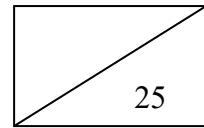


Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

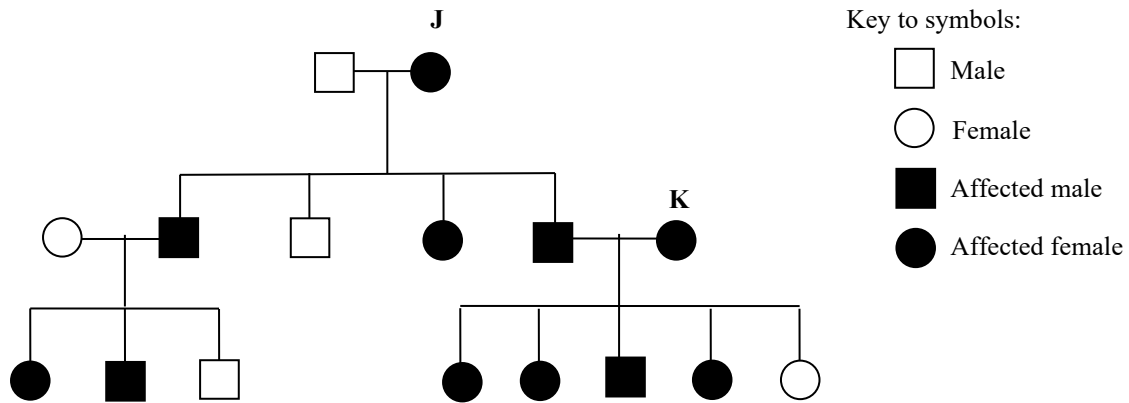
**Multiple-Choice Questions (10 marks)**

1. Different forms of the same gene are known as \_\_\_\_\_.  
A alleles  
B chromosomes  
C chromatids  
D genotypes ( )
2. The physical appearance of an organism is known as its \_\_\_\_\_.  
A genotype  
B phenotype  
C genome  
D alleles ( )
3. When a normal fly with normal wings was mated with a fly with vestigial wings, all the offspring had normal wings. What conclusion can you draw from this?  
A Vestigial wing is dominant over normal wing.  
B Normal wing is dominant over vestigial wing.  
C Both alleles are codominant.  
D Insufficient information to draw a conclusion. ( )

Use the following information to answer questions 4 and 5. In humans, 'curly hair' is dominant over 'straight hair'.

4. A heterozygous man marries a straight-haired woman. What is the expected ratio of their offspring?  
A 1 curly hair : 1 straight hair  
B 3 curly hair : 1 straight hair  
C all curly hair  
D all straight hair ( )
5. A heterozygous couple would most likely have offspring that are \_\_\_\_\_.  
A all homozygous for curly hair  
B all homozygous for straight hair  
C all heterozygous  
D a mixture of homozygous and heterozygous ( )

Refer to the family tree to answer questions 6 to 8. The family tree below shows the inheritance of a disease caused by a dominant allele, R.



6. The genotype of J is \_\_\_\_\_.  
 A RR  
 B Rr  
 C rr  
 D unknown ( )
7. The genotype of K is \_\_\_\_\_.  
 A RR  
 B Rr  
 C rr  
 D unknown ( )
8. Which of the following statement is true about mutation?  
 A Mutation is only affects discontinuous variation.  
 B Mutation results from the accurate replication of hereditary materials.  
 C Mutation will not occur in the absence of mutagens.  
 D Mutation causes variations in a species. ( )
9. Which of the following statements about the human ABO blood group is incorrect?  
 A The allele  $I^A$  is codominant with the allele  $I^B$ .  
 B The allele  $I^O$  is recessive to the allele  $I^B$ .  
 C A person of blood group O has the genotype OO.  
 D A person of blood group O is a homozygous. ( )
10. The sex of a baby is determined by \_\_\_\_\_.  
 A the mother's egg  
 B the father's sperm  
 C the number of ova produced  
 D the age of the mother ( )

## Structured Questions (15 marks)

11. In pea plants, the flower colour is controlled by genes. The allele for purple flowers, F is dominant over the allele for white flowers, f.

