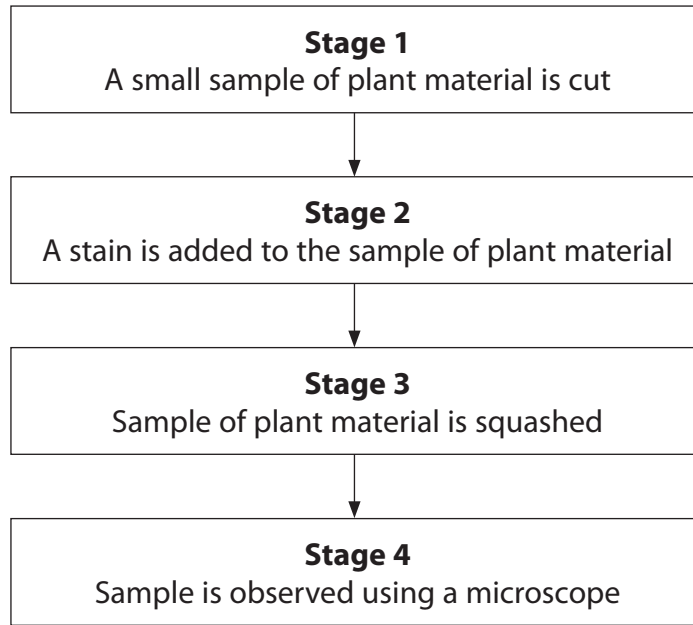


1 Mitosis can be studied using plant material.

(a) The diagram below shows some stages in a process that allows mitosis to be studied in plant material.



Place a cross ☒ in the box next to the correct word or words to complete each of the following statements.

(5)

(i) In stage 1, the small sample of plant material is cut from

- A** a leaf edge
- B** a root tip
- C** sclerenchyma fibres
- D** xylem vessels

(ii) In stage 1, the most sensible safety precaution is to

- A** cut away from oneself
- B** cut towards oneself
- C** wear safety goggles
- D** wear a lab coat

(iii) In stage 2, the most sensible precaution to protect clothes from the stain is to

- A** keep the stain in a waterbath
- B** wear a lab coat
- C** wear gloves
- D** wear safety goggles

(iv) The function of the stain in stage 2 is to

- A** make the chromosomes visible
- B** make the cytoplasm visible
- C** separate the genes from the nucleus to make them more visible
- D** separate the chromosomes from the nucleus to make them more visible

(v) In stage 3, the sample is squashed between

- A** the objective lens of the microscope and the coverslip
- B** the objective lens of the microscope and the slide
- C** the slide and coverslip
- D** two coverslips

*(b) Prophase is one of the stages of mitosis that could be seen using this process.

The two diagrams below show prophase in an animal cell.

Diagram 1 shows early prophase and diagram 2 shows late prophase.

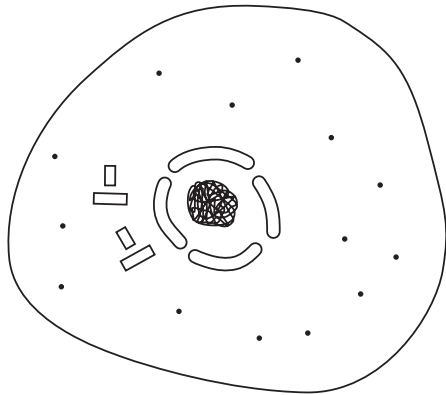


Diagram 1 (early prophase)

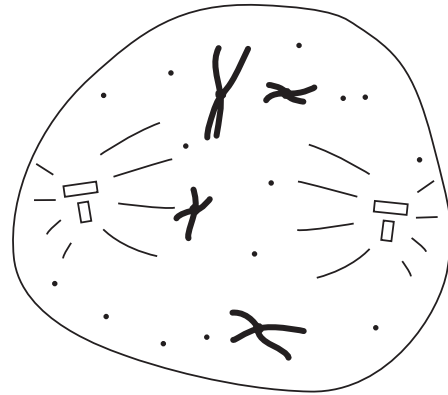


Diagram 2 (late prophase)

Using the two diagrams, describe the changes that occur from early prophase to late prophase.

