AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.1.2

Meiosis

Past-paper questions

Tier	**Foundation**
Question groups	**14**
Available paper years	**2008–2025**

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:** _____

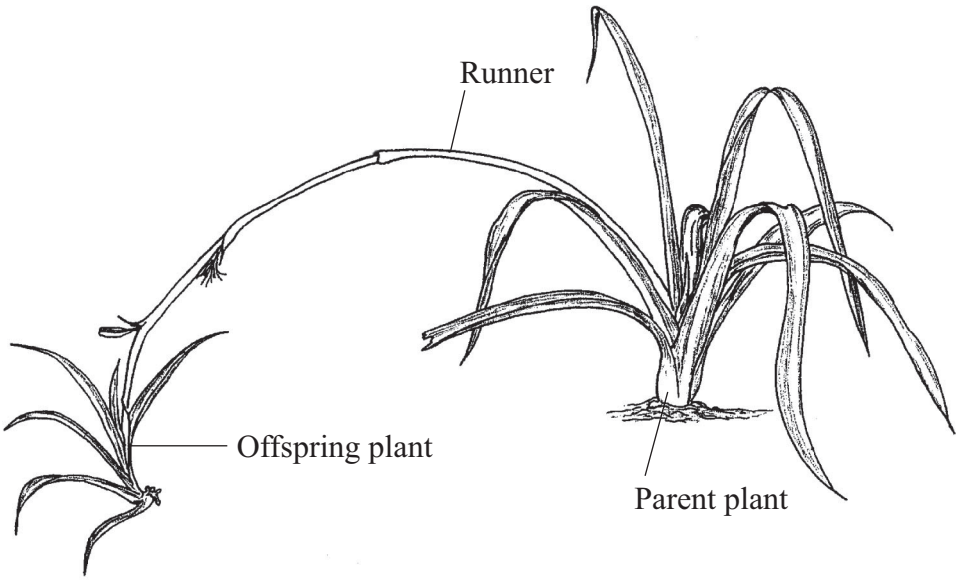
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.6.1.2 Meiosis

Question 01

January 2008 | BLY2F | Original Q3 | Legacy

3 The diagram shows a spider plant during one type of reproduction.



Complete the sentences using words from the box.

asexual	**characteristics**	**chromosomes**	
gametes	**genes**	**mitosis**	**sexual**

(a) The colour and shape of the leaves of a spider plant are known as ..... .

(1 mark)

(b) The shape of the leaves is controlled by ..... .

(1 mark)

(c) The thread-like structures inside the nucleus of the cells are called ..... .

(1 mark)

(d) The spider plant produces new cells in the runner by a process called ..... .

(1 mark)

(e) This type of reproduction is called ..... reproduction.

(1 mark)

5

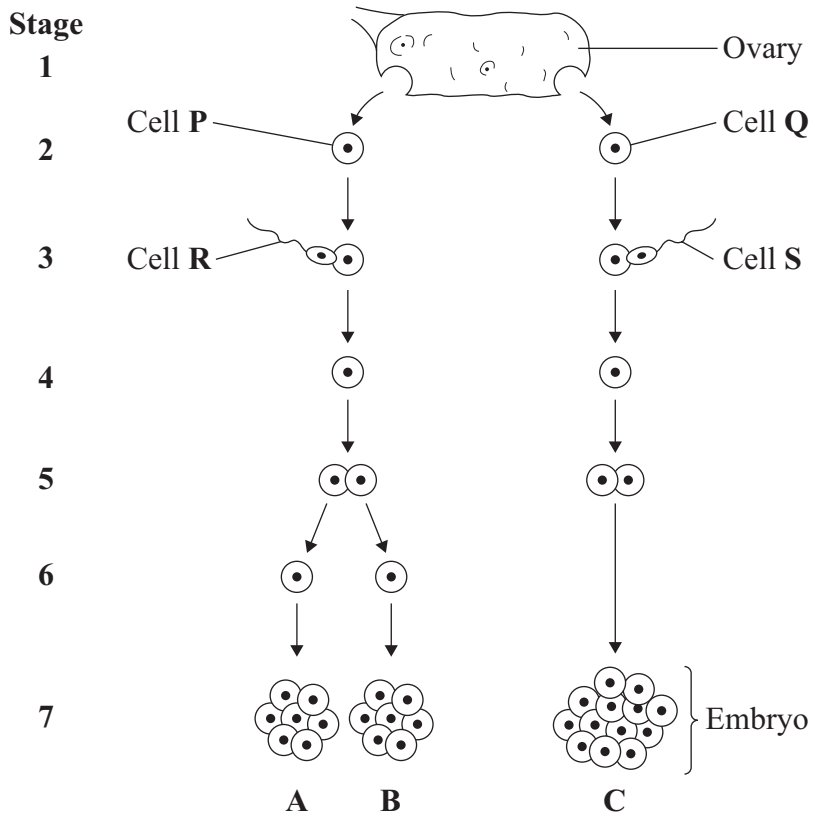
4.6.1.2 Meiosis

Question 02

January 2009 | BLY2F | Original Q3 | Legacy

3 A woman gives birth to triplets.
Two of the triplets are boys and the third is a girl.
The triplets developed from two egg cells released from the ovary at the same time.

