AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.1.8

Sex determination

Past-paper questions

Tier	**Foundation**
Question groups	**8**
Available paper years	**2009–2025**

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.

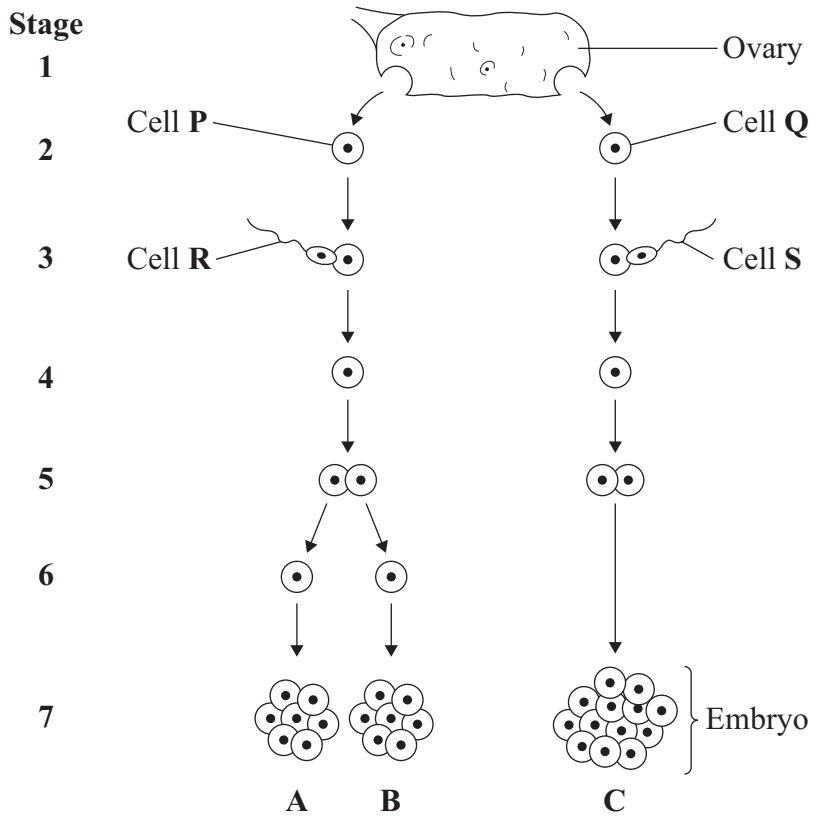
4.6.1.8 Sex determination

Question 01

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)

4.6.1.8 Sex determination

Question 01 · 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

4.6.1.8 Sex determination

Question 01 · 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

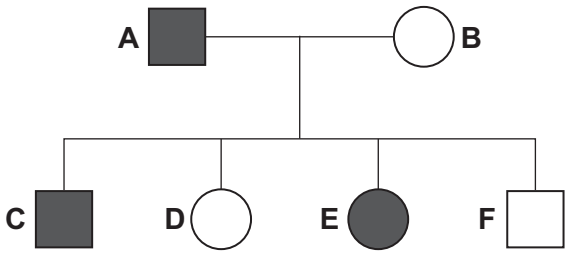
4.6.1.8 Sex determination

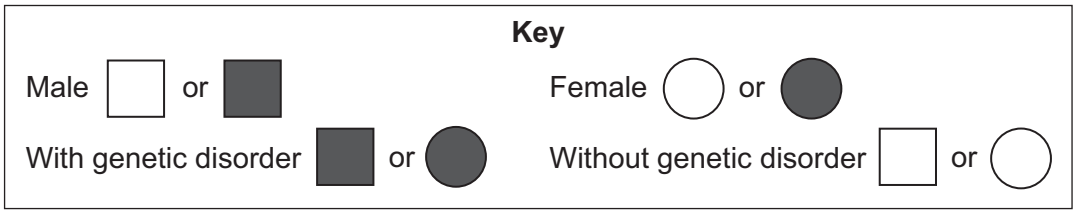
Question 02

January 2011 | BLY2F | Original Q4 | Legacy

4 The diagram shows the family tree of a pair of pigs, **A** and **B**.
Pigs **A** and **B** have four offspring, **C**, **D**, **E** and **F**.