Indicate with a tick (✓) in the table to show the possible phenotypes of offspring resulting from the various crosses listed below. [4]

| Cross | Genotype of parents | Phenotype of offspring     |                           |
|-------|---------------------|----------------------------|---------------------------|
|       |                     | Plants with purple flowers | Plants with white flowers |
| A     | FF × FF             |                            |                           |
| B     | Ff × ff             |                            |                           |
| C     | Ff × Ff             |                            |                           |
| D     | ff × ff             |                            |                           |

12. Normal peppered moths are pale coloured. Occasionally, dark moths are born as a result of a mutation.



- (a) (i) Why does the colour of the moths affect their chance of survival? [1]

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- (ii) Which type of moth, pale or dark, would you expect to survive longest in a town that uses coal as the energy source? (Note: Burning of coal results in soot.) [1]

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- (iii) Explain the reason for this. [1]

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- (b) In a small town, pale moths have selective advantage over dark moths. Is this town most likely an agricultural or an industrialized town? Explain your answer. [2]

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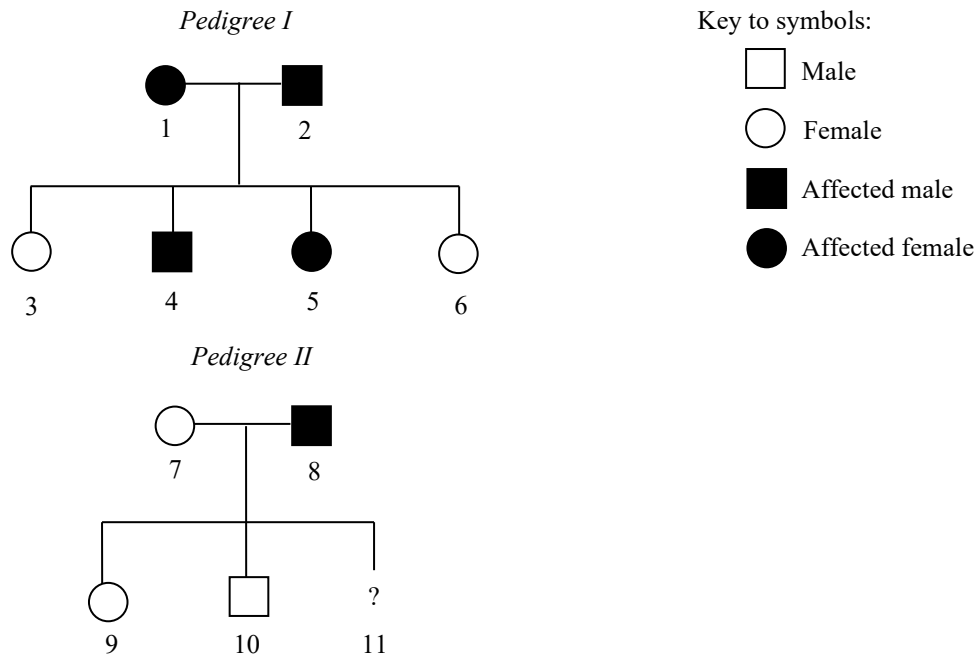


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13. Most people have five toes on each foot. Occasionally a person is born with six toes. The number of toes is an inherited character, controlled by a pair of alleles. With reference to the two pedigrees given below, answer the questions that follow.



- (a) Based on Pedigree 1, which allele — five-toed or six-toed, is dominant? [1]

- (b) What is the possibility that individual 11 is six-toed? Using a genetic diagram, explain how you arrive at your conclusion. [3]

- (c) In order to ensure their offspring will not have the six-toed characteristic, individual 5 undergoes a surgical operation to have her extra toe removed before marrying individual 10. Do you think this method is effective? Explain your answer. [2]

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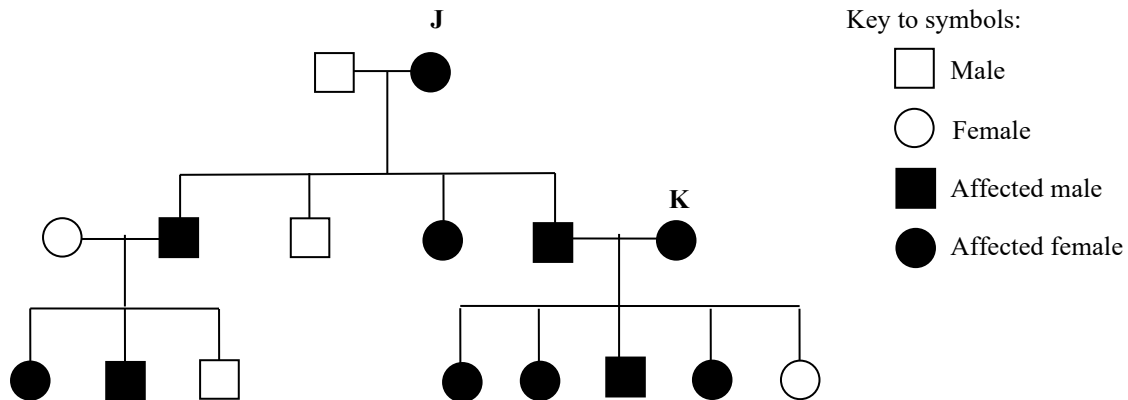
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**Answers****Multiple-Choice Questions (10 marks)**

