AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.1.7

Inherited disorders

Past-paper questions

Tier	**Foundation**
Question groups	**11**
Available paper years	**2008–2024**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.6.1.7 Inherited disorders

Question 01

June 2008 | BLY2F | Original Q8 | Legacy

8 Cystic fibrosis is an inherited disorder that can seriously affect health.

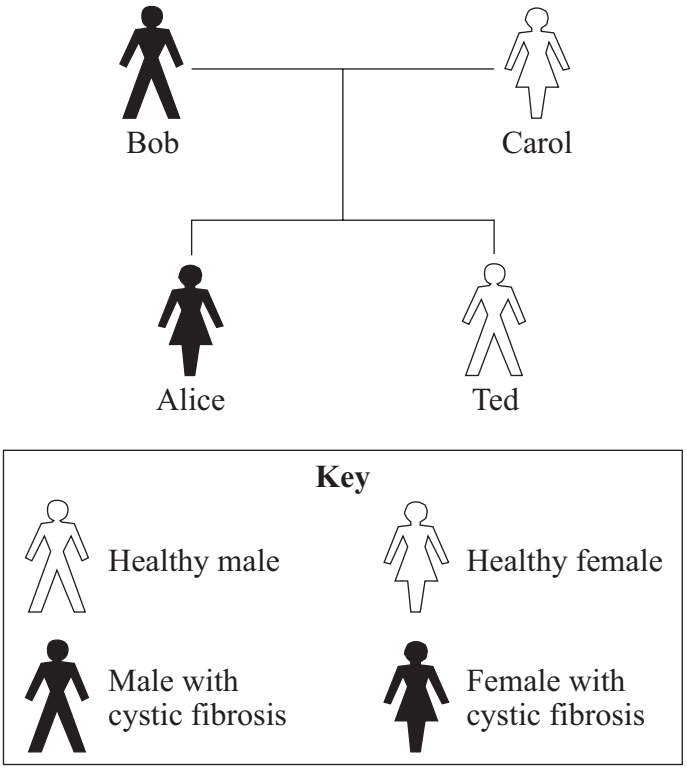
8 (a) Which **one** of these is affected by cystic fibrosis?

Draw a ring around your answer.

blood **cell membranes** **kidneys** **nervous system**

(1 mark)

8 (b) The diagram shows the inheritance of cystic fibrosis in a family. The allele that produces cystic fibrosis is recessive.



8 (b) (i) Explain why Alice inherited cystic fibrosis.

.....

.....

.....

.....

(2 marks)

4.6.1.7 Inherited disorders

Question 01 · continued

for mark

8 (b) (ii) Explain why Ted did **not** inherit cystic fibrosis.

.....

.....

.....

.....

(2 marks)

8 (c) Bob and Carol know that there is a risk that their next baby will have cystic fibrosis.

Embryos can be screened for the allele that produces cystic fibrosis.

Many people support the screening of embryos, but others do not.

8 (c) (i) Suggest **one** reason why many people support the screening of embryos for the cystic fibrosis allele.

.....

.....

.....

(1 mark)

8 (c) (ii) Suggest **one** reason why many people are against the screening of embryos for the cystic fibrosis allele.

.....

.....

.....

(1 mark)

7

4.6.1.7 Inherited disorders

Question 02

January 2010 | BLY2F | Original Q2 | Legacy

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.]

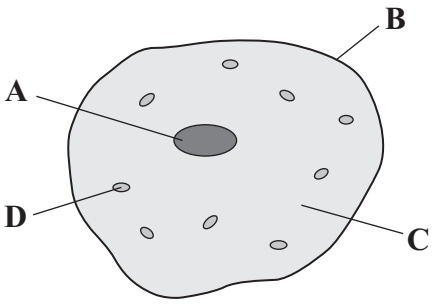
(1 mark)

