AQA GCSE Biology | 8461

SPECIFICATION POINT 4.1.2.1

Chromosomes

Past-paper questions

Tier	**Foundation**
Question groups	**64**
Available paper years	**2007–2025**

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

4 (a) Use words from the box to complete the sentences about curing disease.

antibiotics	**antibodies**	**antitoxins**	**painkillers**	**statins**

The substances made by white blood cells to kill pathogens are called ..... .

The substances made by white blood cells to counteract poisons produced by pathogens are called ..... .

Medicines which kill bacteria are called ..... .

(3 marks)

(b) The MMR vaccine protects people against three diseases.

Write down the names of **two** of these diseases.

1 .....

2 .....

(2 marks)

(c) All vaccinations involve some risk.

The table shows the risk of developing harmful effects:

- from the disease if a child is **not** given the MMR vaccine;
- if a child **is** given the MMR vaccine.

Harmful effect	Risk of getting the harmful effect from the disease (if not vaccinated)	Risk of getting the harmful effect from MMR vaccine
Convulsions	1 in 200	1 in 1000
Meningitis	1 in 3000	Less than 1 in 1 000 000
Brain damage	1 in 8000	0

4.1.2.1 Chromosomes

Question 01 · continued

BLANK

A mother is considering if she should have her child vaccinated with the MMR vaccine.

Use information from the table to persuade the mother that she should have her child vaccinated.

.....

.....

.....

.....

(2 marks)

(d) The vaccine used to protect us from the Hepatitis B virus is produced by genetic engineering.

Yeast cells are used to produce the vaccine.

Use words from the box to complete the sentence.

chromosomes	**drugs**	**enzymes**	**genes**	**hormones**

To produce the vaccine ..... are used to cut out .....

from the Hepatitis B virus which are then inserted into the yeast cells.

(2 marks)

9

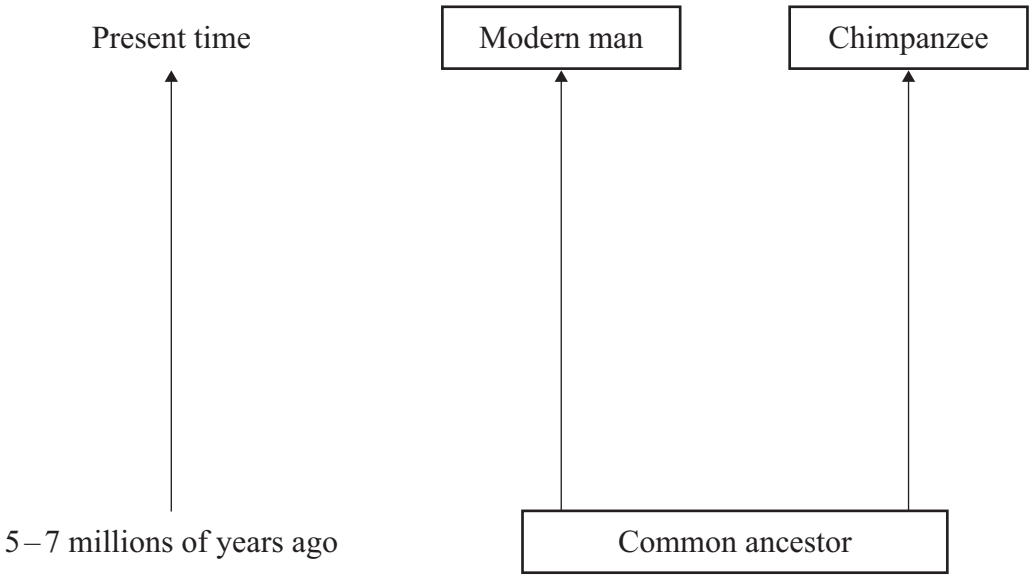
4.1.2.1 Chromosomes

Question 02

March 2007 | BLY1B | Original Q4 | Legacy

QUESTION FOUR

The diagram shows part of the pathway of human evolution from a common ancestor to modern man (Homo sapiens).



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

A evolved

B genes

C natural selection

D survived

Modern man and chimpanzees . . . **1** . . . from a common ancestor as a result of . . . **2** . . . .

Differences in the . . . **3** . . . of different individuals meant that some . . . **4** . . . to breed more successfully than others.

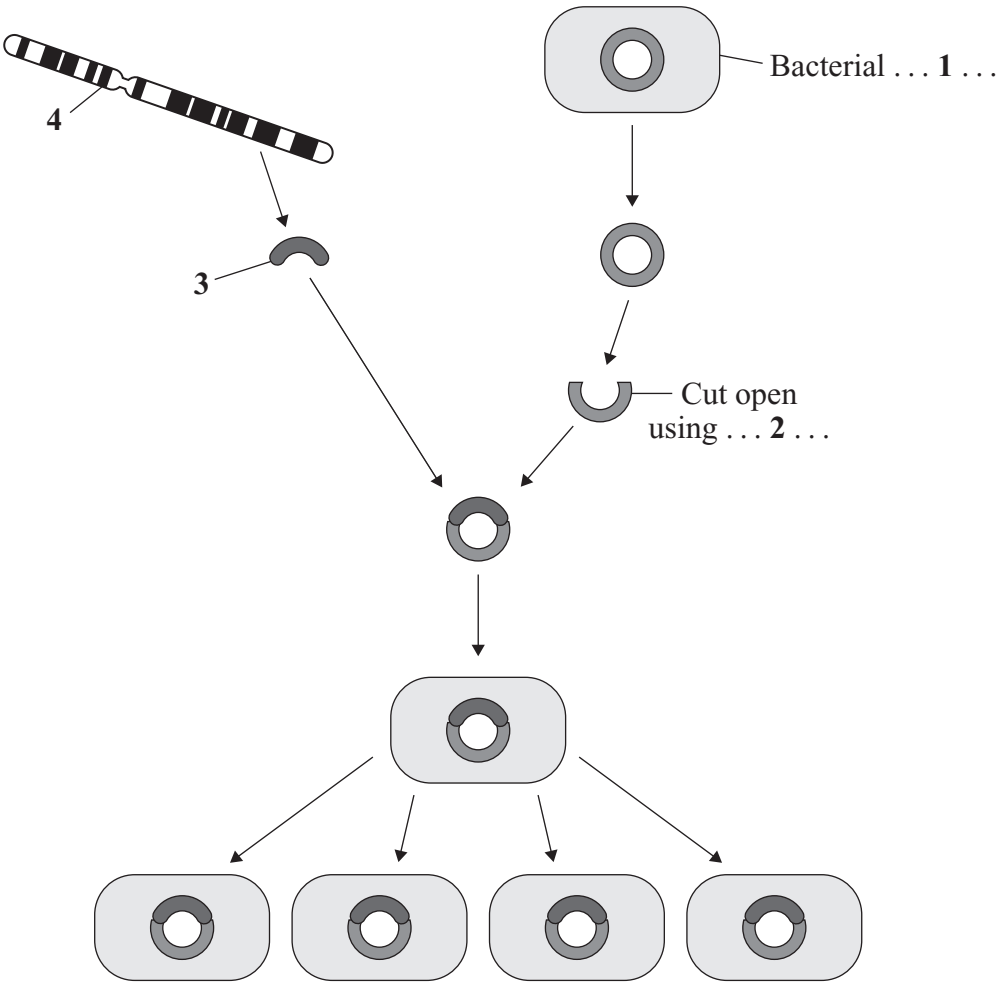
4.1.2.1 Chromosomes

Question 03

March 2007 | BLY1B | Original Q5 | Legacy

QUESTION FIVE

The diagram shows some of the steps involved in genetic engineering.



Match words, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram.

A cell

B chromosome

C enzyme

D gene

4.1.2.1 Chromosomes

Question 04

June 2007 | BLY1B | Original Q3 | Legacy

QUESTION THREE

Young tigers usually look like their parents.

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

A characteristics

B chromosomes

C genes

D mutations

Coat colour and length of the whiskers of tigers are known as . . . **1** . . . .

Coat colour and length of the whiskers are controlled by . . . **2** . . . .

The thread-like structures found in the nuclei of tiger cells are . . . **3** . . . .

Occasionally, white tigers are born.



Changes such as this are caused by . . . **4** . . . .

4.1.2.1 Chromosomes

Question 05

January 2008 | BLY1F | Original Q5 | Legacy

5 Scientists have produced many different types of GM (genetically modified) food crops.

(a) Use words from the box to complete the sentence about genetic engineering.

clones	**chromosomes**	**embryos**	**genes**

GM crops are produced by cutting ..... out of the

..... of one plant and inserting them into the cells of a crop plant.

(2 marks)

(b) Read the information about GM food crops.

- Herbicide-resistant GM crops produce higher yields.
- Scientists are uncertain about how eating GM food affects our health.
- Insect-resistant GM crops reduce the total use of pesticides.
- GM crops might breed naturally with wild plants.
- Seeds for GM crops can be bought from only one manufacturer.
- The numbers of bees will fall in areas where GM crops are grown.

Use this information to answer these questions.

(i) Give **two** reasons why some farmers are in favour of growing GM crops.

1 .....

.....

2 .....

.....

(2 marks)

(ii) Give **two** reasons why many people are against the growing of GM crops.

1 .....

.....

2 .....

.....

(2 marks)

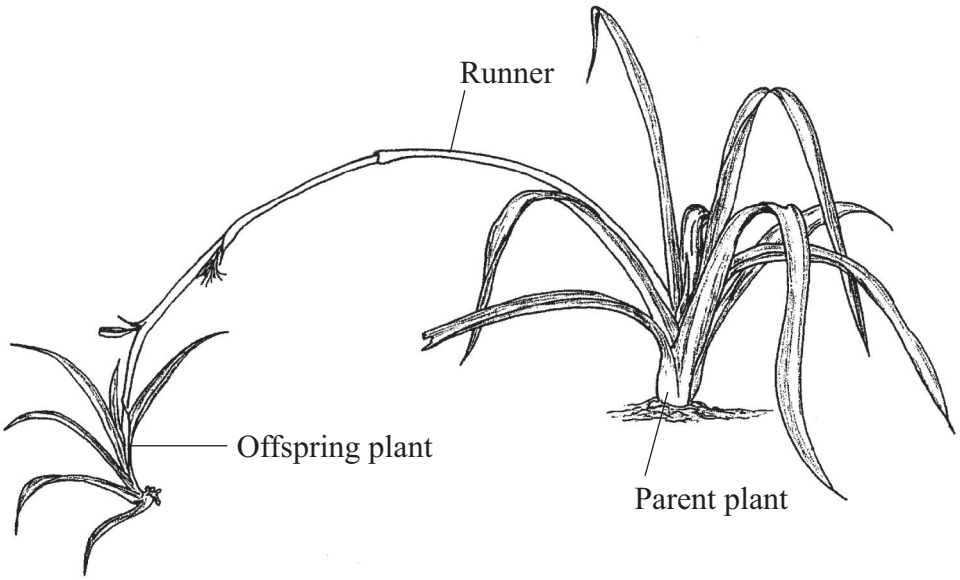
6

4.1.2.1 Chromosomes

Question 06

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

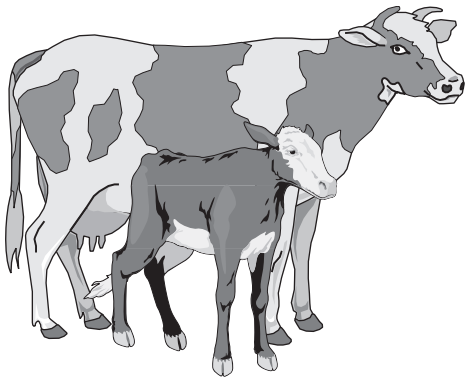
4.1.2.1 Chromosomes

Question 07

March 2008 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

The drawing shows a cow and her calf.



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

A genes

B gametes

C embryos

D characteristics

The colour and the pattern of the skin of the calf are known as . . . **1** . . . .

The information for coat colour is stored in parts of chromosomes called . . . **2** . . . .

This information is passed from the cow to the calf in cells called . . . **3** . . . .

Calves can be cloned by splitting apart cells from . . . **4** . . . .

4.1.2.1 Chromosomes

Question 08

March 2008 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Read the passage:

> The *Agrobacterium tumefaciens* bacterium will accept genes from another organism. The bacterium can then transfer those genes from itself into plants. The plant then grows a lump of cells (a gall) that contain the genes from the bacterium. New plants, containing the genes, can be grown from galls. This technique has been used to transfer genes from a firefly into a tobacco plant, which then glows in the dark.

9A The transfer of genes from the firefly into the bacterium is an example of . . .

1 asexual reproduction.

2 cloning.

3 genetic engineering.

4 transplantation.

9B From which structure in the firefly would scientists cut out the gene that causes glowing?

1 gamete

2 chromosome

3 enzyme

4 cell

9C Cells from the tobacco plants containing the new genes would have to be cloned. This cloning would be carried out using . . .

1 embryo transplantation.

2 adult cell cloning.

3 genetic engineering.

4 tissue culture.

4.1.2.1 Chromosomes

Question 08 · continued

9D What was the most likely reason for carrying out this experiment?

1 to make tobacco plants grow taller

2 to remove genes from fireflies

3 to see whether genes could be transferred from animals to plants

4 to grow plants from galls

END OF TEST

4.1.2.1 Chromosomes

Question 09

June 2008 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

This question is about evolution.

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

A extinction

B natural selection

C mutation

D variation

1	a theory put forward by Darwin
2	differences shown by individuals in the same species
3	a change in a gene
4	may be caused by new predators

4.1.2.1 Chromosomes

Question 10

January 2009 | BLY1F | Original Q5 | Legacy

5 The photographs show a zorse and its parents, a zebra and a horse.

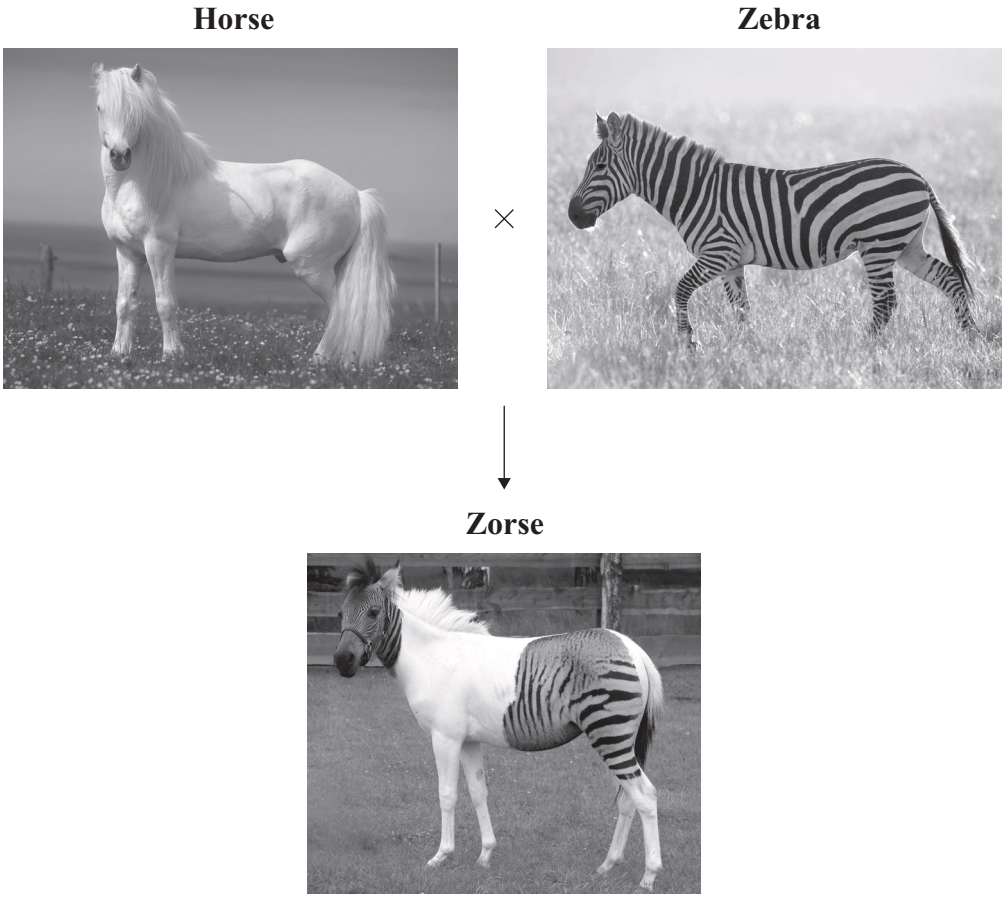


Photo of horse © Arctic-Images/Corbis
Photo of zebra © Arthur Morris/Corbis
Photo of zorse © Udo Richter/epa/Corbis

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

The zorse was produced by

cloning
asexual reproduction
sexual reproduction

.

(1 mark)

4.1.2.1 Chromosomes

Question 10 · continued

for mark

5 (b) Explain the appearance of the zorse.

Use **both** words from the box in your explanation.

gametes	**genes**

.....

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.....

.....

