AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.6.1.4

Genetic inheritance

Past-paper questions

Tier	**Foundation**
Question groups	**7**
Available paper years	**2018–2025**

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.

4.6.1.4 Genetic inheritance

Question 01

June 2018 | 8464/B/2F | Original Q5

0 5 Variation in individual organisms can be caused by:

- genes
- the environment
- a combination of both genes and the environment.

Figure 7 shows variations in a woman.

Figure 7



0 5 . 1 What is the cause of each variation in **Table 5**?

Tick only **one** box in each row.

[3 marks]

Table 5

Variation	Cause of variation		
	Genes only	Environment only	Both genes and the environment
Brown eyes			
Light brown skin colour			
Short hair			

4.6.1.4 Genetic inheritance

Question 01 · continued

0 5 . 2 The allele for blue eyes is recessive (**b**).

The allele for brown eyes is dominant (**B**).

A woman has blue eyes.

What are the woman's alleles?

[1 mark]

Tick **one** box.

BB ☐ **Bb** ☐ **bb** ☐

0 5 . 3 The woman marries a man with the alleles **Bb** for eye colour.

What colour eyes does the man have?

[1 mark]

0 5 . 4 Complete the Punnett square diagram in **Figure 8** for this man and woman.

[1 mark]

Figure 8

		Woman	
Man	**B**		
	b		

0 5 . 5 What is the probability that a child of this man and woman will have brown eyes?

[1 mark]

Question 5 continues on the next page

4.6.1.4 Genetic inheritance

Question 01 · continued

0 5 . 6 What is the scientific term used for the child's eye colour?

[1 mark]

Tick **one** box.

- Chromosome ☐
- Condition ☐
- Genotype ☐
- Phenotype ☐

0 5 . 7 What effect will a mutation have?

[1 mark]

Tick **one** box.

- Almost certainly have no effect ☐
- Definitely change appearance ☐
- Definitely be passed on to all children ☐
- Probably cause a disease ☐

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4.6.1.4 Genetic inheritance

Question 02

June 2019 | 8464/B/2F | Original Q4

0 4 A cat breeder noticed that four kittens from one Siamese cat mother had a new blue colour at the tip of their tails.

0 4 . 1 What has caused the new colour to appear?

[1 mark]

Tick (✓) **one** box.

- Fertilisation ☐
- Mitosis ☐
- Mutation ☐

0 4 . 2 The cat breeder wants to use selective breeding so that all new kittens have blue tail tips.

Describe the process of selective breeding the cat breeder could use.

[3 marks]

0 4 . 3 Suggest **one** reason why the cat breeder wants to have all new kittens with the blue tail tips.

[1 mark]

Question 02 · continued

0 4 . 4 Siamese cats can suffer from heart defects.

Why might there be more Siamese cats with heart defects amongst the kittens with blue tail tips?

[1 mark]

Tick (✓) **one** box.

They are clones ☐

They are formed by mitosis ☐

They are formed by sexual reproduction ☐

They are produced by inbreeding ☐

With each pregnancy, the cat breeder expected that:

- 50% of the kittens would be male
- 50% of the kittens would be female.

The sex chromosomes in cats are inherited in the same way as in humans.

The sex chromosomes are X and Y.

0 4 . 5 Give the combination of sex chromosomes present in a male cat and in a female cat.

[1 mark]

Male cat _____

Female cat _____

4.6.1.4 Genetic inheritance

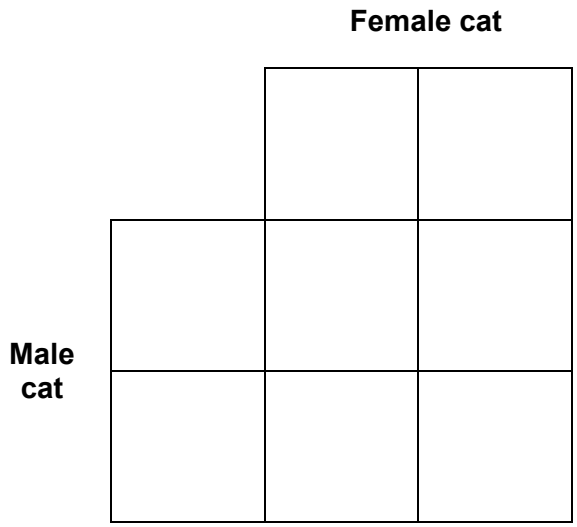
Question 02 · continued

0 4 . 6 The cat breeder expected 50% male kittens and 50% female kittens.

Complete the Punnett square in **Figure 3** to show why.

[2 marks]

Figure 3



0 4 . 7 In the first pregnancy there was one male kitten and three female kittens.

