AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.2.2

Mitosis and the cell cycle

Past-paper questions

Tier	**Higher**
Question groups	**11**
Available paper years	**2010–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.1.2.2 Mitosis and the cell cycle

Question 01

June 2019 | BLY2H | Original Q7 | Legacy

7 The table shows the number of chromosomes found in each body cell of some different organisms.

Animals		Plants	
Species	**Number of chromosomes in each body cell**	**Species**	**Number of chromosomes in each body cell**
Fruit fly	8	Tomato	24
Goat	60	Potato	44
Human	46	Rice	24

7 (a) Nearly every organism on earth has an even number of chromosomes in its body cells.

Suggest why.

.....

.....

(1 mark)

7 (b) Chromosomes contain DNA molecules.

Describe the function of DNA.

.....

.....

.....

.....

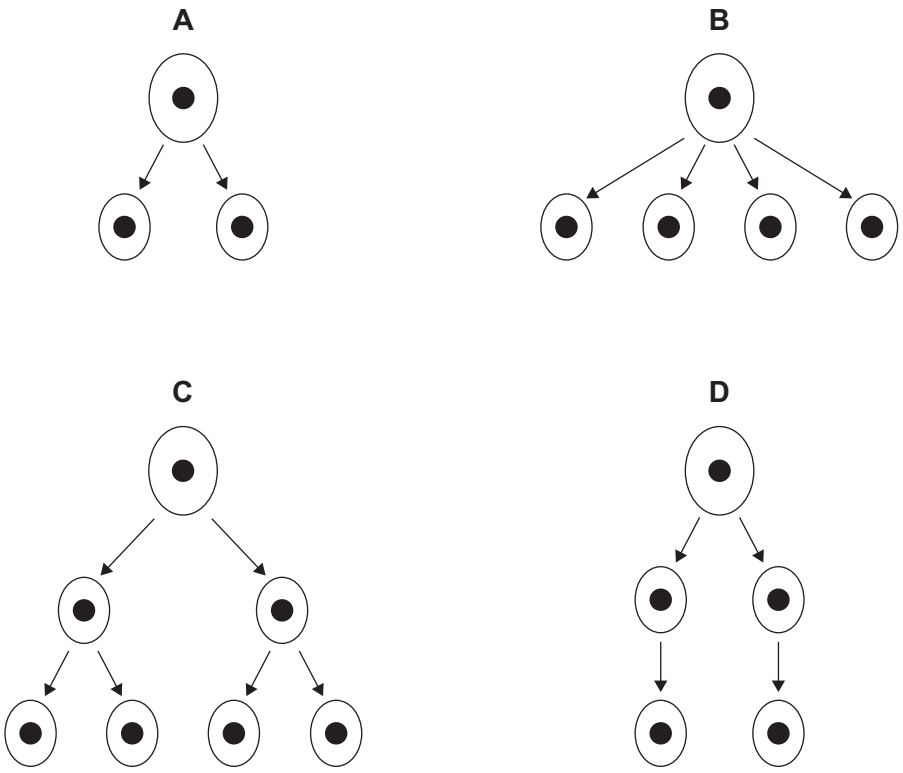
(2 marks)

4.1.2.2 Mitosis and the cell cycle

Question 01 · continued

7 (c) Gametes are made in the testes by meiosis.

7 (c) (i) Look at the diagrams.



Which diagram, **A**, **B**, **C** or **D**, represents how cell division by meiosis produces gametes in the testes? ☐

(1 mark)

7 (c) (ii) How many chromosomes will each goat gamete contain?

.....

(1 mark)

Question 7 continues on the next page

4.1.2.2 Mitosis and the cell cycle

Question 01 · continued

7 (d) Body cells divide by mitosis.

7 (d) (i) Why is the ability of body cells to divide important?

.....

.....

(1 mark)

7 (d) (ii) When a body cell of a potato plant divides, how many chromosomes will each of the new cells contain?

.....

(1 mark)

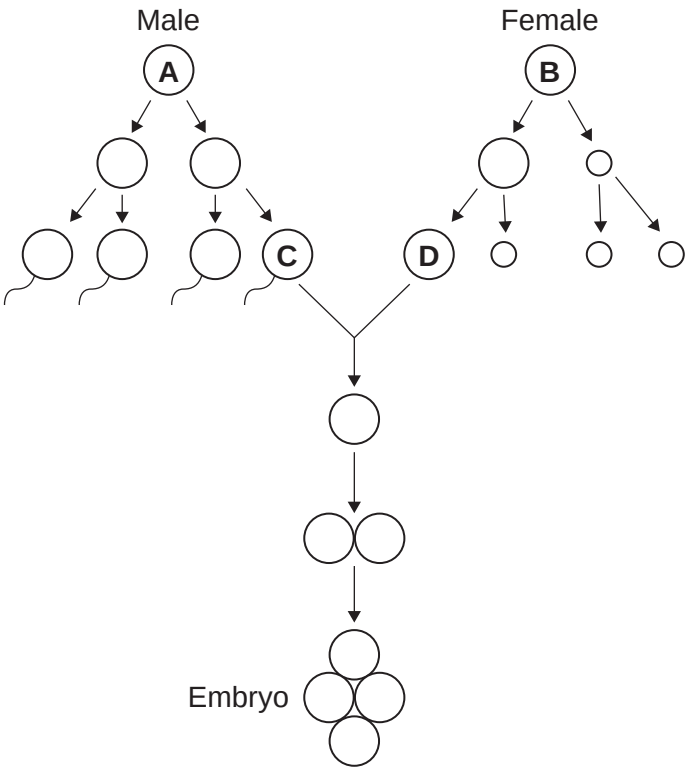
7

4.1.2.2 Mitosis and the cell cycle

Question 02

January 2013 | BL2HP | Original Q4 | Legacy

4 The diagram shows some of the cell divisions that occur during human reproduction.



4 (a) (i) Name the type of cell division that produces cell **D** from cell **B**.