(3 marks)

4

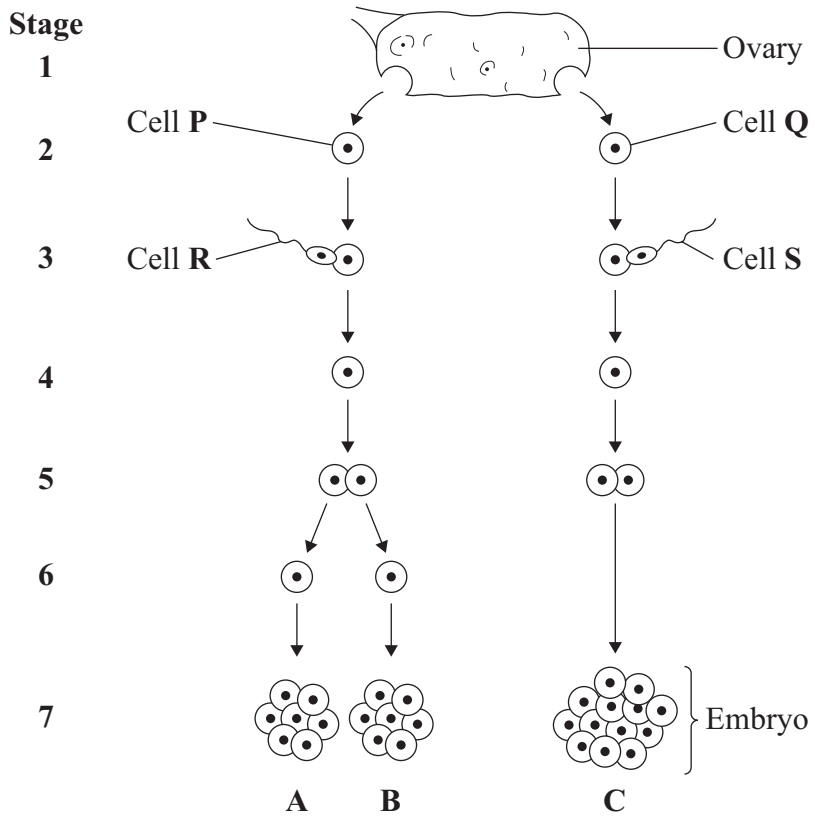
4.1.2.1 Chromosomes

Question 11

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)

4.1.2.1 Chromosomes

Question 11 · 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

4.1.2.1 Chromosomes

Question 11 · 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

4.1.2.1 Chromosomes

Question 12

March 2009 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

Insulin is a drug needed by some people suffering from diabetes.

Bacteria can be genetically engineered to produce insulin.

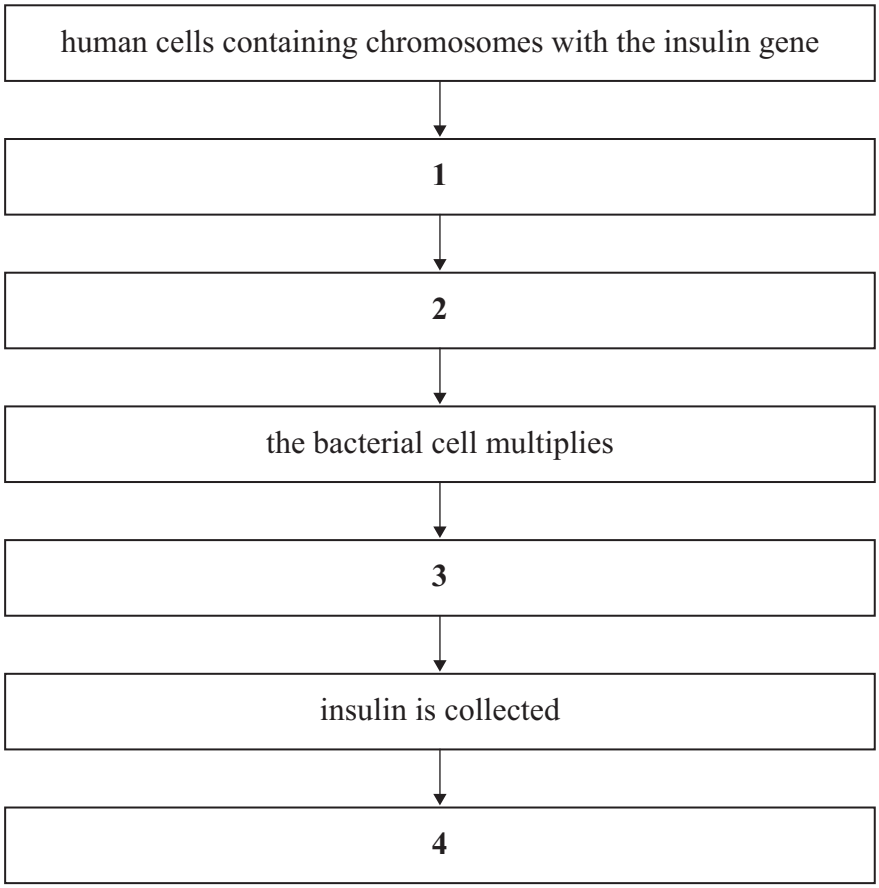
Match statements, **A**, **B**, **C** and **D**, with the labels **1–4** on the flow chart.

A insulin is produced by genetically engineered bacteria

B diabetics inject insulin to control diabetes

C the insulin gene is 'cut out' using enzymes

D the insulin gene is transferred into a bacterium



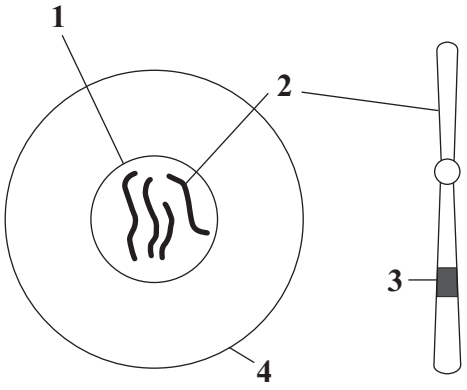
4.1.2.1 Chromosomes

Question 13

March 2009 | BLY1BP | Original Q5 | Legacy

QUESTION FIVE

The diagram shows a human egg.



Match structures, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram.

A cell

B nucleus

C chromosome

D gene

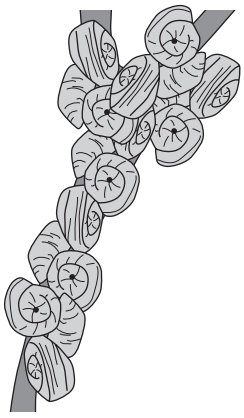
4.1.2.1 Chromosomes

Question 14

June 2009 | BLY1BP | Original Q3 | Legacy

QUESTION THREE

Banded snails live in woodland and grassland.



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

A evolution

B mutation

C selection

D variation

Banded snails have a wide range of different colours on their shells.

This wide range of colours is an example of . . . **1** . . . .

A change in a gene that gives a different colour is caused by . . . **2** . . . .

Birds only eat certain coloured snails. This is an example of . . . **3** . . . .

Over a long period of time, new species of snails develop. This is an example of . . . **4** . . . .

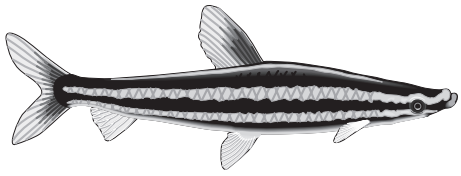
4.1.2.1 Chromosomes

Question 15

June 2009 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Zebra fish are small freshwater fish that can tolerate a wide range of environmental conditions. Scientists want to use zebra fish as an indicator species for different types of water pollution.



9A Scientists have extracted 'glow' genes from a jellyfish and transferred them into the eggs of a zebra fish.

What term describes this process?

1 cloning

2 genetic engineering

3 tissue culture

4 embryo transplant

9B Genes from jellyfish are transferred into zebra fish eggs by . . .

1 using a small pair of sharp scissors.

2 using enzymes.

3 mixing the gametes of jellyfish and zebra fish.

4 taking cytoplasm from a jellyfish egg and placing it into a zebra fish egg.

Question 15 · continued

Zebra fish created by this process would glow with different colours, depending on the type of chemical pollution in the water. The table shows how this would work.

Colour	Type of chemical pollution			
	Pesticides	Fertilisers	Acidity	Herbicides
Red	✓			
Green			✓	
Yellow		✓		
Orange				✓

9C Zebra fish would glow green because of . . .

1 an increase in the sulfur dioxide content of the atmosphere.

2 a reduction in the carbon dioxide content of the atmosphere.

3 an increase in the methane content of the atmosphere.

4 an increase in the amount of chemicals used in agriculture.

9D In one river, different zebra fish glow red and orange.

This indicates that the river is polluted by . . .

1 chemicals released from industry.

2 smoke released from power stations.

3 chemicals washed off farmland.

4 sewage leaking from drains.

END OF TEST

4.1.2.1 Chromosomes

Question 16

June 2009 | BLY1F | Original Q4 | Legacy

4 Some organisms are in danger of extinction.
The photograph shows an African elephant feeding on tree leaves.



4 (a) Read the information about elephants and humans in Africa.

- The African elephant is the largest land animal.
- The African elephant feeds on lots of leaves.
- Adult African elephants have no natural predators.
- Elephants are killed by poachers for their ivory tusks.
- African elephants live for about 70 years.
- Most African elephants live in large herds.
- Land available to elephants is disappearing rapidly.

The African elephant is now extinct in many parts of Africa.

Use information from the list to give **three** reasons why.

1.....

.....

2.....

.....

3.....

.....

(3 marks)

4.1.2.1 Chromosomes

Question 16 · continued

for mark

4 (b) Organisms that are in danger of extinction can be cloned.

List A gives the names of three different cloning techniques.

List B gives information about these techniques.

Draw a line from each technique in **List A** to the correct information about it in **List B**.

List A **Technique**	**List B** **Information**
	Small groups of cells from parts of a plant are grown on a special jelly.
Adult cell cloning	
	Cells from a developing animal are separated before they become specialised and then placed into host mothers.
Embryo transplanting	
	Genes are cut out from chromosomes and inserted into other organisms.
Tissue culture	
	A nucleus is removed from an unfertilised egg cell. The nucleus from a body cell is inserted into the egg cell. An electric shock causes the egg to start to divide.

(3 marks)

6

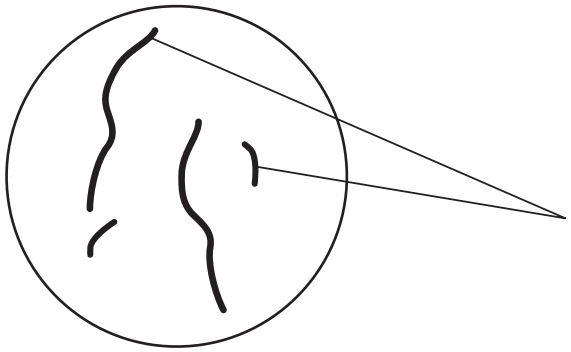
4.1.2.1 Chromosomes

Question 17

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



.....

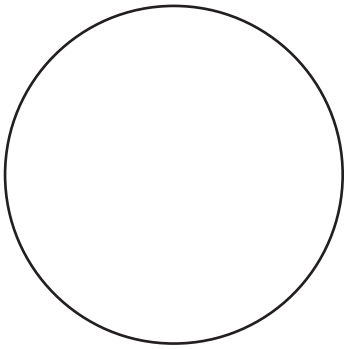
5 (a) Use a word from the box to label **Diagram 1**.

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)

4.1.2.1 Chromosomes

Question 17 · 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

4.1.2.1 Chromosomes

Question 18

November 2009 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

Organisms have changed since life began on Earth.

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

A evolution

B extinction

C natural selection

D reproduction

1	the theory that all living species developed from simple life forms over billions of years
2	genes being passed on from one generation to the next
3	a species dying out
4	organisms that are most suited to their environment survive to breed

4.1.2.1 Chromosomes

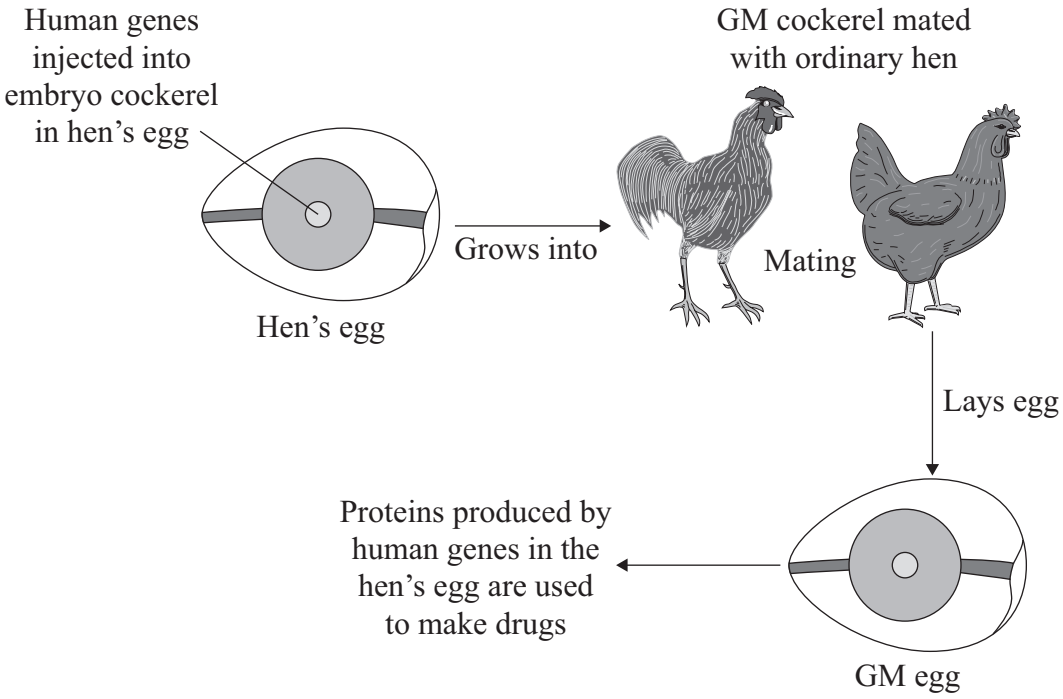
Question 19

January 2010 | BLY1F | Original Q4 | Legacy

4 Scientists have discovered how to produce genetically modified (GM) hens' eggs.

Some proteins produced in GM eggs can be used as drugs to treat humans.

The diagram shows how this is done.



4 (a) Which type of reproduction is involved when the cockerel mates with the hen?

Tick (✓) **one** box.

Asexual ☐

Cloning ☐

Sexual ☐

(1 mark)

4 (b) From which part of a human are the genes cut?

Tick (✓) **one** box.

Chromosome ☐

Embryo ☐

Gland ☐

(1 mark)

4.1.2.1 Chromosomes

Question 19 · continued

for mark

4 (c) Read the information about genetically modified animals.

- GM animals might escape and breed with wild animals.
- Genetic modification can produce fast-growing animals for food.
- Genetic modification can be used to clone animals in danger of extinction.
- Using GM animals can reduce the number of animals used in medical research.
- Animals have the right to be free from genetic modification.

Use **only** this information to answer these questions.

4 (c) (i) Give **two** reasons why many people are in favour of genetically modified animals.

1 .....

.....

2 .....

.....

(2 marks)

4 (c) (ii) Give **two** reasons why many people are against genetically modified animals.

1 .....

.....

2 .....

.....

(2 marks)

6

4.1.2.1 Chromosomes

Question 20

2 Humans reproduce sexually.

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

2 (a) (i) At fertilisation [chromosomes / genes / sex cells] join together.

(1 mark)

2 (a) (ii) At fertilisation a single cell forms, which has new pairs of [chromosomes. / nuclei. / sex cells.]

(1 mark)

2 (b) Cystic fibrosis can be inherited by children whose parents do not have it.

2 (b) (i) A person who has cystic fibrosis has [two / three / four] copies of the cystic fibrosis allele.

(1 mark)

2 (b) (ii) The cystic fibrosis allele is [large. / recessive. / strong.]

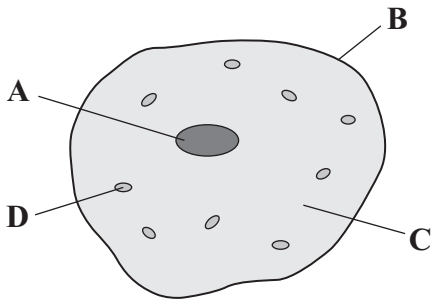
(1 mark)

4.1.2.1 Chromosomes

Question 20 · continued

for mark

2 (c) The diagram shows a human body cell.



Choose the correct answer from the box to complete each sentence.

cell membrane	**cell wall**	**cytoplasm**	**nucleus**

2 (c) (i) The part of the cell labelled **B** is the ..... .

(1 mark)

2 (c) (ii) The part of the cell labelled **C** is the ..... .

(1 mark)

2 (d) Which part of the cell, **A**, **B**, **C** or **D**:

2 (d) (i) contains the allele for cystic fibrosis ☐

(1 mark)

2 (d) (ii) is affected by cystic fibrosis? ☐

(1 mark)

8

4.1.2.1 Chromosomes

Question 21

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

4.1.2.1 Chromosomes

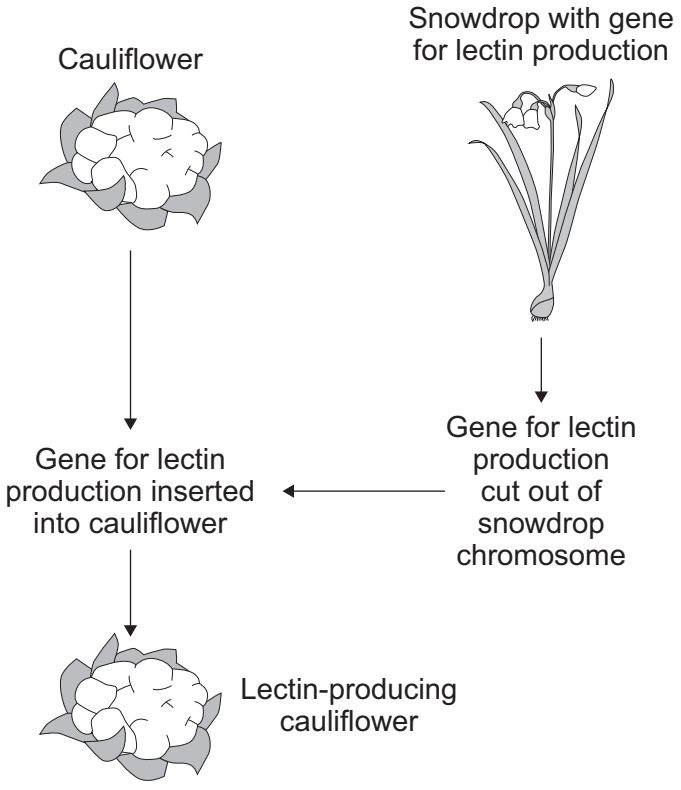
Question 22

June 2010 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Up to 40 % of cauliflower crops may be eaten by insects.
Snowdrops can survive attacks by insects because they produce a substance called lectin.
Lectin interferes with the insect's digestive system.