Give the reason why there were **not** two kittens of each sex.

[1 mark]

10

4.6.1.4 Genetic inheritance

Question 03

November 2021 | 8464/B/2F | Original Q1

0 1 A human body cell contains 46 chromosomes.

0 1 . 1 How many chromosomes does a human sperm cell contain?

[1 mark]

Tick (✓) **one** box.

22 ☐ 23 ☐ 46 ☐

0 1 . 2 Draw **one** line from each word to the meaning of that word.

[3 marks]

Word	Meaning
Gene	A small ring of DNA in the cytoplasm
Genome	All the genetic material of an organism
Nucleus	A small section of DNA which codes for a protein
	A structure which contains chromosomes

4.6.1.4 Genetic inheritance

Question 03 · continued

Some plants contain a harmful chemical called PTC.

Some people can taste PTC.

0 1 . 3 Suggest **one** advantage of being able to taste PTC.

[1 mark]

Only people with a dominant allele **T** can taste PTC.

People with **only** the allele **t** cannot taste PTC.

0 1 . 4 A person has the genotype **Tt**.

What word describes the person's genotype?

[1 mark]

Tick (✓) **one** box.

- Heterozygous ☐
- Phenotype ☐
- Recessive ☐

0 1 . 5 Give the genotype of a person who **cannot** taste PTC.

[1 mark]

4.6.1.4 Genetic inheritance

Question 03 · continued

0 1 . 6 A woman and a man plan to have a child.

The woman and the man both have the genotype **Tt**.

Complete **Figure 1** to show the possible genotypes of the child.

[2 marks]

Figure 1

		Woman	
		T	**t**
Man	**T**	**T T**	
	t		

0 1 . 7 What is the chance of the child being able to taste PTC?

Use **Figure 1**.

[1 mark]

Tick (✓) **one** box.

25% ☐ 50% ☐ 75% ☐ 100% ☐

10

4.6.1.4 Genetic inheritance

Question 04

June 2022 | 8464/B/2F | Original Q1

0 1 This question is about genetics.

0 1 . 1 Crop plants are genetically modified (GM) for useful characteristics.

Which useful characteristic are crops genetically modified for?

[1 mark]

Tick (✓) **one** box.

Fewer roots ☐

Larger yields ☐

Smaller fruits ☐

0 1 . 2 What is **one** concern about GM crops?

[1 mark]

Tick (✓) **one** box.

GM crops will add to global warming. ☐

GM crops will cause air pollution. ☐

GM crops will harm wildlife. ☐

GM crops will produce too much food. ☐

Some inherited disorders are caused by a faulty piece of DNA.

0 1 . 3 What is the name of a piece of DNA that codes for a characteristic?

[1 mark]

_____

4.6.1.4 Genetic inheritance

Question 04 · continued

0 1 . 4 DNA contains a code for making substances in the cell.

What type of substance is made using the DNA code?

[1 mark]

Tick (✓) **one** box.

- Fat ☐
- Protein ☐
- Starch ☐
- Sugar ☐

Cystic fibrosis (CF) is an inherited disorder.

The allele for having CF is recessive (**h**).

The allele for **not** having CF is dominant (**H**).

0 1 . 5 What is a recessive allele?

[1 mark]

Tick (✓) **one** box.

- An allele that is always expressed. ☐
- An allele that is expressed if only one copy is present. ☐
- An allele that is only expressed if two copies are present. ☐

Question 1 continues on the next page

Question 04 · continued

A man and a woman do **not** have CF. The man has the alleles **Hh**.

0 1 . 6 What word describes the alleles of the man?

[1 mark]

Tick (✓) **one** box.

Heterozygous ☐

Homozygous ☐

Phenotype ☐

0 1 . 7 The man and the woman want to have a child.

Complete **Figure 1** to show the possible genotypes of the child.

Draw a ring around the genotype of a child who will have CF.

[3 marks]

Figure 1

		Woman	
		H	**h**
Man	**H**		
	h		hh

4.6.1.4 Genetic inheritance

Question 04 · continued

0 1 . 8 What is the chance that a child of the man and the woman will have CF?

[1 mark]

Tick (✓) **one** box.

25% ☐ 50% ☐ 75% ☐ 100% ☐

0 1 . 9 The woman is pregnant.

The woman can have embryo screening to find out if the child will have CF.

Suggest **one** reason why the woman might **not** want to have embryo screening.

[1 mark]

_____

_____

_____

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4.6.1.4 Genetic inheritance

Question 05

June 2023 | 8464/B/2F | Original Q6

0 6 Sexual reproduction in humans involves the production of egg cells and sperm cells.

0 6 . 1 Name the type of cell division that produces egg cells and sperm cells.

