

# Inheritance

## Question Paper 2

Level	Edexcel
Subject	Biology
Exam Board	GCSE(9-1)
Topic	Genetics
Sub Topic	Inheritance
Booklet	Question Paper 2

**Time Allowed:** 60 minutes

**Score:** /50

**Percentage:** /100

1 Gregor Mendel investigated the genetics of peas.

He did not know about genes but showed that inherited characteristics can be dominant or recessive.

- (a) Explain how Mendel used homozygous tall and homozygous short pea plants to show that the tall allele is dominant to the short allele.

(2)

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- (b) Figure 4 shows a strawberry plant that has produced several runners and new strawberry plantlets are growing at the end of each runner. This is asexual reproduction.

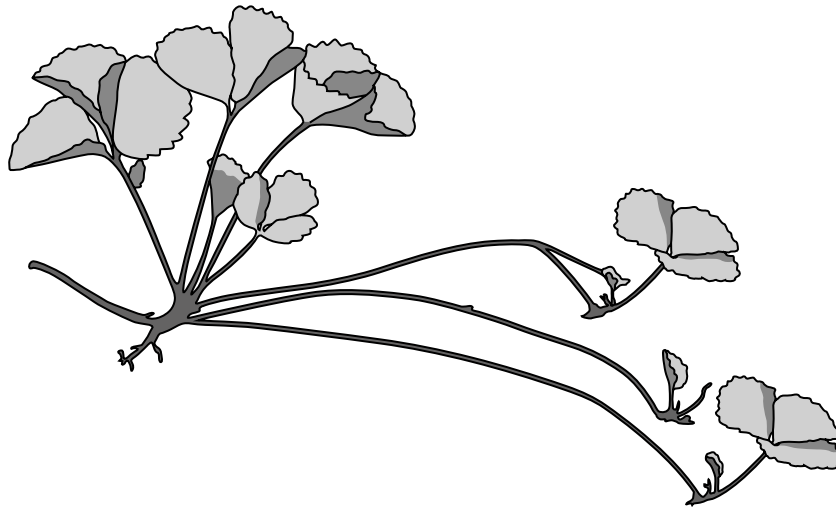


Figure 4

- (i) Explain why asexual reproduction in strawberries is beneficial to strawberry farmers.

(2)

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(ii) Strawberry fruits, containing seeds, are produced after a flower is fertilised.

Explain why seed production is an advantage to the strawberry plant.

(2)

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- (c) Duchenne muscular dystrophy is a sex-linked recessive genetic disorder caused by a mutation on a single gene on the X-chromosome.

The letter D can be used for the dominant allele and the letter d for the recessive allele.

Figure 5 shows the inheritance of Duchenne muscular dystrophy in a family.

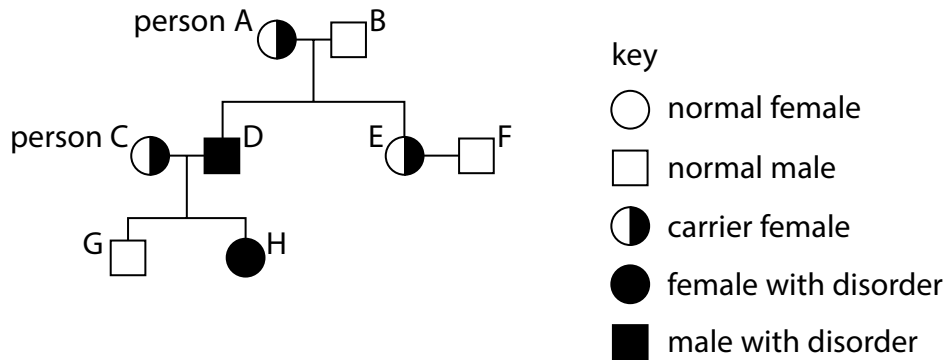


Figure 5

- (i) What is the percentage chance of any child from person A inheriting the mutated allele?

(1)

- A 0%
- B 25%
- C 50%
- D 75%

- (ii) Explain the conclusion that can be made about the genotype of person C.

