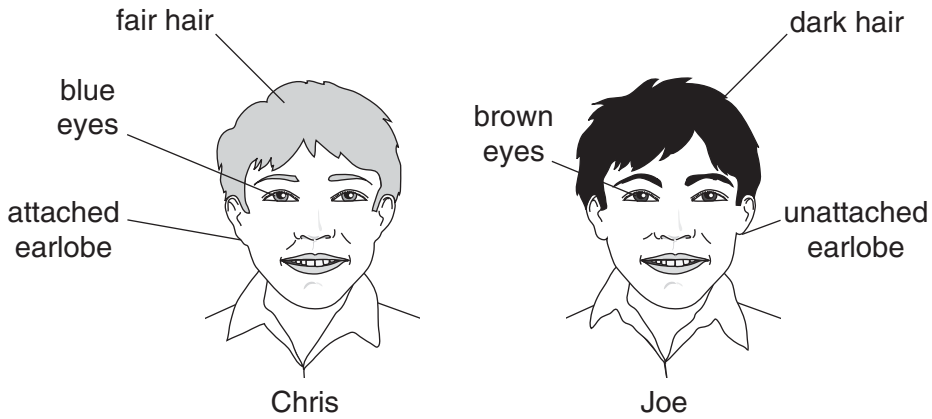


Answer **all** the questions.

- 1 Chris and Joe are brothers.
They have the same parents.



- (a) Chris and Joe look different from each other.

Choose the **best** explanation for this.
Put a tick (✓) in the correct box.

Chris is older than Joe.

They have different combinations of alleles.

They are both boys.

[1]

- (b) Chris and Joe look like their parents in some ways.

Explain why.

.....

.....

.....[2]

- (c) Complete the following sentences about the inheritance of ear shape.

Choose from this list.

a gene **a protein** **chromosomes** **DNA** **recessive**

Ear shape is determined by with two different alleles.

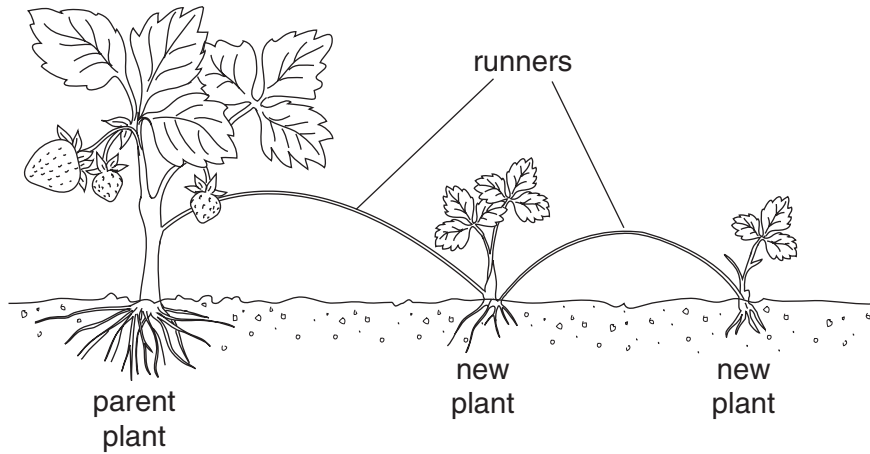
One allele is dominant, the other is

The alleles are carried by inside the cell nucleus.

[3]

[Total: 6]

- 2 Jean grows strawberry plants in her garden.
The diagram shows how the parent plant produces new plants using runners.



- (a) The new plants are clones.

What is a clone?

.....

[2]

- (b) Jean could also grow new strawberry plants from seeds.

Write down **one** advantage of growing plants from clones rather than from seeds.

.....
[1]

- (c) Jean notices that the strawberry plants growing nearest to the garden wall are very small and produce a poor crop.

Suggest an explanation.

.....
[1]

[Total: 4]


5 Read this newspaper article about DNA.

The story of DNA.

1940
Oswald Avery showed that chromosomes contain DNA which carries genetic information.

1953
Francis Crick and James Watson worked out that the structure of DNA was a double helix.

1985
DNA fingerprinting was invented by Alex Jeffreys at Leicester University.



1987
Colin Pitchfork was the first murderer to be convicted by DNA evidence.

1996
Bones in Russia were identified by genetic testing as being from the murdered Tsar Nicholas.

1999
Genetic tests prove President Clinton is not the father of Danny Williams, as claimed.

(a) (i) Which part of the cell contains DNA?

Put a **ring** round the correct answer.

cell wall **chromosome** **membrane** **vacuole**
[1]

(ii) What did Francis Crick and James Watson find out about the structure of DNA?