Some of the pigs have a genetic disorder.





4 (a) Which pig, **A**, **B**, **C**, **D**, **E** or **F**, is:

4 (a) (i) a male pig with the genetic disorder ☐

(1 mark)

4 (a) (ii) a female pig without the genetic disorder? ☐

(1 mark)

4 (b) Draw a ring around the correct answer to complete the sentences.

Pig **C** has the genetic disorder.

4 (b) (i) Pig **C** inherited the genetic disorder from

pig **A**.
pig **B**.
pig **E**.

(1 mark)

4 (b) (ii) The gene for the genetic disorder was passed on in

an embryo.
an enzyme.
a gamete.

(1 mark)

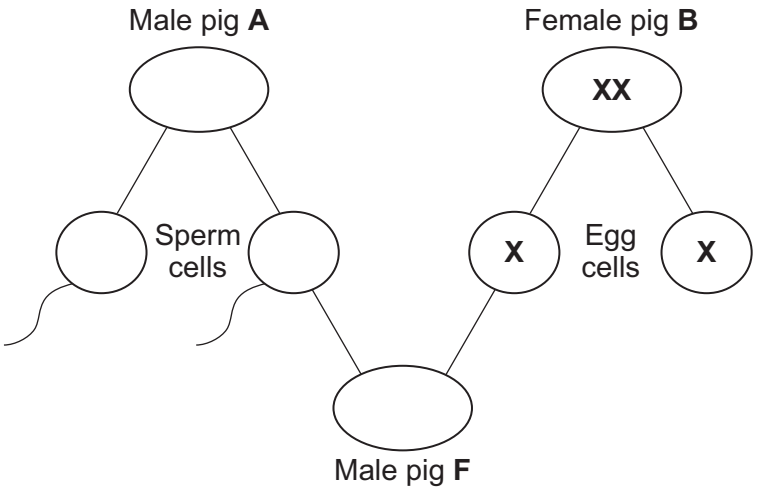
4.6.1.8 Sex determination

Question 02 · continued

4 (c) Pig **F** is a male.

Complete the diagram to show how the sex of pig **F** depends on the inheritance of the sex chromosomes **X** and **Y**.

The sex chromosomes of pig **B** and the egg cells have been completed for you.



(3 marks)

7

4.6.1.8 Sex determination

Question 03

June 2012 | BL2FP | Original Q4 | Legacy

4 (a) Human body cells contain 46 chromosomes.

4 (a) (i) How many chromosomes are there in a human sperm cell? ☐

(1 mark)

4 (a) (ii) Name the part of the sperm cell that contains the chromosomes.

.....

(1 mark)

4 (b) Draw a ring around the correct answer to complete each sentence.

4 (b) (i) In human females, the sex chromosomes are

X and **X**.

X and **Y**.

Y and **Y**.

(1 mark)

4 (b) (ii) In human males, the sex chromosomes are

X and **X**.

X and **Y**.

Y and **Y**.

(1 mark)

4 (c) A man might release 300 million sperm cells at a time.

How many of these sperm cells would contain an **X** chromosome?

.....

(1 mark)

