroplast labelled **A** and **B**.

Name of **A** .....

Name of **B** .....

**(2)**

(c) Calculate the length of the chloroplast shown in the figure above.

Answer .....

(1)

(d) Name **two** structures in a eukaryotic cell that **cannot** be identified using an optical microscope.

1 .....

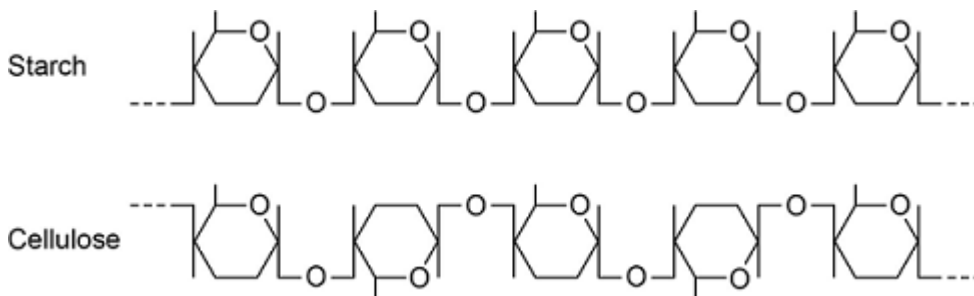
2 .....

(1)

(Total 7 marks)

**Q4.** Starch and cellulose are two important plant polysaccharides.

The following diagram shows part of a starch molecule and part of a cellulose molecule.



(a) Explain the difference in the structure of the starch molecule and the cellulose molecule shown in the diagram above.

.....  
 .....  
 .....  
 .....

(2)

- (b) Starch molecules and cellulose molecules have different functions in plant cells. Each molecule is adapted for its function.

Explain **one** way in which starch molecules are adapted for their function in plant cells.

.....  
.....  
.....  
.....

(2)

- (c) Explain how cellulose molecules are adapted for their function in plant cells.

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**(Extra space)** .....

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(3)

(Total 7 marks)

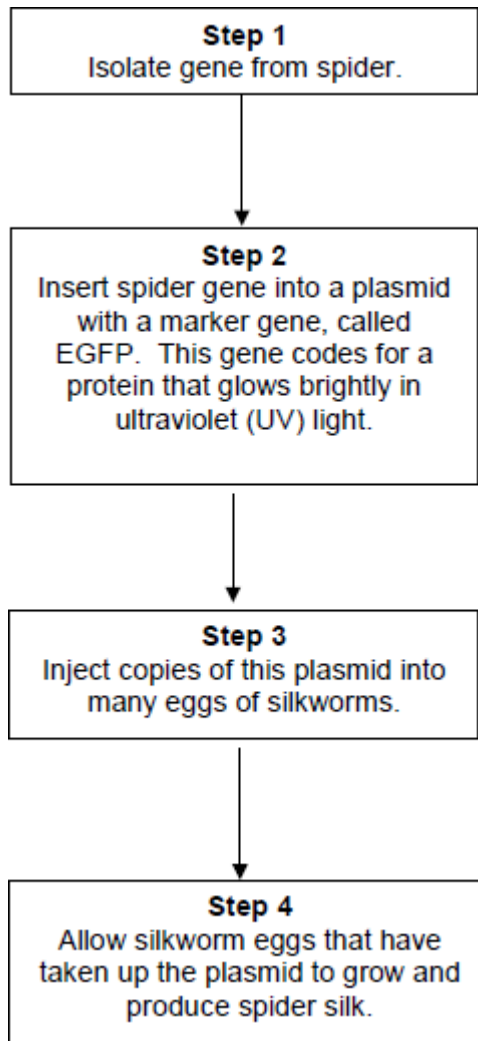
**Q5.** Silkworms secrete silk fibres, which are harvested and used to manufacture silk fabric.

Scientists have produced genetically modified (GM) silkworms that contain a gene from a spider.

The GM silkworms secrete fibres made of spider web protein (spider silk), which is

stronger than normal silk fibre protein.

The method the scientists used is shown in the figure below.



(a) Suggest why the plasmids were injected into the eggs of silkworms, rather than into the silkworms.

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(2)

(b) Suggest why the scientists used a marker gene and why they used the EGFP gene.

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(2)

The scientists ensured the spider gene was expressed only in cells within the silk glands.

- (c) What would the scientists have inserted into the plasmid along with the spider gene to ensure that the spider gene was only expressed in the silk glands of the silkworms?

.....

(1)

- (d) Suggest **two** reasons why it was important that the spider gene was expressed only in the silk glands of the silkworms.

1 .....

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2 .....

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(2)

(Total 7 marks)

- Q6.(a)** Describe how you could make a temporary mount of a piece of plant tissue to observe the position of starch grains in the cells when using an optical (light) microscope.

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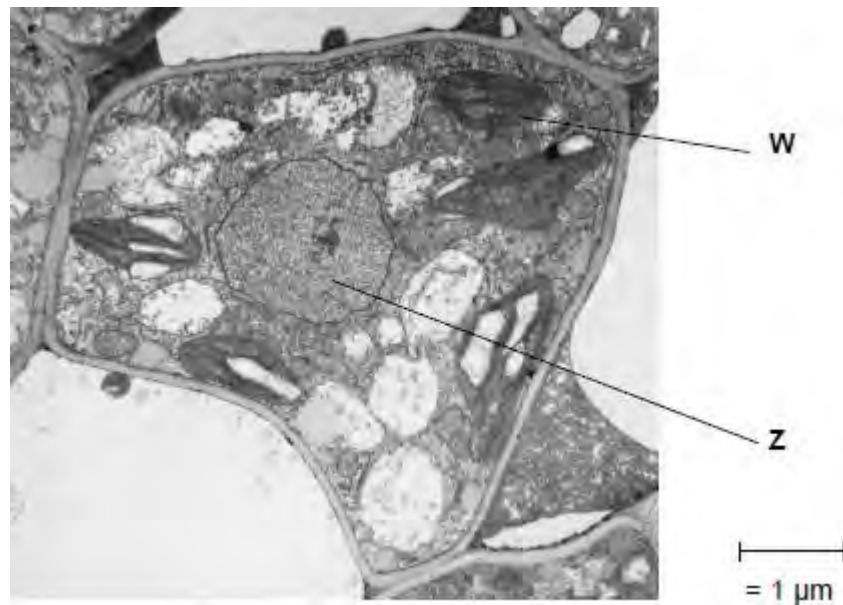
**(Extra space)** .....

.....

.....

(4)

The figure below shows a microscopic image of a plant cell.



© Science Photo Library

(b) Give the name and function of the structures labelled **W** and **Z**.

Name of **W** .....

Function of **W** .....

Name of **Z** .....

Function of **Z** .....

(2)

(c) A transmission electron microscope was used to produce the image in the figure above. Explain why.

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.....  
.....

(2)

(d) Calculate the magnification of the image shown in the figure in part (a).

Answer = .....

(1)

(Total 9 marks)

**Q7.(a)** Describe how phospholipids are arranged in a plasma membrane.

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(2)

(b) Cells that secrete enzymes contain a lot of rough endoplasmic reticulum (RER) and a large Golgi apparatus.

(i) Describe how the RER is involved in the production of enzymes.

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(2)

(ii) Describe how the Golgi apparatus is involved in the secretion of enzymes.

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(1)  
**(Total 5 marks)**