.....
.....[1]

(iii) The article shows how information from DNA can be used.

Write down **one** of the uses described in the article.

.....
.....[1]

(b) The newspaper article also suggests how DNA could be used in the future.

<p>2010 DNA samples used to make up a picture of what a criminal looks like.</p>		<p>2015 DNA records of every person kept on a Government database available to police and medical research organisations.</p>
--	---	---

Some people agree with these possible future uses of DNA. Other people disagree.

Suggest **two** reasons why people might agree and **two** reasons why people might disagree.

Reasons for agreeing

1

2

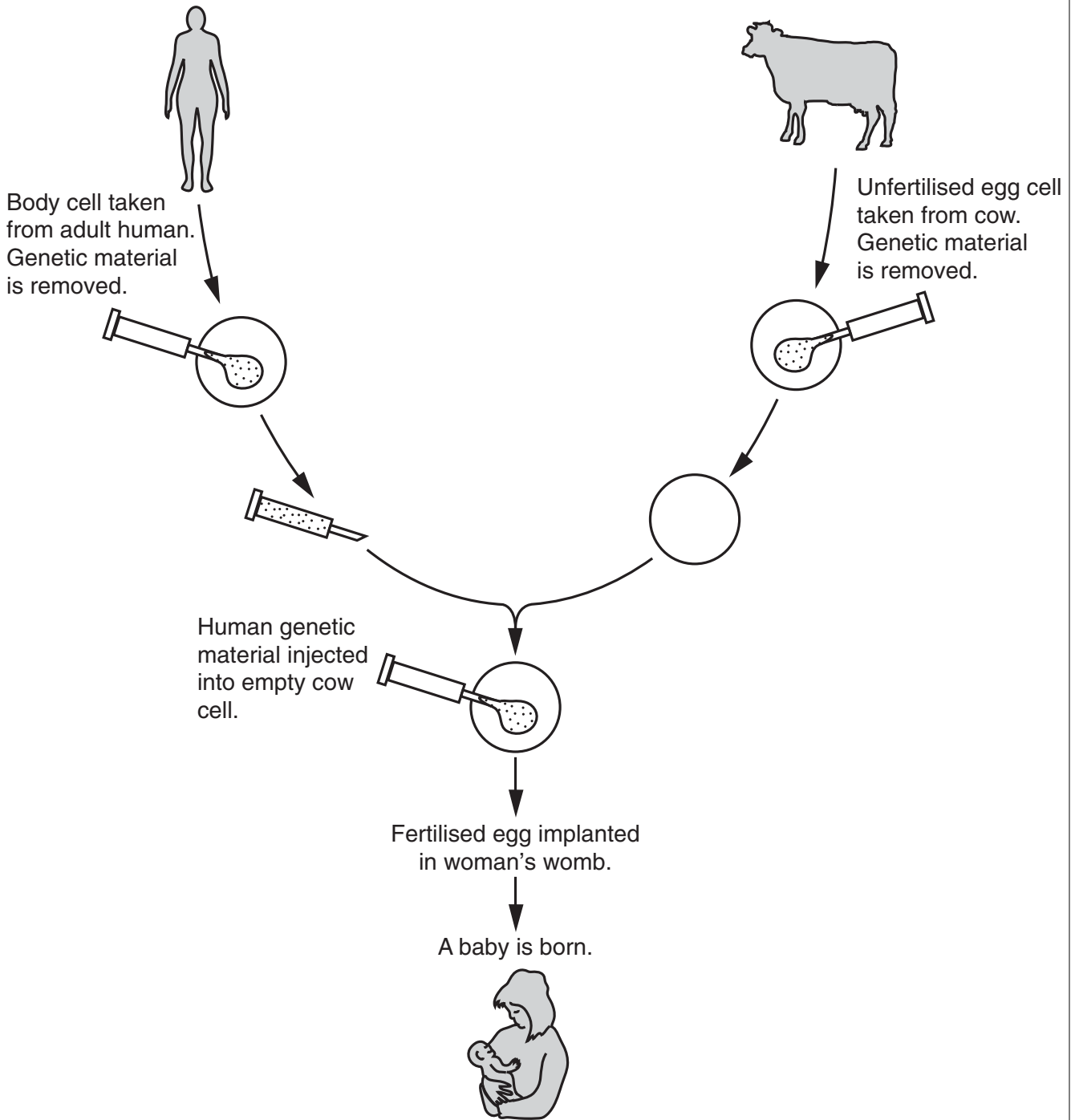
Reasons for disagreeing

1

2[4]

[Total: 7]

6 Scientists think it may be possible to produce a human from a cow's egg.



- (a) The baby produced would not have cow characteristics. It would have human characteristics.