The diagram shows one method of introducing the gene for lectin production into cauliflowers.



9A The gene for lectin production is cut from the snowdrop chromosome using . . .

1 lectin.

2 a herbicide.

3 an enzyme.

4 an electric shock.

9B The technique used to transfer the gene from the snowdrop to the cauliflower is called . . .

1 biodiversity.

2 embryo transplant.

3 cloning.

4 genetic engineering.

4.1.2.1 Chromosomes

Question 22 · continued

9C What is the main benefit to the environment of farmers growing lectin-producing cauliflowers?

1 More snowdrops will survive.

2 Less pesticide will be used.

3 Insects will eat something else.

4 Less fertiliser will be needed.

9D An ethical concern about this technique is that . . .

1 it will make farmers richer.

2 it will increase biodiversity.

3 it is interfering with nature.

4 it is sustainable.

END OF TEST

4.1.2.1 Chromosomes

Question 23

June 2010 | BLY1F | Original Q4 | Legacy

4 We breed animals with the characteristics that we prefer.

4 (a) The photograph shows a rabbit with some of its babies.



Use words from the box to complete the sentences about inheritance in rabbits.

characteristic	**chromosome**	**gene**	**gamete**

4 (a) (i) The colour of a rabbit's fur is known as a ..... .

(1 mark)

4 (a) (ii) This colour is controlled by a ..... .

(1 mark)

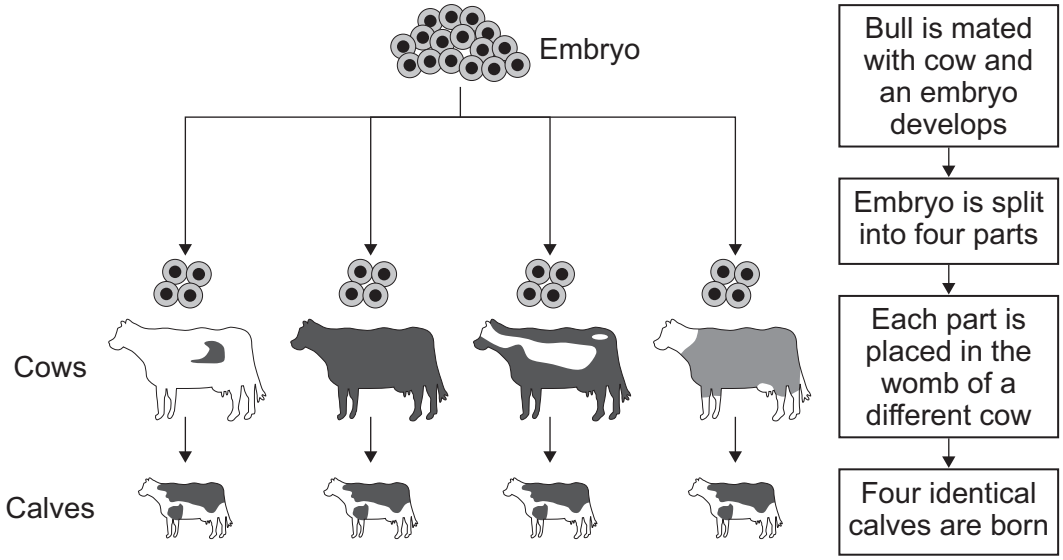
4 (a) (iii) Each sex cell of a rabbit is known as a ..... .

(1 mark)

4.1.2.1 Chromosomes

Question 23 · continued

4 (b) The diagram shows one way of producing calves.



Use words from the box to complete the sentences.

asexual	**clones**	**cuttings**	**gametes**	**genetic**	**sexual**

A bull was mated with a cow.

This is ..... reproduction.

The embryo produced was split into four parts.

The calves in the diagram have identical genetic information.

This is because the calves were produced by ..... reproduction.

The identical calves are known as ..... .

(3 marks)

6

4.1.2.1 Chromosomes

Question 24

November 2010 | BLY1BP | Original Q3 | Legacy

QUESTION THREE

Living things have evolved on Earth over billions of years.

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

A extinction

B mutation

C natural selection

D variation

1	a sudden change in a gene or chromosome
2	the range of differences in the characteristics of a species
3	the survival of organisms best suited to the environment
4	the death of all organisms of a species

4.1.2.1 Chromosomes

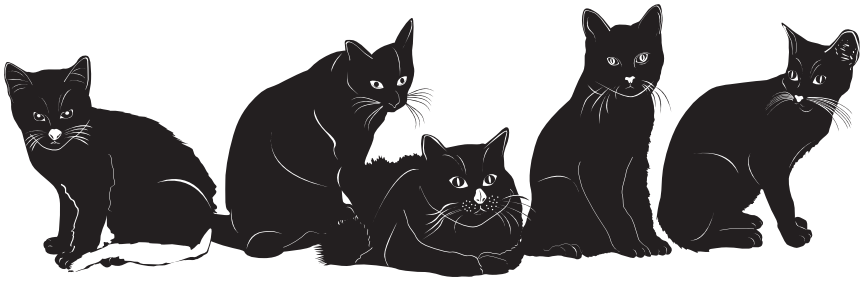
Question 25

November 2010 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

These young kittens look like their parents.

Kittens look like their parents because information is passed from the parents to their young. The information is about characteristics such as fur colour.



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

A chromosomes

B clones

C gametes

D genes

1	are kittens with identical characteristics
2	control one characteristic, eg fur colour
3	are sex cells
4	are thread-like structures carrying the information

4.1.2.1 Chromosomes

Question 26

4 We can now produce organisms with the characteristics we want the organisms to have.

List A gives the names of four ways of producing organisms.

List B gives information about the ways of producing organisms.

Draw **one** line from each way of producing organisms in **List A** to the correct information in **List B**.

List A **Ways of producing organisms**	**List B** **Information**
	Taking part of the stem from a plant, then putting this part of the stem in wet soil in a plant pot.
Embryo transplantation	
	Growing groups of cells from a plant on special jelly.
Genetic engineering	
	Transferring genes from one organism to a different organism.
Taking cuttings	
	Growing plants from seeds in a garden.
Tissue culture	
	Separating groups of cells from a very young developing animal then putting the groups of cells into host mothers.

(4 marks)

4

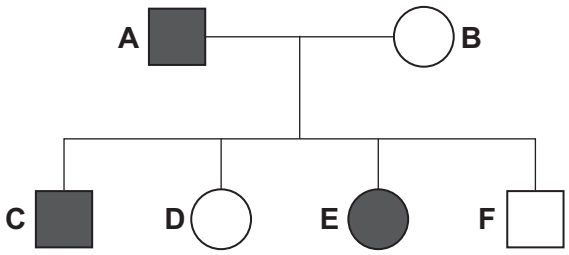
4.1.2.1 Chromosomes

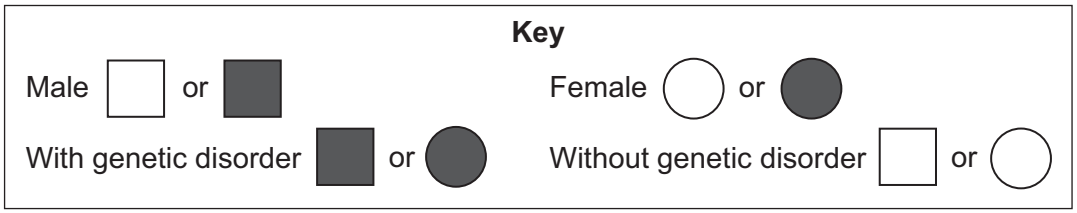
Question 27

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)

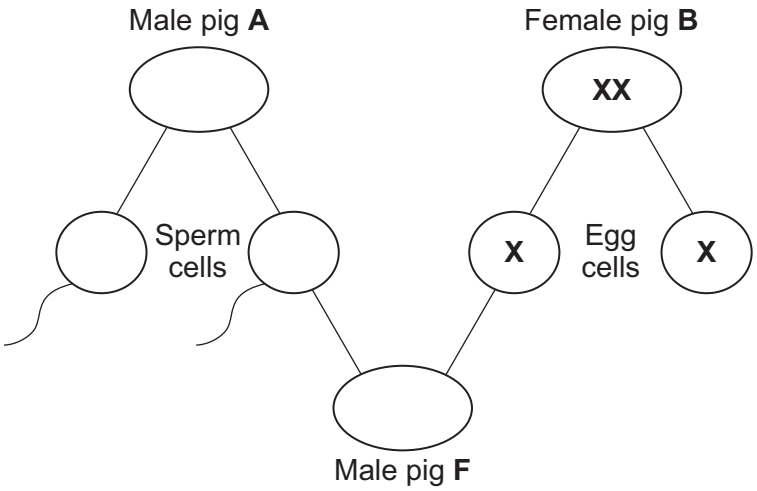
4.1.2.1 Chromosomes

Question 27 · 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

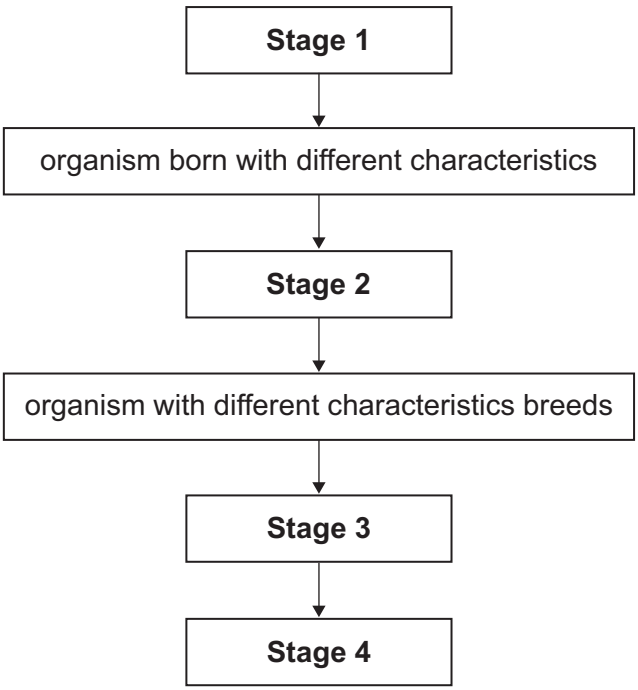
4.1.2.1 Chromosomes

Question 28

March 2011 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

The diagram shows a flow chart for evolution.



Match stages of evolution, **A**, **B**, **C** and **D**, with the stages **1**–**4** in the flow chart.

A the organism is now a better competitor

B the mutated gene is passed on to offspring

C a gene mutates

D a new species is produced

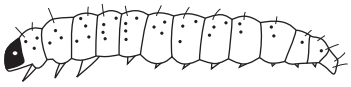
4.1.2.1 Chromosomes

Question 29

March 2011 | BLY1BP | Original Q9 | Legacy

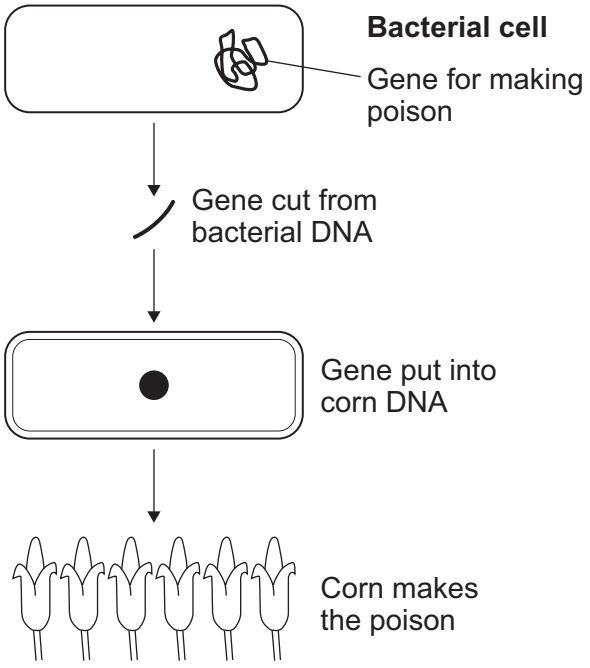
QUESTION NINE

The drawing shows a European corn borer. European corn borers eat and destroy corn stems.



It is possible to produce corn plants that produce a poison which kills the corn borer if it eats any part of the plant.

The gene for making the poison is cut from the genetic material of a bacterial cell. The gene is then inserted into the cells of a corn plant. The corn plant then produces the poison.



9A Transferring genes from one organism to another is called . . .

1 cloning.

2 evolution.

3 genetic engineering.

4 tissue culture.

4.1.2.1 Chromosomes

Question 29 · continued

9B One economic benefit of producing this type of corn is that . . .

1 more people will want to buy this type of corn.

2 there will be fewer pests.

3 the farmer will need to use less fertiliser.

4 the farmer will produce more corn.

9C An environmental concern about growing this type of corn is that . . .

1 more chemicals will have to be used on the land.

2 it is against some people's religious beliefs.

3 the bacterial gene may get transferred to wild plant species.

4 this type of corn will be much more expensive.

9D Scientists think that this type of corn is not harmful for people to eat.

This is very difficult to prove because . . .

1 people will not volunteer to be part of a trial.

2 the human diet contains a wide variety of foods.

3 scientists are not allowed to carry out experiments on humans.

4 animals that eat this corn appear to be healthy.

END OF TEST

4.1.2.1 Chromosomes

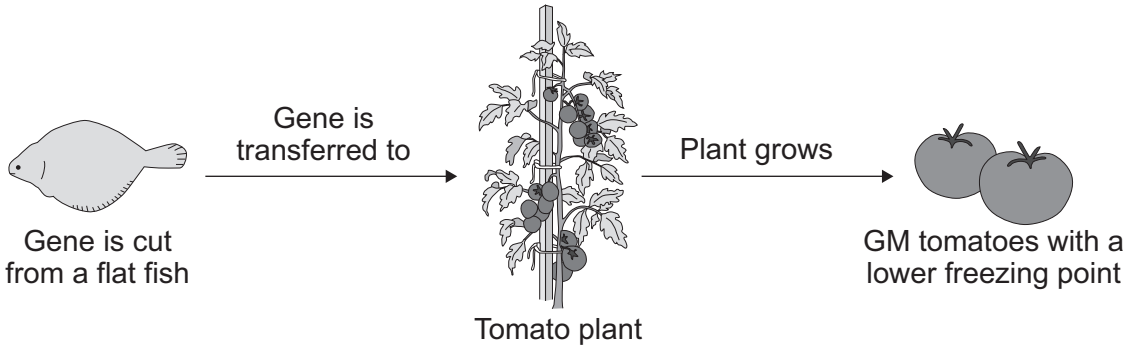
Question 30

June 2011 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Scientists have produced genetically modified (GM) tomatoes. The GM tomatoes freeze at a lower temperature than non-GM tomatoes. GM tomatoes are less likely to be damaged in storage.

The diagram shows how the scientists produced the GM tomatoes by genetic engineering.



9A The scientists removed the gene from the flat fish by using . . .

1 hormones.

2 enzymes.

3 very small scissors.

4 a very fine pipette.

9B The scientists wanted to produce large numbers of plants identical to the new tomato plants quickly.

Which would be the best way of doing this?

1 reproducing the new embryo plant sexually

2 splitting embryos from the new tomato plant

3 growing seeds from the new tomato plant

4 culturing groups of cells from the new tomato plant

4.1.2.1 Chromosomes

Question 30 · continued

9C One ethical reason for allowing the GM crops to be grown is that . . .

1 scientists know that there are no health risks from eating GM crops.

2 GM companies will make large profits from the sale of GM plants.

3 the high yield from some GM crops could feed starving people.

4 GM crops are not a risk to the environment.

9D Some people object to GM crops because GM crops . . .

1 could be made resistant to insect attack.

2 could have a longer shelf-life.

3 could be made resistant to weedkillers.

4 could transfer genes to wild plants.