.....

(1 mark)

4 (a) (ii) Which organ in the male body produces cell **C** from cell **A**?

.....

(1 mark)

4 (b) (i) Cells **A** and **B** each contain 46 chromosomes.

How many chromosomes would there be in the nucleus of cell **C**? ☐

(1 mark)

4 (b) (ii) Why is it important that cell **C** has this number of chromosomes?

.....

.....

.....

.....

(2 marks)

5

4.1.2.2 Mitosis and the cell cycle

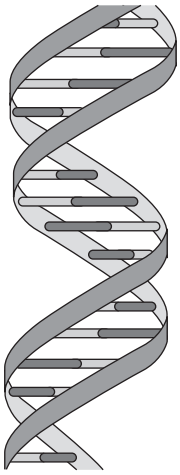
Question 03

June 2015 | BL2HP | Original Q3 | Legacy

3 DNA is the genetic material of human cells.

Figure 4 shows the structure of part of a DNA molecule.

Figure 4



3 (a) (i) Describe where DNA is found in a human cell.

[2 marks]

.....

.....

.....

3 (a) (ii) When a cell divides by mitosis the new cells are genetically identical.

What causes the cells to be genetically identical?

[1 mark]

.....

.....

3 (b) Many genes have different forms called alleles.

3 (b) (i) A person has polydactyly (extra fingers or toes). Polydactyly is caused by a dominant allele.
What is the smallest number of copies of the dominant allele for polydactyly that could be found in a body cell of this person?

[1 mark]

.....

3 (b) (ii) Another person has cystic fibrosis. Cystic fibrosis (CF) is caused by a recessive allele.
How many copies of the recessive CF allele are there in a body cell of this person?

[1 mark]

.....

4.1.2.2 Mitosis and the cell cycle

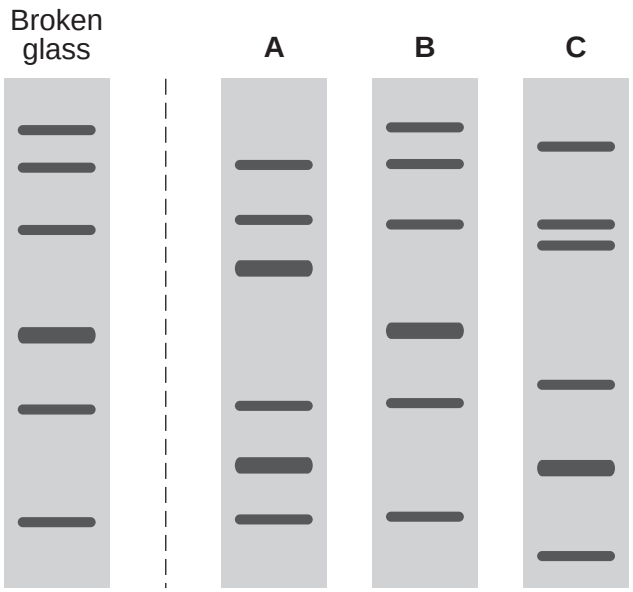
Question 03 · continued

3 (c) A burglar broke into a house. The burglar cut his hand on some broken glass. Scientists extracted DNA from the blood on the broken glass.

The scientists analysed the DNA from the glass and DNA from three suspects, **A**, **B** and **C**. The scientists used a method called DNA fingerprinting.

Figure 5 shows the scientists' results.

Figure 5



Which suspect, **A**, **B** or **C**, is most likely to have been the burglar?

[1 mark]

Tick (✓) **one** box.

A ☐

B ☐

C ☐

6

4.1.2.2 Mitosis and the cell cycle

Question 04

0 5 Cell division is needed for growth and for reproduction.

0 5 . 1 **Table 3** contains three statements about cell division.

Complete **Table 3**.

[2 marks]

Tick **one** box for each statement.

Table 3

Statement	Statement is true for		
	Mitosis only	**Meiosis only**	**Both mitosis and meiosis**
All cells produced are genetically identical			
In humans, at the end of cell division each cell contains 23 chromosomes			
Involves DNA replication			

4.1.2.2 Mitosis and the cell cycle

Question 04 · continued

Bluebell plants grow in woodlands in the UK.

- Bluebells can reproduce sexually by producing seeds.
- Bluebells can also reproduce asexually by making new bulbs.

0 5 . 2 One advantage of asexual reproduction for bluebells is that only **one** parent is needed.

Suggest **two** other advantages of asexual reproduction for bluebells.

[2 marks]

1

2

0 5 . 3 Explain why sexual reproduction is an advantage for bluebells.