12. Different forms of the same gene are known as \_\_\_\_\_.  
A alleles  
B chromosomes  
C chromatids  
D genotypes ( A )
13. The physical appearance of an organism is known as its \_\_\_\_\_.  
A genotype  
B phenotype  
C genome  
D alleles ( B )
14. When a normal fly with normal wings was mated with a fly with vestigial wings, all the offspring had normal wings. What conclusion can you draw from this?  
E Vestigial wing is dominant over normal wing.  
F Normal wing is dominant over vestigial wing.  
G Both alleles are codominant.  
H Insufficient information to draw a conclusion. ( B )
- Use the following information to answer questions 4 and 5. In humans, 'curly hair' is dominant over 'straight hair'.
15. A heterozygous man marries a straight-haired woman. What is the expected ratio of their offspring?  
A 1 curly hair : 1 straight hair  
B 3 curly hair : 1 straight hair  
C all curly hair  
D all straight hair ( A )
16. A heterozygous couple would most likely have offspring that are \_\_\_\_\_.  
E all homozygous for curly hair  
F all homozygous for straight hair  
G all heterozygous  
H a mixture of homozygous and heterozygous ( D )

Refer to the family tree to answer questions 6 to 8. The family tree below shows the inheritance of a disease caused by a dominant allele, R.



17. The genotype of J is \_\_\_\_\_.  
 A RR  
 B Rr  
 C rr  
 D unknown ( B )
18. The genotype of K is \_\_\_\_\_.  
 A RR  
 B Rr  
 C rr  
 D unknown ( B )
19. Which of the following statement is true about mutation?  
 A Mutation is only affects discontinuous variation.  
 B Mutation results from the accurate replication of hereditary materials.  
 C Mutation will not occur in the absence of mutagens.  
 D Mutation causes variations in a species. ( D )
20. Which of the following statements about the human ABO blood group is incorrect?  
 E The allele  $I^A$  is codominant with the allele  $I^B$ .  
 F The allele  $I^O$  is recessive to the allele  $I^B$ .  
 G A person of blood group O has the genotype OO.  
 H A person of blood group O is a homozygous. ( C )
21. The sex of a baby is determined by \_\_\_\_\_.  
 A the mother's egg  
 B the father's sperm  
 C the number of ova produced  
 D the age of the mother ( B )

## Structured Questions (15 marks)

22. In pea plants, the flower colour is controlled by genes. The allele for purple flowers, F is dominant over the allele for white flowers, f.

Indicate with a tick (✓) in the table to show the possible phenotypes of offspring resulting from the various crosses listed below. [4]

| Cross | Genotype of parents | Phenotype of offspring     |                           |
|-------|---------------------|----------------------------|---------------------------|
|       |                     | Plants with purple flowers | Plants with white flowers |
| A     | FF × FF             | ✓                          |                           |
| B     | Ff × ff             | ✓                          | ✓                         |
| C     | Ff × Ff             | ✓                          | ✓                         |
| D     | ff × ff             |                            | ✓                         |

13. Normal peppered moths are pale coloured. Occasionally, dark moths are born as a result of a mutation.



- (c) (i) Why does the colour of the moths affect their chance of survival? [1]

It helps them to camouflage (hide) from predators.

- (ii) Which type of moth, pale or dark, would you expect to survive longest in a town that uses coal as the energy source? (Note: Burning of coal results in soot.) [1]

Dark.

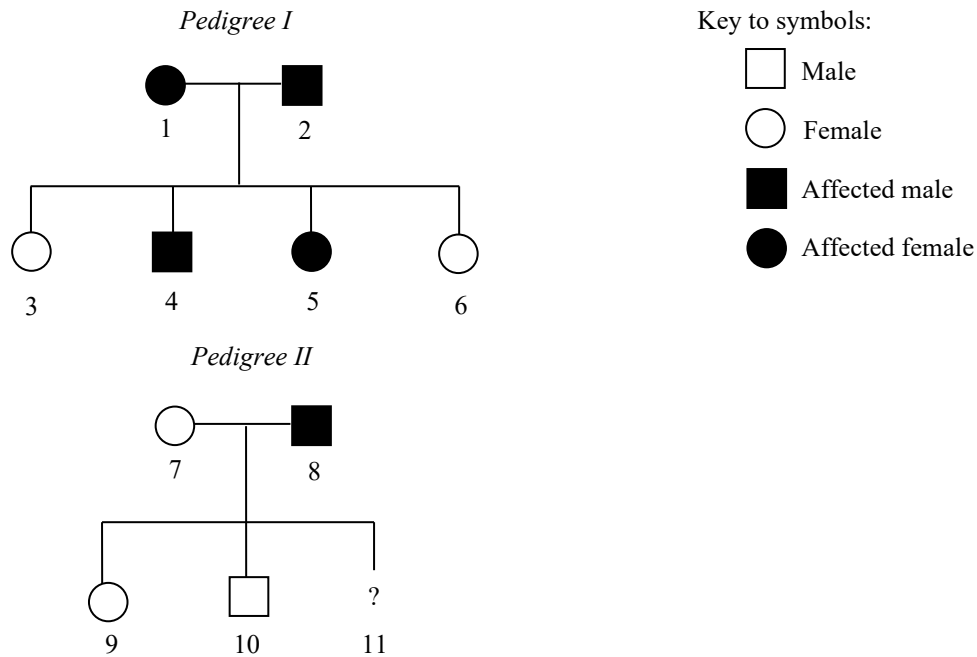
- (iii) Explain the reason for this. [1]