END OF TEST

4.1.2.1 Chromosomes

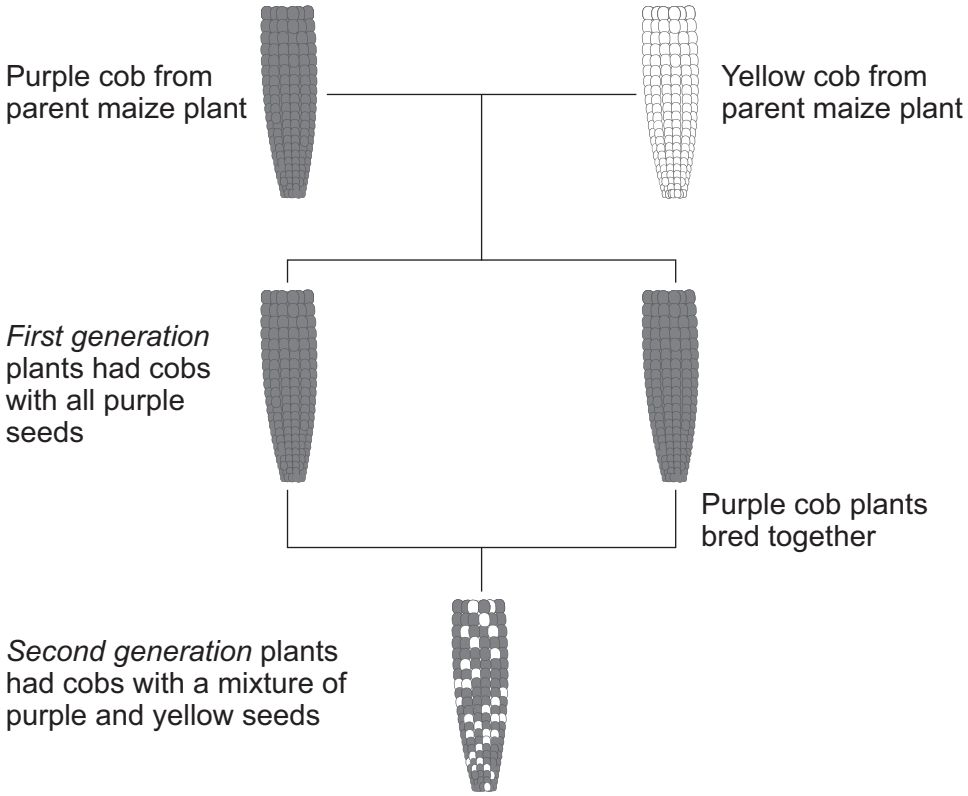
Question 31

June 2011 | BLY2F | Original Q5 | Legacy

5 Maize plants reproduce sexually to form maize cobs.
Each maize cob has many seeds.

The colour of the seeds is controlled by a gene.
The gene has two alleles, purple and yellow.

The diagram shows the cobs produced by breeding maize plants.



5 (a) Use words from the box to complete the sentences.

dominant	**environmental**	**recessive**

5 (a) (i) The first generation plants show that the purple allele is

..... .

(1 mark)

5 (a) (ii) The second generation plants show that the yellow allele is

..... .

(1 mark)

4.1.2.1 Chromosomes

Question 31 · continued

5 (b) The allele for purple can be represented by the letter **A**.
The allele for yellow can be represented by the letter **a**.

5 (b) (i) What alleles does a yellow seed have?

Draw a ring around **one** answer.

AA **Aa** **aa**

(1 mark)

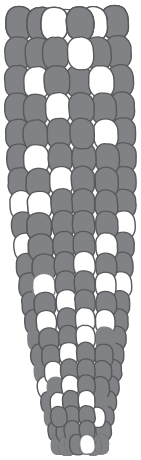
5 (b) (ii) What alleles does a purple seed from a *first generation* plant have?

Draw a ring around **one** answer.

AA **Aa** **aa**

(1 mark)

5 (c) The drawing shows a cob from one of the *second generation* plants.



A student counted 334 purple seeds and 110 yellow seeds on this maize cob.

What is the approximate ratio of purple seeds to yellow seeds on the cob?

Tick (✓) **one** box.

3 purple : 1 yellow ☐

1 purple : 3 yellow ☐

1 purple : 1 yellow ☐

(1 mark)

5

4.1.2.1 Chromosomes

Question 32

November 2011 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Scientists use genetic engineering to produce genetically modified (GM) plants.

9A Which row in the table shows the correct order of sizes of structures involved in genetic engineering?

	Largest → Smallest						
1	chromosome	→	cell	→	gene	→	nucleus
2	nucleus	→	cell	→	chromosome	→	gene
3	cell	→	gene	→	nucleus	→	chromosome
4	cell	→	nucleus	→	chromosome	→	gene

Seeds from crops of oil-seed rape are used to produce biofuels.

Farmers spray their fields with herbicide before planting a crop of oil-seed rape.

GM oil-seed rape was developed to be resistant to the herbicide.

9B The GM oil-seed rape has most probably been developed by . . .

1 spraying herbicide on oil-seed rape plants over several generations.

2 taking cuttings from other species that are resistant to herbicides.

3 transferring genes from other species into oil-seed rape plants.

4 producing mutations in non-GM varieties of oil-seed rape.

9C In trials of the GM crop, four field trials were set up.

Which trial will produce the **smallest** yield of oil-seed rape crop?

1 spraying with herbicide before planting non-GM crops

2 spraying with herbicide during growth of a non-GM crop

3 spraying with herbicide before planting a GM crop

4 spraying with herbicide during growth of a GM crop

4.1.2.1 Chromosomes

Question 32 · continued

9D The main concern about planting a GM oil-seed rape crop is that the gene for herbicide resistance might spread to . . .

1 wild plants.

2 other oil-seed rape crops.

3 insects.

4 humans.

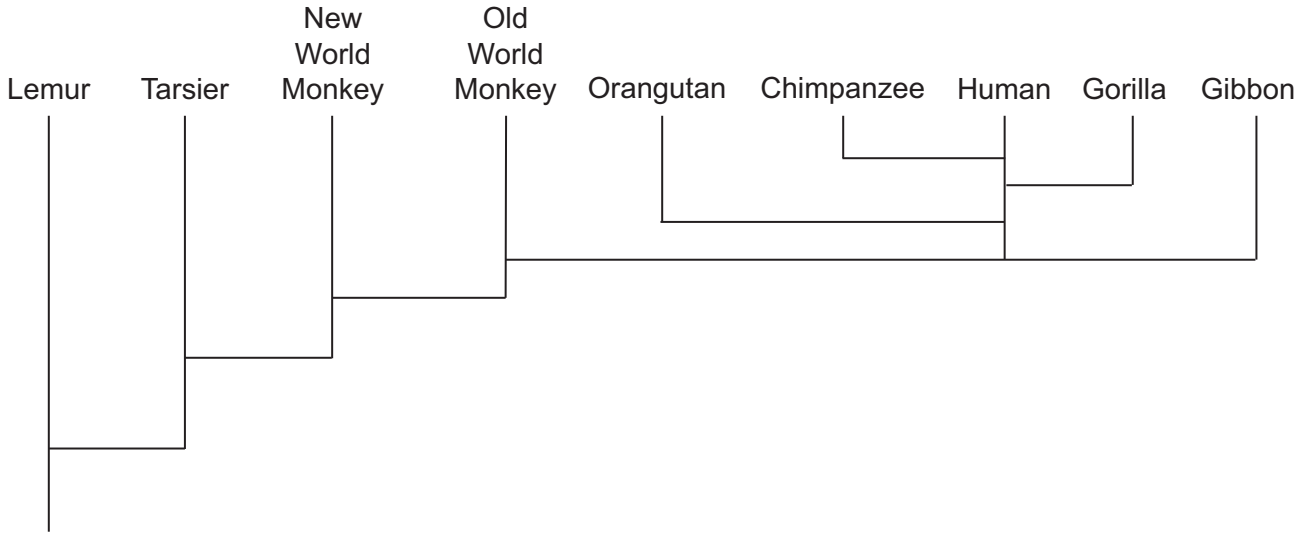
END OF TEST

4.1.2.1 Chromosomes

Question 33

January 2012 | BL1FP | Original Q3 | Legacy

3 The diagram shows the evolution of a group called the primates.



3 (a) Which primate evolved first?

.....

(1 mark)

3 (b) Name **two** primates that developed most recently from the same common ancestor as humans.

1 .....

2 .....

(2 marks)

3 (c) (i) The theory of evolution by natural selection was suggested in the 1800s.

Which scientist suggested this theory?

.....

(1 mark)

4.1.2.1 Chromosomes

Question 33 · continued

3 (c) (ii) Use words from the box to complete the passage about natural selection.

evolution	**environment**	**generation**
mutate	**survive**	**variation**

Individual organisms of a species may show a wide range of ..... because of differences in their genes. Individuals with characteristics most suited to the ..... are more likely to ..... and breed successfully. The genes that have helped these individuals to survive are then passed on to the next ..... .

(4 marks)

8

4.1.2.1 Chromosomes

Question 34

June 2012 | BL1FP | Original Q6 | Legacy

6 Insecticides are chemicals which kill insects.
Insecticides may be sprayed onto crops to increase crop yield.

6 (a) Killing insects on crops increases crop yield.

Suggest why.

.....

.....

(1 mark)

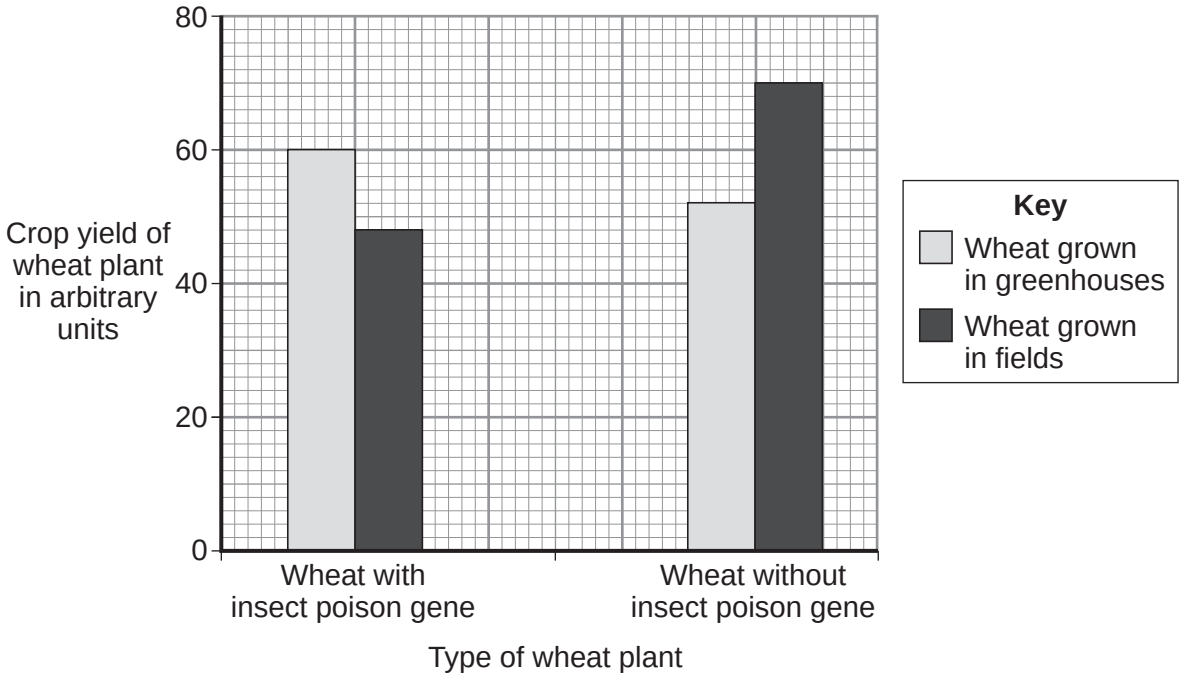
6 (b) A microorganism contains a gene which causes the production of an insect poison.

Scientists transferred the gene for production of the insect poison into wheat plants.
This makes genetically modified (GM) wheat.

The scientists:

- grew wheat plants with the insect poison gene in fields and in greenhouses
- grew wheat plants without the insect poison gene in fields and in greenhouses
- measured the crop yield of the wheat plants.

The bar chart shows the results.



6 (b) (i) What was the yield of the wheat with the insect poison gene grown in greenhouses?

..... arbitrary units
(1 mark)

4.1.2.1 Chromosomes

Question 34 · continued

6 (b) (ii) The yield from wheat without the insect poison gene grown in greenhouses was different from the yield you gave in **(b)(i)**.

Describe this difference in yield.

.....

.....

.....

.....

(2 marks)

6 (b) (iii) Look again at the bar chart.

What advice would you give to a farmer about the type of wheat to grow in fields?

Give a reason for your answer.

.....

.....

.....

.....

(2 marks)

6 (c) Some people are concerned about the use of GM crops.

Why?

.....

.....

.....

.....

.....

(2 marks)

8

4.1.2.1 Chromosomes

Question 35

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

4.1.2.1 Chromosomes

Question 36

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

4.1.2.1 Chromosomes

Question 37

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

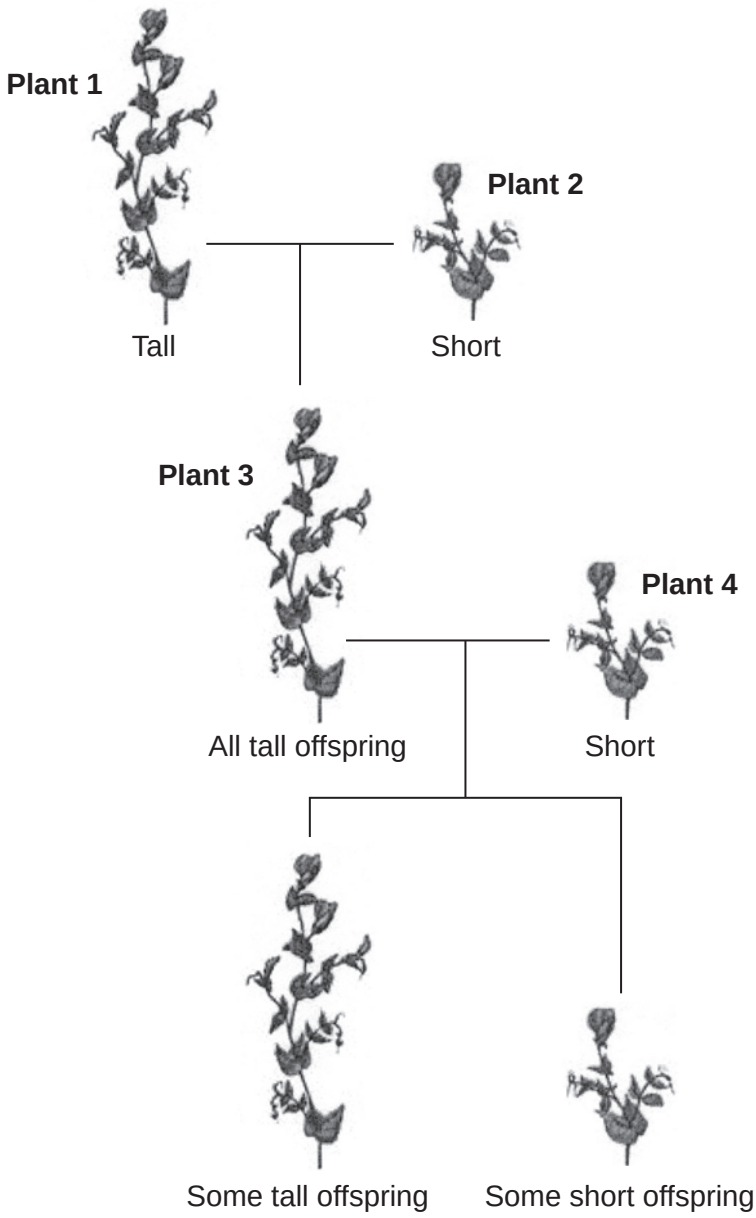
Darwin.
Lamarck.
Mendel.

(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



Question 37 · 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)

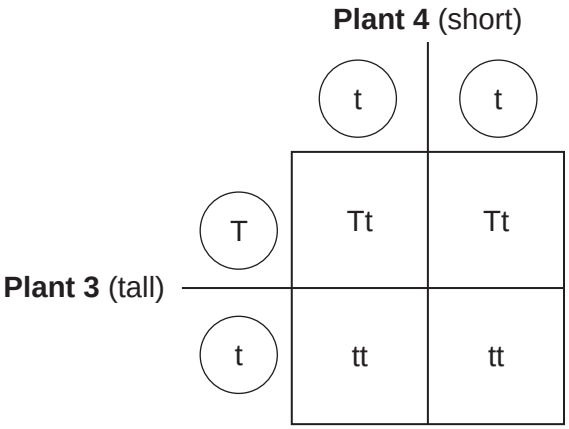
5 (b) (ii) **Plant 3** is tall because of

- 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

4.1.2.1 Chromosomes

Question 37 · 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

4.1.2.1 Chromosomes

Question 38

June 2013 | BL1FP | Original Q6 | Legacy

6 The photographs show two breeds of cow.

Friesian cow



Jersey cow



In parts **(a)** and **(b)** draw a ring around the correct answer to complete each sentence.

6 (a) Cows produce their young (calves) by

asexual reproduction.
cloning.
sexual reproduction.

(1 mark)

6 (b) Cows and their calves have many similar characteristics.

6 (b) (i) The information for characteristics is carried by

clones.
embryos.
genes.

(1 mark)

6 (b) (ii) The information for characteristics is passed to the next generation in cells

called

body cells.
gametes.
neurones.

(1 mark)

4.1.2.1 Chromosomes

Question 38 · continued

6 (c) Friesian and Jersey cows can both be used for meat or to produce milk.

The information shows features of Friesian and Jersey cows.

Friesian cows	Jersey cows
Body mass up to 600 kg	Body mass up to 400 kg
Milk contains 3.4% protein	Milk contains 3.8% protein
Can be milked for 325 days after giving birth	Can be milked for 250 days after giving birth
Produce no milk for 55 days before having a calf	Produce no milk for 45 days before having a calf
Produce > 30 litres of milk per day	Produce < 30 litres of milk per day

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

In your answers you must make comparisons between the two breeds of cow.

6 (c) (i) Give **two** advantages of a farmer keeping Friesian cows and **not** Jersey cows.

1 .....

.....

2 .....

.....

(2 marks)

6 (c) (ii) Give **two** advantages of a farmer keeping Jersey cows and **not** Friesian cows.

1 .....

.....

2 .....

.....

(2 marks)

Question 6 continues on the next page

4.1.2.1 Chromosomes

Question 38 · continued

6 (d) Cow's milk is different from human milk. Cow's milk should **not** be given to young human babies.

Scientists in China have *genetically engineered* cows to produce human milk. Milk from these cows can be fed to young human babies.

6 (d) (i) What is *genetic engineering*?

Tick (✓) **one** box.

