AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.3.3

The understanding of genetics (biology only)

Past-paper questions

Tier	**Foundation**
Question groups	**4**
Available paper years	**2013–2024**

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.

4.6.3.3 The understanding of genetics (biology only)

Question 01

January 2013 | BL2FP | Original Q5 | Legacy

5 In each question, draw a ring around the correct answer to complete the sentence.

5 (a) Our understanding of how genes are inherited is mostly because of

the work of

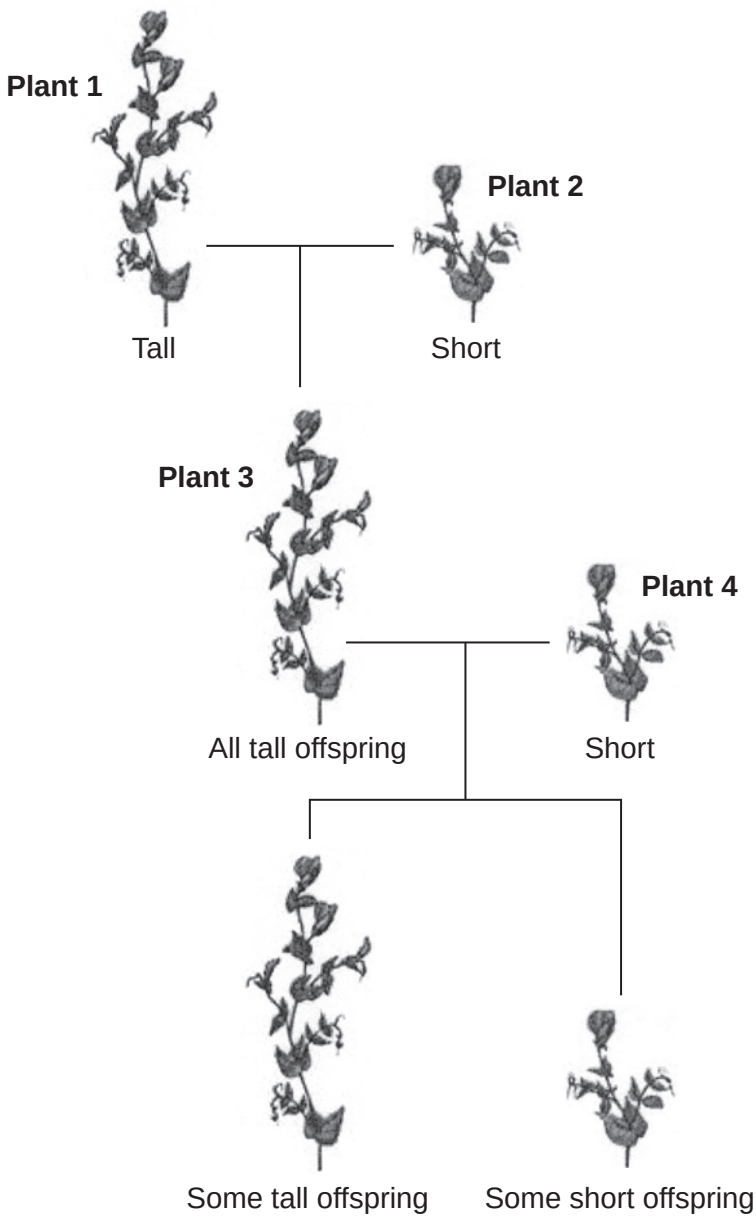
Darwin.
Lamarck.
Mendel.

(1 mark)

5 (b) A scientist investigated inheritance in pea plants.

The scientist crossed tall pea plants with short pea plants. **Diagram 1** shows the results.

Diagram 1



4.6.3.3 The understanding of genetics (biology only)

Question 01 · continued

In the rest of this question, the following symbols are used to represent alleles.

T = allele for tall
t = allele for short

5 (b) (i) The 1st cross in **Diagram 1** produced 120 offspring. All of these offspring were tall.

This shows that **plant 1** contained the alleles

- **TT**.
- **Tt**.
- **tt**.