Presence of soot blackened tree trunks. White moths stand out on tree trunks, making them an easy target for the predators.

- (d) In a small town, pale moths have selective advantage over dark moths. Is this town most likely an agricultural or an industrialized town? Explain your answer. [2]

Agricultural town. The presence of more pale moths suggests that they are better camouflaged from predators. This implies that the tree trunks are not covered in industrial soot.

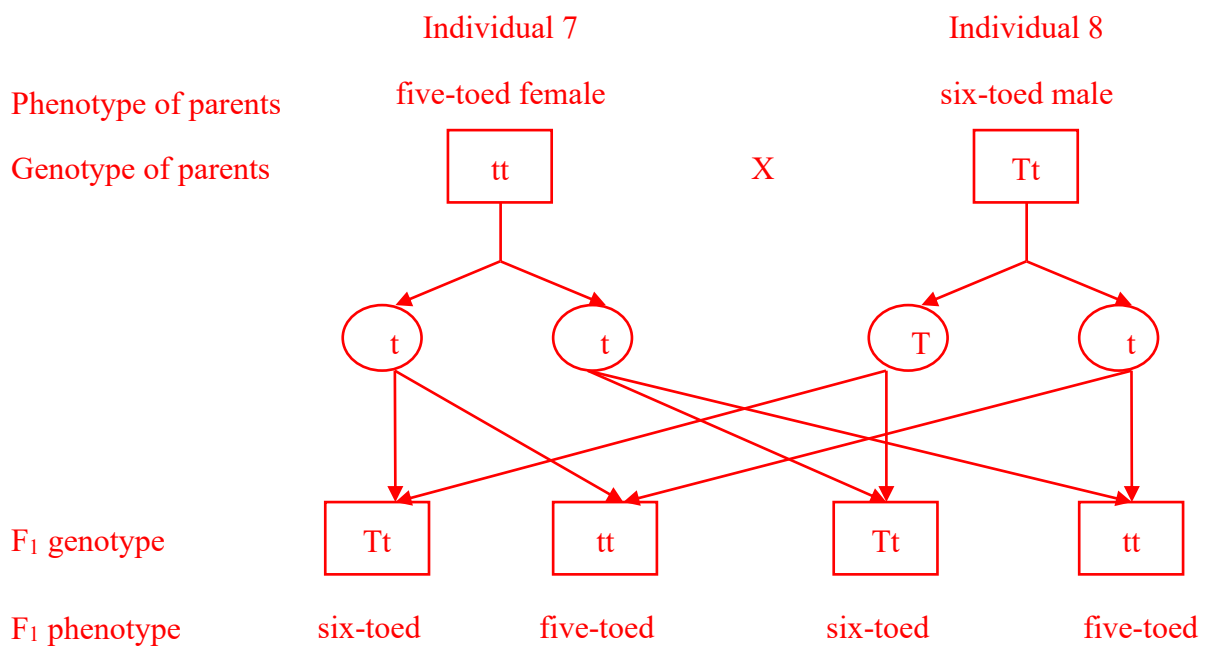
13. Most people have five toes on each foot. Occasionally a person is born with six toes. The number of toes is an inherited character, controlled by a pair of alleles. With reference to the two pedigrees given below, answer the questions that follow.



- (d) Based on Pedigree 1, which allele — five-toed or six-toed, is dominant? [1]

The six-toed allele is dominant.

- (e) What is the possibility that individual 11 is six-toed? Using a genetic diagram, explain how you arrive at your conclusion. [3]



The possibility that individual 11 is six-toed is 50%.

- (f) In order to ensure their offspring will not have the six-toed characteristic, individual 5 undergoes a surgical operation to have her extra toe removed before marrying individual 10. Do you think this method is effective? Explain your answer. [2]

This method is not effective. Six-toed character is inheritable. Individual 5 still carries the allele that codes for the six-toed characteristic after the surgery.