Genes from one organism are transferred to a different organism ☐

Cells are separated from an embryo and are transferred to host mothers ☐

The nucleus from a body cell is transferred to an egg cell ☐

(1 mark)

6 (d) (ii) Some people are worried about using milk from genetically engineered cows, to feed human babies.

Give **one** reason why.

.....

.....

(1 mark)

9

4.1.2.1 Chromosomes

Question 39

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

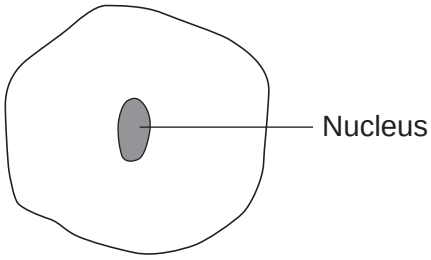
4.1.2.1 Chromosomes

Question 40

June 2014 | BL1FP | Original Q1 | Legacy

1 **Figure 1** shows a cell.

Figure 1



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

1 (a) (i) In the nucleus of a cell, genes are part of

chromosomes.
membranes.
receptors.

[1 mark]

1 (a) (ii) Different genes control different

characteristics
gametes
nuclei

of an organism.

[1 mark]

1 (a) (iii) Studying the similarities and differences between organisms allows us to

classify
clone
grow

the organisms.

[1 mark]

1 (b) Complete the following sentence.

[1 mark]

Living things can be grouped into animals, microorganisms and ..... .

4

4.1.2.1 Chromosomes

Question 41

5 Most cows produce milk with a fat content of 3.4%.

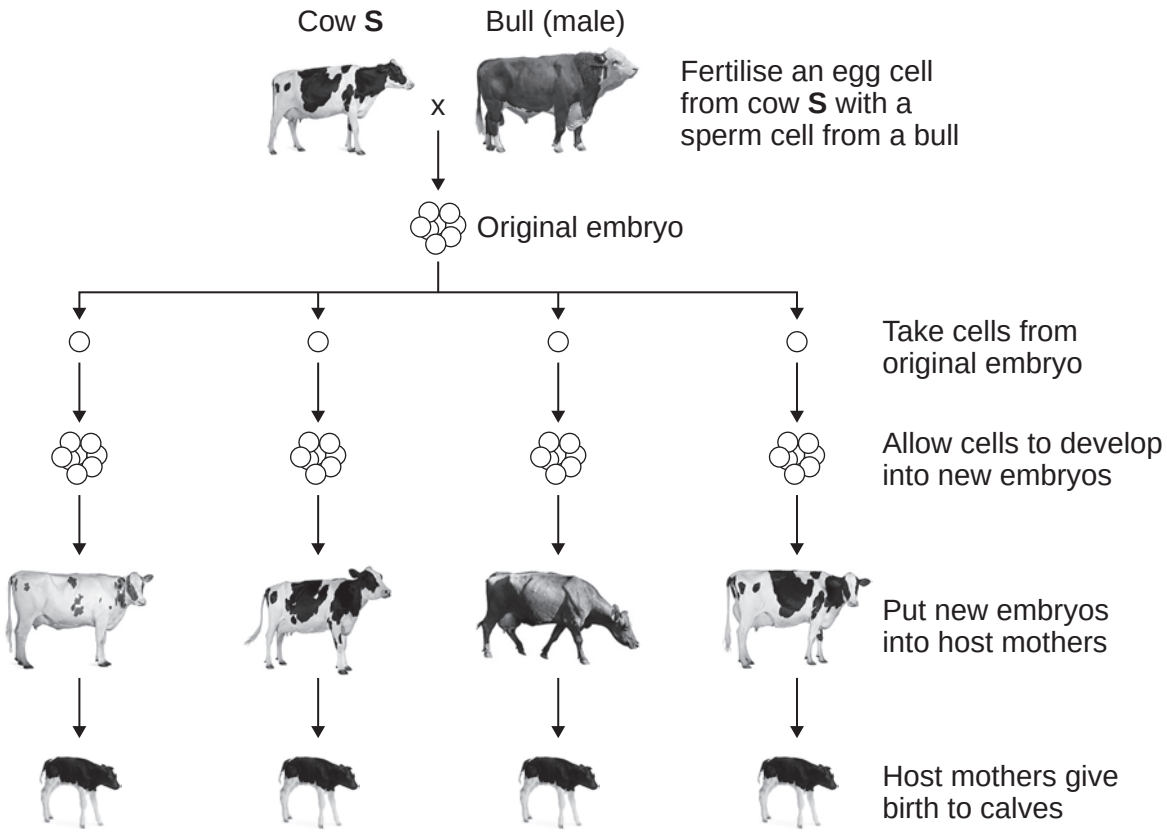
Cow **S** produces milk with a fat content of 1.2%.

Only cow **S** has the gene to produce this low-fat milk.

5 (a) A farmer plans to develop more cows like cow **S**.

Figure 6 shows how the farmer plans to do this.

Figure 6



5 (a) (i) An egg cell from cow **S** is fertilised by a sperm cell from a bull. This is part of sexual reproduction.

What is the scientific name for sex cells such as egg cells and sperm cells?

[1 mark]

.....

4.1.2.1 Chromosomes

Question 41 · continued

5 (a) (ii) After fertilisation, cells are taken from the original embryo.

These cells develop into new embryos.

Which part of the host mother's body should each new embryo be put into?

[1 mark]

.....

5 (b) (i) The calves born to all of the host mothers are genetically identical to each other.

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

[1 mark]

The calves are genetically identical to each other because

they

- are formed from the same original embryo.
- have the same host mother.
- have the same two parents.

5 (b) (ii) What term is used to describe the method of producing calves shown in **Figure 6**?

Tick (✓) **one** box.

[1 mark]

Adult cell cloning ☐

Embryo transplantation ☐

Genetic modification ☐

5 (b) (iii) Why are the calves born to the host mothers **not** genetically identical to cow **S**?

[1 mark]

.....

.....

5

4.1.2.1 Chromosomes

Question 42

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

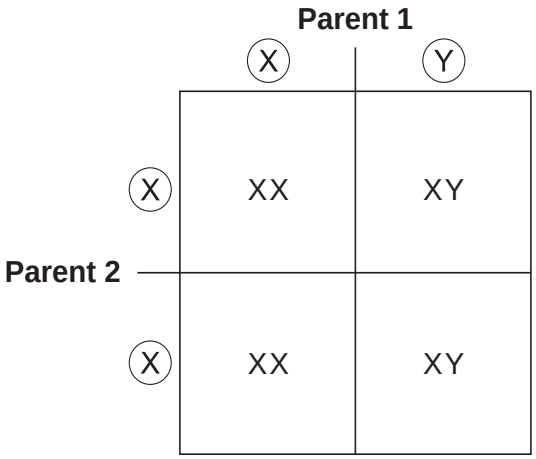
carbohydrate.
DNA.
protein.

4.1.2.1 Chromosomes

Question 42 · 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

4.1.2.1 Chromosomes

Question 43

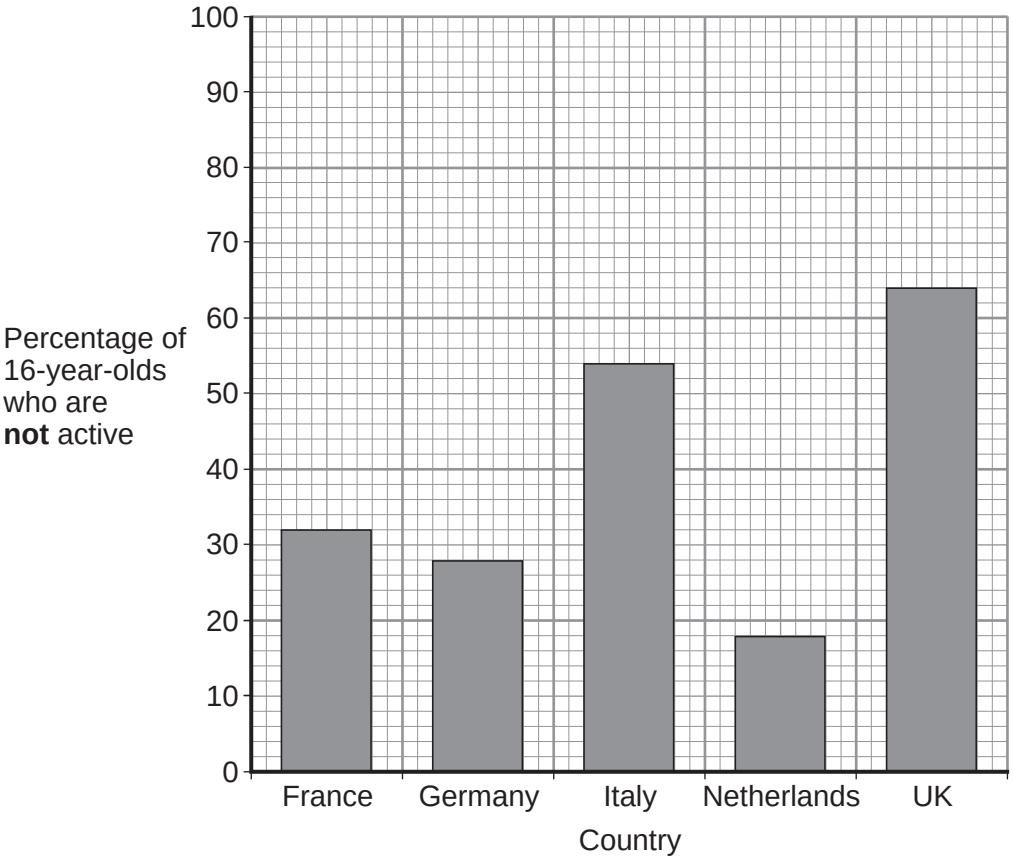
June 2015 | BL1FP | Original Q2 | Legacy

2 Scientists investigated the effect of different factors on health.

2 (a) People who are **not** active may have health problems.

Figure 3 shows the percentage of 16-year-olds in some countries who are **not** active.

Figure 3



2 (a) (i) What percentage of 16-year-olds in the UK are **not** active?

[1 mark]

..... %

2 (a) (ii) What percentage of 16-year-olds in the UK are **active**?

[1 mark]

..... %

4.1.2.1 Chromosomes

Question 43 · continued

2 (a) (iii) A newspaper headline states:

People in the UK are the laziest in the world.

Information in **Figure 3** does **not** support the newspaper headline.

Suggest **one** reason why the newspaper headline may be wrong.

[1 mark]

.....

.....

2 (b) Doctors gave a percentage rating to the health of 16-year-olds.
100% is perfect health.

Table 2 shows the amount of exercise 16-year-olds do and their health rating.

Table 2

Amount of exercise done in minutes every week	Health rating as %
Less than 30	72
90	76
180	82
300	92

What conclusion can be made about the effect of exercise on health?

Use information from **Table 2**.

[1 mark]

.....

.....

Question 2 continues on the next page

4.1.2.1 Chromosomes

Question 43 · continued

2 (c) Inherited factors can also affect health.

Give **one** health problem that may be affected by the genes someone inherits.

Draw a ring around the correct answer.

[1 mark]

being malnourished	**having a high cholesterol level**	**having a deficiency disease**

2 (d) White blood cells are part of the immune system.

Use the correct answer from the box to complete each sentence.

antibiotics	**antibodies**	**pathogens**	**vaccines**

2 (d) (i) When we are ill, white blood cells produce ..... to kill microorganisms.

[1 mark]

2 (d) (ii) Many strains of bacteria, including MRSA, have developed resistance to drugs called ..... .

[1 mark]

7

4.1.2.1 Chromosomes

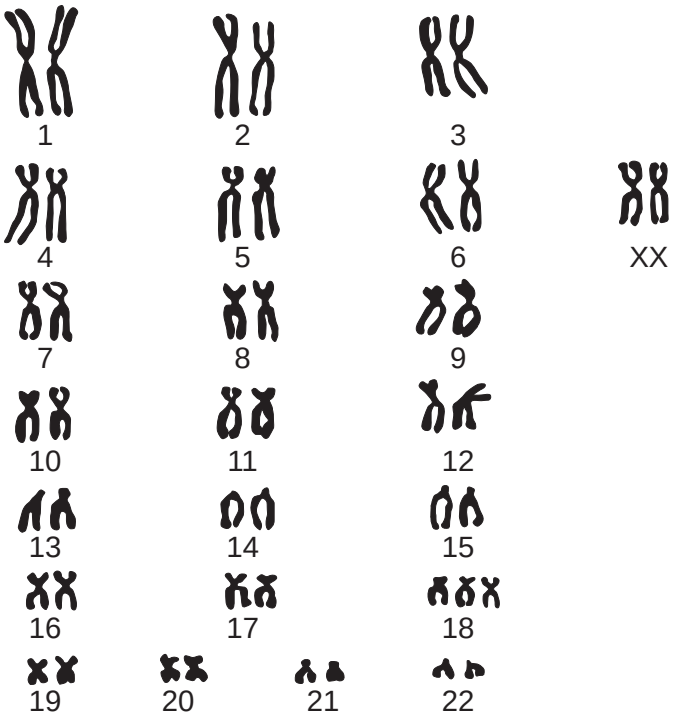
Question 44

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]

.....

.....

.....

.....

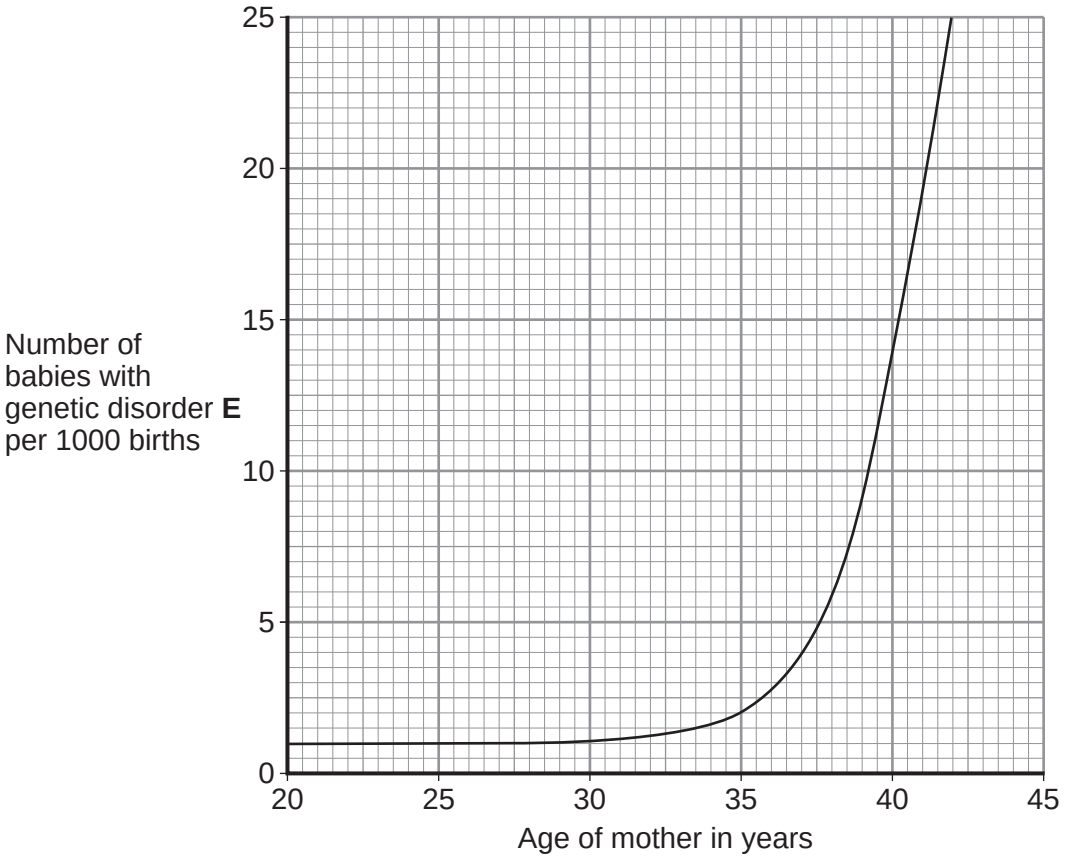
4.1.2.1 Chromosomes

Question 44 · continued

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

4.1.2.1 Chromosomes

Question 44 · 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

4.1.2.1 Chromosomes

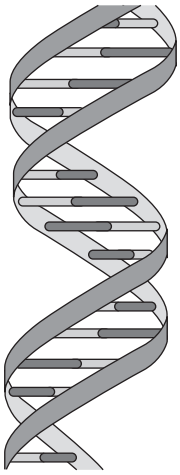
Question 45

June 2015 | BL2FP | Original Q9 | Legacy

9 DNA is the genetic material of human cells.

Figure 10 shows the structure of part of a DNA molecule.

Figure 10



9 (a) (i) Describe where DNA is found in a human cell.

[2 marks]

.....

.....

.....

9 (a) (ii) When a cell divides by mitosis the new cells are genetically identical.

What causes the cells to be genetically identical?

[1 mark]

.....

.....

9 (b) Many genes have different forms called alleles.

9 (b) (i) A person has polydactyly (extra fingers or toes). Polydactyly is caused by a dominant allele.
What is the smallest number of copies of the dominant allele for polydactyly that could be found in a body cell of this person?

[1 mark]

.....

9 (b) (ii) Another person has cystic fibrosis. Cystic fibrosis (CF) is caused by a recessive allele.
How many copies of the recessive CF allele are there in a body cell of this person?

[1 mark]

.....