[1 mark]

0 6 . 2 Sexual reproduction produces offspring that are genetically different from each other.

Give **two** reasons why sexual reproduction causes variation in the offspring.

[2 marks]

1 _____

_____

2 _____

_____

Question 6 continues on the next page

4.6.1.4 Genetic inheritance

Question 05 · continued

Polydactyly is an inherited disorder.

The allele for polydactyly is dominant, **D**.

A person with two copies of the allele **d** will **not** have polydactyly.

0 6 . 3 A person with the genotype **DD** is homozygous.

What word describes the genotype **Dd**?

[1 mark]

_____

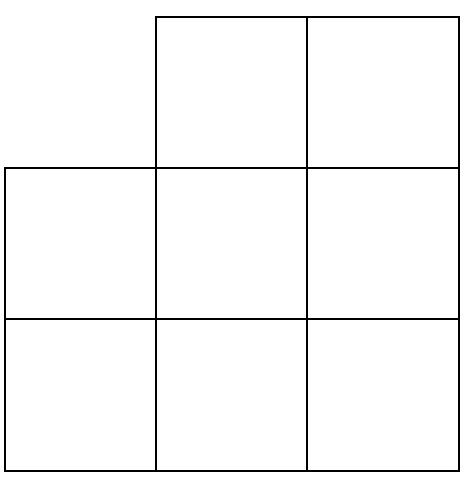
0 6 . 4 A person with the genotype **Dd** and a person with the genotype **dd** plan to have a child.

Determine the probability that the child will have polydactyly.

You should:

- complete the Punnett square diagram
- identify any offspring genotype that would have polydactyly.

[5 marks]



Probability that the child will have polydactyly = _____

4.6.1.4 Genetic inheritance

Question 05 · continued

0 6 . 5 Embryos can be screened for the alleles that cause inherited disorders.

Give **two** advantages of embryo screening.

[2 marks]

1 _____

_____

2 _____

_____

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Turn over for the next question

4.6.1.4 Genetic inheritance

Question 06

June 2024 | 8464/B/2F | Original Q1

0 1 Cystic fibrosis is a genetic disorder.

0 1 . 1 Cystic fibrosis affects the movement of substances into and out of cells.

Which part of a cell controls the movement of substances into and out of the cell?

[1 mark]

Tick (✓) **one** box.

- Cell membrane ☐
- Cytoplasm ☐
- Mitochondria ☐

Cystic fibrosis is caused by a recessive allele, **b**.

0 1 . 2 What name is given to the allele **B**?

[1 mark]

Tick (✓) **one** box.

- DNA ☐
- Dominant ☐
- Gene ☐

0 1 . 3 Which term describes the genotype **Bb**?

[1 mark]

Tick (✓) **one** box.

- Chromosome ☐
- Heterozygous ☐
- Phenotype ☐

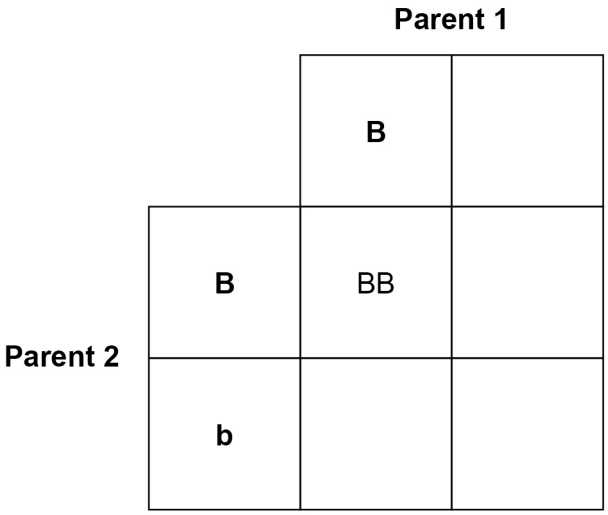
0 1 . 4 Two people plan to have a child.

Both people have the genotype **Bb**.

Complete **Figure 1** to show the possible genotypes of the child.

[3 marks]

Figure 1



0 1 . 5 What is the chance that a child of these parents will have cystic fibrosis?

Use **Figure 1**.

[1 mark]

Tick (✓) **one** box.

0% ☐ 25% ☐ 50% ☐ 75% ☐

Question 1 continues on the next page

Question 06 · continued

0 1 . 6 An embryo can be tested to find out its genotype.

What is the name of the testing process?

[1 mark]

Tick (✓) **one** box.

Genetic engineering ☐

Screening ☐

Selective breeding ☐

0 1 . 7 Inherited disorders can be caused by changes in DNA.

What is the name of a change in DNA?

[1 mark]

Tick (✓) **one** box.