5

4.6.1.8 Sex determination

Question 04

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

4.6.1.8 Sex determination

Question 05

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

4.6.1.8 Sex determination

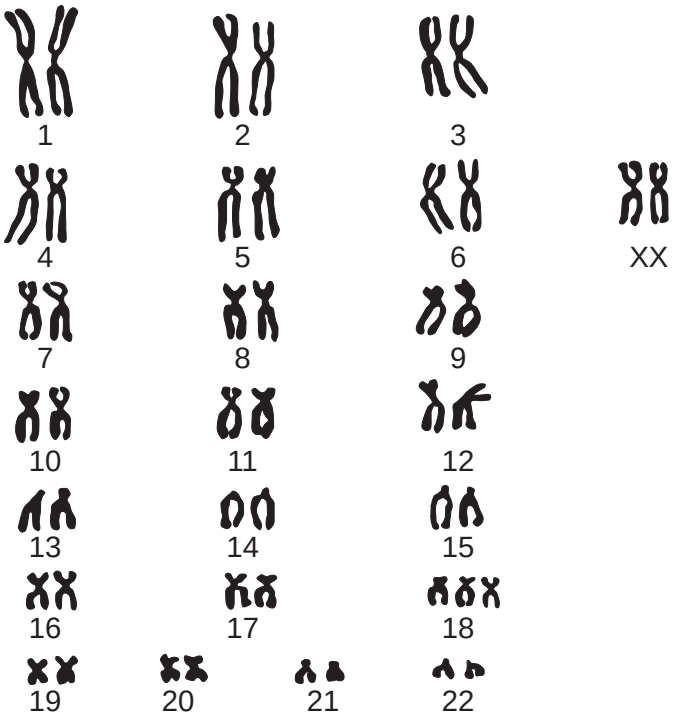
Question 06

June 2015 | BL2FP | Original Q5 | Legacy

5 Genetic disorder **E** is a condition caused by a change in the chromosomes.

5 (a) **Figure 4** shows the chromosomes from one cell of a person with genetic disorder **E**.

Figure 4



5 (a) (i) How do you know this person is female?

Use information from **Figure 4**.

[1 mark]

.....

.....

5 (a) (ii) Describe how the chromosomes shown in **Figure 4** are different from the chromosomes from a person who does not have genetic disorder **E**.

[2 marks]

.....

.....

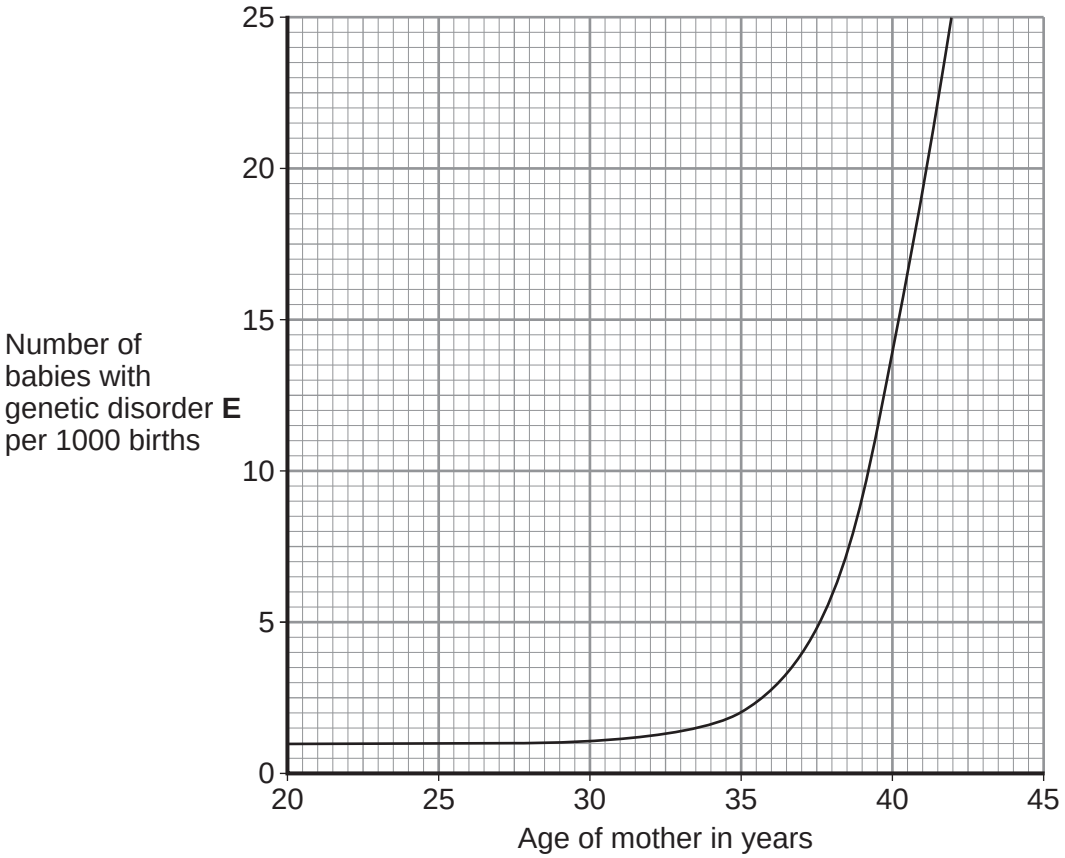
.....