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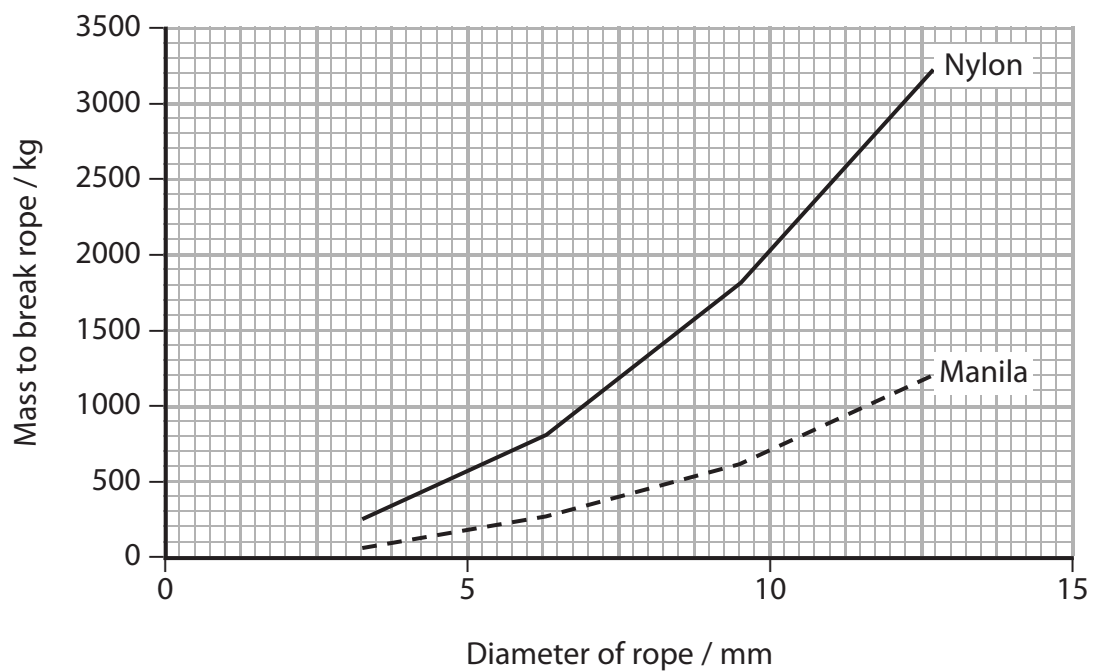
(Total for Question 1 = 10 marks)

- 2 Ropes can be made from many substances including nylon and manila. Nylon is a synthetic fibre. Manila is made of fibres from the *Musa textilis* plant, shown in the photograph below.



Malkolm Warrington / Science Photo Library

- (a) The mass required to break ropes, of different diameters, made from nylon and manila was investigated. The results of this investigation are shown in the graph below.



Compare the effect of increasing the diameter on the mass needed to break nylon rope rather than manila rope.

(3)

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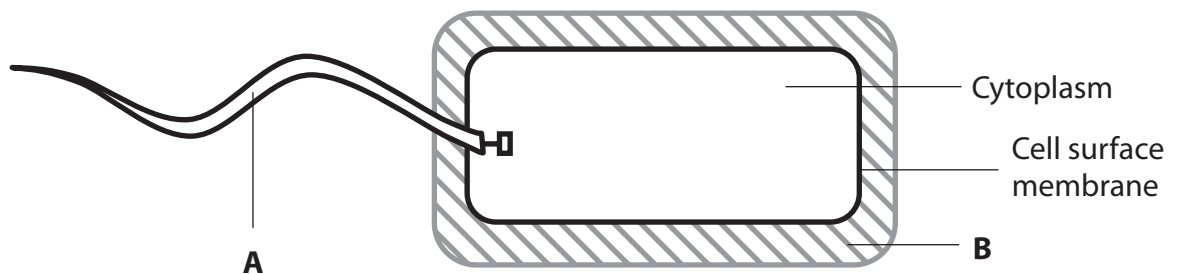
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(b) In the process of making rope, waste material is produced. Some of these waste materials can be broken down by prokaryotic cells such as bacteria.

The diagram below shows the structure of a prokaryotic cell.



(i) Name the parts labelled **A** and **B** on the diagram.

(2)

A

B

(ii) On the diagram, draw and label **two** structures present in the cytoplasm.

(2)

(Total for Question 2 = 7 marks)

3 Mitosis and meiosis are both forms of nuclear division. Mitosis can be observed in root tip squashes from a plant such as garlic.

(a) Place a cross in the box next to the correct word or words to complete each of the following statements.

(i) The stain used in a root tip squash can be intensified by

(1)

- A** adding acid
- B** adding alkali
- C** gently heating
- D** squashing the tip

(ii) Mitosis occurs in

(1)

- A** plant fibres
- B** sclerenchyma fibres
- C** stem cells
- D** xylem vessels

(b) Describe the appearance of a cell in telophase of mitosis as seen in a root tip squash.