4.1.2.1 Chromosomes

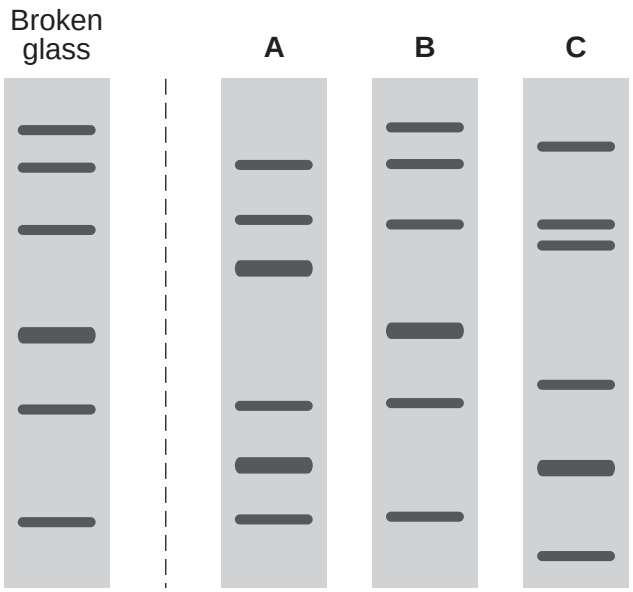
Question 45 · continued

9 (c) A burglar broke into a house. The burglar cut his hand on some broken glass. Scientists extracted DNA from the blood on the broken glass.

The scientists analysed the DNA from the glass and DNA from three suspects, **A**, **B** and **C**. The scientists used a method called DNA fingerprinting.

Figure 11 shows the scientists' results.

Figure 11



Which suspect, **A**, **B** or **C**, is most likely to have been the burglar?

[1 mark]

Tick (✓) **one** box.

A ☐

B ☐

C ☐

6

4.1.2.1 Chromosomes

Question 46

June 2016 | BL1FP | Original Q6 | Legacy

6 Darwin's theory of natural selection states that all living things have evolved from simple life forms.

6 (a) Use the correct answer from the box to complete the sentence.

[1 mark]

three billion	**three million**	**three thousand**

Darwin's theory states that life began on Earth _____ years ago.

6 (b) Life evolved due to changes in genes. Changes in genes cause variation.

Complete the sentences.

[2 marks]

Changes in genes are called _____ .

Individuals with characteristics most suited to the environment are more likely to survive and _____ .

3

4.1.2.1 Chromosomes

Question 47

June 2016 | BL2FP | Original Q6 | Legacy

6 (a) Which organ of the human body produces egg cells?

[1 mark]

Draw a ring around the correct answer.

liver **ovary** **testis**

6 (b) An egg joins with a sperm and develops into an embryo.

How many chromosomes are there in each cell of a human embryo?

[1 mark]

Draw a ring around the correct answer.

23 **46** **48**

6 (c) Some women find it difficult to have a baby. A doctor may suggest that these women should use In Vitro Fertilisation (IVF) to help them have a baby.

Table 2 shows how successful IVF was for women of different ages at one clinic.

Table 2

Age of women in years	Percentage of women who had a baby
<35	35
35–37	31
38–39	25
40–42	32
43–44	7
>44	0

6 (c) (i) A student thought that the result for women aged 40–42 was anomalous.

Suggest why the student thought this result was anomalous.

[1 mark]

_____

_____

6 (c) (ii) Describe the general trend in the results in **Table 2**.

You should ignore the anomalous result.

[1 mark]

_____

_____

4.1.2.1 Chromosomes

Question 47 · continued

6 (d) Some babies are born with a faulty chromosome.

Scientists investigated whether the chance of having a baby with a faulty chromosome is also related to the age of the woman.

Table 3 shows the scientists' results.

Table 3

Age of women in years	Number of women per 1000 who had a baby with a faulty chromosome
25	2.0
30	2.6
35	6.1
40	19.6
45	66.0

6 (d) (i) A 45-year-old woman is more likely than a 25-year-old woman to have a baby with a faulty chromosome.

How many times more likely?

[2 marks]

Answer = _____ times

6 (d) (ii) Suggest **two** reasons why many fertility clinics will **not** accept women over 40 years of age for IVF treatment.

Use information from **Table 2** and **Table 3** in your answer.

[2 marks]

1 _____

2 _____

8

4.1.2.1 Chromosomes

Question 48

June 2017 | BL1FP | Original Q2 | Legacy

2 Genes control some of the characteristics of an organism.

2 (a) Write the words from the box in the correct size order, starting with the smallest structure.

[3 marks]

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

Smallest structure _____

_____

_____

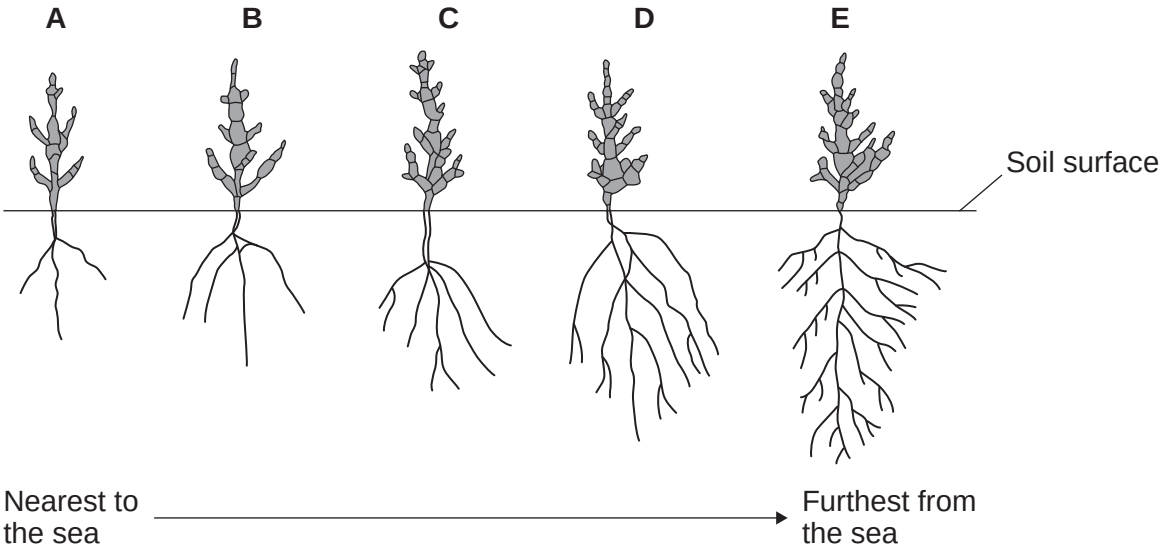
Largest structure _____

2 (b) Glasswort is a plant that grows on seashores.

Figure 2 shows five glasswort plants, **A**, **B**, **C**, **D** and **E**.

The glasswort plants live on different parts of the same seashore.

Figure 2



4.1.2.1 Chromosomes

Question 48 · continued

2 (b) (i) Describe **two** effects of increasing distance from the sea on the growth of **roots** in glasswort plants.

[2 marks]

1 _____

_____

2 _____

_____

2 (b) (ii) In an investigation, plant **A** was dug up and replanted next to plant **E**.

One month later, the roots of plant **A** were the same as the roots of plant **E**.

Use the correct answer from the box to complete the sentence.

[1 mark]

genes only	**the environment only**	**genes and the environment**

The change in the growth of the roots in plant **A** after replanting is due to

_____ .

6

4.1.2.1 Chromosomes

Question 49

June 2017 | BL2FP | Original Q4 | Legacy

4 Alkaptonuria (AKU) is a rare, inherited condition.

4 (a) The allele that causes AKU is on chromosome number 3.

4 (a) (i) How many chromosomes are there in most human cells?

[1 mark]

Draw a ring around the correct answer.

23 **24** **46** **48**

4 (a) (ii) The allele for AKU is recessive.

What is a recessive allele?

[1 mark]

Tick (✓) **one** box.

An allele that causes a genetic disorder. ☐

An allele that shows its effect only if the dominant allele is not present. ☐

An allele that shows its effect when only one chromosome carries it. ☐

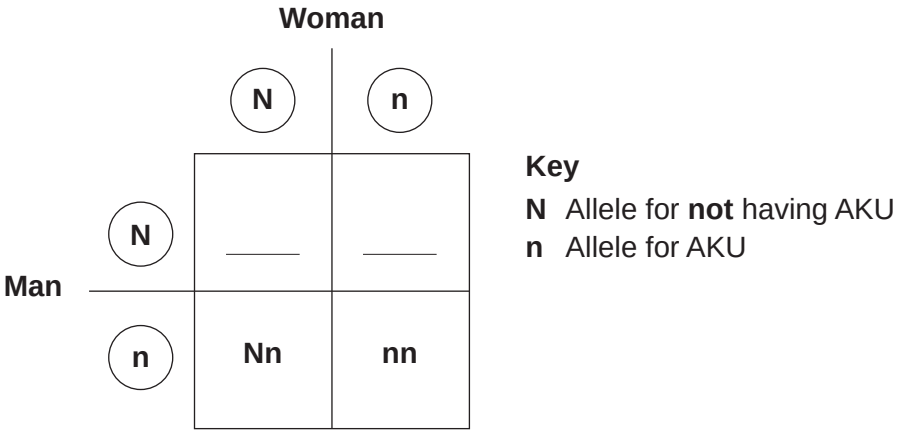
4.1.2.1 Chromosomes

Question 49 · continued

4 (b) Two parents, who do **not** have AKU, have a child with AKU.

Figure 4 shows how this can happen.

Figure 4



4 (b) (i) **Figure 4** is incomplete.

Complete **Figure 4** to show the missing combinations of alleles.

[2 marks]

Write the correct letters in the **two** empty boxes.

4 (b) (ii) Draw a ring around **one** pair of alleles in **Figure 4** to show a child with AKU.

[1 mark]

4 (b) (iii) The man and woman in **Figure 4** want to have another child.

What is the chance that their next child will have AKU?

[1 mark]

Draw a ring around the correct answer.

0 in 4 **1 in 4** **2 in 4** **3 in 4**

6

4.1.2.1 Chromosomes

Question 50

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.

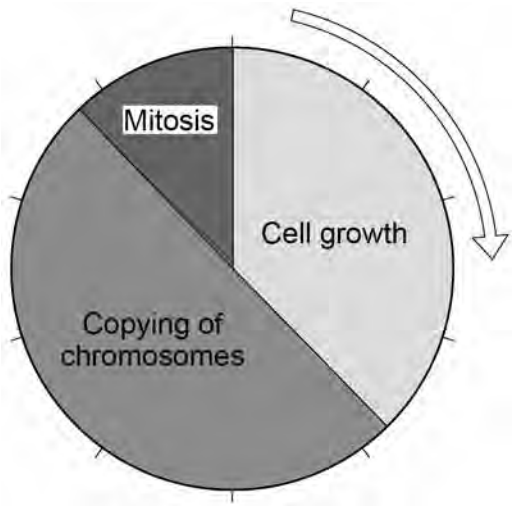
- Cytoplasm ☐
- Nucleus ☐
- Ribosomes ☐
- Vacuole ☐

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



4.1.2.1 Chromosomes

Question 50 · 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]

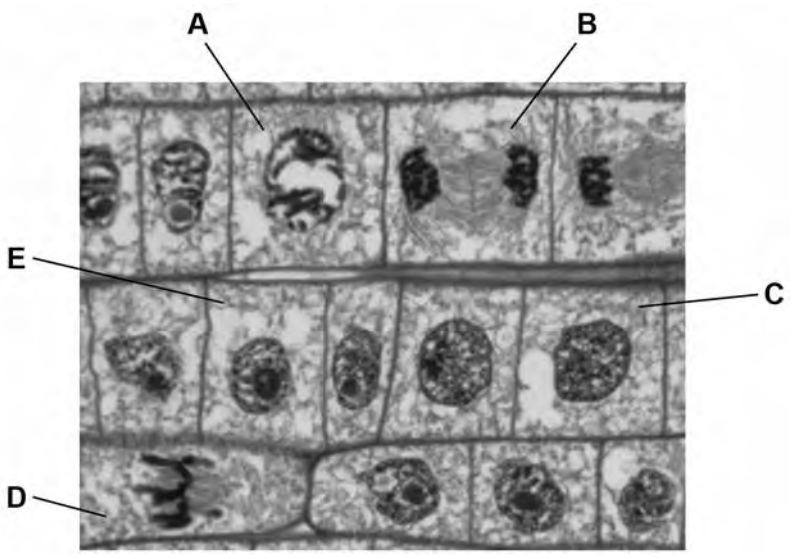
Time = _____ minutes

4.1.2.1 Chromosomes

Question 50 · 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	

4.1.2.1 Chromosomes

Question 50 · continued

June 2018 | 8461/1F | Original Q1

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

4.1.2.1 Chromosomes

Question 51

June 2018 | 8461/2F | Original Q4

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 ☐

4.1.2.1 Chromosomes

Question 51 · 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

4.1.2.1 Chromosomes

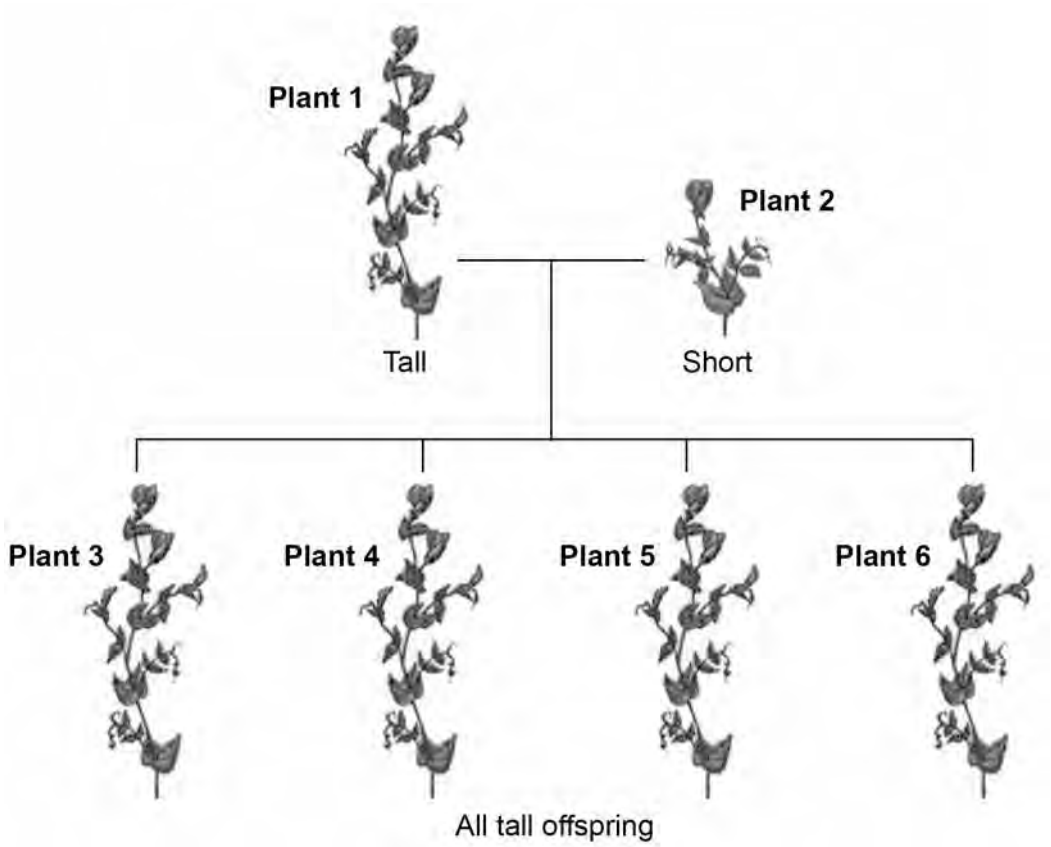
Question 51 · continued

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



4.1.2.1 Chromosomes

Question 51 · 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

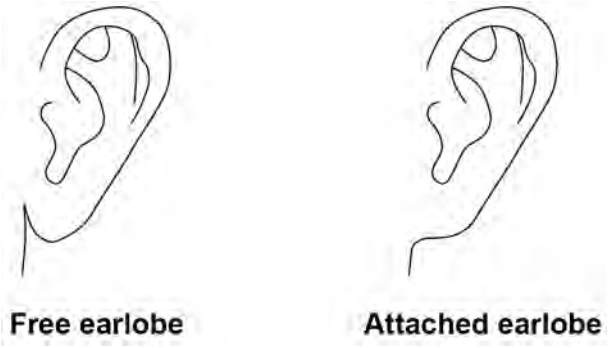
4.1.2.1 Chromosomes

Question 52

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

4.1.2.1 Chromosomes

Question 52 · 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 ☐

4.1.2.1 Chromosomes

Question 52 · 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

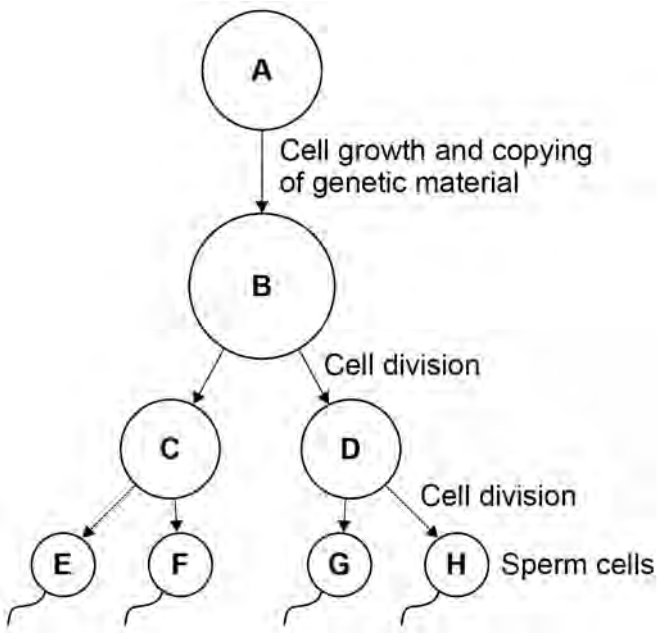
4.1.2.1 Chromosomes

Question 53

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** ☐

4.1.2.1 Chromosomes

Question 53 · 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]

4.1.2.1 Chromosomes

Question 53 · 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?

