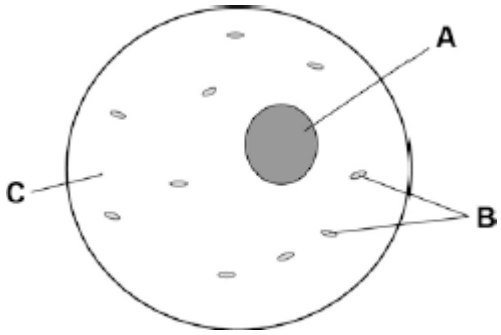
Q1.Figure 1 shows a human body cell.

Figure 1



(a) Which part in **Figure 1** contains chromosomes?

Tick **one** box.

A ☐ **B** ☐ **C** ☐

(1)

(b) Humans have pairs of chromosomes in their body cells.

Draw **one** line from each type of cell to the number of chromosomes it contains.

Type of cell	Number of Chromosomes
	10
Human body cell	23
	46
Sperm cell	60
	92

(2)

(c) Humans have two different sex chromosomes, **X** and **Y**.

Figure 2 shows the inheritance of sex in humans.

Figure 2

		Mother	
		X	X
Father	X	XX	XX
	Y	XY	XY

Circle a part of **Figure 2** that shows an egg cell.

(1)

(d) Give the genotype of male offspring.

.....

(1)

(e) A man and a woman have two sons. The woman is pregnant with a third child.

What is the chance that this child will also be a boy?

Tick **one** box.

0% ☐

25% ☐

50% ☐

100% ☐

(1)
(Total 6 marks)

Q2. Our understanding of genetics and inheritance has improved due to the work of many scientists.

(a) Draw **one** line from each scientist to the description of their significant work.

Scientist	Description of significant work
Charles Darwin	Carried out breeding experiments on pea plants.
Alfred Russel Wallance	Wrote 'On the origin of species'.
Gregor Mendel	Worked on plant defence systems.
	Worked on warning colouration in animals.

(3)

(b) In the mid-20th century the structure of DNA was discovered.

What is a section of DNA which codes for one specific protein called?

.....

(1)

(c) **Figure 1** shows one strand of DNA.

The strand has a sequence of bases (A, C, G and T).

Figure 1



How many amino acids does the strand of DNA in **Figure 1** code for?

Tick **one** box.

2 ☐

3 ☐

4 ☐

6 ☐

(1)

(d) Mutations of DNA cause some inherited disorders.

One inherited disorder is cystic fibrosis (CF).

A recessive allele causes CF.

Complete the genetic diagram in **Figure 2**.

- Identify any children with CF.
- Give the probability of any children having CF.

Each parent does not have CF.

The following symbols have been used:

D = dominant allele for **not** having CF

d = recessive allele for having CF

Figure 2

		Mother	
		D	d
Father	D	DD	
	d		

Probability of a child with CF = ...

(3)

(e) What is the genotype of the mother shown in **Figure 2**?

Tick **one** box.

Heterozygous ☐

Homozygous dominant ☐

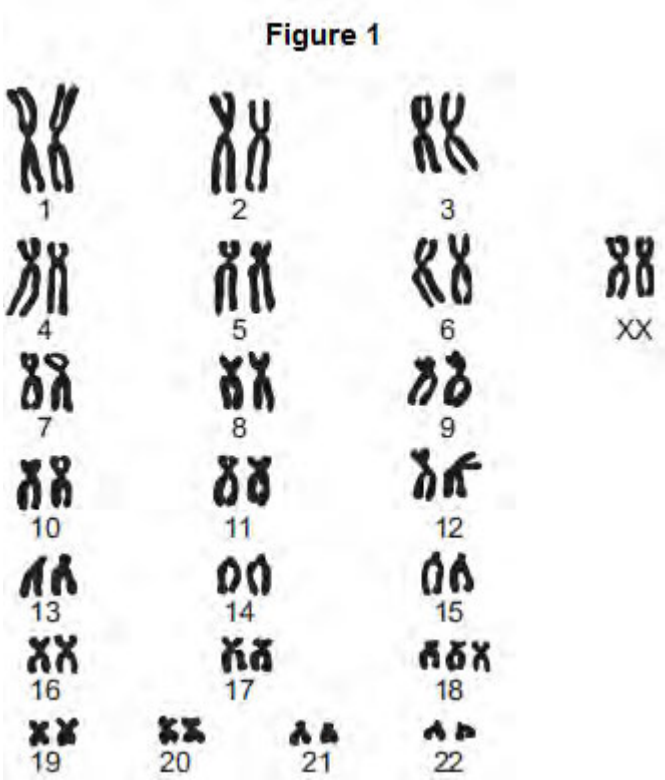
Homozygous recessive ☐

(1)
(Total 9 marks)

Q3. Genetic disorder **E** is a condition caused by a change in the chromosomes.