[4 marks]

8

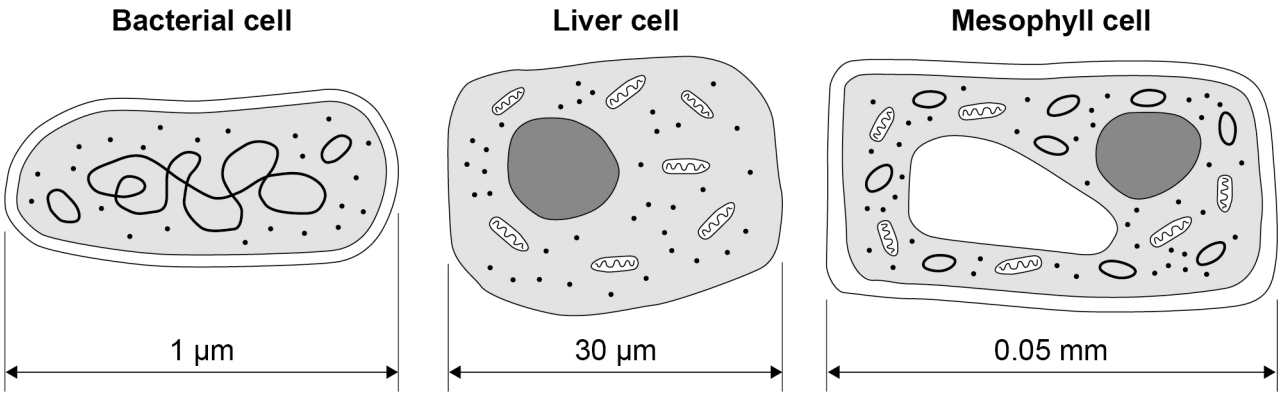
4.1.2.2 Mitosis and the cell cycle

Question 05

November 2020 | 8461/1H | Original Q3

0 3 **Figure 5** shows three types of cell.

Figure 5



0 3 . 1 Give **two** similarities between the prokaryotic cell and the eukaryotic cells in **Figure 5**.

[2 marks]

1 _____

2 _____

0 3 . 2 Give **three** differences between the prokaryotic cell and the eukaryotic cells in **Figure 5**.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

4.1.2.2 Mitosis and the cell cycle

Question 05 · continued

0 3 . 3 Calculate the ratio of the size of the bacterial cell to the size of the mesophyll cell.

[2 marks]

Ratio = 1 : _____

0 3 . 4 Name the type of cell division that produces genetically identical body cells for growth and repair.

[1 mark]

_____

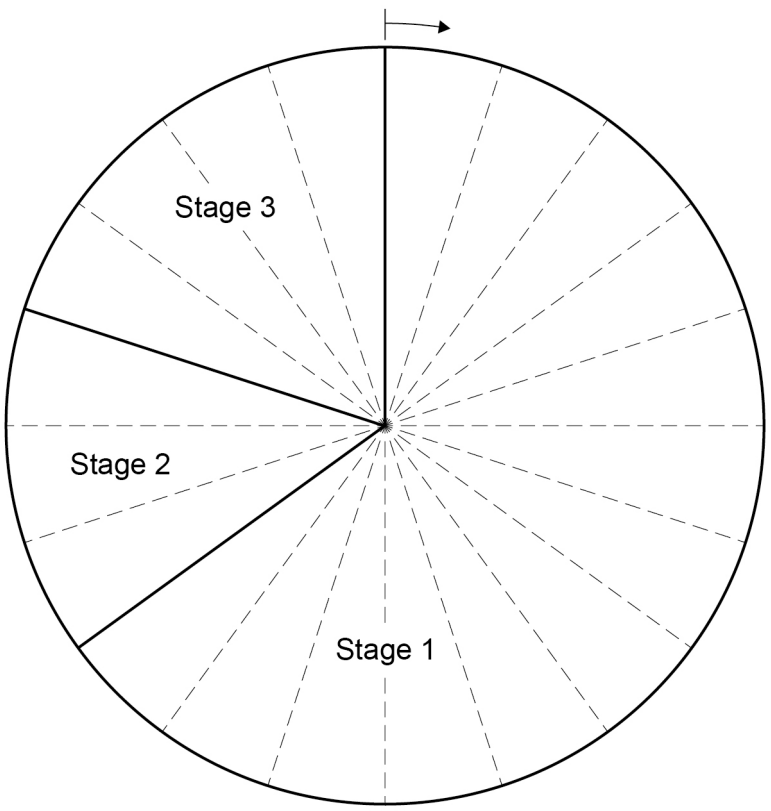
Question 3 continues on the next page

4.1.2.2 Mitosis and the cell cycle

Question 05 · continued

Figure 6 shows a cell cycle.

Figure 6



0 3 . 5 What percentage of the time for one cell cycle is represented by stage 2 and stage 3 together?

[1 mark]

Tick (✓) **one** box.

7% ☐ 35% ☐ 40% ☐ 65% ☐

4.1.2.2 Mitosis and the cell cycle

Question 05 · continued

0 3 . 6 Describe what happens during each stage of the cell cycle.

[4 marks]

Stage 1 _____

_____

_____

_____

Stage 2 _____

_____

Stage 3 _____

_____

13

Turn over for the next question

4.1.2.2 Mitosis and the cell cycle

Question 06

November 2020 | 8461/2H | Original Q5

0 5 There are two types of cell division: mitosis and meiosis.