.....

5 (b) As a woman gets older, the chance of her having a baby with genetic disorder **E** increases.

Figure 5 shows this.

Figure 5



5 (b) (i) The chance of a 35-year-old woman having a baby with genetic disorder **E** is 2 per 1000 births.

What is the chance of a 40-year-old woman having a baby with genetic disorder **E**?

[1 mark]

..... per 1000 births

5 (b) (ii) A 40-year-old woman is more likely than a 35-year-old woman to have a baby with genetic disorder **E**.

How many times more likely?

[1 mark]

..... times

Question 5 continues on the next page

4.6.1.8 Sex determination

Question 06 · continued

5 (c) A 41-year-old woman wants to have a baby. A 41-year-old woman has an increased chance of having a baby with genetic disorder **E**.

Doctors can screen embryos for genetic disorder **E**.

Table 2 gives some information about two methods of embryo screening.

Table 2

Method 1	Method 2
1 The woman is given hormones to cause the release of a few eggs. The eggs are taken from her body in a minor operation. The eggs are fertilised in a glass dish.	1 The woman gets pregnant in the normal way.
2 One cell is taken from each embryo when the embryo is 3 days old.	2 Cells are taken when the embryo is 10 weeks old.
3 Cells are screened for genetic disorder **E**.	3 Cells are screened for genetic disorder **E**.
4 An unaffected embryo is placed in the woman's uterus. Embryos that are not used are destroyed or used in medical research.	4 An unaffected fetus is allowed to develop. If the fetus has genetic disorder **E**, the woman can choose to have an abortion.
5 This method costs about £6000.	5 This method costs about £600.

Use information from **Table 2** to give **two** advantages and **one** disadvantage of **Method 1** compared with **Method 2** for detecting genetic disorder **E**.

[3 marks]

Advantages of **Method 1**:

1 .....

.....

2 .....

.....

Disadvantage of **Method 1**:

.....

.....

8

4.6.1.8 Sex determination

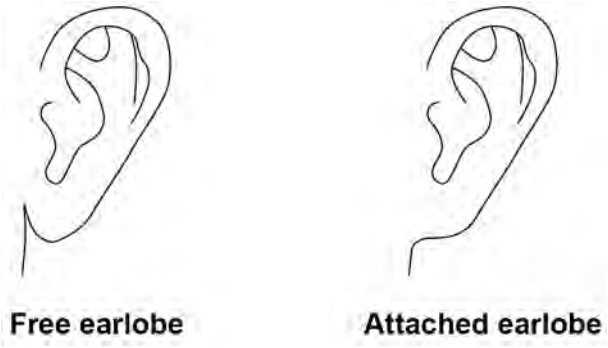
Question 07

June 2019 | 8461/2F | Original Q2

0 2 The shape of a person's earlobes is controlled by a gene.

Figure 3 shows two types of earlobe.

Figure 3



A dominant allele codes for free earlobes.

0 2 . 1 What is a dominant allele?

[1 mark]

Tick (✓) **one** box.

An allele expressed even if a person only has one copy of the allele ☐

An allele expressed only if a person has two copies of the allele ☐

An allele expressed only if a person has no recessive allele ☐

An allele expressed only if it is inherited from the male parent ☐

Question 2 continues on the next page

4.6.1.8 Sex determination

Question 07 · continued

0 2 . 2 A man with free earlobes and a woman with attached earlobes have children together.