Explain why.

.....
.....
.....
.....[2]

- (b) This method uses cow eggs instead of human eggs.

Write down **two** advantages of using cow eggs instead of human eggs.

1

.....

2

.....

.....[2]

[Total: 4]

5 Read this newspaper story about gene therapy.

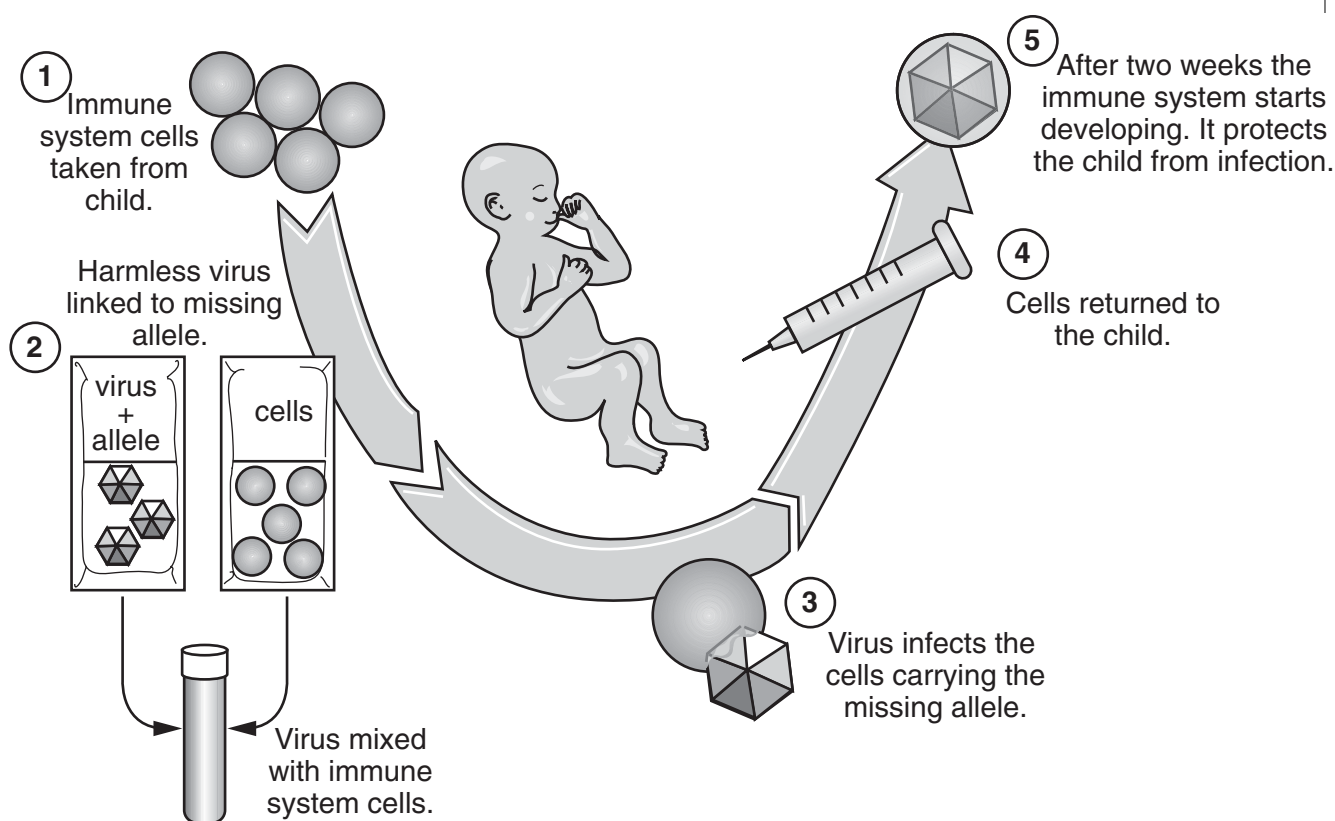
Scientific Success.

A boy born with a deadly genetic disorder has been cured by gene therapy!
The boy lacked an allele essential to the development of his immune system.
It looked as if he would have to spend the rest of his life inside a plastic bubble.

(a) Explain how living inside a plastic bubble would protect him.

.....
.....[1]

(b) The diagram shows how gene therapy cured the boy.

