AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.1.2.1

Chromosomes

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.

4.1.2.1 Chromosomes

Question 01

June 2018 | 8464/B/2F | Original Q2

0 2 The genetic material in cells is made of DNA.

0 2 . 1 Which **two** of the following describe the structure of DNA?

[2 marks]

Tick **two** boxes.

- A double helix ☐
- A monomer ☐
- A polymer ☐
- A protein ☐
- A single strand ☐

0 2 . 2 Complete the sentences.

Choose answers from the box.

[2 marks]

clone	**disorder**	**gene**
genome		**mutation**

A small section of DNA which codes for one protein is called a _____ .

All the genetic material of an organism is called its _____ .

0 2 . 3 Gametes (sex cells) contain half the amount of DNA compared to body cells.

Give the names of the **two** types of gametes in humans.

[1 mark]

_____ and _____

0 2 . 4 What is the process called when the gametes join?

[1 mark]

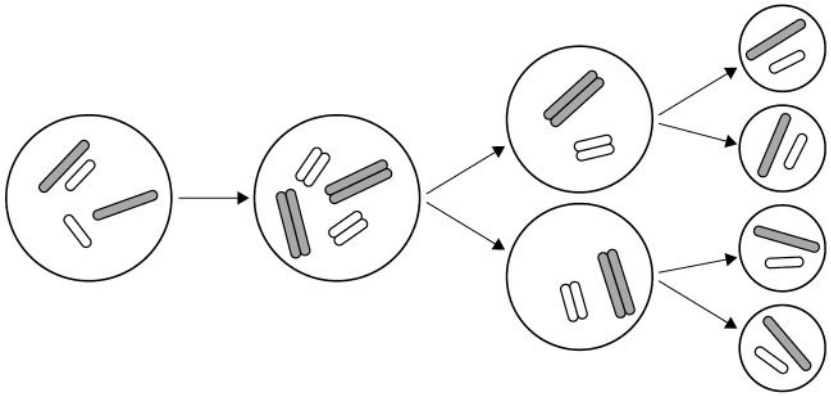
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4.1.2.1 Chromosomes

Question 01 · continued

0 2 . 5 **Figure 1** shows cell division by meiosis to form gametes.

Figure 1



Which **two** features in **Figure 1** show that this cell division is meiosis and **not** mitosis?

[2 marks]

Tick **two** boxes.

- The cell divides twice ☐
- The chromosomes pull apart into the new cells ☐
- The cytoplasm divides into new cells ☐
- The DNA is copied ☐
- The new cells have half the number of chromosomes ☐

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4.1.2.1 Chromosomes

Question 02

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			

4.1.2.1 Chromosomes

Question 02 · 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

4.1.2.1 Chromosomes

Question 02 · 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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4.1.2.1 Chromosomes

Question 03

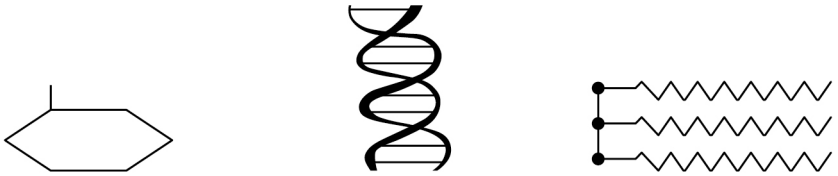
November 2020 | 8464/B/2F | Original Q6

0 6 This question is about DNA and genes.

0 6 . 1 Which diagram represents a DNA molecule?

[1 mark]

Tick (✓) **one** box.



☐ ☐ ☐

0 6 . 2 Describe the structure of a DNA molecule.

[1 mark]

_____

_____

0 6 . 3 A gene is a small section of DNA on a chromosome.

Complete the sentences.

[2 marks]

A gene codes for a particular sequence of _____ .

This sequence makes a specific _____ .

4.1.2.1 Chromosomes

Question 03 · continued

0 6 . 4 What is meant by the term genome?

[1 mark]

0 6 . 5 The complete human genome is now known.

Which important scientific advance was made using knowledge of the human genome?

[1 mark]

Tick (✓) **one** box.