(1 mark)

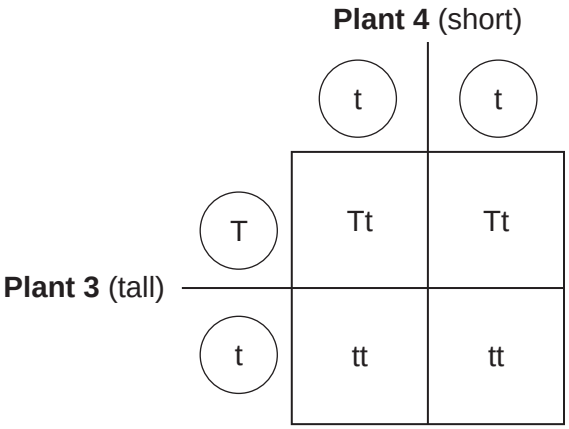
5 (b) (ii) **Plant 3** is tall because of

- a dominant allele.
- the environment.
- a recessive allele.

(1 mark)

5 (c) **Diagram 2** gives more information about the cross between **plant 3** and **plant 4**.

Diagram 2



This cross produced some tall offspring and some short offspring.

The ratio of tall to short offspring in **Diagram 2** is

- 1:1.
- 2:1.
- 3:1.

(1 mark)

Question 5 continues on the next page

4.6.3.3 The understanding of genetics (biology only)

Question 01 · continued

5 (d) Two short plants were crossed. This cross produced 100 offspring.

The expected offspring would be

- 100 short plants.
- 50 tall plants and 50 short plants.
- 75 tall plants and 25 short plants.

(1 mark)

5

4.6.3.3 The understanding of genetics (biology only)

Question 02

0 4 In the mid-19th century, a scientist studied inheritance in pea plants.

The scientist's work was the beginning of our modern understanding of genetics.

0 4 . 1 What is the name of this scientist?

[1 mark]

Tick **one** box.

- Alfred Russel Wallace ☐
- Charles Darwin ☐
- Gregor Mendel ☐
- Jean-Baptiste Lamarck ☐

0 4 . 2 In the mid-20th century, other scientists identified the chemical substance that makes up genetic material.

What is the name of the chemical substance that makes up genetic material?

[1 mark]

Tick **one** box.

- Carbohydrate ☐
- DNA ☐
- Lipid ☐
- Protein ☐

4.6.3.3 The understanding of genetics (biology only)

Question 02 · continued

0 4 . 3 A gene often has two alleles.

One allele is dominant and the other allele is recessive.

When is a recessive allele expressed as a characteristic?

[1 mark]

Tick **one** box.

- When the dominant allele is not present ☐
- When the recessive allele is inherited from the female parent ☐
- When the recessive allele is inherited from the male parent ☐
- When the recessive allele is present on only one of the chromosomes ☐