The diagram shows how triplets **A**, **B** and **C** developed.



3 (a) Which stages on the diagram show gametes?

Draw a ring around your answer.

1 and 2 **2 and 3** **3 and 7** **1 and 7**

(1 mark)

4.6.1.2 Meiosis

Question 02 · continued

for mark

3 (b) Embryo **B** is male.

Which of the following explains why embryo **B** is male?

Tick (✓) **one** box.

Cell **P** has an X chromosome; cell **R** has an X chromosome. ☐

Cell **P** has a Y chromosome; cell **R** has an X chromosome. ☐

Cell **P** has an X chromosome; cell **R** has a Y chromosome. ☐

(1 mark)

3 (c) The children that develop from embryos **A** and **C** will **not** be identical.

Explain why.

You may use words from the box in your answer.

egg	**genes**	**sperm**

.....

.....

.....

.....

.....

(2 marks)

Question 3 continues on the next page

4.6.1.2 Meiosis

Question 02 · continued

for mark

3 (d) Single cells from an embryo at **Stage 7** can be separated and grown in a special solution.

3 (d) (i) What term describes cells that are grown in this way?

Draw a ring around your answer.

alleles **screened cells** **stem cells**

(1 mark)

3 (d) (ii) What happens when the cells are placed in the special solution?

Tick (✓) **two** boxes.

The cells divide ☐

The cells fertilise ☐

The cells differentiate ☐

The cells separate ☐

(2 marks)

3 (d) (iii) Give **one** use of cells grown in this way.

.....

.....

(1 mark)

3 (d) (iv) Some people might object to using cells from embryos in this way.

Give **one** reason why.

.....

.....

.....

(1 mark)

9

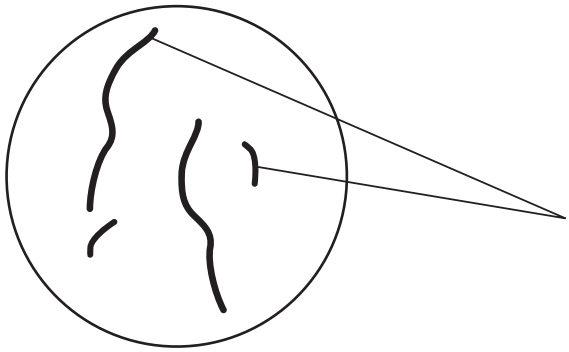
4.6.1.2 Meiosis

Question 03

June 2009 | BLY2F | Original Q5 | Legacy

5 **Diagram 1** shows the nucleus of a body cell as it begins to divide by mitosis.

Diagram 1



.....

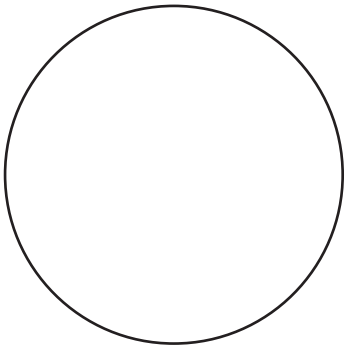
5 (a) Use a word from the box to label **Diagram 1**.

alleles	**chromosomes**	**gametes**

(1 mark)

5 (b) Complete **Diagram 2** to show what the nucleus of one of the cells produced by this mitosis would look like.

Diagram 2



(1 mark)

4.6.1.2 Meiosis

Question 03 · continued

for mark

5 (c) Stem cells from a recently dead embryo can be grown in special solutions.

Some facts about stem cells are given below.

- Stem cells from an embryo can grow into any type of tissue.
- Stem cells may grow out of control, to form cancers.
- Large numbers of stem cells can be grown in the laboratory.
- Stem cells may be used in medical research or to treat some human diseases.
- Patients treated with stem cells need to take drugs for the rest of their life to prevent rejection.
- Collecting and growing stem cells is expensive.

Use **only** the information above to answer these questions.

5 (c) (i) Give **two** advantages of using stem cells.

1 .....

.....

2 .....

.....

(2 marks)

5 (c) (ii) Give **two** disadvantages of using stem cells.

1 .....

.....

2 .....

.....

(2 mark)

6

4.6.1.2 Meiosis

Question 04

March 2010 | BLY1BP | Original Q3 | Legacy

QUESTION THREE

This question is about reproduction.

Match words, **A**, **B**, **C** and **D**, with the statements **1–4** in the table.

A genes

B gametes

C characteristics

D nucleus

1	cells which fuse to form offspring
2	control the development of features
3	the part of a cell which contains chromosomes
4	features we can see, such as eye colour

4.6.1.2 Meiosis

Question 05

June 2012 | BL2FP | Original Q2 | Legacy

2 In a living organism, the cells are organised into organs, systems and tissues.

2 (a) Use words from the box to complete the list of these structures in order of size.

organs	systems	tissues

The smallest structure is at the top of the list and the largest is at the bottom.