- Discovering antibiotic resistant bacteria ☐
- Finding more foods to eat from tropical forests ☐
- Tracing how aboriginal people spread across Australia ☐
- Working out when the last ice age ended ☐

Question 6 continues on the next page

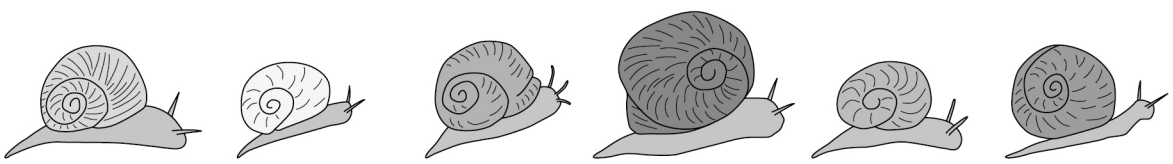
4.1.2.1 Chromosomes

Question 03 · continued

A student found six different snails of one species in his garden.

Figure 7 shows the snails.

Figure 7



0 6 . 6 All the snails are different.

What scientific term describes differences in characteristics between individuals of a species?

[1 mark]

0 6 . 7 A change in DNA has caused snail **P** to be very different from the other five snails.

Suggest why there might be an increasing number of snails similar to snail **P** in each future generation.

[2 marks]

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4.1.2.1 Chromosomes

Question 04

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

4.1.2.1 Chromosomes

Question 04 · 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]

4.1.2.1 Chromosomes

Question 04 · 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% ☐

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4.1.2.1 Chromosomes

Question 05

November 2021 | 8464/B/2F | Original Q3

0 3 **Figure 2** shows one species of bird on a bird feeder.

Figure 2



The birds use their beaks to reach nuts inside the bird feeder.

Cats sometimes eat the birds.

0 3 . 1 Give the food chain for the birds, cats and nuts.

[2 marks]

0 3 . 2 Which organism in the food chain you gave in Question **03.1** is the primary consumer?

[1 mark]

4.1.2.1 Chromosomes

Question 05 · continued

0 3 . 3 Cats are one biotic factor that affects the size of the bird population.

Which **two** of the following are **biotic** factors?

[2 marks]

Tick (✓) **two** boxes.

- Food ☐
- Pathogens ☐
- Sunlight ☐
- Temperature ☐
- Water ☐

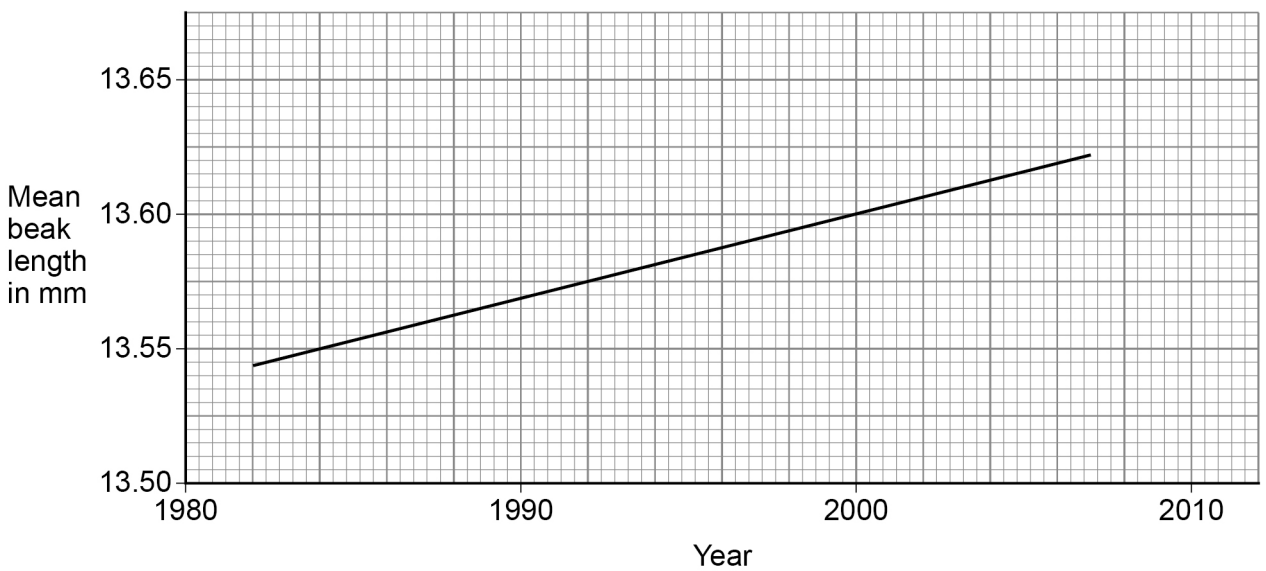
Question 3 continues on the next page

4.1.2.1 Chromosomes

Question 05 · continued

Figure 3 shows the mean beak length of this species of bird from 1982 to 2007.