Genome ☐

Helix ☐

Mutation ☐

0 1 . 8 Inheritance is one cause of variation in a population.

Environmental factors also cause variation in a population.

Suggest **one** environmental cause of variation in a human population.

Do **not** refer to inheritance or to changes in DNA in your answer.

[1 mark]

_____

_____

10

4.6.1.4 Genetic inheritance

Question 07

June 2025 | 8464/B/2F | Original Q5

0 5 This question is about genetics.

The fur colour of rabbits is controlled by two alleles.

0 5 . 1 Draw **one** line from each term to the meaning of the term relating to genetics in rabbits.

[3 marks]

Term	Meaning of the term
Chromosome	A fur colour that is seen
Gene	A whole strand of DNA found in the nucleus of a rabbit cell
Genome	Codes for a protein that affects fur colour
	The complete genetic composition of a rabbit

Question 5 continues on the next page

4.6.1.4 Genetic inheritance

Question 07 · continued

0 5 . 2 In rabbits:

- the allele for brown fur (**B**) is dominant
- the allele for white fur (**b**) is recessive.

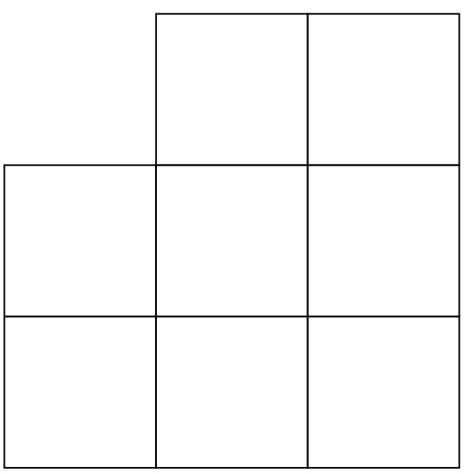
A rabbit with the alleles **Bb** and a rabbit with the alleles **bb** breed together.

Determine the probability that one of the offspring will have white fur.

You should:

- complete the Punnett square diagram
- identify any offspring that will have white fur.

[5 marks]



Probability = _____

4.6.1.4 Genetic inheritance

Question 07 · continued

0 5 . 3 A male rabbit is heterozygous for fur colour.

The rabbit's body cells have the genotype **Bb**.

One of the sperm cells from the rabbit has the allele **b**.

Explain why the alleles in the rabbit's body cells and the allele in the sperm cell are different.

[2 marks]

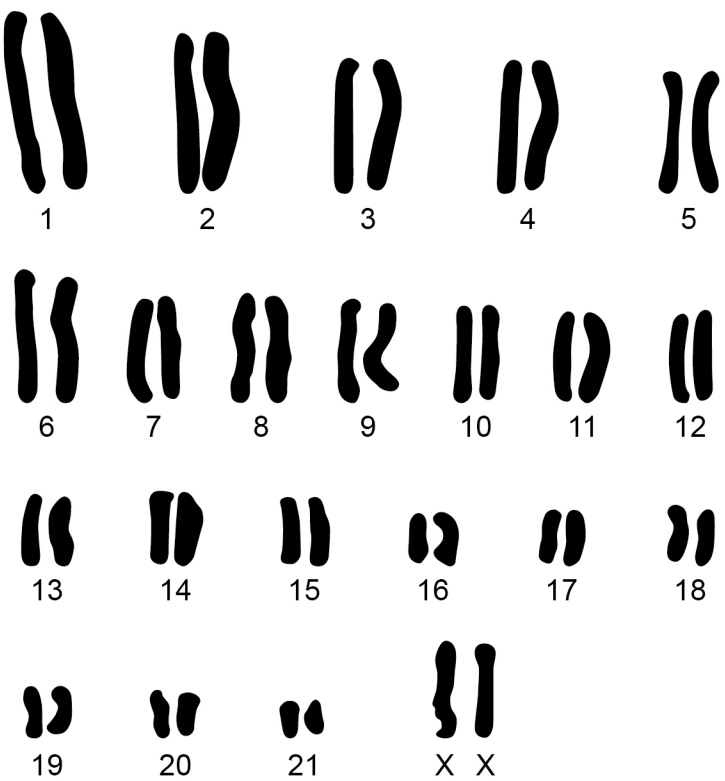
Question 5 continues on the next page

4.6.1.4 Genetic inheritance

Question 07 · continued

Figure 7 shows the chromosomes of a rabbit.

Figure 7



0 5 . 4 How many chromosomes would be found in a skin cell of a rabbit?

Use **Figure 7**.

[1 mark]

Number of chromosomes = _____

0 5 . 5 The sex of a rabbit is controlled in the same way as the sex of a human.

Give the evidence from **Figure 7** that the rabbit is female.

[1 mark]

_____

_____

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