0 5 . 1 Describe **three** differences between the processes of mitosis and meiosis.

[3 marks]

1 _____

_____

_____

2 _____

_____

_____

3 _____

_____

_____

0 5 . 2 Describe **one** similarity between the processes of mitosis and meiosis.

[1 mark]

_____

_____

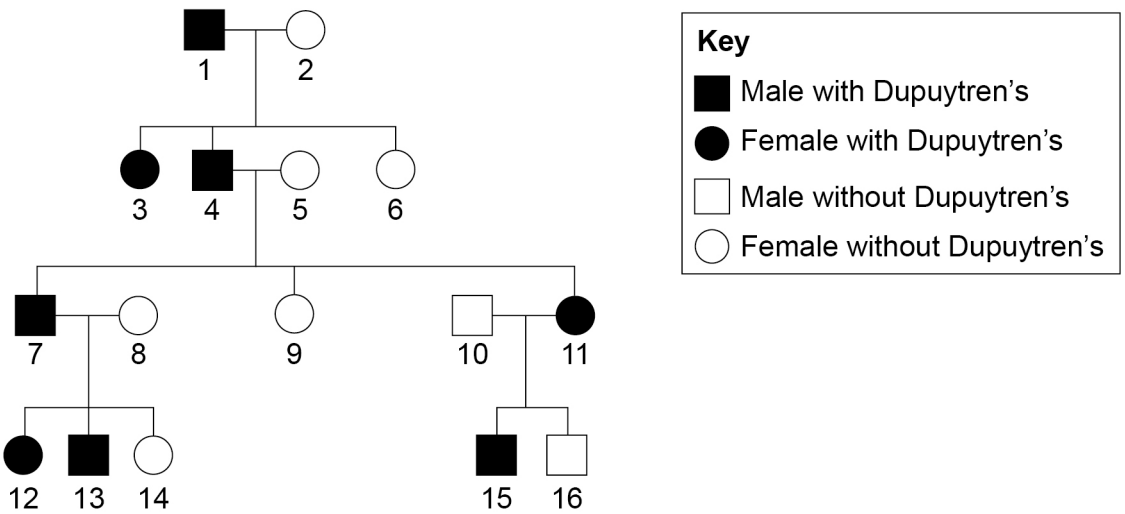
Question 5 continues on the next page

Question 06 · continued

Dupuytren's is a disorder that affects the hands.

Figure 6 shows the inheritance of Dupuytren's in one family.

Figure 6



Dupuytren's is caused by a dominant allele in this family.

D = dominant allele

d = recessive allele

0 5 . 3 Give the genotype of person **1**.

Explain your answer.

[2 marks]

Genotype _____

Question 06 · continued

0 5 . 4 Person **7** and person **8** in **Figure 6** are expecting a fourth child.

What is the probability of the child having Dupuytren's?

You should:

- draw a Punnett square diagram
- identify which offspring have Dupuytren's

[5 marks]

Probability = _____

0 5 . 5 Explain how **Figure 6** shows the allele for Dupuytren's is **not** on the Y chromosome.

[2 marks]

_____

_____

_____

_____

13

4.1.2.2 Mitosis and the cell cycle

Question 07

November 2021 | 8461/2H | Original Q1

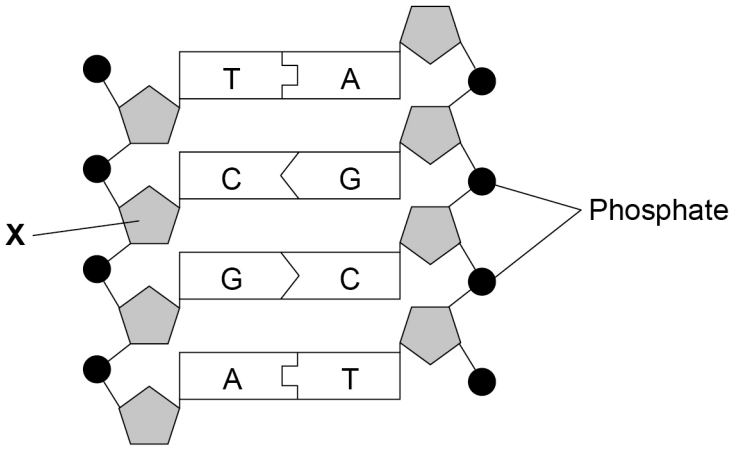
0 1 The nucleus of a cell contains DNA.

0 1 . 1 Name the structures inside the cell nucleus that contain DNA.

[1 mark]

Figure 1 shows part of a DNA molecule.

Figure 1



0 1 . 2 Name the part of the DNA molecule labelled **X**.

[1 mark]

0 1 . 3 What type of substances are labelled **A**, **C**, **G** and **T** in **Figure 1**?