Figure 3



0 3 . 4 What was the mean beak length in 2000?

[1 mark]

Mean beak length = _____ mm

0 3 . 5 What type of adaptation is beak length?

[1 mark]

Tick (✓) **one** box.

Behavioural ☐

Chemical ☐

Structural ☐

4.1.2.1 Chromosomes

Question 05 · continued

Figure 3 shows evidence of evolution in this species of bird.

0 3 . 6 Scientists have concluded that beak length in this species of bird is increasing.

Complete the sentences about the evolution of this species of bird.

Choose answers from the box.

[4 marks]

excretion	**generation**	**mutation**
reproduction	**respiration**	**variation**

The difference in beak length in the bird population

is called _____ .

A change in a gene affects the beak length.

Change in a gene is called _____ .

The birds with the longest beaks get more food.

Getting more food improves a bird's chances of

survival and _____ .

This process of evolution takes place over more

than one _____ .

Question 3 continues on the next page

4.1.2.1 Chromosomes

Question 05 · continued

0 3 . 7 Birds of this species:

- live for about 3 years
- produce up to 24 eggs every year.

Why is evolution easier to study in birds than in humans?

[1 mark]

Tick (✓) **one** box.

Birds breed less frequently than humans. ☐

Birds have a shorter life cycle than humans. ☐

Birds have fewer offspring than humans. ☐

0 3 . 8 Bacteria also provide evidence for evolution.

Which statement describes evidence for evolution?

[1 mark]

Tick (✓) **one** box.

Bacteria can become resistant to antibiotics. ☐

Decomposition can be caused by bacteria. ☐

Some bacteria are pathogens. ☐

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4.1.2.1 Chromosomes

Question 06

June 2022 | 8464/B/1F | Original Q6

0 6 This question is about cell division.

0 6 . 1 Write the biological structures from the box in the correct order of size.

[1 mark]

cell	**chromosome**	**gene**	**nucleus**

Smallest

↓

Largest

_____

_____

_____

_____

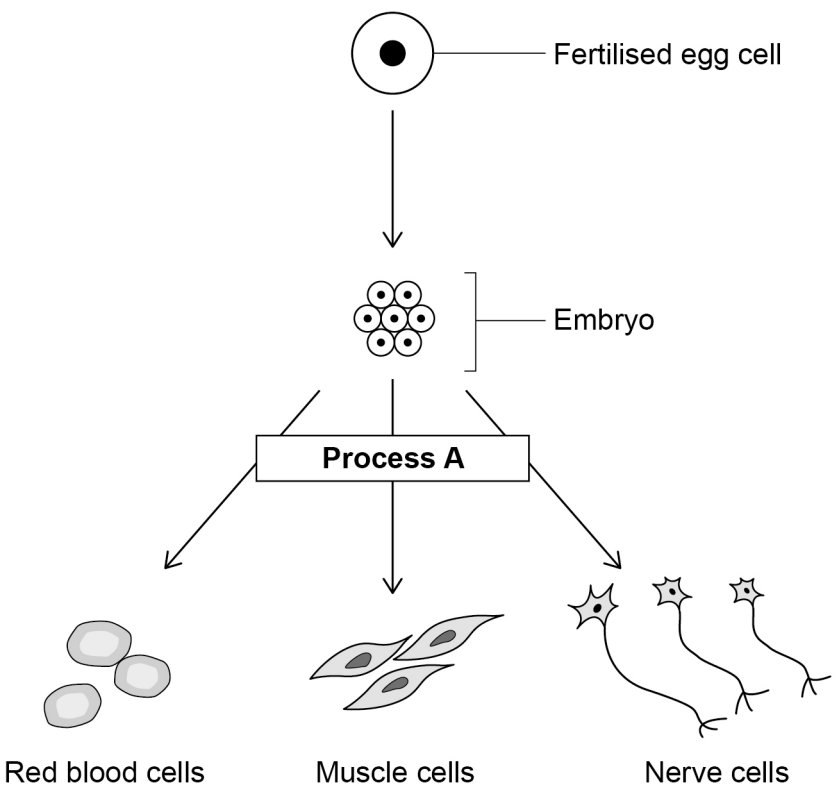
Question 6 continues on the next page

4.1.2.1 Chromosomes

Question 06 · continued

Figure 9 shows how a fertilised egg cell can produce specialised cells.

Figure 9



0 6 . 2 Name **Process A**.