(2)

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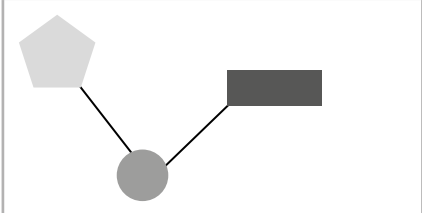



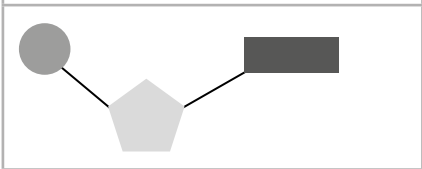
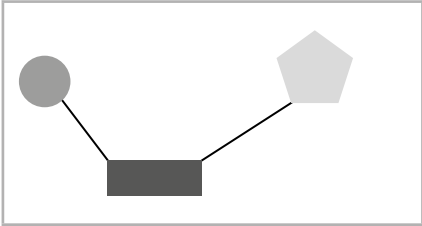
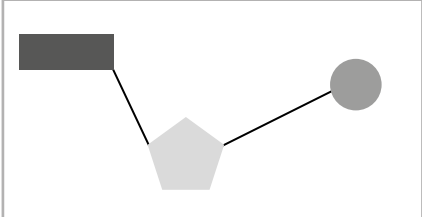
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**(Total for Question 1 = 9 marks)**

2 (a) DNA is composed of four different DNA nucleotides.

(i) Which diagram represents the arrangement of the sugar, phosphate and the base in a DNA nucleotide?

(1)

<input type="checkbox"/> <b>A</b>		<p>key</p> <p> sugar</p> <p> phosphate</p> <p> base</p>
<input type="checkbox"/> <b>B</b>		
<input type="checkbox"/> <b>C</b>		
<input type="checkbox"/> <b>D</b>		

(ii) An allele starts with the DNA sequence ATGCATGTACCG.

Give the sequence of the complementary DNA sequence.

(1)

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(iii) The length of one DNA nucleotide was measured at  $3.3 \times 10^{-10}$  metres.

Calculate the approximate length of a gene containing 250 nucleotides in nanometres.

(2)

..... nm

(b) The DNA of an organism determines its phenotype.

White tigers are produced because of a mutation of a single allele which usually produces the normal orange and yellow fur pigmentation.

The mutated allele is recessive.

Samba, a male white tiger, was bred with Rani. They had three offspring; two offspring have white fur and one has a normal fur pigmentation.

(i) State the genotype of Rani.

(1)

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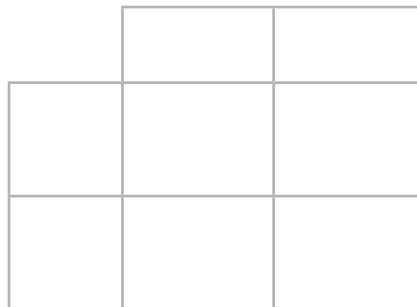
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(ii) The offspring with normal fur pigmentation was bred with a tiger that was heterozygous.

Use A/a to represent the alleles for fur pigmentation.

Predict, using the Punnett square, the percentage probability of the offspring from this cross having normal fur pigmentation.

(2)



percentage probability = ..... %

(c) Explain how two parents with a dominant phenotype can produce offspring expressing a recessive characteristic.

(2)

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**(Total for Question 2 = 9 marks)**

- 3 The images show a normal red blood cell and a red blood cell from someone who has sickle cell disease. Sickle cell disease is a genetic disorder caused by two recessive alleles.



Normal red blood cell



Red blood cell from someone who has sickle cell disease

- (a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

An individual with sickle cell disease is said to be

(1)

- A** a carrier for sickle cell disease
- B** heterozygous
- C** homozygous dominant
- D** homozygous recessive

(ii) Describe the main symptoms of sickle cell disease.