1 **cells** (smallest)

2 .....

3 .....

4 .....

5 **organism** (largest)

(1 mark)

2 (b) **List A** gives three tissues found in the human body.
List B gives four functions of tissues.

Draw a straight line from each tissue in **List A** to its correct function in **List B**.

List A – Tissue	List B – Function
	Covers many parts of the body
Muscular tissue	
	Contracts to cause movement
Glandular tissue	
	Divides by meiosis
Epithelial tissue	
	Releases hormones or enzymes

(3 marks)

4

4.6.1.2 Meiosis

Question 06

January 2013 | BL2FP | Original Q2 | Legacy

2 When humans reproduce, chromosomes and genes are passed on to the next generation.

In each of the following questions, draw a ring around the correct answer to complete the sentence.

2 (a) A gene is a small section of

- cellulose.
- DNA.
- protein.

(1 mark)

2 (b) The sex chromosomes in the human male are

- X and X.
- X and Y.
- Y and Y.

(1 mark)

2 (c) (i) Most human body cells contain

- 23 chromosomes.
- 46 chromosomes.
- 92 chromosomes.

(1 mark)

2 (c) (ii) The number of chromosomes in a human gamete (sex cell)

is

- the same number as
- half the number
- twice the number

in body cells.

(1 mark)

2 (d) Gametes are produced by

- fertilisation.
- meiosis.
- mitosis.

(1 mark)

5

4.6.1.2 Meiosis

Question 07

June 2013 | BL2FP | Original Q3 | Legacy

3 (a) (i) Mitosis and meiosis are types of cell division.

For each feature in the table, tick (✓) **one** box to show if the feature occurs:

- only in mitosis
- only in meiosis.

Feature	Only in mitosis (✓)	Only in meiosis (✓)
Produces new cells during growth and repair		
Produces gametes (sex cells)		
Produces genetically identical cells		

(2 marks)

3 (a) (ii) Name the organ that produces gametes (sex cells) in:

a man .....

a woman. .....

(2 marks)

3 (b) **X** and **Y** chromosomes are the sex chromosomes. They determine a person's sex.

What sex chromosomes will be found in the body cells of:

3 (b) (i) a man .....

(1 mark)

3 (b) (ii) a woman? .....

(1 mark)

3 (c) A man and a woman decide to have a child.

What is the chance that the child will be a boy? .....

(1 mark)

7

4.6.1.2 Meiosis

Question 08

June 2014 | BL2FP | Original Q5 | Legacy

5 In sexual reproduction, an egg fuses with a sperm.

5 (a) (i) Draw a ring around the correct answer to complete the sentence.

[1 mark]

An egg and a sperm fuse together in the process of

cloning.

fertilisation.

mitosis.

5 (a) (ii) Egg cells and sperm cells each contain the structures given in the box.

chromosome	**gene**	**nucleus**

List these three structures in size order, starting with the smallest.

[2 marks]

1 ..... (smallest)

2 .....

3 ..... (largest)

5 (a) (iii) The egg and the sperm contain genetic material.

Draw a ring around the correct answer to complete the sentence.

[1 mark]

The genetic material is made of

carbohydrate.

DNA.

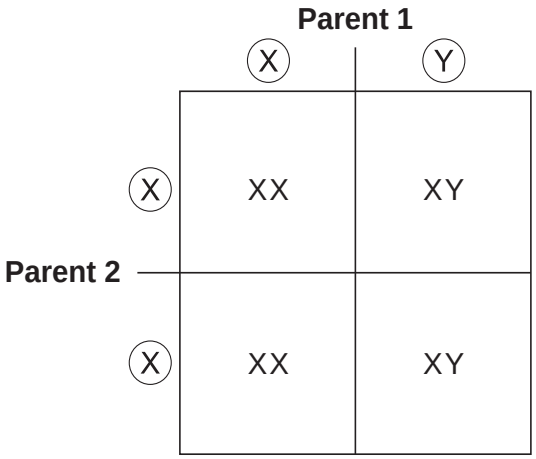
protein.

4.6.1.2 Meiosis

Question 08 · continued

5 (b) **Figure 8** shows the inheritance of **X** and **Y** chromosomes.

Figure 8



5 (b) (i) **On Figure 8**, draw a tick (✓) on the part of the diagram that shows a sperm cell.

[1 mark]

5 (b) (ii) What is the chance of having a female child?

Give the reason for your answer.

[2 marks]

.....

.....

.....

.....

7

4.6.1.2 Meiosis

Question 09

June 2018 | 8461/1F | Original Q1

0 1 This question is about the cell cycle.

0 1 . 1 Chromosomes are copied during the cell cycle.

Where are chromosomes found?

[1 mark]

Tick **one** box.