[1 mark]

0 6 . 3 How many cell divisions are needed to form a 16-cell embryo from the original fertilised egg cell?

[1 mark]

Number of cell divisions = _____

4.1.2.1 Chromosomes

Question 06 · continued

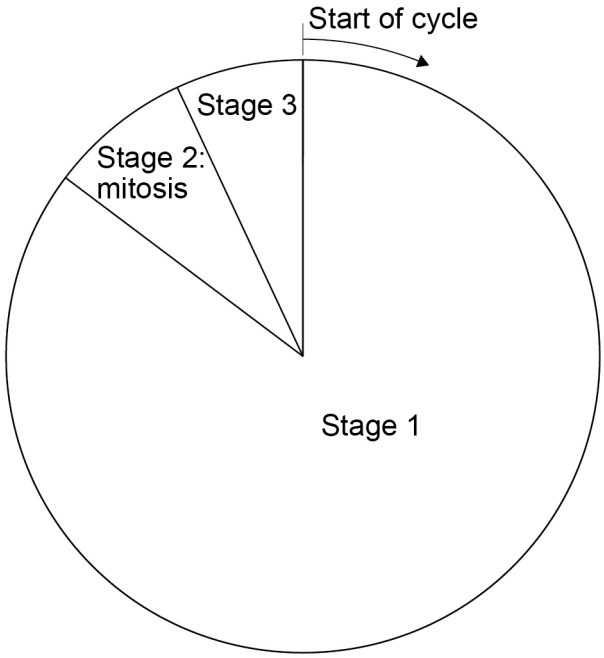
0 6 . 4 In humans a fertilised egg cell contains 23 pairs of chromosomes.

How many chromosomes will there be in each of the embryo cells?

[1 mark]

0 6 . 5 **Figure 10** represents a cell cycle for a human embryonic cell.

Figure 10



Describe **one** change in the cell that occurs during **each** of the stages of the cell cycle.

[3 marks]