(3)

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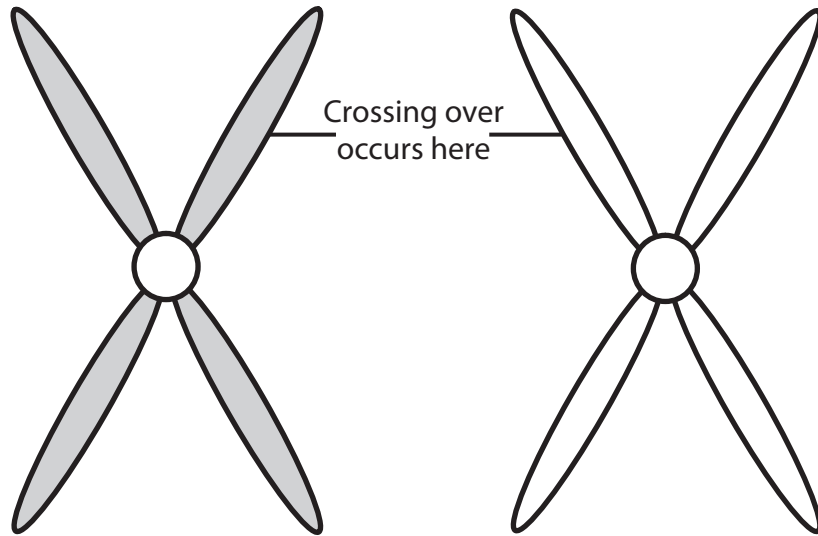
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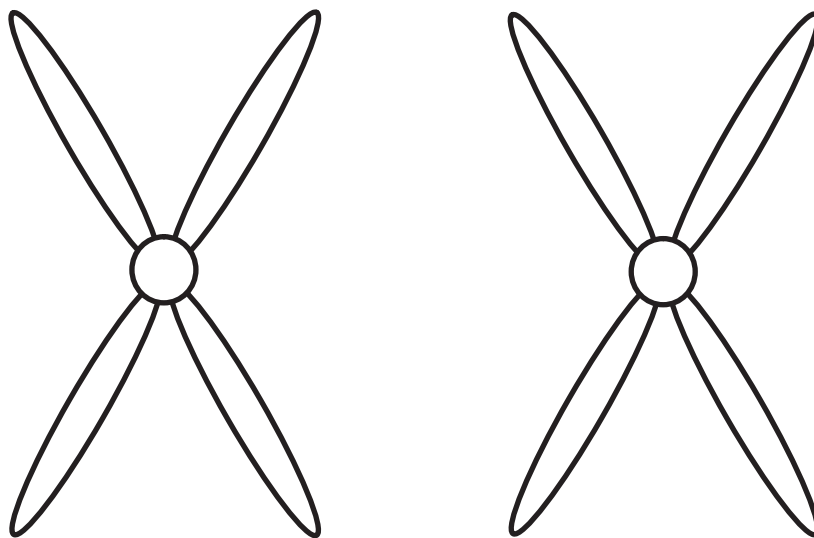
(c) One way in which meiosis increases genetic variation is through crossing over.

- (i) The diagram below shows a pair of homologous chromosomes during meiosis. They are positioned next to each other but crossing over has not yet occurred.



Complete the diagram below to show these chromosomes after crossing over has occurred.

(1)