(a) **Figure 1** shows the chromosomes from one cell of a person with genetic disorder **E**.

Figure 1



(i) How do you know this person is female?

Use information from **Figure 1**.

.....

.....

(1)

(ii) Describe how the chromosomes shown in **Figure 1** are different from the chromosomes from a person who does not have genetic disorder **E**.

.....

.....

.....

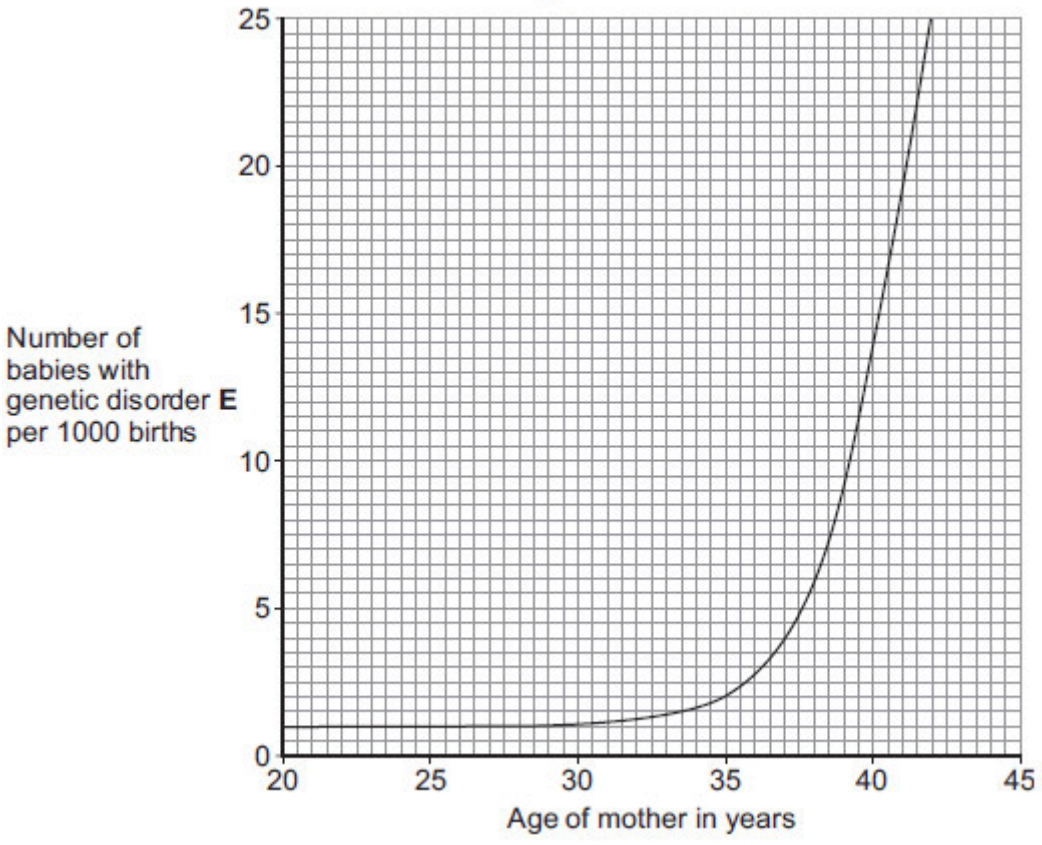
.....

(2)

(b) As a woman gets older, the chance of her having a baby with genetic disorder **E** increases.

Figure 2 shows this.

Figure 2



(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**?

..... per 1000 births

(1)

(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?

..... times

(1)

(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**.

The table gives some information about two methods of embryo screening.

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 the table to give **two** advantages and **one** disadvantage of **Method 1** compared with **Method 2** for detecting genetic disorder **E**.

Advantages of **Method 1**:

1.....

.....

2.....

.....

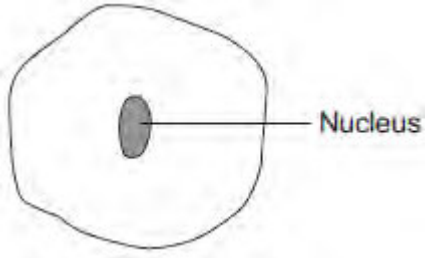
Disadvantage of **Method 1**:

.....