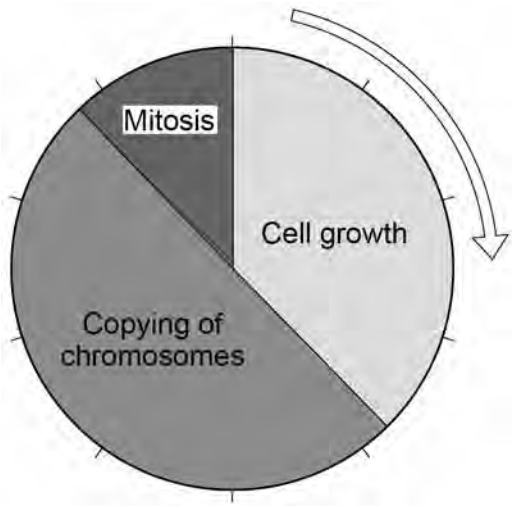
- Cytoplasm ☐
- Nucleus ☐
- Ribosomes ☐
- Vacuole ☐

0 1 . 2 What is the name of a section of a chromosome that controls a characteristic?

[1 mark]

Figure 1 shows information about the cell cycle.

Figure 1



4.6.1.2 Meiosis

Question 09 · continued

0 1 . 3 Which stage of the cell cycle in **Figure 1** takes the most time?

[1 mark]

Tick **one** box.

- Cell growth ☐
- Copying of chromosomes ☐
- Mitosis ☐

0 1 . 4 During mitosis cells need extra energy.

Which cell structures provide most of this energy?

[1 mark]

Tick **one** box.

- Chromosomes ☐
- Cytoplasm ☐
- Mitochondria ☐
- Ribosomes ☐

0 1 . 5 The cell cycle in **Figure 1** takes two hours in total.

The cell growth stage takes 45 minutes.

Calculate the time taken for mitosis.

[2 marks]

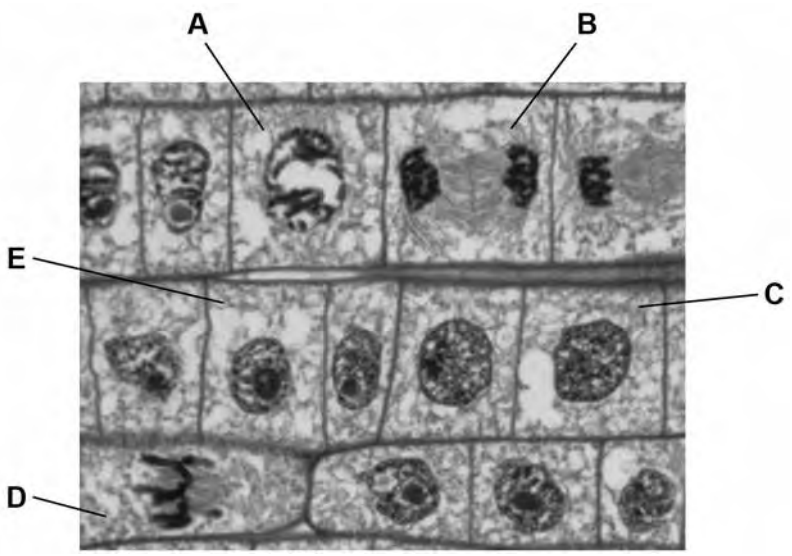
Time = _____ minutes

4.6.1.2 Meiosis

Question 09 · continued

Figure 2 shows some cells in different stages of the cell cycle.

Figure 2



0 1 . 6 Which cell is **not** dividing by mitosis?

[1 mark]

Tick **one** box.

A		B		C		D	

4.6.1.2 Meiosis

Question 09 · continued

0 1 . 7 Cell **E** in **Figure 2** contains 8 chromosomes.

Cell **E** divides by mitosis.

How many chromosomes will each new cell contain?

[1 mark]

Tick **one** box.

2 ☐

4 ☐

8 ☐

16 ☐

0 1 . 8 Why is mitosis important in living organisms?

[1 mark]

Tick **one** box.

To produce gametes ☐

To produce variation ☐

To release energy ☐

To repair tissues ☐

9

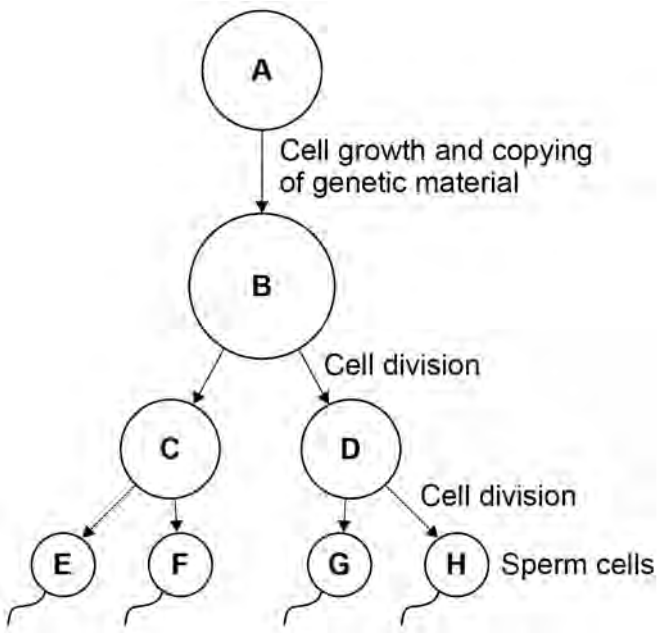
4.6.1.2 Meiosis

Question 10

June 2019 | 8461/2F | Original Q3

0 3 **Figure 6** shows the production of sperm cells in humans.