4.6.1.7 Inherited disorders

Question 02 · 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

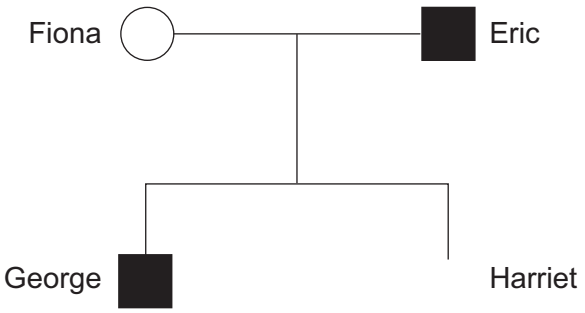
4.6.1.7 Inherited disorders

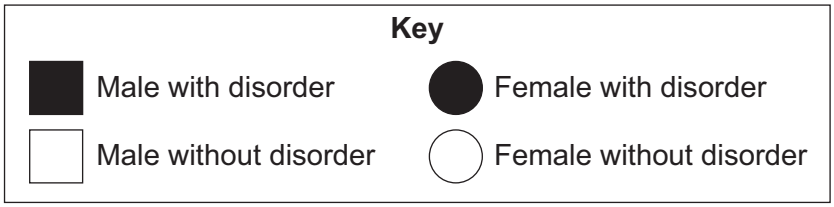
Question 03

June 2019 | BLY2F | Original Q4 | Legacy

4 The family tree shows the inheritance of a disorder caused by a dominant allele.

Fiona and Eric have two children George and Harriet.





4 (a) The son, George, has the disorder.

The daughter, Harriet, does **not** have the disorder.

4 (a) (i) Use the key to draw the symbol for Harriet next to her name **on the family tree**.

(2 marks)

4 (a) (ii) The symbol **D** represents the dominant allele for the disorder.
The symbol **d** represents the recessive allele.

Fiona has the pair of alleles **dd**.

Write the correct pairs of alleles in the boxes.

Harriet has the pair of alleles ☐.

A person with the disorder could have

the pair of alleles ☐ or the pair of alleles ☐.

(3 marks)

4.6.1.7 Inherited disorders

Question 03 · continued

4 (b) Before Harriet was born, a doctor suggested that Fiona should have the embryo 'screened'.

4 (b) (i) Give **one** reason why the doctor suggested screening.

Tick (✓) **one** box.

To check for the **D** allele ☐

To check the sex of the embryo ☐

To cure the disorder ☐

(1 mark)

4 (b) (ii) Why do some people believe that embryos should **not** be screened?

.....

.....

(1 mark)

7

4.6.1.7 Inherited disorders

Question 04

June 2011 | BLY2F | Original Q3 | Legacy

3 Our bodies control the concentration of glucose in the blood.

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

3 (a) The concentration of glucose in the blood is controlled by a

hormone called

- carbohydrase.
- insulin.
- protease.

(1 mark)

3 (b) This hormone is produced by the

- intestine.
- stomach.
- pancreas.

(1 mark)

3 (c) If the body does not produce enough of this hormone,

the person develops

- diabetes.
- cystic fibrosis.
- Huntington's disease.

(1 mark)

3

4.6.1.7 Inherited disorders

Question 05

June 2012 | BL2FP | Original Q7 | Legacy

7 Cystic fibrosis is an inherited disorder.

Mr and Mrs Brown do **not** have cystic fibrosis but they have a child with cystic fibrosis.

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

7 (a) (i) The allele for cystic fibrosis is a

carrier allele.

dominant allele.

recessive allele.

(1 mark)

7 (a) (ii) Mr and Mrs Brown are both

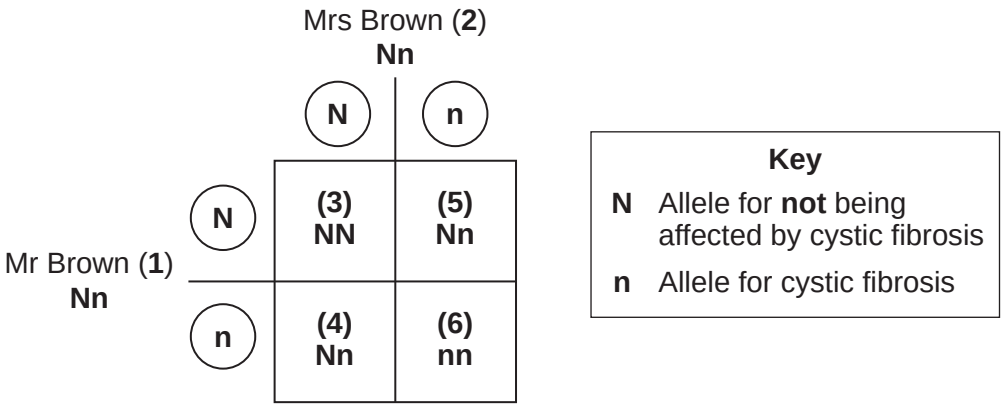
carriers.

immune.

infected.

(1 mark)

7 (b) The diagram shows how the allele for cystic fibrosis can be inherited by Mr and Mrs Brown's children.



7 (b) (i) Give the number of **one** person in the diagram who has cystic fibrosis. ☐

(1 mark)

7 (b) (ii) The chance that Mr and Mrs Brown's next child will have cystic fibrosis is

..... .