.....

(3)
(Total 8 marks)

Q4. The diagram below shows a cell.



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

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

chromosomes.
membranes.
receptors.

(1)

(ii) Different genes control different

characteristics
gametes
nuclei

of an organism.

(1)

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

classify
clone
grow

the organisms.

(1)

(b) Complete the following sentence.

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

(1)

(Total 4 marks)

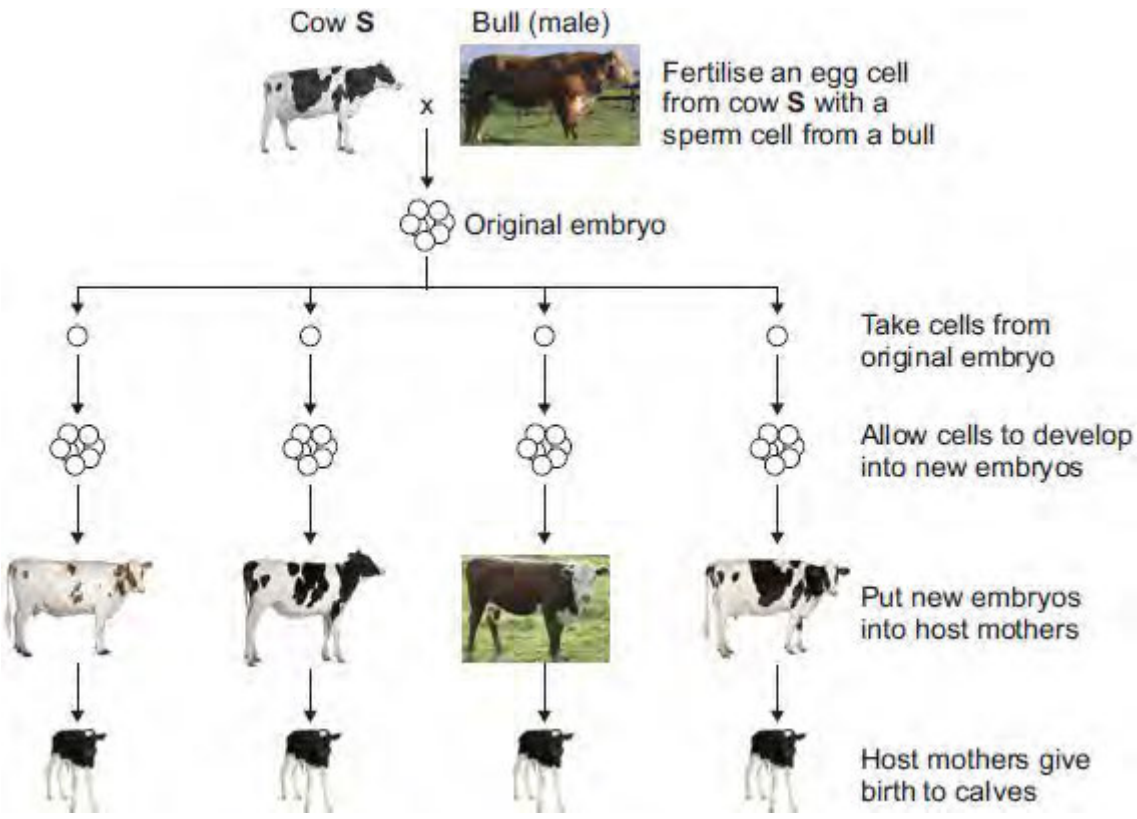
Q5. Most cows produce milk with a fat content of 3.4%.

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

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

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

The diagram below shows how the farmer plans to do this.



Cow S © GlobalP/iStock/Thinkstock, **Bull** © Fuse/Thinkstock, **Whitish cow** © Eric Isselee/iStock/Thinkstock, **Brown cow** © DC Productions/Photodisc/Thinkstock, **Holstein cow(1)** © GlobalP/iStock/Thinkstock, **Holstein cow(2)** © GlobalP/iStock/Thinkstock, **Calf** © Eric Isselee/iStock/Thinkstock.

(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)

(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)

(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.

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.

(1)

(ii) What term is used to describe the method of producing calves shown in the diagram in part (a)?

Tick (✓) **one** box.