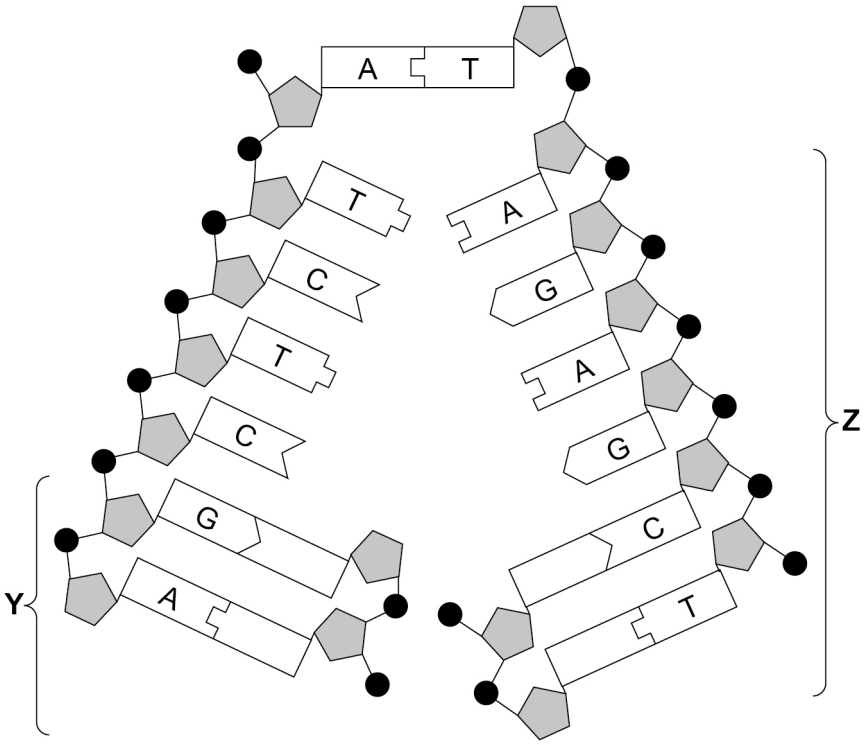
[1 mark]

4.1.2.2 Mitosis and the cell cycle

Question 07 · continued

Figure 2 shows another section of a DNA molecule.

Figure 2



0 1 . 4 Four of the substances you named in Question **01.3** are **not** labelled in part **Y** of **Figure 2**.

Label each of these substances with the correct letter, **A**, **C**, **G** or **T**.

Use information from other parts of **Figure 2** to help you.

[1 mark]

0 1 . 5 What is happening to the DNA in part **Z** of **Figure 2**?

[1 mark]

Tick (✓) **one** box.

- Differentiation ☐
- Evolution ☐
- Fertilisation ☐
- Replication ☐

4.1.2.2 Mitosis and the cell cycle

Question 07 · continued

0 1 . 6 A gene is a length of DNA.

What type of substance does a gene code for?

[1 mark]

0 1 . 7 Most human body cells contain 6×10^{-12} grams of DNA.

What mass of DNA will a human sperm cell contain?

[1 mark]

Tick (✓) **one** box.

- 6×10^{-6} grams ☐
- 6×10^{-12} grams ☐
- 3×10^{-6} grams ☐
- 3×10^{-12} grams ☐

0 1 . 8 What is the name of the type of cell division that produces sperm cells?

[1 mark]

Tick (✓) **one** box.

- Binary fission ☐
- Differentiation ☐
- Meiosis ☐
- Mitosis ☐

8

4.1.2.2 Mitosis and the cell cycle

Question 08

0 4 Plants and animals have many defence responses.

0 4 . 1 **Table 5** shows some plant defences.

Identify whether each defence is a chemical response or a physical response.

[2 marks]

Tick (✓) **one** box in each row.

Table 5

	Type of response	
Plant defence	**Chemical**	**Physical**
Thick, waxy layer on leaf surface		
Berries that are poisonous		
Bark on trees that falls off		

4.1.2.2 Mitosis and the cell cycle

Question 08 · continued

Mimicry is a mechanical adaptation seen in both plants and animals.

Figure 5 shows two insects.

Figure 5



Hornet **Hornet Moth**

0 4 . 2 Hornets are insects that sting other animals and cause pain.

Hornet moths do **not** sting other animals.

Suggest how mimicry helps the **hornet moth** survive.

[1 mark]

Question 4 continues on the next page

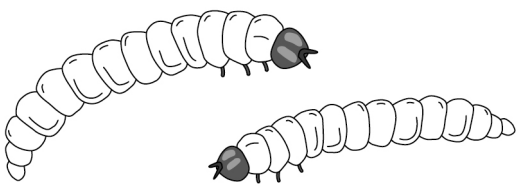
4.1.2.2 Mitosis and the cell cycle

Question 08 · continued

Adult hornet moths lay eggs that hatch into larvae.

Figure 6 shows the larvae of a hornet moth.

Figure 6



0 4 . 3 The larvae of the hornet moth:

- live inside the roots of trees
- use the tree roots as a source of food
- cause damage to the tree roots.

Explain why a tree might die if the roots of the tree are damaged.

[6 marks]

4.1.2.2 Mitosis and the cell cycle

Question 08 · continued

0 4 . 4 The larvae of the hornet moth form when fertilised eggs divide by mitosis.

Describe how mitosis produces two genetically identical cells.

[4 marks]

0 4 . 5 The cells which are first formed from the fertilised eggs of the hornet moth are stem cells.

Name the process by which these stem cells then form specialised cells.