Figure 6



0 3 . 1 Cell **A** is a normal body cell.

How many chromosomes are there in cell **A**?

[1 mark]

Tick (✓) **one** box.

23 ☐ 46 ☐ 48 ☐ 92 ☐

0 3 . 2 What is the mass of DNA in cell **E**?

[1 mark]

Tick (✓) **one** box.

A quarter of the mass of the DNA in cell **A** ☐

Half the mass of the DNA in cell **A** ☐

The same mass as the DNA in cell **A** ☐

Twice the mass of the DNA in cell **A** ☐

4.6.1.2 Meiosis

Question 10 · continued

0 3 . 3 What type of cell division produces sperm cells?

[1 mark]

Tick (✓) **one** box.

- Binary fission ☐
- Differentiation ☐
- Meiosis ☐

0 3 . 4 Sometimes there are errors in copying the genetic material.

What term describes an error in the genetic material?

[1 mark]

Tick (✓) **one** box.

- Absorption ☐
- Fertilisation ☐
- Mitosis ☐
- Mutation ☐

0 3 . 5 A woman has three children, aged 4, 6 and 9 years.

Why are the children **not** genetically identical?

[2 marks]

Question 10 · continued

In sexual reproduction, a sperm cell fuses with an egg cell to form a new single cell.

An embryo develops from the single cell.

The cell divides three times to produce the embryo.

0 3 . 6 How many cells are there in the embryo after three cell divisions?

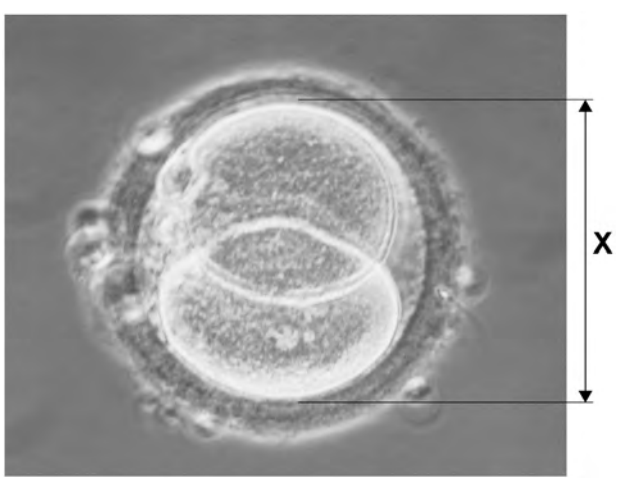
[1 mark]

Tick (✓) **one** box.

3 ☐ 6 ☐ 8 ☐ 9 ☐

Figure 7 shows a different human embryo.

Figure 7



0 3 . 7 Measure image length **X** on **Figure 7**.

[1 mark]

Give your answer in millimetres (mm).

X = _____ mm

4.6.1.2 Meiosis

Question 10 · continued

0 3 . 8 The image in **Figure 7** has been magnified ×500

Calculate the real length of the embryo.

Use the equation:

$$\text{real length of the embryo} = \frac{\text{image length}}{\text{magnification}}$$

Give your answer in micrometres (μm).

1 mm = 1000 μm

[3 marks]

Real length of the embryo = _____ μm

0 3 . 9 The embryo may **not** implant in the lining of the uterus.

The embryo will then be lost from the woman's body several days later.

Explain why the woman may **not** notice this has happened.

[2 marks]

13

4.6.1.2 Meiosis

Question 11

November 2020 | 8461/2F | Original Q3

0 3 Sperm cells and egg cells are formed by meiosis.

0 3 . 1 During meiosis a cell divides twice.

How many sperm cells are formed when a cell divides by meiosis?

[1 mark]

0 3 . 2 Human body cells contain 46 chromosomes.

How many chromosomes are in each human egg cell?

[1 mark]

4.6.1.2 Meiosis

Question 11 · continued

Dupuytren's is a disorder that affects the hands.

One form of Dupuytren's is caused by a dominant allele (**D**).

The allele for **not** having Dupuytren's is recessive (**d**).

0 3 . 3 What is an allele?

[1 mark]

Tick (✓) **one** box.

A different form of a chromosome ☐

A different form of a gamete ☐

A different form of a gene ☐

0 3 . 4 A man with Dupuytren's has the genotype **Dd**.

Which word describes the man's genotype?