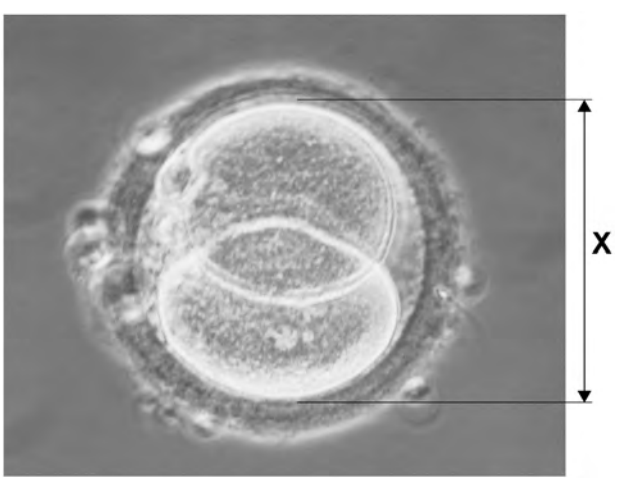
[1 mark]

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

4.1.2.1 Chromosomes

Question 53 · 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

4.1.2.1 Chromosomes

Question 54

November 2020 | 8461/1F | Original Q2

0 2 This question is about cell division.

0 2 . 1 Which process makes two identical new body cells for growth and repair?

[1 mark]

Tick (✓) **one** box.

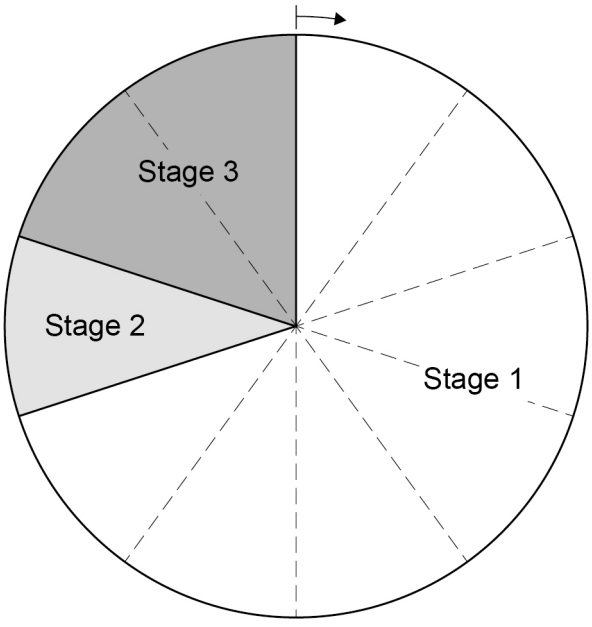
Differentiation ☐

Fertilisation ☐

Mitosis ☐

Figure 5 shows the three stages of a cell cycle.

Figure 5



4.1.2.1 Chromosomes

Question 54 · continued

0 2 . 2 Draw **one** line from each stage of the cell cycle to what happens during that stage.

[2 marks]

Stage of cell cycle	What happens during that stage
Stage 1	One set of chromosomes is pulled to each end of the cell
Stage 2	The cytoplasm and cell membrane divide to form two new cells
Stage 3	The cell grows and the chromosomes replicate

0 2 . 3 What percentage of the total time for the cell cycle is taken by stage 1?

[2 marks]

Percentage = _____ %

0 2 . 4 A cell divides to form two new cells every 24 hours.

How many days will it take for the original cell to divide into 8 cells?

[1 mark]

Tick (✓) **one** box.

1 ☐ 3 ☐ 6 ☐ 8 ☐

4.1.2.1 Chromosomes

Question 54 · continued

0 2 . 5 The chromosomes contain the genetic material.

Name the chemical which the genetic material is made from.

[1 mark]

0 2 . 6 The genetic material is made of many small sections.

Each section codes for a specific protein.

What is one section of genetic material on a chromosome called?

[1 mark]

Tick (✓) **one** box.

A gamete ☐

A gene ☐

A nucleus ☐

0 2 . 7 Stem cells are cells which have **not** yet been specialised to carry out a particular job.

Bone marrow cells are one example of stem cells.

Explain how a transplant of bone marrow cells can help to treat medical conditions.

[2 marks]

10

4.1.2.1 Chromosomes

Question 55

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]

4.1.2.1 Chromosomes

Question 55 · 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

4.1.2.1 Chromosomes

Question 55 · 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% ☐

4.1.2.1 Chromosomes

Question 55 · 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

4.1.2.1 Chromosomes

Question 56

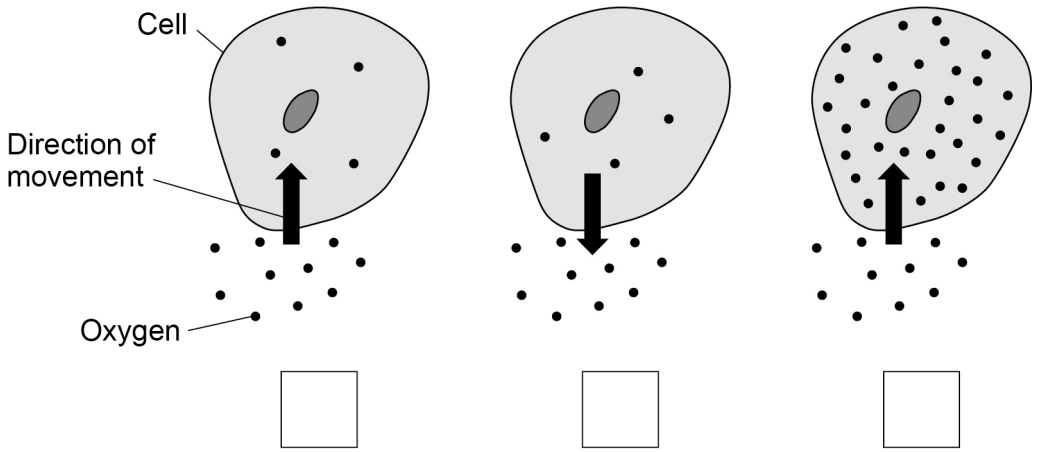
November 2021 | 8461/1F | Original Q1

0 1 This question is about cells.

0 1 . 1 Which diagram shows oxygen moving by diffusion?

[1 mark]

Tick (✓) **one** box.



0 1 . 2 Complete the sentences.

[3 marks]

Choose answers from the box.

carbon dioxide	**chlorophyll**	**energy**
light	**mineral ions**	**water**

Plant cells absorb substances from the soil.

Plant cells use osmosis to absorb _____.

Plant cells use active transport to absorb _____.

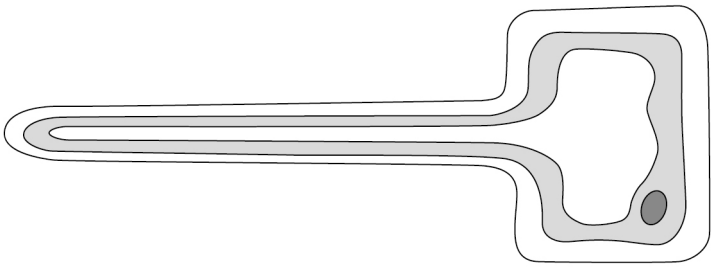
Active transport moves substances against the concentration gradient and needs _____.

4.1.2.1 Chromosomes

Question 56 · continued

Figure 1 shows a specialised cell that absorbs substances from the soil.

Figure 1



0 1 . 3 Name the type of specialised cell in **Figure 1**.

[1 mark]

0 1 . 4 Describe how the cell in **Figure 1** is adapted to increase the absorption of substances from the soil.

[1 mark]

Question 1 continues on the next page

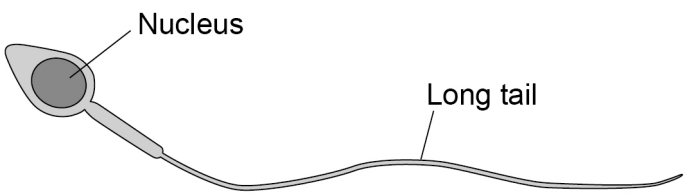
4.1.2.1 Chromosomes

Question 56 · continued

A sperm cell is another specialised cell.

Figure 2 shows a sperm cell.

Figure 2



0 1 . 5 Draw **one** line from each feature to how the feature helps the sperm cell carry out its function.

[2 marks]

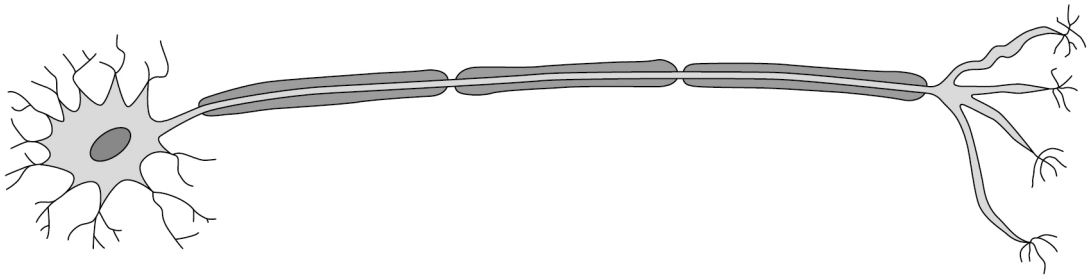
Feature of sperm cell	How the feature helps
Contains a nucleus	To break the outer layer of the egg
	To help the cell to swim to the egg
Has a long tail	To provide the chromosomes for fertilisation
	To release energy

4.1.2.1 Chromosomes

Question 56 · continued

Figure 3 shows another specialised cell.

Figure 3



0 1 . 6 Name the type of cell in **Figure 3**.

Describe **one** feature of the cell that helps it to carry out its function.

[2 marks]

Name of the cell _____

Feature of the cell _____

_____

10

4.1.2.1 Chromosomes

Question 57

November 2021 | 8461/2F | Original Q8

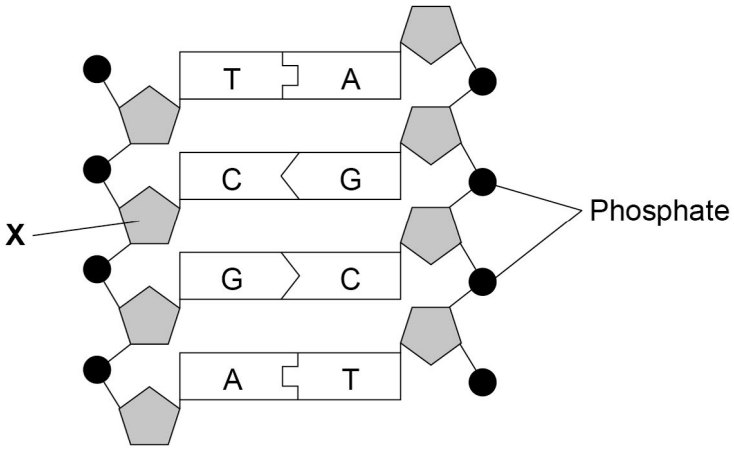
0 8 The nucleus of a cell contains DNA.

0 8 . 1 Name the structures inside the cell nucleus that contain DNA.

[1 mark]

Figure 13 shows part of a DNA molecule.

Figure 13



0 8 . 2 Name the part of the DNA molecule labelled **X**.

[1 mark]

0 8 . 3 What type of substances are labelled **A**, **C**, **G** and **T** in **Figure 13**?

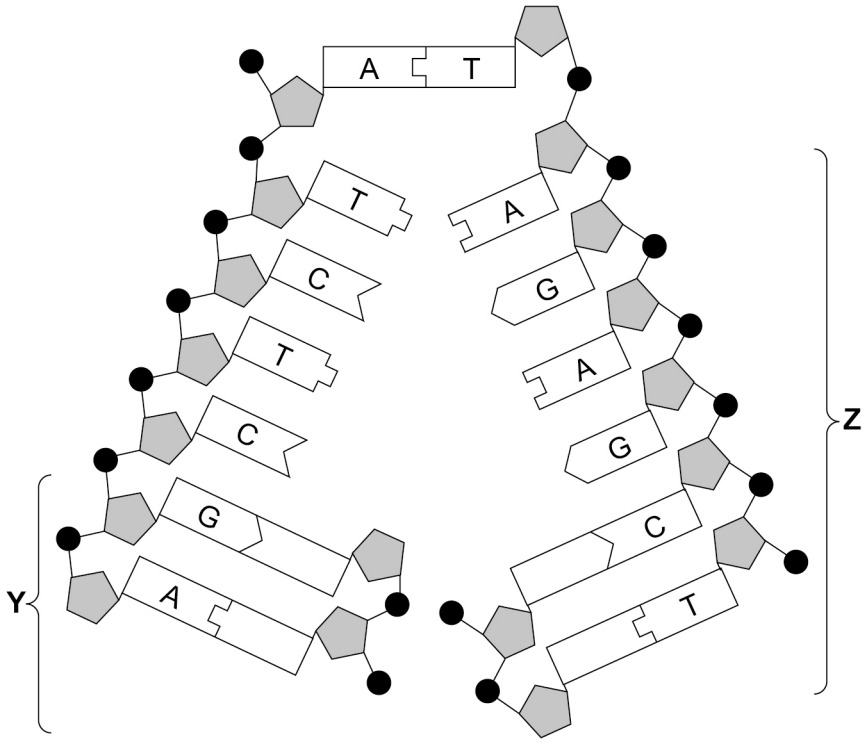
[1 mark]

4.1.2.1 Chromosomes

Question 57 · continued

Figure 14 shows another section of a DNA molecule.

Figure 14



0 8 . 4 Four of the substances you named in Question **08.3** are **not** labelled in part **Y** of **Figure 14**.

Label each of these substances with the correct letter, **A**, **C**, **G** or **T**.

Use information from other parts of **Figure 14** to help you.

[1 mark]

0 8 . 5 What is happening to the DNA in part **Z** of **Figure 14**?

[1 mark]

Tick (✓) **one** box.

- Differentiation ☐
- Evolution ☐
- Fertilisation ☐
- Replication ☐

4.1.2.1 Chromosomes

Question 57 · continued

0 8 . 6 A gene is a length of DNA.

What type of substance does a gene code for?

[1 mark]

0 8 . 7 Most human body cells contain 6×10^{-12} grams of DNA.

What mass of DNA will a human sperm cell contain?

[1 mark]

Tick (✓) **one** box.

- 6×10^{-6} grams ☐
- 6×10^{-12} grams ☐
- 3×10^{-6} grams ☐
- 3×10^{-12} grams ☐

0 8 . 8 What is the name of the type of cell division that produces sperm cells?

[1 mark]

Tick (✓) **one** box.

- Binary fission ☐
- Differentiation ☐
- Meiosis ☐
- Mitosis ☐

8

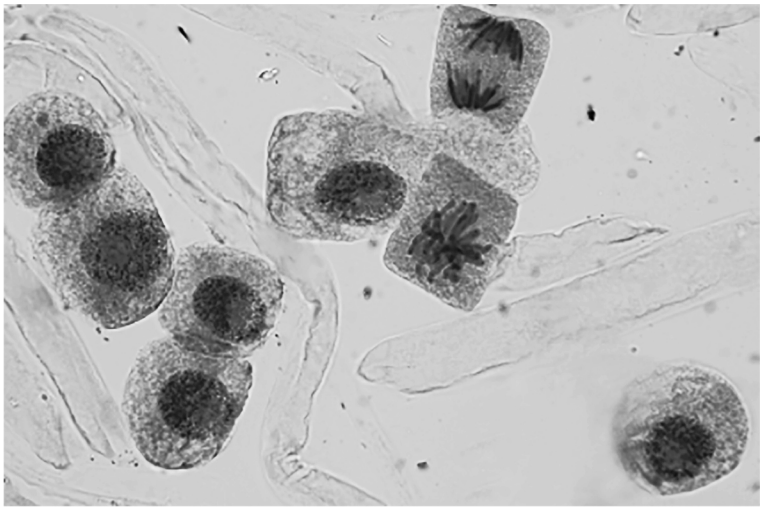
4.1.2.1 Chromosomes

Question 58

0 2 **Figure 1** shows animal cells.

Some of the cells are dividing by mitosis for growth and repair.

Figure 1



0 2 . 1 What fraction of the cells in **Figure 1** is dividing by mitosis?

[1 mark]

Tick (✓) **one** box.

$\frac{1}{8}$ ☐ $\frac{1}{4}$ ☐ $\frac{1}{2}$ ☐ $\frac{3}{4}$ ☐

4.1.2.1 Chromosomes

Question 58 · continued

0 2 . 2 The cells which are **not** dividing in **Figure 1** each contain 10 chromosomes.

One of these cells divides by mitosis to produce two new cells.

How many chromosomes will each new cell contain after mitosis?

[1 mark]

Tick (✓) **one** box.

5 ☐ 10 ☐ 15 ☐ 20 ☐

0 2 . 3 Cells divide in a series of stages called the cell cycle.

Complete the sentences.

Choose answers from the box.

[3 marks]

contracts	**divides**	**grows**
reacts	**relaxes**	**replicates**

Before mitosis occurs, the cell _____.

The genetic material in the cell doubles when the DNA _____.

After the chromosomes have been pulled to each end of the cell, the cytoplasm _____.

