

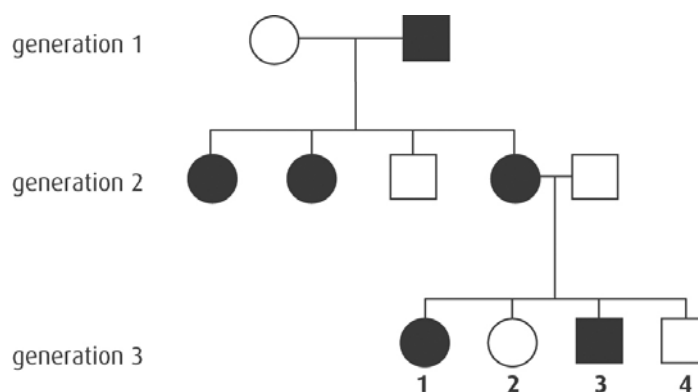
## Exemplar exam question – Chapter 10, *Genetics II*

### Structured questions

This type of question appears in the second part of Paper 2, following the data response question. It is important to make sure that you use the correct notation for all responses to genetics problems.

### Exemplar question

The family tree shown below shows how a rare genetic condition is inherited.



- a** Is the condition sex-linked? Explain your answer. (2)
- b** Is the condition dominant or recessive? Explain your answer. (2)
- c** Write the genotypes for all members of the third generation using the correct notation. (2)
- d** Why are more females than males affected in this family? (1)

### Student answer

- a** Yes
- b** Dominant because a lot of the children are affected even though only one parent is.
- c**  $XX_G$   $XX$   $X_GY$   $XY$
- d** Because females have two copies of the X chromosome.

## Commentary

The student has not fully understood this question and the response is only moderate.

- a** The student has correctly answered that the condition is sex-linked but not provided an explanation to show understanding. The answer should explain that since both males and females are affected and since having one parent of either sex affected means that offspring have the condition, the evidence suggests that the condition is passed on the X chromosome. All daughters of affected males have the condition. Just 1 mark would be awarded out of the possible 2.
- b** The student has correctly said that the condition is dominant but given an incorrect reason. The condition is sex-linked and dominant so any child who receives an X chromosome with the dominant allele will be affected. The answer earns just 1 mark.
- c** The student has understood and has the correct answers but would lose marks for failing to identify the individuals and for not using the correct notation. 0 marks would be awarded.  
A better response would be: Individual 1 =  $XX^G$ , and so on.
- d** The student has suggested an incorrect answer here, and earns 0 marks.  
More females than males are likely to be affected if they have a father who is affected. There is a 100% chance that the daughters of the affected male in generation 1 will have the condition but no chance that his sons will be affected. In generation 3 where the mother of the children is affected there is a 50% chance that any child, whether male or female, will be affected. Thus overall in this family tree, there is a higher incidence of the condition in females.

**Total marks awarded:** 2 out of 7