[1 mark]

Tick (✓) **one** box.

Heterozygous ☐

Homozygous ☐

Phenotype ☐

Question 3 continues on the next page

Question 11 · continued

The man with Dupuytren's (**Dd**) and a woman who does **not** have Dupuytren's (**dd**) plan to have a child.

0 3 . 5 Complete the genetic diagram in **Figure 4** to show the possible genotypes of the child.

[2 marks]

Figure 4

		Woman	
		d	**d**
Man	**D**	Dd	
	d		

0 3 . 6 Draw a ring around the genotype of a child in **Figure 4** who will have Dupuytren's.

[1 mark]

0 3 . 7 What is the chance of the child having Dupuytren's?

[1 mark]

Tick (✓) **one** box.

25% ☐ 50% ☐ 75% ☐ 100% ☐

4.6.1.2 Meiosis

Question 11 · continued

0 3 . 8 A genetic disorder develops as a result of a change in a gene.

What scientific term describes a change in a gene?

[1 mark]

0 3 . 9 People with a family history of some genetic disorders are offered embryo screening.

Suggest **one** way embryo screening can help people with a family history of a genetic disorder.

[1 mark]

10

Turn over for the next question

4.6.1.2 Meiosis

Question 12

June 2022 | 8461/2F | Original Q8

0 8 There are two types of reproduction:

- sexual reproduction
- asexual reproduction.

0 8 . 1 Complete **Table 4** to compare sexual reproduction with asexual reproduction.

Write a tick (✓) in the box if the statement is true.

The first row has been completed for you.

[2 marks]

Table 4

	Sexual reproduction	Asexual reproduction
Cell division occurs	✓	✓
Fertilisation occurs		
Genes are passed on from parent to offspring		
Offspring are genetically identical to each other		

0 8 . 2 Gametes are formed in sexual reproduction.

Name the male gamete formed in flowering plants.

[1 mark]

_____

Question 8 continues on the next page

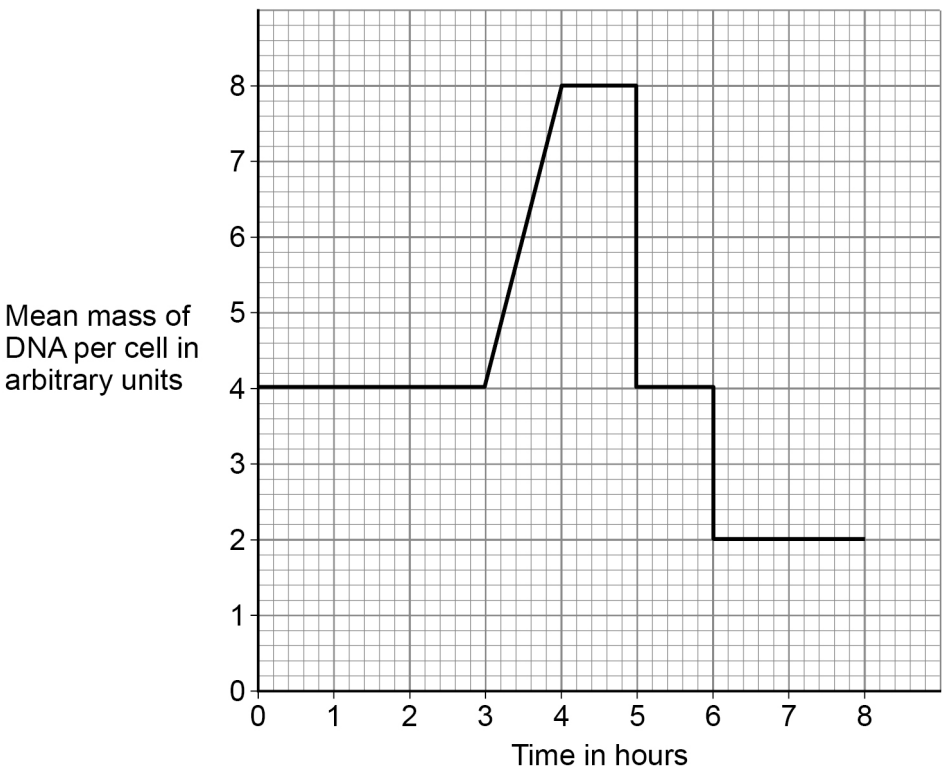
4.6.1.2 Meiosis

Question 12 · continued

Cell division by meiosis forms gametes.

Figure 12 shows the mean mass of DNA per cell before, during and after meiosis.

Figure 12



Use information from **Figure 12** to answer questions **08.3** to **08.6**.

0 8 . 3 When is the DNA in the chromosomes being copied?

[1 mark]

Tick (✓) **one** box.

Between 0 and 3 hours ☐

Between 3 and 4 hours ☐

Between 4 and 5 hours ☐

Between 5 and 6 hours ☐

4.6.1.2 Meiosis

Question 12 · continued

0 8 . 4 Cells divide twice during meiosis.