Complete **Figure 4** to show the possible genotypes of the children.

Use the symbols:

E = allele for free earlobes
e = allele for attached earlobes

[2 marks]

Figure 4

Woman

Man		**e**	**e**
	E	**Ee**	
	e		

0 2 . 3 What is the probability that one of the children would have attached earlobes?

Use **Figure 4**.

[1 mark]

Tick (✓) **one** box.

0.125 ☐ 0.25 ☐ 0.5 ☐ 0.75 ☐

4.6.1.8 Sex determination

Question 07 · continued

0 2 . 4 **Figure 5** shows the inheritance of the sex chromosomes, **X** and **Y**.

Complete **Figure 5** to show the sex chromosomes in the gametes of the man and the woman.

[2 marks]

Figure 5

		Woman	
Man		**XX**	**XX**
		XY	**XY**

0 2 . 5 Calculate the probability that the man and the woman's next child will be a girl with attached earlobes.

[2 marks]

Use the equation:

probability of a girl with attached earlobes

= probability of attached earlobes × probability of being a girl

Probability of a girl with attached earlobes = _____

8

4.6.1.8 Sex determination

Question 08

0 1 Some people keep rabbits as pets.

Figure 1 shows two types of rabbit.

Figure 1



Himalayan rabbit
has black patches

White rabbit
has no black patches

The fur colour pattern in the Himalayan rabbit is caused by a dominant allele.

0 1 . 1 What is a dominant allele?

[1 mark]

Tick (✓) **one** box.

An allele expressed only if a rabbit has two copies of the allele ☐

An allele expressed only if it is inherited from the male rabbit ☐

An allele expressed when a rabbit has only one copy of the allele ☐

Question 1 continues on the next page

In Questions **01.2** and **01.3**, use the following symbols:

H = dominant allele for Himalayan fur pattern

h = recessive allele for white fur.

0 1 . 2 What is the genotype of a white rabbit?

[1 mark]

Tick (✓) **one** box.

HH ☐ **Hh** ☐ **hh** ☐

A male Himalayan rabbit was crossed with a female Himalayan rabbit.

The male rabbit and the female rabbit each had the heterozygous genotype **Hh**.

Some of the offspring were Himalayan rabbits and some of the offspring were white rabbits.

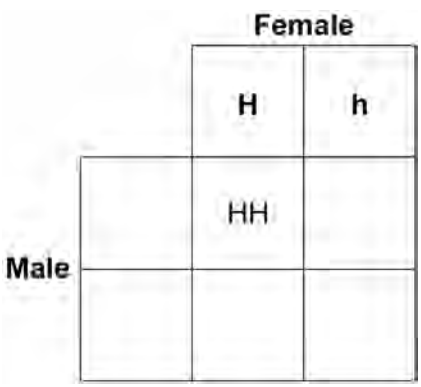
0 1 . 3 Complete the Punnett square diagram in **Figure 2**.

You should show:

- the male gametes
- the offspring genotypes.

[3 marks]

Figure 2



4.6.1.8 Sex determination

Question 08 · continued

0 1 . 4 Some of the offspring in **Figure 2** are homozygous and some are heterozygous.

Draw a ring around the genotype of **one homozygous** offspring in **Figure 2**.

[1 mark]

0 1 . 5 Four offspring were born.

How many of the four offspring would you expect to be Himalayan rabbits?

Use **Figure 2**.

[1 mark]

Tick (✓) **one** box.

1 ☐ 2 ☐ 3 ☐ 4 ☐

0 1 . 6 Inheritance of sex in rabbits is the same as inheritance of sex in humans.

A female rabbit has two X chromosomes in each body cell.

How many X chromosomes does a male rabbit have in each body cell?

[1 mark]

Tick (✓) **one** box.

0 ☐ 1 ☐ 2 ☐

0 1 . 7 Some of the offspring in **Figure 2** would be male and some of the offspring would be female.

How many of the four offspring in Question **01.5** would you predict to be female?

[1 mark]

9