[1 mark]

14

4.1.2.2 Mitosis and the cell cycle

Question 09

June 2023 | 8461/1H | Original Q5

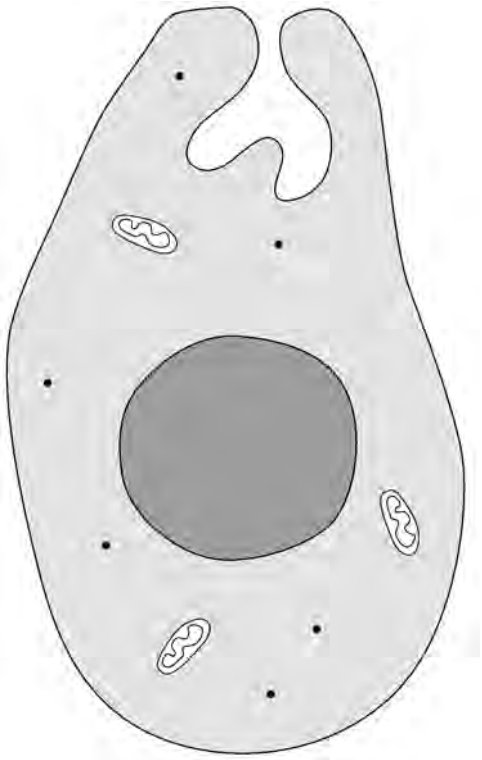
0 5 The protist that causes malaria is passed from one person to another person by mosquitos.

0 5 . 1 What term describes an organism that passes a pathogen from one person to another person?

[1 mark]

0 5 . 2 **Figure 7** shows the malarial protist.

Figure 7



4.1.2.2 Mitosis and the cell cycle

Question 09 · continued

The malarial protist is a eukaryotic cell.

Describe **three** ways the structure of the malarial protist is different from the structure of a prokaryotic cell.

Do **not** refer to size in your answer.

[3 marks]

1 _____

2 _____

3 _____

0 5 . 3 During one stage of malaria infection, the malarial protists enter red blood cells and cause them to burst.

Explain why the bursting of red blood cells causes tiredness.

[2 marks]

_____

_____

_____

_____

Question 5 continues on the next page

4.1.2.2 Mitosis and the cell cycle

Question 09 · continued

0 5 . 4 The malarial protist reproduces sexually and asexually during a life cycle.

Complete **Table 3** to give **three** differences between sexual reproduction and asexual reproduction.

[3 marks]

One difference has been completed for you.

Table 3

	Sexual reproduction	Asexual reproduction
	Involves two parents	Involves one parent
1		
2		
3		

0 5 . 5 One drug for treating malaria prevents mitosis occurring in the malarial protist.

The drug stops the synthesis of new DNA bases in the cell.

Suggest how the drug prevents mitosis occurring.

[1 mark]

4.1.2.2 Mitosis and the cell cycle

Question 09 · continued

0 5 . 6 Describe the process of cell division by mitosis.

[3 marks]

Question 5 continues on the next page

0 5 . 7 Different types of disease may interact.

Scientists studied the incidence of malaria infections in children:

- with disorder **S**
- without disorder **S**.

The incidence of malaria in children with disorder **S** was calculated as a percentage of the incidence in children without disorder **S**.

Table 4 shows the results.

Table 4

Age in years	Calculated percentage (%) incidence of malaria in children with disorder S
2 to < 4	69
4 to < 6	63
6 to < 8	50
8 to 10	45
> 10	73

Describe what the results in **Table 4** show about the interaction between disorder **S** and malaria.

[2 marks]

15

4.1.2.2 Mitosis and the cell cycle

Question 10

June 2024 | 8461/1H | Original Q8

0 8 Cancer is caused by changes in cells that result in uncontrolled cell division.

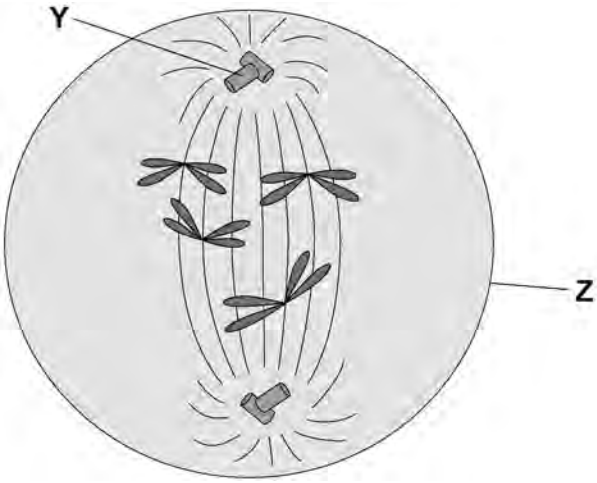
0 8 . 1 Before a cell begins to divide, its DNA replicates to form two copies of each chromosome.

Describe **one other** change that occurs in a cell **before** the cell begins to divide.

[1 mark]

Figure 8 shows a cell during one of the stages of cell division.

Figure 8



0 8 . 2 Name structure **Z** in **Figure 8**.

[1 mark]

4.1.2.2 Mitosis and the cell cycle

Question 10 · continued

0 8 . 3 Structure **Y** in **Figure 8** is a cylinder.

For structure **Y**:

- real volume = 24 500 000 nm^3
- real radius = 125 nm.

The length of a cylinder is calculated using the equation:

$$\text{length} = \frac{\text{volume}}{\pi \times \text{radius}^2}$$

The length of the image of structure **Y** in **Figure 8** is 4 mm.