Stage 1 _____

Stage 2 _____

Stage 3 _____

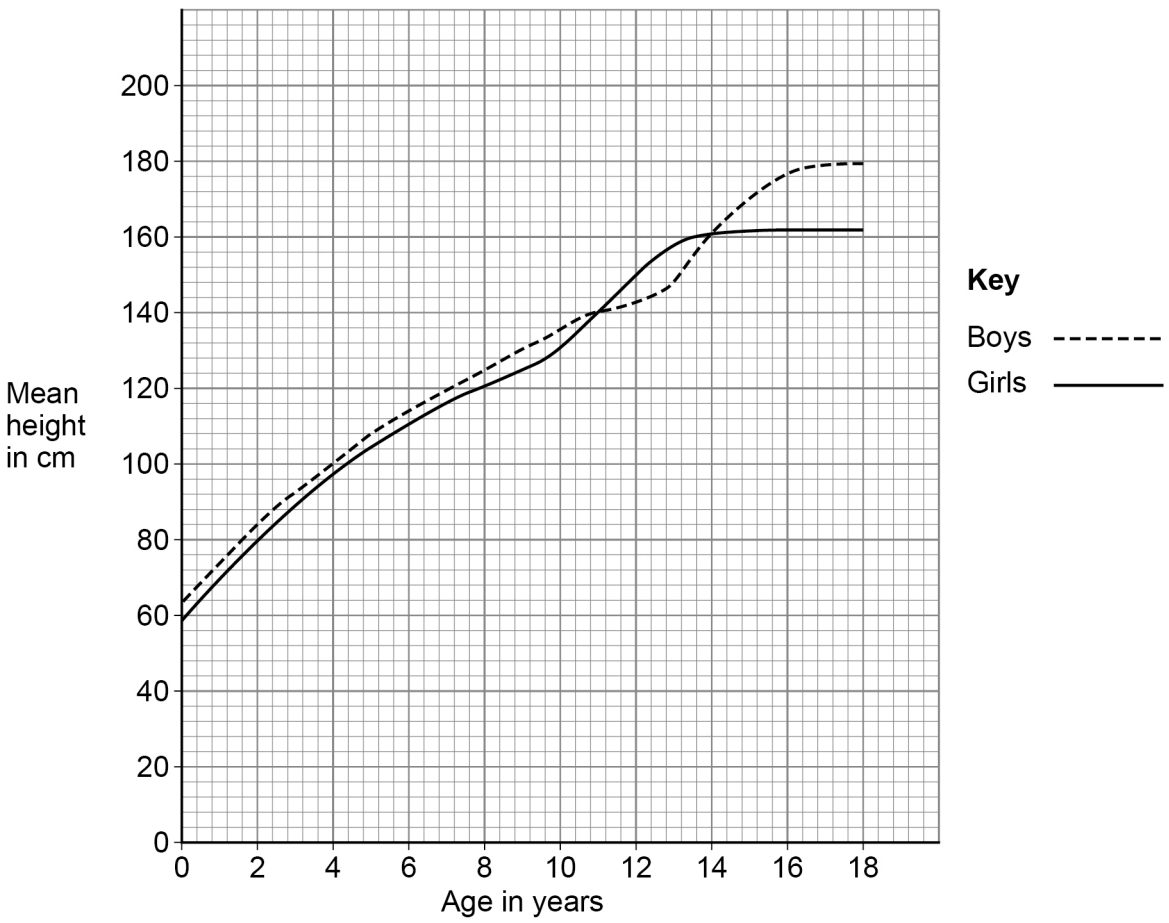
4.1.2.1 Chromosomes

Question 06 · continued

Cell division is important in the growth of multicellular organisms.

0 6 . 6 **Figure 11** shows the mean height of boys and of girls from birth to age 18 years.

Figure 11



4.1.2.1 Chromosomes

Question 06 · continued

Compare the growth of boys with the growth of girls.

Use data from **Figure 11** in your answer.

[6 marks]

0 6 . 7 Give **one** way that cell division by mitosis is important in **fully grown** animals.

[1 mark]

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4.1.2.1 Chromosomes

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

4.1.2.1 Chromosomes

Question 07 · continued

0 5 . 2 In rabbits:

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

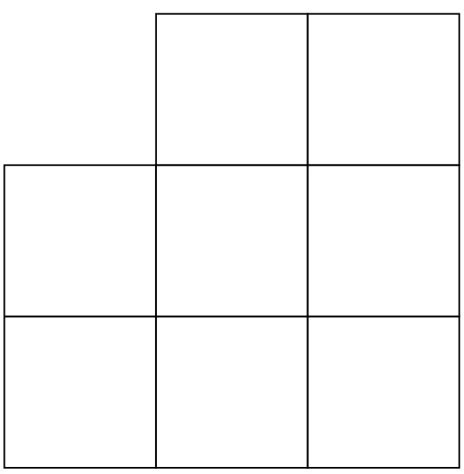
A rabbit with the alleles **Bb** and a rabbit with the alleles **bb** breed together.

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 = _____

4.1.2.1 Chromosomes

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]

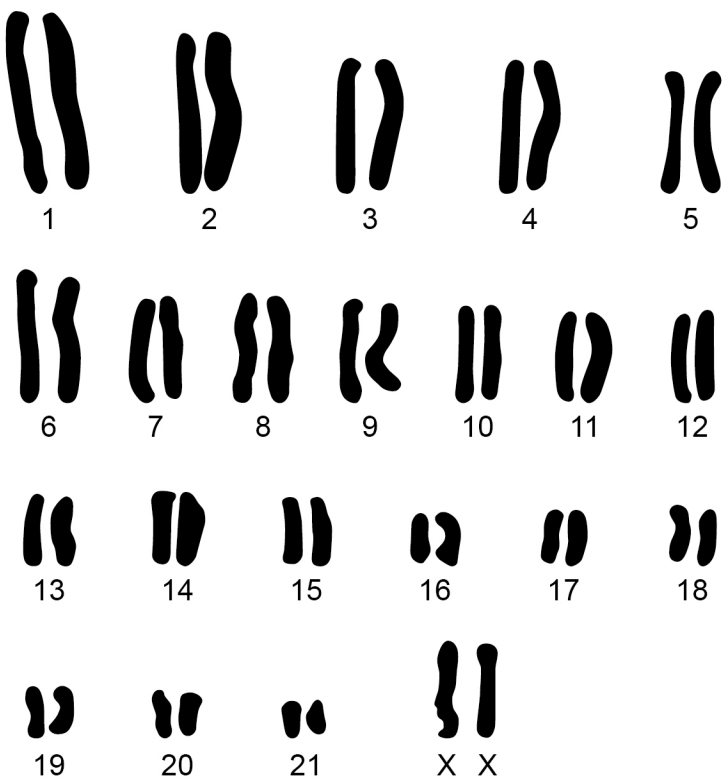
Question 5 continues on the next page

4.1.2.1 Chromosomes

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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