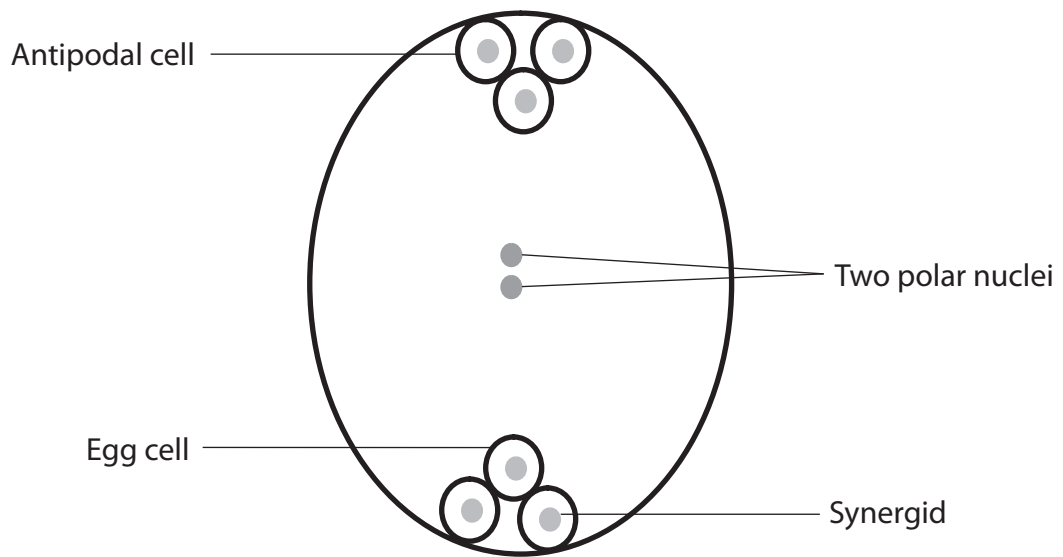


(ii) Meiosis produces haploid structures in the plant.

The diagram below shows an embryo sac.

Draw a circle round each of the labels of **two** haploid structures that are fertilised in the embryo sac.

(2)



(iii) Explain what is meant by the term **haploid number** of chromosomes.

(1)

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(Total for Question 3 = 9 marks)

4 Antibiotics are used to treat bacterial infections in eukaryotic organisms.

(a) The table below describes some of the structures that are found in cells. Complete the table by writing the name of each of the structures described and stating whether it is found in prokaryotic cells only (**P**), eukaryotic cells only (**E**) or both types of cell (**B**).

(3)

Description	Name of structure	P, E or B
Enclosed by outer smooth membrane; inner membrane folded forming cristae		
Long strand-like structure extending out from the cell; used for locomotion		
Small, circular loop of double-stranded DNA		

(b) Vancomycin is an antibiotic that kills bacterial cells by preventing the synthesis of peptidoglycan, a component of bacterial cell walls.

(i) State the term used to describe antibiotics, such as vancomycin, that kill bacterial cells.

(1)

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(ii) Suggest how bacterial cells are killed by vancomycin.

(2)

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(iii) Explain why doctors have been advised to limit the prescription of antibiotics.

(2)

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(c) Describe how you could investigate the effect of different antibiotics on bacteria.

(4)

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(Total for Question 4 = 12 marks)

5 All organisms are made up of one or more cells.

(a) For each of the descriptions below, put a cross ☒ in the box that corresponds to the correct statement about the features of animal, plant and prokaryotic cells.

(6)

(i) Genetic material is

- A separate strands in animal and prokaryotic cells
- B separate strands in animal and plant cells
- C circular in animal and prokaryotic cells
- D circular in animal and plant cells

(ii) Centrioles are present in

- A plant cells only
- B animal cells only
- C prokaryotic cells only
- D animal, plant and prokaryotic cells

(iii) The cell surface membrane is present in

- A plant cells only
- B animal cells only
- C prokaryotic cells only
- D animal, plant and prokaryotic cells

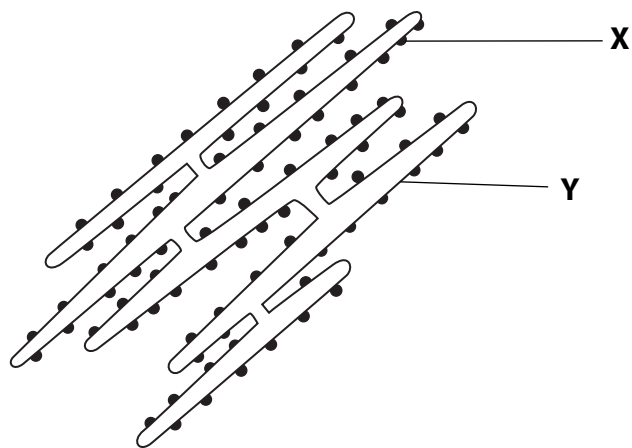
(iv) Pits are found in the cell walls of

- A plant cells only
- B prokaryotic cells only
- C plant and prokaryotic cells
- D animal, plant and prokaryotic cells

- (v) The tonoplast may be present in
- A** plant cells only
 - B** prokaryotic cells only
 - C** plant and prokaryotic cells
 - D** animal, plant and prokaryotic cells

- (vi) Cell walls are found in
- A** plant cells only
 - B** prokaryotic cells only
 - C** plant and prokaryotic cells
 - D** animal, plant and prokaryotic cells

(b) The diagram below shows a structure found in the cytoplasm of both plant and animal cells, as seen using an electron microscope.



- (i) Name the structure shown in the diagram. (1)

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- (ii) Name the parts labelled **X** and **Y**. (2)

X

Y

(Total for Question 5 = 9 marks)