(1 mark)

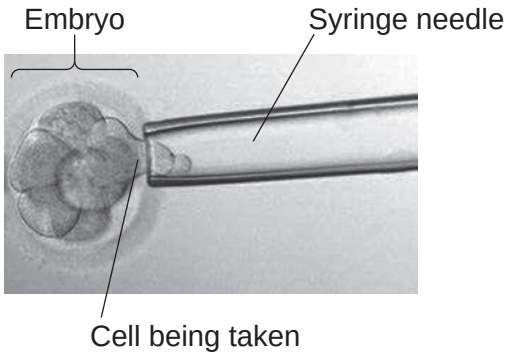
4.6.1.7 Inherited disorders

Question 05 · continued

7 (c) A genetic counsellor describes to Mr and Mrs Brown one way of screening embryos for cystic fibrosis.

- Some eggs are collected from Mrs Brown.
- The eggs are then fertilised in a dish.
- Several embryos may start to develop.

The photograph shows how doctors take one cell from each embryo when it is only 3 days old.



Source: © Pascal Goetgheluck/Science Photo Library

- The DNA in the cell from each embryo is tested for cystic fibrosis.
- Doctors select one embryo that is unaffected and place it in Mrs Brown's uterus.
- The embryo then develops into a baby.

Use the information to suggest **one** advantage and **one** disadvantage of screening embryos in this way.

Advantage .....

.....

Disadvantage .....

.....

(2 marks)

6

4.6.1.7 Inherited disorders

Question 06

June 2013 | BL2FP | Original Q5 | Legacy

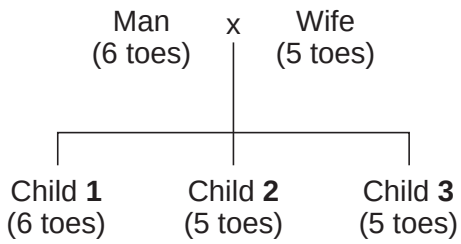
5 Polydactyly is an inherited condition. Polydactyly is controlled by a dominant allele.

The photograph shows the foot of a baby with polydactyly.



A man and his wife have three children. The man has polydactyly.

The diagram shows the inheritance of polydactyly in this family.
The diagram also shows the number of toes each person has on each foot.



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

D = allele for polydactyly (6 toes on each foot)
d = allele for 5 toes on each foot

5 (a) (i) How many alleles for the number of toes will there be in **one** sperm cell? ☐

(1 mark)

5 (a) (ii) Complete the sentence.

A sperm cell joins with an egg cell in a process called ..... .

(1 mark)

4.6.1.7 Inherited disorders

Question 06 · continued

5 (b) (i) What combination of alleles does the man have?

Tick (✓) **one** box.

DD ☐

Dd ☐

dd ☐

(1 mark)

5 (b) (ii) What combination of alleles does the man's wife have?

Tick (✓) **one** box.

DD ☐

Dd ☐

dd ☐

(1 mark)

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

5 (c) (i) The man and his wife plan to have a fourth child.

The probability that this child will have 6 toes on each foot is

1 in 2.

1 in 3.

1 in 4.

(1 mark)

5 (c) (ii) When Child **2** grows up, he marries a woman with 5 toes on each foot.

The probability that their first child will have 6 toes on each foot is

0.

1 in 2.

1 in 4.

(1 mark)

6

4.6.1.7 Inherited disorders

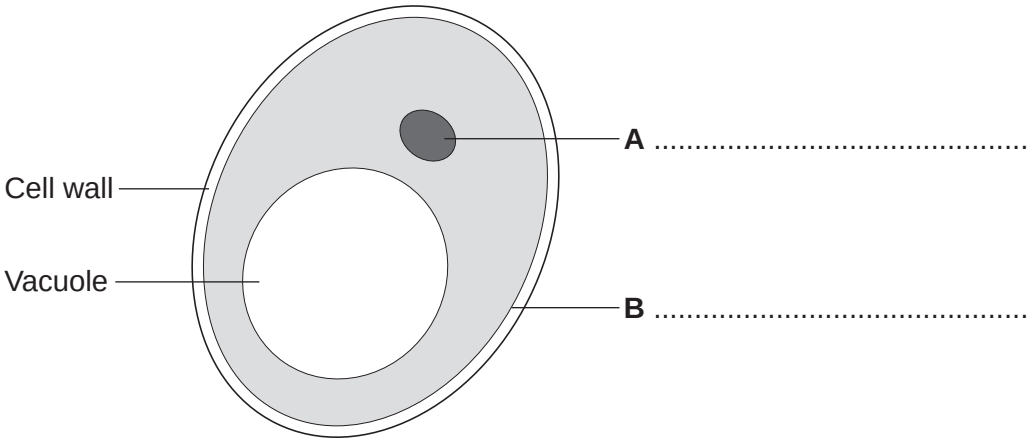
Question 07

June 2015 | BL2FP | Original Q1 | Legacy

1 Human cells and yeast cells have some parts that are the same.

1 (a) **Figure 1** shows a yeast cell.