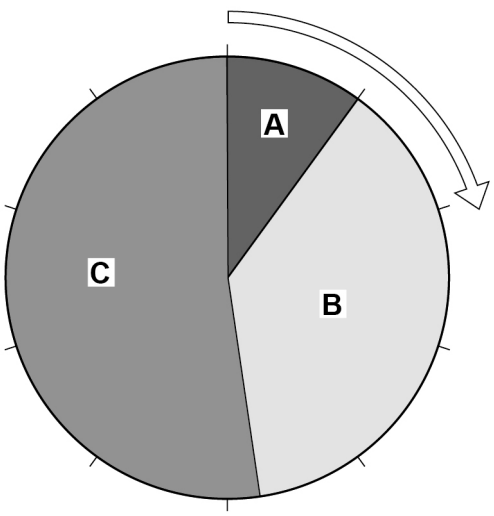
Question 2 continues on the next page

4.1.2.1 Chromosomes

Question 58 · continued

Figure 2 shows the time taken to complete different stages of the cell cycle.

Figure 2



0 2 . 4 Which stage of the cell cycle takes the most time?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐

0 2 . 5 What percentage of time in the cell cycle is stage **A**?

[1 mark]

Tick (✓) **one** box.

5% ☐ 10% ☐ 15% ☐ 25% ☐

4.1.2.1 Chromosomes

Question 58 · continued

Stem cells divide by mitosis.

Scientists can use stem cells from an embryo to create heart cells in a laboratory.

0 2 . 6 Which organ system contains heart cells?

[1 mark]

Tick (✓) **one** box.

- Circulatory system ☐
- Digestive system ☐
- Nervous system ☐
- Respiratory system ☐

0 2 . 7 Name **one** medical condition that could be treated using heart cells created from an embryo.

[1 mark]

_____

0 2 . 8 Give **one** reason why a patient may **not** want to be treated with heart cells created from an embryo.

[1 mark]

_____

_____

10

4.1.2.1 Chromosomes

Question 59

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

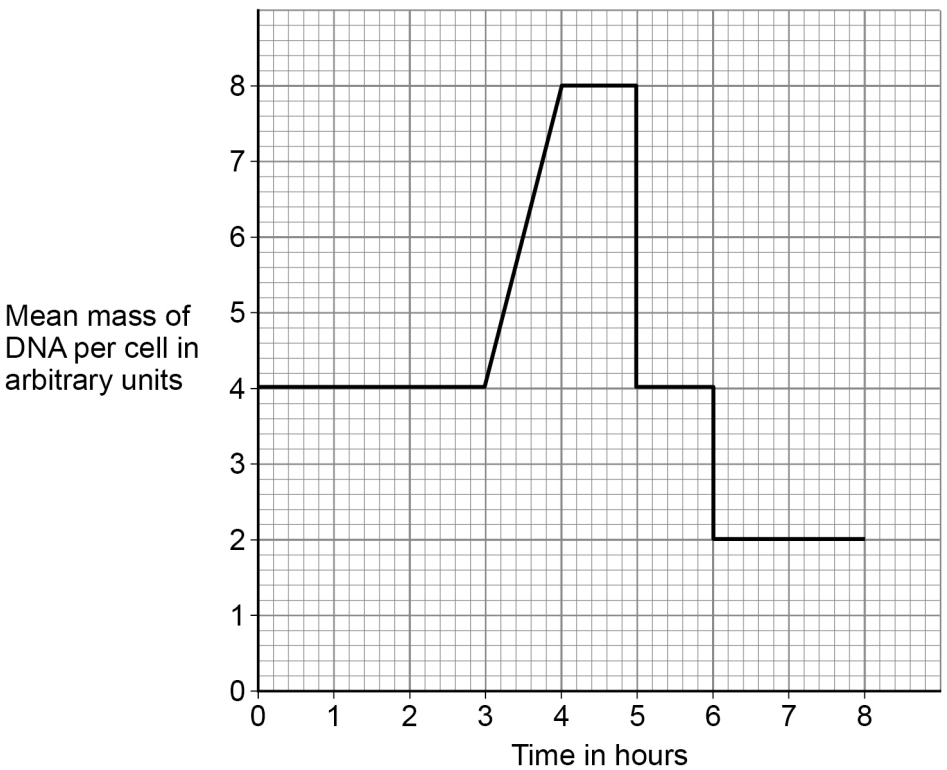
4.1.2.1 Chromosomes

Question 59 · 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 ☐

4.1.2.1 Chromosomes

Question 59 · 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

4.1.2.1 Chromosomes

Question 60

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 ☐

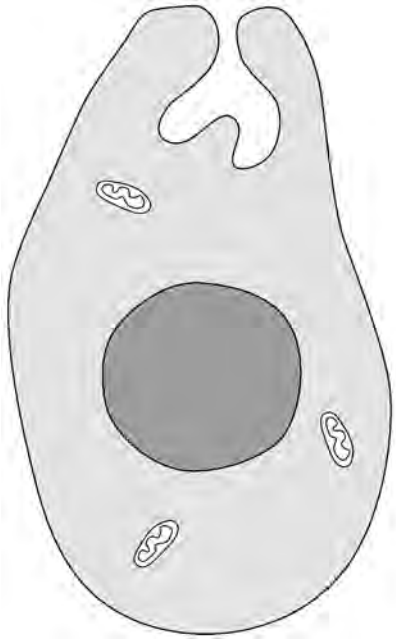
Gene ☐

Vector ☐

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

Figure 2 shows a malarial protist.

Figure 2



Question 60 · continued

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

4.1.2.1 Chromosomes

Question 60 · 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 ☐

4.1.2.1 Chromosomes

Question 60 · 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

4.1.2.1 Chromosomes

Question 60 · 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

4.1.2.1 Chromosomes

Question 61

June 2023 | 8461/2F | Original Q9

0 9 Reproduction can produce offspring which are:

- genetically different

  or

- genetically identical.

Farmers grow tomato plants in greenhouses.

The tomatoes are sold in supermarkets.

0 9 . 1 Suggest **one** advantage of growing tomato plants that are genetically different.

[1 mark]

0 9 . 2 Suggest **one** advantage of growing tomato plants that are genetically identical.

[1 mark]

0 9 . 3 Scientists can grow genetically identical tomato plants using tissue culture.

What is tissue culture?

[1 mark]

0 9 . 4 Genetically identical tomato plants growing in the same garden do **not** all grow to the same height.

Give **one** reason why.

[1 mark]

4.1.2.1 Chromosomes

Question 61 · continued

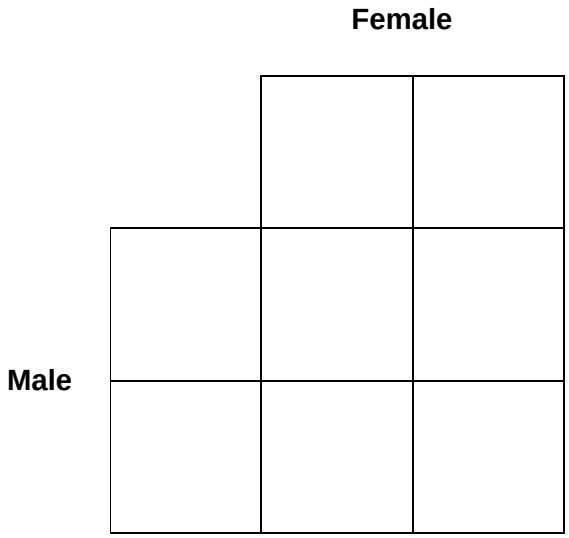
The sex of dogs is determined by **X** and **Y** chromosomes in the same way as in humans.

0 9 . 5 Complete the Punnett square diagram in **Figure 15** to show the inheritance of sex in dogs.

Use the symbols **X** and **Y**.

[3 marks]

Figure 15



0 9 . 6 A female dog gave birth to six offspring.

Why would you expect there to be three male offspring and three female offspring?

Use your answer to Question **09.5**.

[1 mark]

Question 9 continues on the next page

Question 61 · continued

Farmers keep chickens for:

- meat production
- egg production.

Some varieties of chicken grow more quickly and are more suitable for meat production.

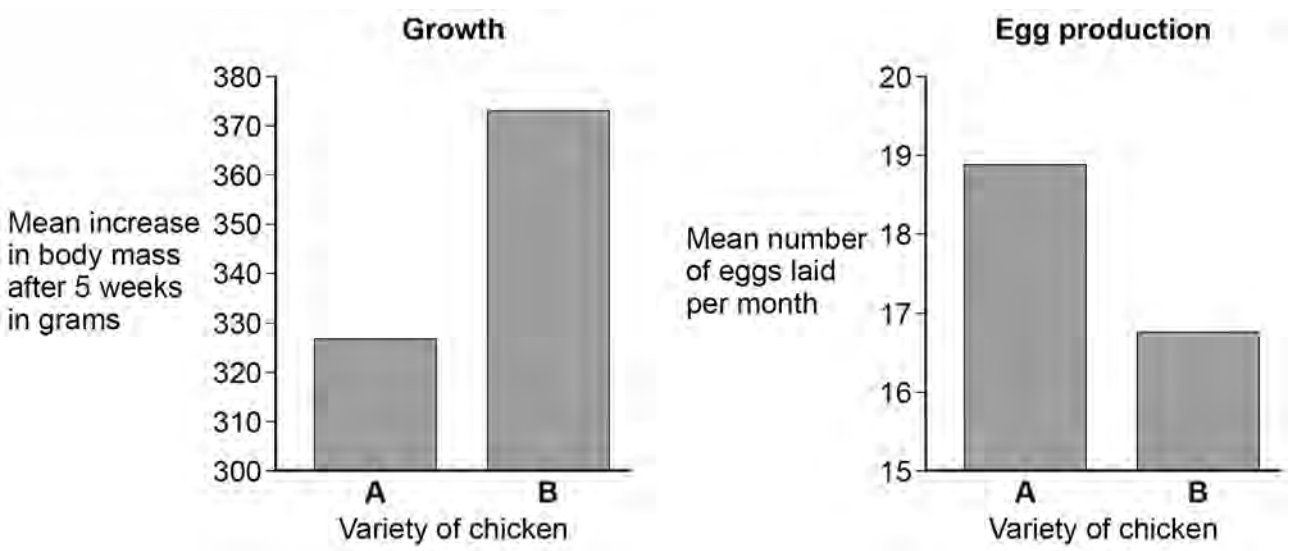
Other varieties of chicken produce more eggs.

A farmer keeps two varieties of chicken, **A** and **B**.

The farmer investigated the growth rates and egg-production rates of both varieties.

Figure 16 shows the results.

Figure 16



0 9 . 7 Suggest **two** control variables the farmer should have used in this investigation.

[2 marks]

1 _____

_____

2 _____

_____

4.1.2.1 Chromosomes

Question 61 · continued

0 9 . 8 **Figure 16** shows mean values from 500 chickens of each variety.

Give the reason the farmer used a large number of chickens.

[1 mark]

0 9 . 9 The farmer wants to produce a new variety of chicken that is good for **both** meat production **and** egg production.

Describe how selective breeding of chicken varieties **A** and **B** can produce the new variety of chicken.

[4 marks]

15

4.1.2.1 Chromosomes

Question 62

June 2024 | 8461/1F | Original Q8

0 8 Cystic fibrosis (CF) is an inherited disorder caused by a faulty gene.

0 8 . 1 Where in a cell would the CF gene be found?

[1 mark]

4.1.2.1 Chromosomes

Question 62 · continued

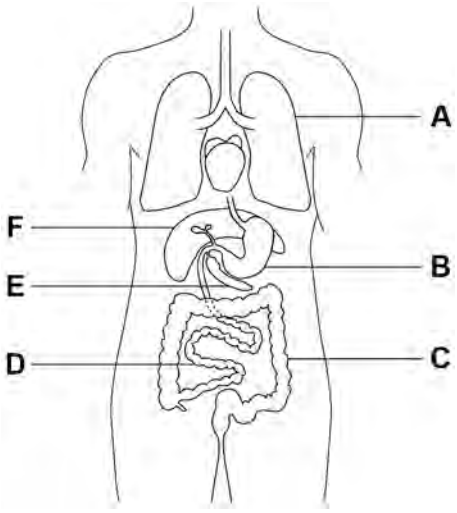
CF affects many organs in the body.

The main organs affected are:

- the lungs
- the pancreas
- the small intestine.

0 8 . 2 **Figure 7** shows organs of the human body.

Figure 7



Which letters in **Figure 7** show the lungs, the pancreas and the small intestine?

[1 mark]

Tick (✓) **one** box.

A, **D** and **E** ☐

A, **E** and **F** ☐

B, **C** and **D** ☐

B, **C** and **F** ☐

Question 8 continues on the next page

4.1.2.1 Chromosomes

Question 62 · continued

0 8 . 3 The pancreas produces several digestive enzymes.

CF reduces the amount of each enzyme that reaches the small intestine.

Explain why a person with CF has:

- difficulty digesting food
- difficulty gaining body mass.

[6 marks]

4.1.2.1 Chromosomes

Question 62 · continued

0 8 . 4 Gas exchange happens in the alveoli in the lungs.

Describe **three** features of the alveoli that help maximise gas exchange.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

0 8 . 5 CF reduces the amount of oxygen that can enter the blood from the alveoli.

Explain how a reduced amount of oxygen entering the blood will affect the human body.

[3 marks]

_____

_____

_____

_____

_____

_____

14

4.1.2.1 Chromosomes

Question 63

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

Question 63 · continued

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.

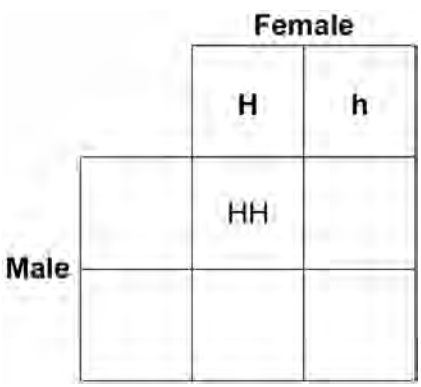
0 1 . 3 Complete the Punnett square diagram in **Figure 2**.

You should show:

- the male gametes
- the offspring genotypes.

[3 marks]

Figure 2



4.1.2.1 Chromosomes

Question 63 · 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

4.1.2.1 Chromosomes

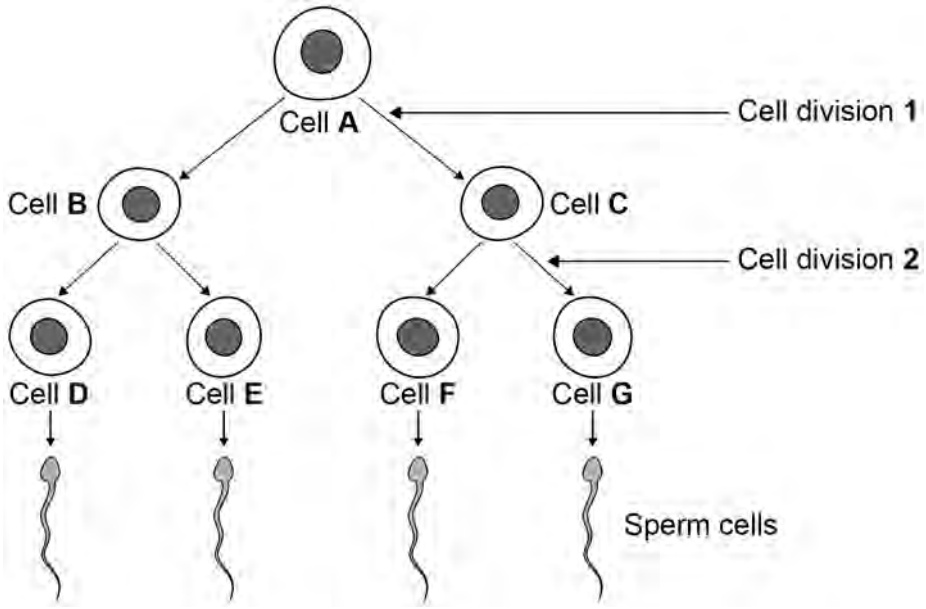
Question 64

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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** _____

4.1.2.1 Chromosomes

Question 64 · 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

4.1.2.1 Chromosomes

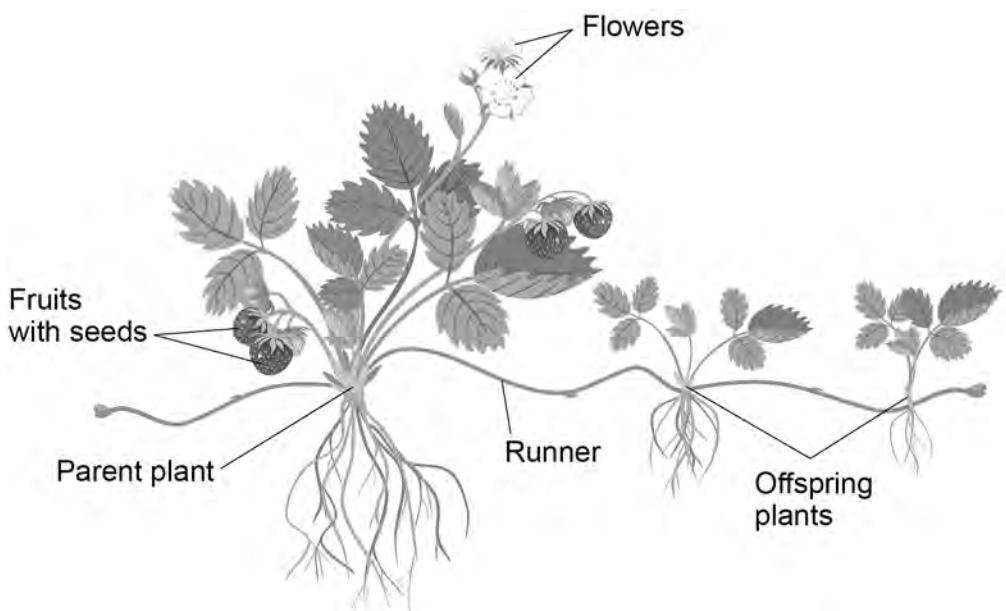
Question 64 · continued

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 ☐

4.1.2.1 Chromosomes

Question 64 · 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

4.1.2.1 Chromosomes

Question 64 · 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