Calculate the magnification of structure **Y** in **Figure 8**.

Use $\pi = 3.14$

[6 marks]

Magnification = × _____

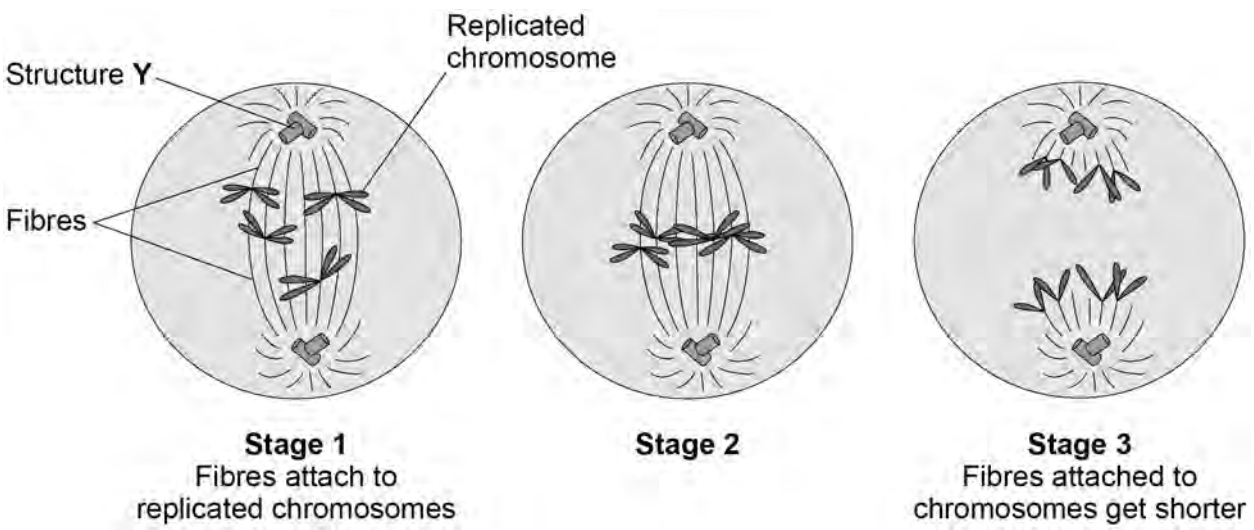
Question 8 continues on the next page

4.1.2.2 Mitosis and the cell cycle

Question 10 · continued

Figure 9 shows some of the stages of cell division.

Figure 9



Some cancer drugs prevent cell division.

Drug **X** prevents the fibres from attaching to the replicated chromosomes in **stage 1**.

0 8 . 4 Explain why a cell **cannot** complete division when affected by drug **X**.

[2 marks]

4.1.2.2 Mitosis and the cell cycle

Question 10 · continued

June 2024 | 8461/1H | Original Q8

0 8 . 5 Give the reason why a drug that stops cell division helps to treat cancer.

[1 mark]

0 8 . 6 New cancer drugs are tested in clinical trials.

Preclinical testing happens before clinical trials.

What is involved in preclinical testing of drugs?

[1 mark]

Tick (✓) **one** box.

- Testing the drugs for side effects ☐
- Testing the drugs on live tissues in a laboratory ☐
- Testing the drugs to find the optimum dose ☐
- Testing the drugs with chemicals in a laboratory ☐

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4.1.2.2 Mitosis and the cell cycle