Which **two** times in **Figure 12** show one cell dividing into two cells?

[2 marks]

Tick (✓) **two** boxes.

- 3 hours ☐
- 4 hours ☐
- 5 hours ☐
- 6 hours ☐
- 8 hours ☐

0 8 . 5 What is the mean mass of DNA in arbitrary units in a sperm cell?

[1 mark]

Tick (✓) **one** box.

2 ☐ 4 ☐ 8 ☐ 16 ☐

0 8 . 6 What is the mean mass of DNA in arbitrary units in each cell in an embryo?

[1 mark]

Tick (✓) **one** box.

2 ☐ 4 ☐ 8 ☐ 16 ☐

8

4.6.1.2 Meiosis

Question 13

June 2023 | 8461/1F | Original Q4

0 4 Malaria is caused by a protist.

The protist is passed from one person to another person by mosquitos.

0 4 . 1 Which term describes the mosquito?

[1 mark]

Tick (✓) **one** box.

Bacterium ☐

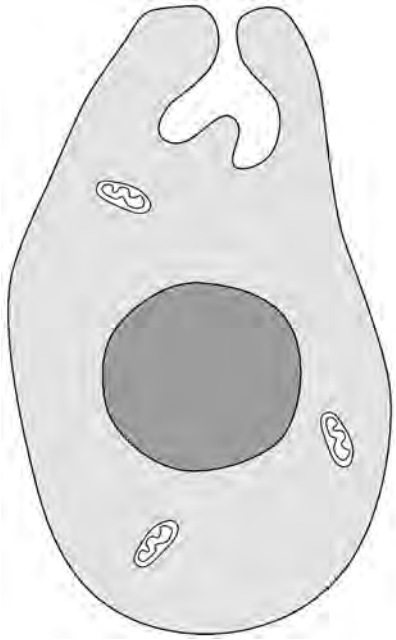
Gene ☐

Vector ☐

0 4 . 2 The malarial protist is a eukaryotic cell.

Figure 2 shows a malarial protist.

Figure 2



Give **two** features of the malarial protist that show the cell is eukaryotic and **not** prokaryotic.

[2 marks]

1 _____

_____

2 _____

_____

0 4 . 3 Which organism is prokaryotic?

[1 mark]

Tick (✓) **one** box.

Cow ☐

Grass ☐

Salmonella ☐

0 4 . 4 The malarial protist reproduces asexually.

What is a feature of asexual reproduction?

[1 mark]

Tick (✓) **one** box.

Only one parent is involved. ☐

The offspring show genetic variation. ☐

Two gametes fuse. ☐

Question 4 continues on the next page

4.6.1.2 Meiosis

Question 13 · continued

0 4 . 5 Mitosis occurs in the malarial protist during asexual reproduction.

The protist has 14 chromosomes.

How many chromosomes will each new protist cell have after mitosis?

[1 mark]

Tick (✓) **one** box.

7 ☐ 14 ☐ 21 ☐ 28 ☐

0 4 . 6 When a person has malaria, the protists destroy red blood cells.

What change would happen in the blood of a person with malaria?

[1 mark]

Tick (✓) **one** box.

Decreased antibodies ☐

Decreased haemoglobin ☐

Increased plasma ☐

Increased platelets ☐

Question 13 · continued

0 4 . 7 It is estimated that 210 million people are infected with malaria every year. Half of these infected people survive the disease.

Calculate how many people would survive the disease in 3 years if the estimate is correct.

Give your answer in standard form.

[4 marks]

Number of people (in standard form) = _____

0 4 . 8 The spread of malaria can be controlled by using mosquito nets to avoid being bitten.

Describe **two** other ways that people can reduce the chance of being bitten by mosquitos.

Do **not** refer to mosquito nets in your answer.

[2 marks]

1 _____

2 _____

Question 4 continues on the next page

Question 13 · continued

0 4 . 9 Different types of disease may interact.

Scientists studied how having disorder **S** interacts with malaria.

The scientists calculated the chance of children with disorder **S** getting malaria.

Table 4 shows the results.

Table 4

Age in years	Percentage (%) chance of children with disorder S getting malaria
2	70
4	65
6	50
8	45

Describe the trend shown in **Table 4**.

Use data from **Table 4**.