Adult cell cloning ☐

Embryo transplantation ☐

Genetic modification ☐

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

.....

.....

(1)
(Total 5 marks)

Q6. In sexual reproduction, an egg fuses with a sperm.

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

An egg and a sperm fuse together in the process of

cloning.
fertilisation.

mitosis.

(1)

(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.

1 ..... (smallest)

2 .....

3 ..... (largest)

(2)

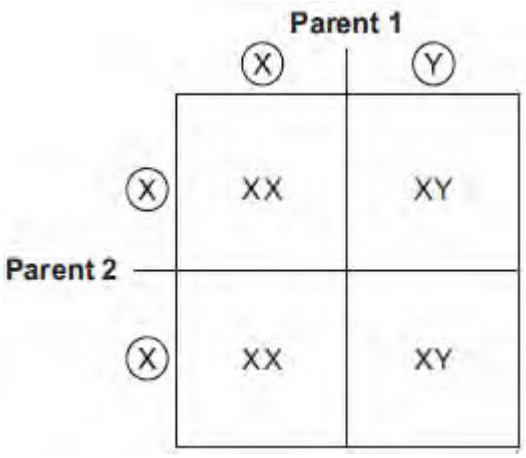
(iii) The egg and the sperm contain genetic material.

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

The genetic material is made of	carbohydrate.
	DNA.
	protein.

(1)

(b) The diagram below shows the inheritance of **X** and **Y** chromosomes.



(i) Draw a tick (✓) on the part of the diagram that shows a sperm cell.

(1)

(ii) What is the chance of having a female child?

Give the reason for your answer.

.....

.....

.....

.....

(2)

(Total 7 marks)

Q7. 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.

(a) A gene is a small section of

cellulose.
DNA.
protein.

(1)

(b) The sex chromosomes in the human male are

X and X.
X and Y.
Y and Y.

(1)

(c) (i) Most human body cells contain

23 chromosomes.
46 chromosomes.
92 chromosomes.

(1)

(ii) The number of chromosomes in a human gamete (sex cell)

is

the same number as
half the number
twice the number

n body cells.

(1)

(d) Gametes are produced by

fertilisation.
meiosis.
mitosis.

(1)
(Total 5 marks)

Q8. In each question, draw a ring around the correct answer to complete the sentence.

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

the work of

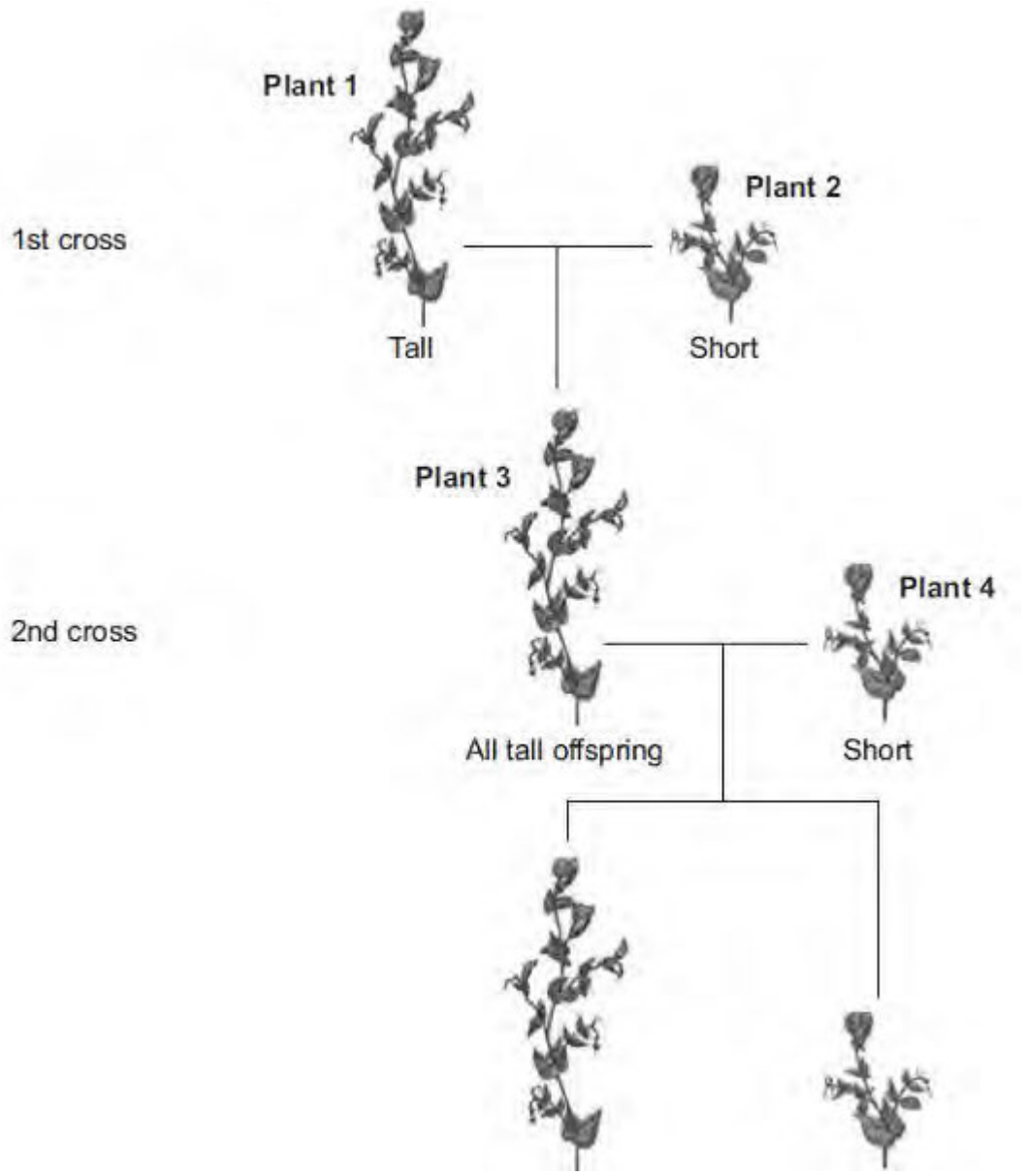
- Darwin.
- Lamarck.
- Mendel.