Figure 1



Parts **A** and **B** in **Figure 1** are found in human cells and in yeast cells.
On **Figure 1**, label parts **A** and **B**.

[2 marks]

1 (b) Many types of cell can divide to form new cells.

Some cells in human skin can divide to make new skin cells.

Why do human skin cells need to divide?

[1 mark]

.....

.....

4.6.1.7 Inherited disorders

Question 07 · continued

1 (c) Human stem cells can develop into many different types of human cell.

1 (c) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

embryos	**hair**	**nerve cells**

Human stem cells may come from ..... .

1 (c) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

cystic fibrosis	**paralysis**	**polydactyly**

Human stem cells can be used to treat ..... .

5

Turn over for the next question

4.6.1.7 Inherited disorders

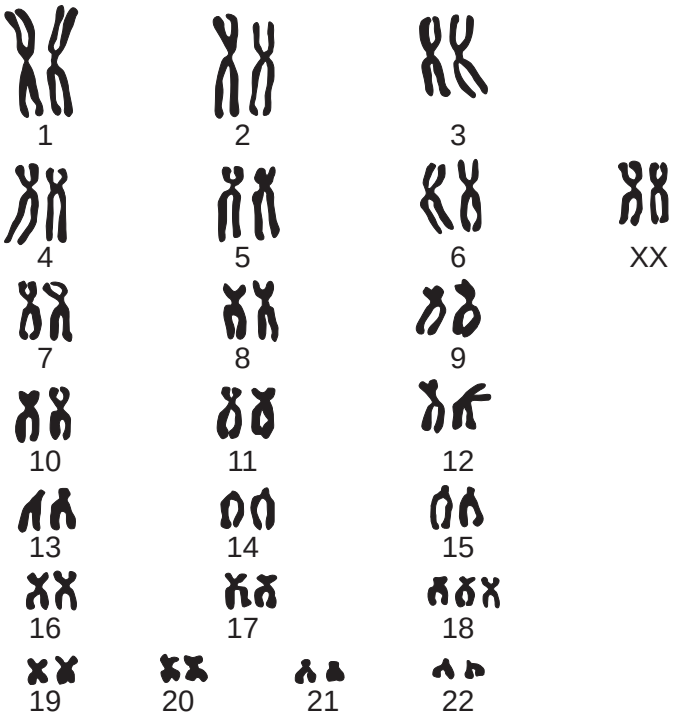
Question 08

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]

.....

.....

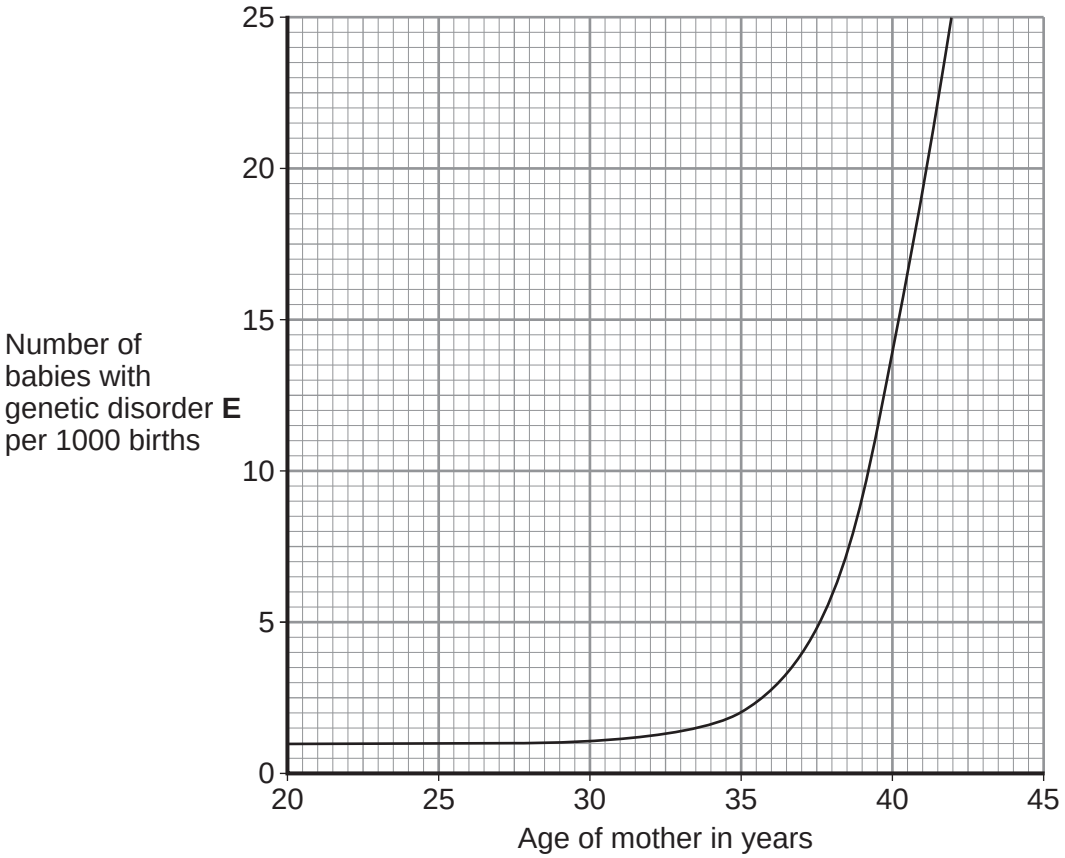
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.....