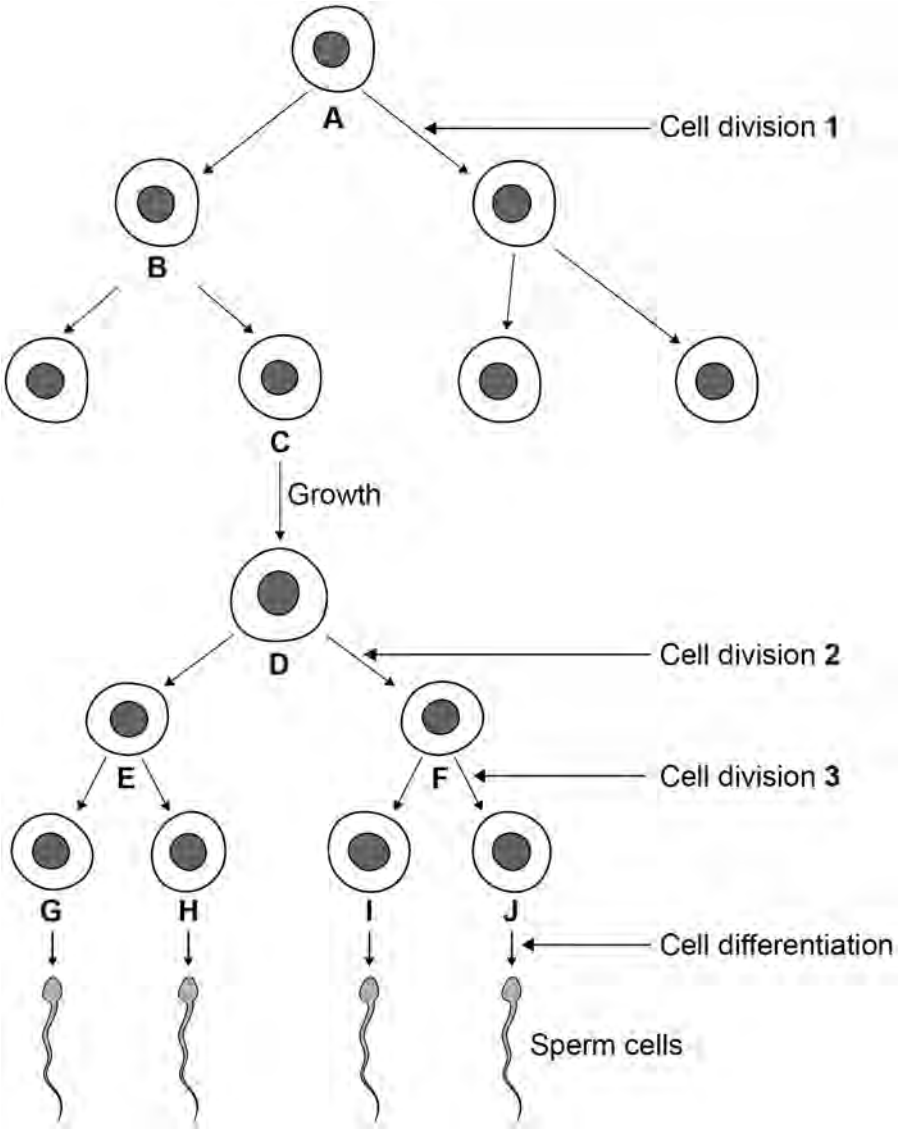
Question 11

June 2025 | 8461/2H | Original Q6

0 6 New cells are produced by cell division.

Figure 5 shows sperm formation in a human.

Figure 5



4.1.2.2 Mitosis and the cell cycle

Question 11 · continued

0 6 . 1 Which cell division in **Figure 5** represents mitosis?

[1 mark]

Tick (✓) **one** box.

Cell division **1** ☐

Cell division **2** ☐

Cell division **3** ☐

0 6 . 2 Which two cells in **Figure 5** are genetically identical?

[1 mark]

Tick (✓) **one** box.

A and **C** ☐ **B** and **I** ☐ **F** and **J** ☐ **G** and **H** ☐

0 6 . 3 How many chromosomes are there in cell **J** in **Figure 5**?

[1 mark]

0 6 . 4 How many of the cells **C**, **D**, **E**, **F**, **G**, **H**, **I** and **J** contain a Y chromosome?

Use **Figure 5**.

[1 mark]

Question 6 continues on the next page

4.1.2.2 Mitosis and the cell cycle

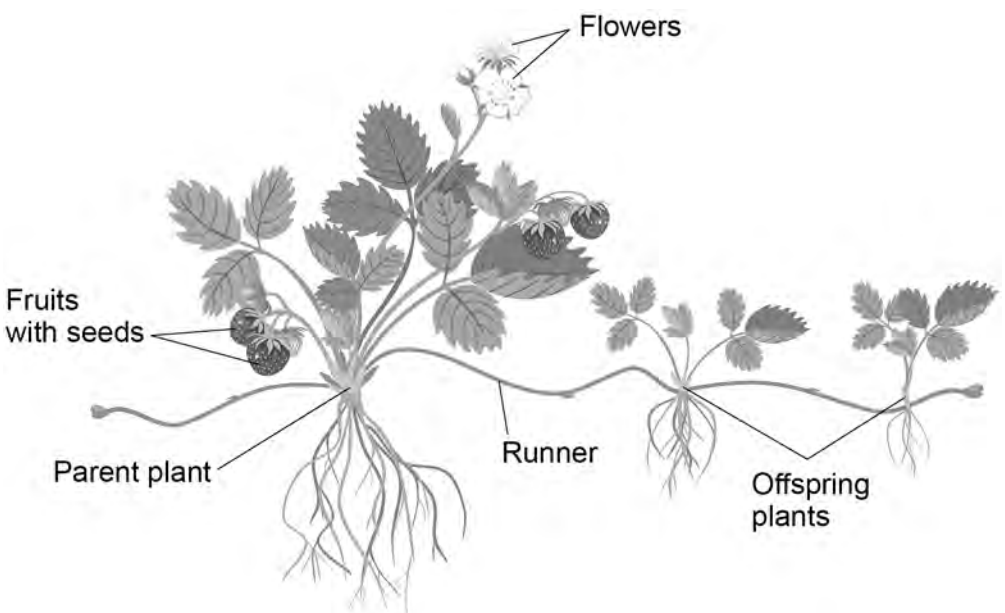
Question 11 · continued

Strawberry plants can reproduce both sexually and asexually.

Figure 6 shows a strawberry plant reproducing:

- sexually using flowers, fruits and seeds
- asexually using horizontal stems called runners.

Figure 6



0 6 . 5 Explain why the offspring produced using runners are genetically identical.

[2 marks]

4.1.2.2 Mitosis and the cell cycle

Question 11 · continued

0 6 . 6 Explain why the offspring produced using flowers, fruits and seeds are **not** genetically identical.

[2 marks]

0 6 . 7 Describe **two** advantages of **asexual** reproduction for the survival of strawberry plants.

[2 marks]

1

2

0 6 . 8 Describe **two** advantages of **sexual** reproduction for the survival of strawberry plants.

[2 marks]

1

2

12