

## Genetic inheritance (dominant/recessive alleles, Punnett squares, family trees)

### Q1. (2020)

Cystic fibrosis (CF) is an inherited disorder.

**0 5 . 3** A man and a woman do **not** have CF.

The man and the woman have a child who has CF.

Draw a Punnett square diagram to find the probability that their next child will have CF.

Use the symbols:

**T** = dominant allele

**t** = recessive allele

Draw a ring around the genotype of any children with CF.

**[4 marks]**

### Q2. (2020)

Embryo screening for CF can be done by two methods.

#### Method 1

- The woman becomes pregnant by sexual intercourse.
- After 10 weeks of pregnancy a fine needle is inserted into the uterus.
- A sample of the fluid surrounding the embryo is taken.
- The DNA of the embryo is tested for CF.

The screening is done free by specialist hospitals for couples who are at risk of having a child with CF.

There is a small risk of miscarriage.

#### Method 2

- The couple use In Vitro Fertilisation (IVF) to produce a small number of embryos.
- Each embryo is tested for CF.
- One or two embryos without CF are implanted in the woman's uterus.

In 2017 the success rate for having a baby by IVF for women under 35 years was 30%

IVF is a stressful, invasive procedure.

In most UK areas the free public health service does not provide IVF for all women asking for it.

A)

**0 5 . 4** Suggest **three** reasons for choosing **Method 1** instead of **Method 2**.

**[3 marks]**

- 1 \_\_\_\_\_  
\_\_\_\_\_
- 2 \_\_\_\_\_  
\_\_\_\_\_
- 3 \_\_\_\_\_  
\_\_\_\_\_

B)

0 5 . 5 Suggest **one** advantage of **Method 2**.

[1 mark]

Q3. (2021)

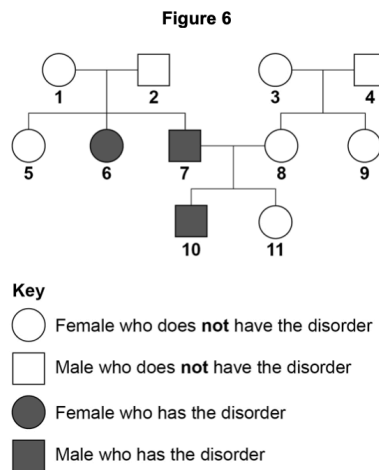
0 6 . 1 Some people are heterozygous for a genetic disorder.

Define the term 'heterozygous'.

[1 mark]

Q4. (2021)

0 6 . 2 **Figure 6** shows the inheritance of a genetic disorder in a family.



Person 7 and person 8 plan to have another child.

Determine the probability that the child will be a **male** who has the disorder.

You should:

- draw a Punnett square diagram
- identify the genotype of person 7 and the genotype of person 8
- identify the phenotype of each offspring genotype
- use the symbols:  
**H** = dominant allele  
**h** = recessive allele

[6 marks]

Probability of having a male child with the disorder = \_\_\_\_\_

Q5. (2023)

Polydactyly is an inherited disorder.

The allele for polydactyly is dominant, **D**.

A person with two copies of the allele **d** will **not** have polydactyly.

A)

0 1 . 3 A person with the genotype **DD** is homozygous.

What word describes the genotype **Dd**?

[1 mark]

B)

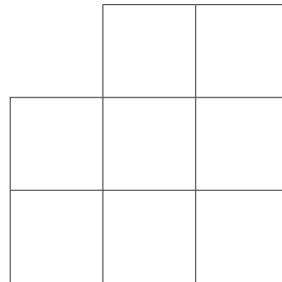
- 0 1 . 4 A person with the genotype **Dd** and a person with the genotype **dd** plan to have a child.

Determine the probability that the child will have polydactyly.

You should:

- complete the Punnett square diagram
- identify any offspring genotype that would have polydactyly.

[5 marks]



Probability that the child will have polydactyly = \_\_\_\_\_

Q6. (2024)

- 0 2 . 3 Flowers of potato plants contain gametes for sexual reproduction.

How is a gamete different from other cells in a potato plant?

[1 mark]

Tick (✓) **one** box.

A gamete contains one-quarter of the number of chromosomes.

☐

A gamete contains half of the number of chromosomes.

☐

A gamete contains double the number of chromosomes.

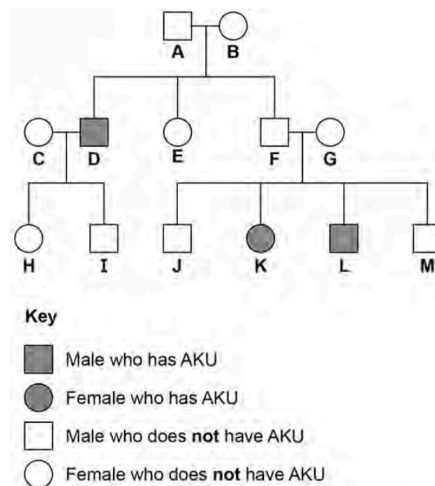
☐

Q7. (2024)

- 0 3 AKU is a genetic disorder.

Figure 3 shows the inheritance of AKU in one family.

Figure 3



A)

0 3 . 1 Describe how **Figure 3** shows that the allele for AKU is recessive.

[1 mark]

B)

0 3 . 2 Which person is **definitely** heterozygous for AKU?

[1 mark]

Tick (✓) **one** box.

C ☐ D ☐ E ☐ G ☐

C)

0 3 . 3 A female who has AKU and a male who is heterozygous for AKU plan to have a child.

Determine the probability that the child will have AKU.

You should:

- complete **Figure 4**
- identify the phenotype of each offspring genotype
- use the symbols:  
A = dominant allele  
a = recessive allele.

[5 marks]

**Figure 4**

|      |                      |                      |
|------|----------------------|----------------------|
|      | Female               |                      |
|      | <input type="text"/> | <input type="text"/> |
| Male | <input type="text"/> | <input type="text"/> |
|      | <input type="text"/> | <input type="text"/> |

Probability that the child will have AKU = \_\_\_\_\_