Question 4 continues on the next page

4.6.3.3 The understanding of genetics (biology only)

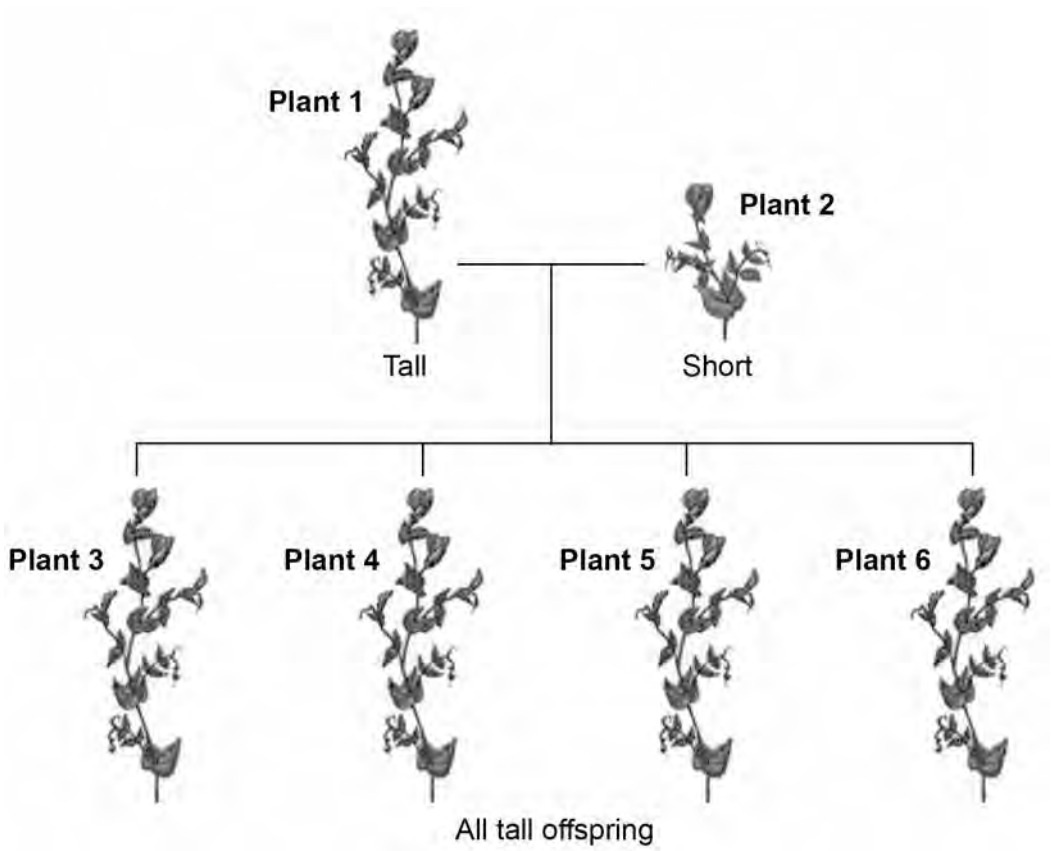
Question 02 · continued

A scientist investigated the inheritance of height in pea plants.

The scientist crossed tall pea plants with short pea plants.

Figure 4 shows the scientist's results.

Figure 4



4.6.3.3 The understanding of genetics (biology only)

Question 02 · continued

In Questions **04.4** and **04.5**, use the following symbols to represent alleles:

T = the dominant allele for tall.

t = the recessive allele for short.

0 4 . 4 In **Figure 4**, the genotype of plant **1** is **TT**.

Give the genotype of plant **2**.

[1 mark]

_____

0 4 . 5 The scientist crossed plant **3** with plant **4**.

Complete **Figure 5** to show the offspring produced from this cross.

[2 marks]

Figure 5

		Male gametes: **T**	Male gametes: **t**
Female gametes: **T**		**TT**	
Female gametes: **t**			

0 4 . 6 Draw a circle around **one** of the homozygous offspring in **Figure 5**.

[1 mark]

0 4 . 7 What is the ratio of tall plants **:** short plants in the offspring in **Figure 5**?

[1 mark]

Ratio of tall plants **:** short plants = _____ **:** _____

8

4.6.3.3 The understanding of genetics (biology only)

Question 03

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]

4.6.3.3 The understanding of genetics (biology only)

Question 03 · 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

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% ☐

4.6.3.3 The understanding of genetics (biology only)

Question 03 · 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

4.6.3.3 The understanding of genetics (biology only)

Question 04

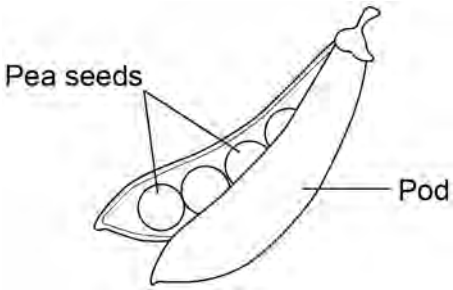
0 8

In 1866, a monk called Gregor Mendel published the results of his investigations into inheritance in pea plants.

Pea plants produce seeds in a pod.

Figure 9 shows a pea pod.