(3)

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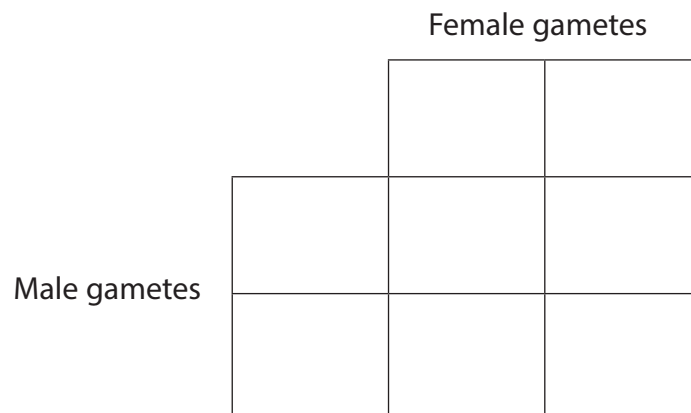
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(b) ( A female with the genotype (**Dd**) and a male with the genotype (**DD**) for sickle cell disease are about to start a family.

Complete the Punnett square to show the possible genotypes of their offspring for sickle cell disease.

(2)



(ii) State the percentage chance that a child from these individuals will be

(2)

1. a carrier of sickle cell disease ..... %

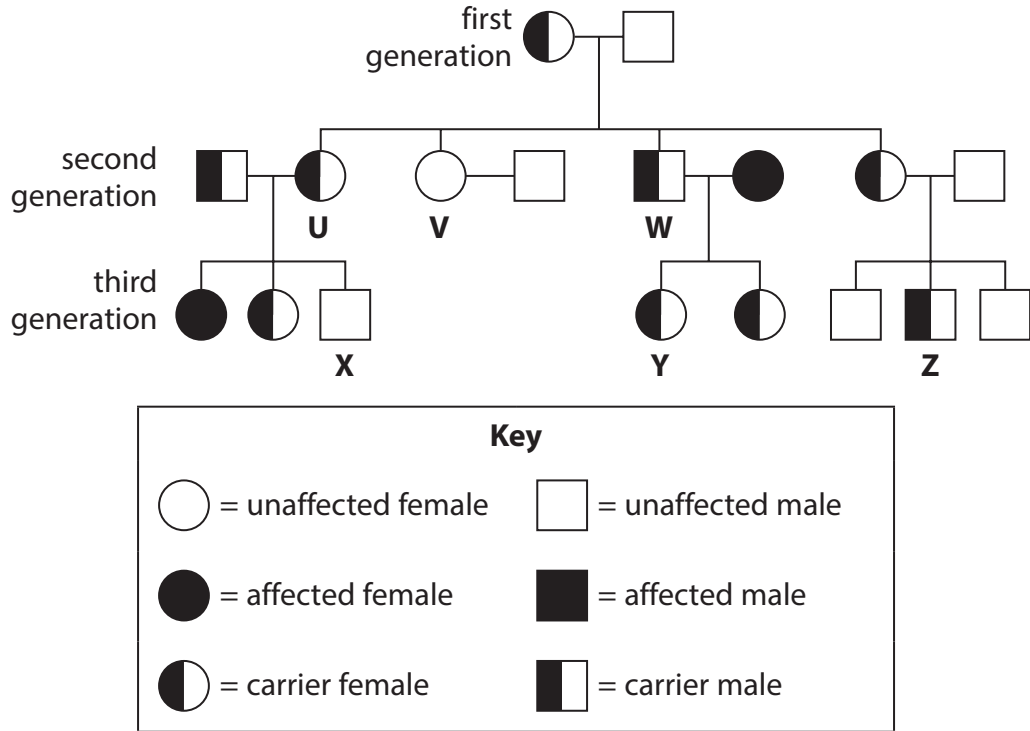
2. an individual with sickle cell disease ..... %

**(Total for Question 3 = 8 marks)**

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- 4 The family pedigree shows the inheritance of sickle cell disease through three generations.



- (a) (i) Calculate the percentage of the offspring from the first generation who are heterozygous for sickle cell disease.

(1)

.....%

- (ii) Explain why the offspring produced by the first generation parents are not the same as those predicted in a Punnett square.

(2)

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(iii) Person **W** and his partner have a third child.

State the probability that this child will have sickle cell disease.