(1)

(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



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

T = allele for tall
t = allele for short

(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)

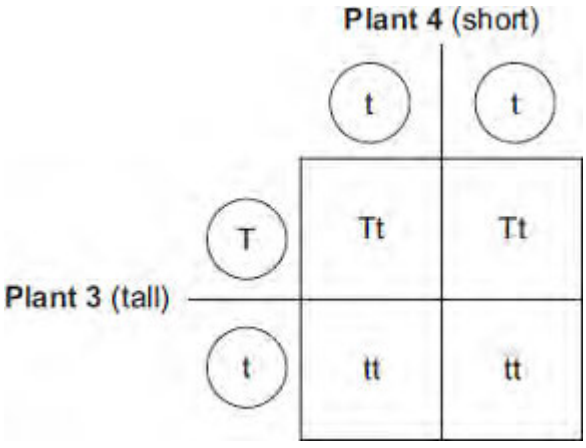
(ii) **Plant 3** is tall because of

a dominant allele.
the environment.
a recessive allele.

(1)

(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)

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

100 short plants.

The expected offspring would be

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

(1)
(Total 5 marks)

Q9. Humans reproduce sexually.

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

(i) At fertilisation

chromosomes
genes
gametes

join together.

(1)

(ii) At fertilisation a single cell forms. The cell has new pairs of

chromosomes.
nuclei.
gametes.

(1)

(b) A child inherits cystic fibrosis. The child's parents do **not** have cystic fibrosis.

(i) What does this information tell us about the cystic fibrosis allele?

Tick (✓) **one** box.

The allele is dominant. ☐

The allele is recessive. ☐

The allele is strong. ☐

(1)

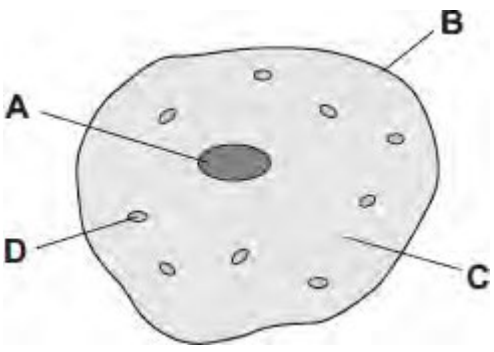
(ii) How many copies of the cystic fibrosis allele does the child have?

Draw a ring around your answer.

one **two** **four**

(1)

(c) The diagram shows a human body cell.



Which part of the cell, **A**, **B**, **C** or **D**:

(i) contains the allele for cystic fibrosis ☐

(1)

(ii) is affected by cystic fibrosis? ☐

(1)

(Total 6 marks)