[2 marks]

15

4.6.1.2 Meiosis

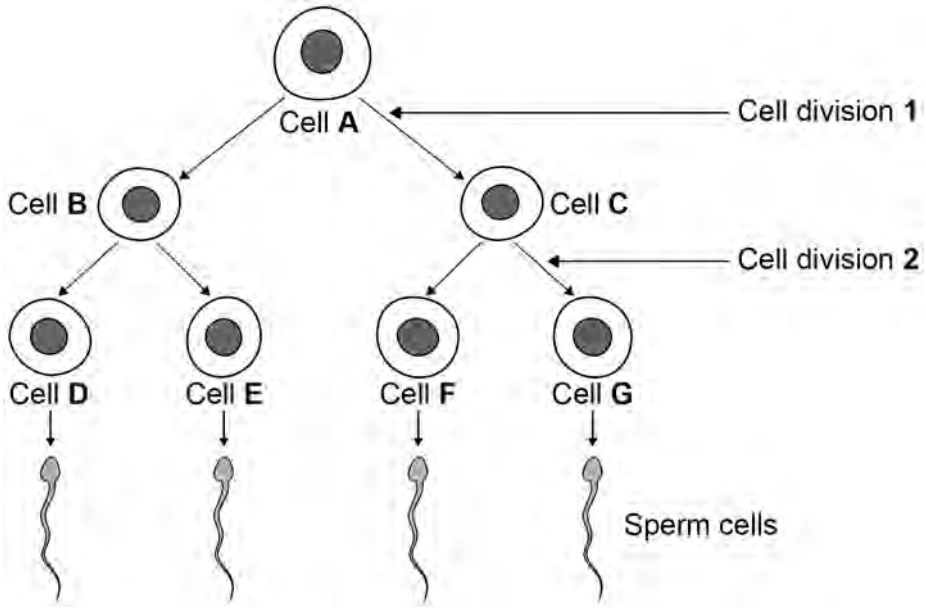
Question 14

June 2025 | 8461/2F | Original Q3

0 3 New cells are produced by cell division.

Figure 5 shows sperm formation in a human.

Figure 5



0 3 . 1 Where in the body are sperm cells produced?

[1 mark]

_____

0 3 . 2 How many chromosomes are there in cell **A** and in cell **D**?

Choose answers from the box.

[2 marks]

23	24	46	92

Cell **A** _____

Cell **D** _____

4.6.1.2 Meiosis

Question 14 · continued

0 3 . 3 Complete the sentence.

Choose the answer from the box.

[1 mark]

differentiation	evolution	fertilisation

A sperm cell joins with an egg cell in a process called _____.

Question 3 continues on the next page

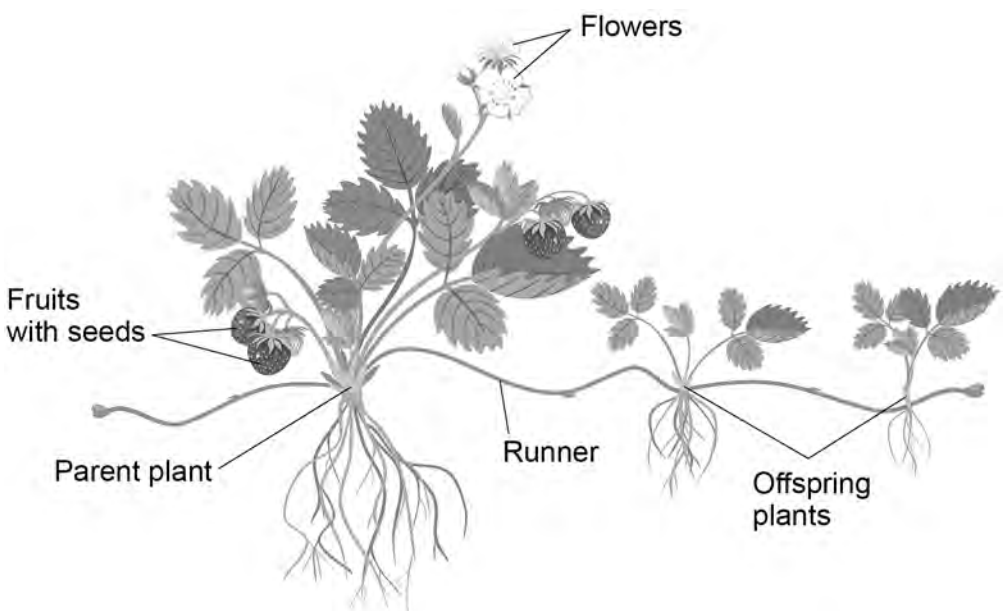
Question 14 · continued

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 3 . 4 Meiosis produces gametes.

What is the name of the male gamete in a flower?

[1 mark]

Tick (✓) **one** box.

Embryo ☐

Ovum ☐

Pollen ☐

4.6.1.2 Meiosis

Question 14 · continued

0 3 . 5 Which process produces new cells in runners?

[1 mark]

Tick (✓) **one** box.

- Binary fission ☐
- Evolution ☐
- Mitosis ☐

0 3 . 6 Substances used for growth pass through the runners from the parent plant to the offspring plants.

Which **two** substances pass through the runners?

[2 marks]

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- DNA ☐
- Insulin ☐
- Sugar ☐
- Water ☐

Question 3 continues on the next page

4.6.1.2 Meiosis

Question 14 · continued

Sexual reproduction and asexual reproduction each have different advantages for the strawberry plant.

0 3 . 7 Give **one** advantage of reproducing **sexually**.

[1 mark]

0 3 . 8 Give **one** advantage of reproducing **asexually**.

[1 mark]

10