Complete the Punnett square to show this.

(2)


probability .....

(iv) Complete the sentence by putting a cross (☒) in the box next to your answer.

The genotype of person **V** is

(1)

- A** homozygous dominant
- B** homozygous recessive
- C** heterozygous
- D** carrier



5 Cystic fibrosis (CF) is a recessive genetic disorder.

The recessive allele is shown as **f** and the dominant allele as **F**.

(a) (i) What is the genotype of a person with cystic fibrosis?

Put a cross (☒) in the box next to your answer.

(1)

**A** **FF**

**B** **Ff**

**C** **fF**

**D** **ff**

(ii) Explain why a person with cystic fibrosis (CF) may lose body mass.

(2)

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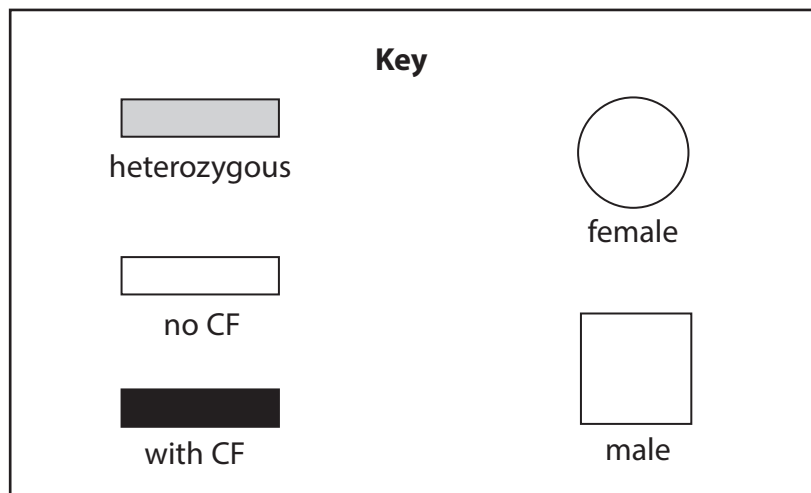
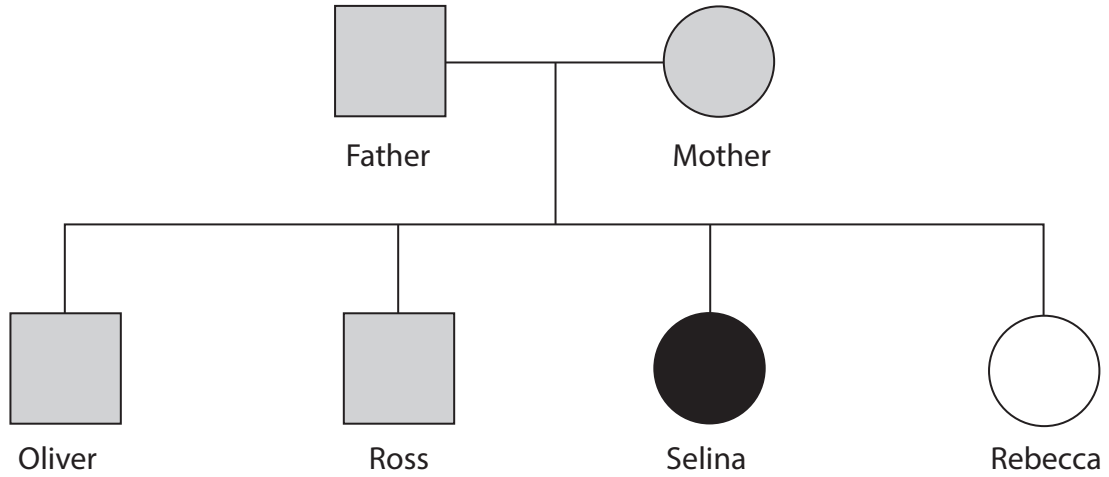
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(b) The family pedigree shows the inheritance of cystic fibrosis (CF).

Both parents are heterozygous for CF.



(i) State what is meant by the term **heterozygous**.

(1)

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(ii) Explain why Rebecca does not have CF.

(2)

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