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

4.6.1.7 Inherited disorders

Question 08 · 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

4.6.1.7 Inherited disorders

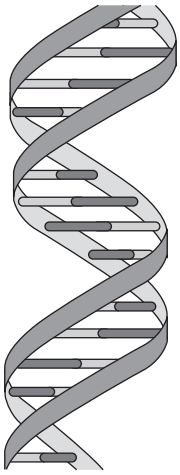
Question 09

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]

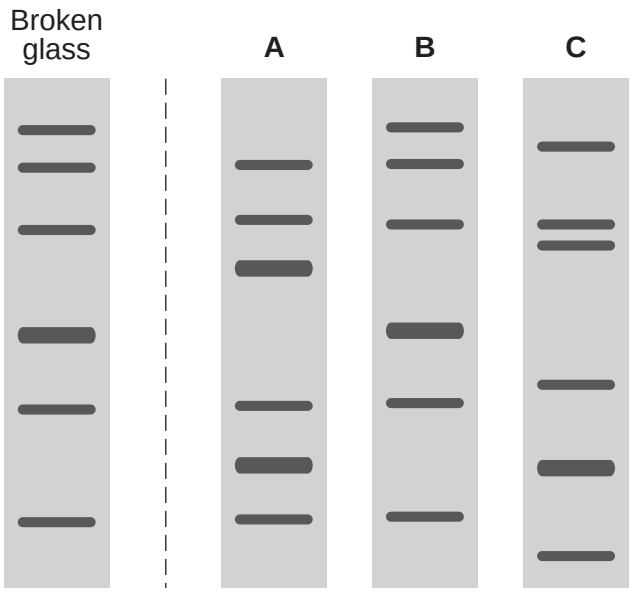
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9 (c) A burglar broke into a house. The burglar cut his hand on some broken glass. Scientists extracted DNA from the blood on the broken glass.

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

4.6.1.7 Inherited disorders

Question 10

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]

4.6.1.7 Inherited disorders

Question 10 · 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

4.6.1.7 Inherited disorders

Question 10 · 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% ☐

4.6.1.7 Inherited disorders

Question 10 · 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

4.6.1.7 Inherited disorders

Question 11

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]

Question 11 · continued

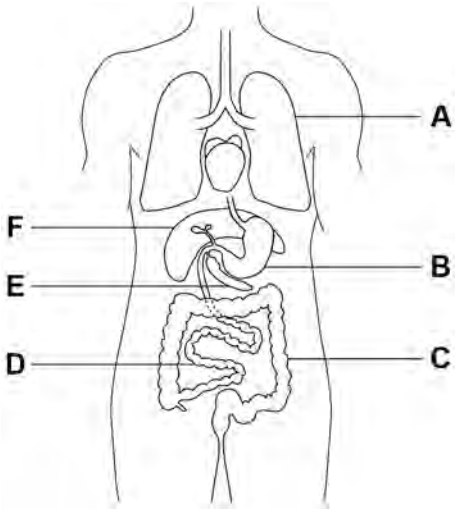
CF affects many organs in the body.

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

4.6.1.7 Inherited disorders

Question 11 · 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]

4.6.1.7 Inherited disorders

Question 11 · 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