Figure 9

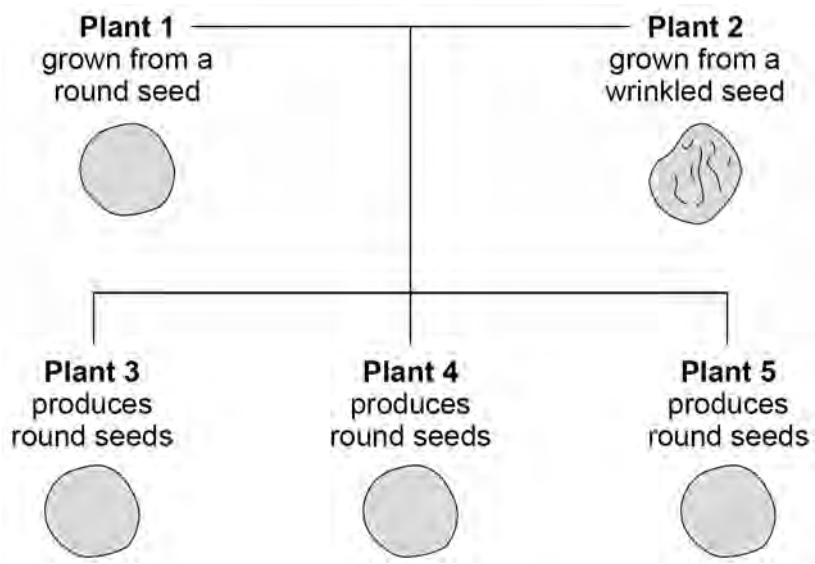


Pea seeds can be round or wrinkled in shape.

Mendel crossed pea plants that produced round seeds with pea plants that produced wrinkled seeds.

Figure 10 shows the results.

Figure 10



4.6.3.3 The understanding of genetics (biology only)

Question 04 · continued

In questions **08.1** to **08.3** use the following symbols to represent the alleles:

R = dominant allele for round seeds

r = recessive allele for wrinkled seeds.

0 8 . 1 In **Figure 10**, the genotype of plant **1** is **RR**.

Give the genotype of plant **2**.

[1 mark]

_____

Mendel collected the seeds from plants **3** and **4** and grew new plants from the seeds.

Mendel crossed the new plants.

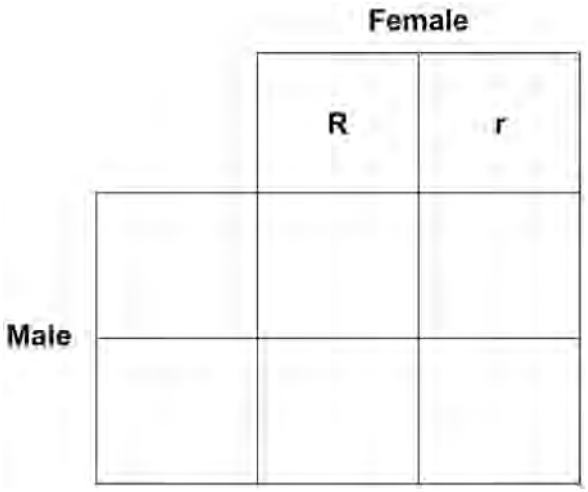
0 8 . 2 Complete the Punnett square diagram in **Figure 11**.

You should show:

- the male gametes
- the offspring genotypes.

[3 marks]

Figure 11



0 8 . 3 Give the ratio of round seeds to wrinkled seeds in the offspring in **Figure 11**.

[1 mark]

Ratio of round seeds to wrinkled seeds = _____ : _____

4.6.3.3 The understanding of genetics (biology only)

Question 04 · continued

0 8 . 4 Some of the offspring in **Figure 11** are homozygous and some are heterozygous.

What does 'heterozygous' mean?

[1 mark]

0 8 . 5 Mendel published his work in 1866.

Suggest **two** reasons why the importance of Mendel's work was **not** recognised until the early 1900s.

[2 marks]

1

2

8