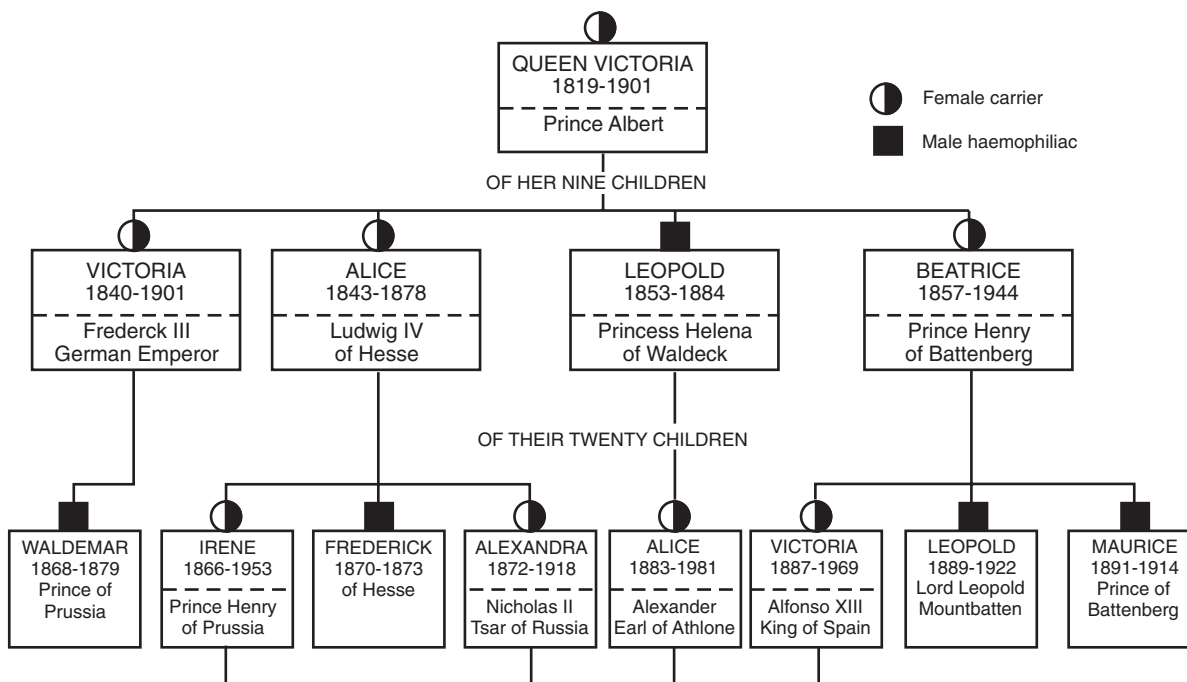


7 Queen Victoria had the allele responsible for haemophilia. She was a carrier of haemophilia.

(a) Explain what is meant by a *carrier*.

.....
[1]

(b) Look at the diagram of Queen Victoria's family tree.
 It shows only her descendants who either had haemophilia or were carriers.



The table shows the life span of some male haemophiliacs from Queen Victoria's family tree.

name	life span in years
Leopold	31
Waldemar	11
Frederick	3
Leopold	33
Maurice	23

(i) Calculate the average life span of the male haemophiliacs shown in the table.

You **must** show your working.

Average = years [2]

(ii) The average life span of female carriers in Queen Victoria's family tree was 66 years.

Suggest why the average life span of the male haemophiliacs was less.

.....
.....
.....[2]

(c) Haemophilia is a genetic disorder.
It is possible to find out very early in a pregnancy whether the baby has haemophilia. Following a positive result of this test, some people may decide to terminate the pregnancy.
Other people may decide to continue with the pregnancy.

Write down **two** arguments to support **each** decision.

To terminate the pregnancy

.....
.....
.....
.....

To continue with the pregnancy

.....
.....
.....
.....[4]

[Total: 9]

7 Chris has diabetes.

In the future, gene therapy may cure diabetes.

(a) Here are five sentences describing the process of gene therapy.

They are in the wrong order.

- A Put normal gene into cells of person with diabetes.
- B Find a person without diabetes to donate some cells.
- C Identify the gene that causes diabetes.
- D Cells follow instructions on normal gene, curing the diabetes.
- E Take normal gene from donated cells.

Fill in the boxes to show the correct order. The first one has been done for you.

C					
---	--	--	--	--	--

[3]

(b) Chris reads that gene therapy could be used on human embryos, to prevent genetic conditions. He has mixed views about this.

Suggest one argument **for** and one argument **against** using gene therapy on human embryos.

one argument for

.....

.....

one argument against

.....

..... [2]

[Total: 5]

END OF QUESTION PAPER