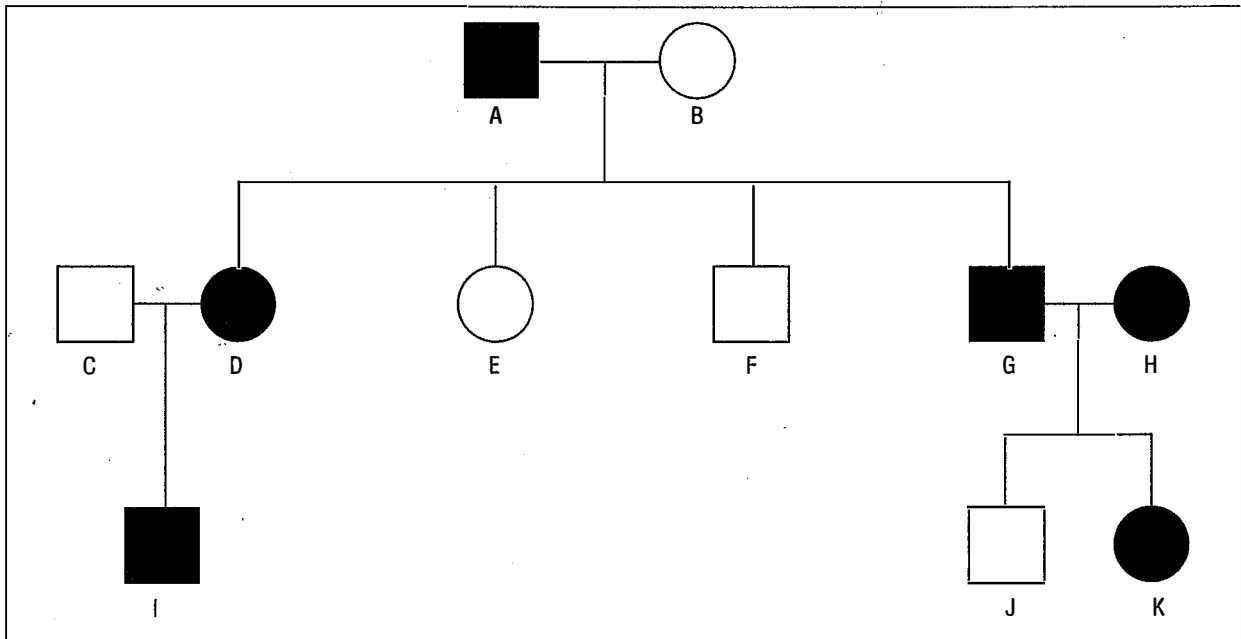


Skill: understanding

Study the pedigree below, which shows the inheritance of a disease in humans. The disease is caused by a single gene with dominant (X) and recessive (x) alleles.

1 Using the labelling convention used in the coursebook:

- Identify the sex of the person labelled G. _____
- Identify the letter symbols of two males who have the disease. _____



2 Answer the following questions to determine whether the disease is caused by the dominant or the recessive allele.

- Suppose the disease is caused by the recessive allele.
 - Identify the genotype of G and H. _____
 - Identify the only possible genotype of their offspring. _____
 - Could they produce a child (J) without the disease? _____
- Suppose the disease is caused by the dominant allele.
 - Identify the possible genotypes of G and H. _____
 - Identify the possible genotypes of their offspring. _____
 - Could they produce a child (J) without the disease? _____

3 Using the symbols X (dominant) and x (recessive), deduce the genotypes of each of the following individuals.

A _____
I _____

B _____
K _____

Genetics punnet squares

1. In poodles, coat colour is controlled by a single gene. Black coat colour (B) is dominant over brown coat colour (b). Complete the punnet square to show the cross between two heterozygous poodles. Give proportions of expected genotypes and phenotypes.

Genotypes: _____

Phenotypes: _____

| | | |
|--|--|--|
| | | |
| | | |
| | | |

2. A long-haired guinea pig has a recessive genotype for hair (hh). It is mated with a guinea pig with short hair (HH). What proportion of the offspring will be short-haired? Use a punnet square to show your reasoning.

Percentage: _____

| | | |
|--|--|--|
| | | |
| | | |
| | | |

3. When two short-haired guinea pigs were mated together, they only produced offspring with short hair. Explain why it is not certain that the genotype of the guinea pigs is heterozygous or homozygous dominant. Use a punnet square to show your reasoning.

Explanation: _____

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|--|--|--|
| | | |
| | | |
| | | |

4. Cystic fibrosis is a genetic disease caused by two recessive genes. Among people of Caucasian ancestry, 1 in 25 is a genetic carrier for cystic fibrosis, usually without knowing it. What is the probability that one of your future children has cystic fibrosis? (Assume that both you and your future partner have that 1 in 25 chance of being a carrier.) Use a punnet square to show your reasoning.

Probability: _____

| | | |
|--|--|--|
| | | |
| | | |
| | | |

5. In some cultures, male offspring are prized and female offspring are not. Use the punnet square to explain why the sperm from the father determines the sex of the offspring rather than the egg from the mother.

Explanation: _____

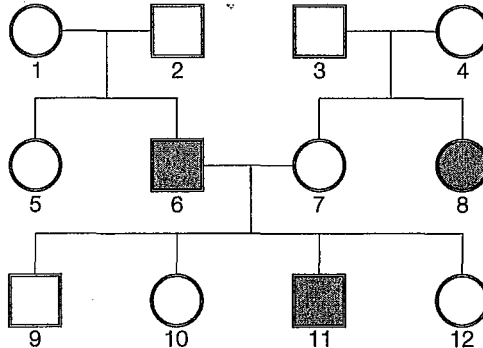
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Pedigree charts

Fur colour in mice is controlled by a single gene which is expressed as either white or grey.

| | Female | Male |
|-------|--------|------|
| White | | |
| Grey | | |



1. Based on the information in the pedigree chart above, is white or grey fur dominant? Cross out the wrong answer and give a reason for your chosen answer. Use a punnet square to help you explain your answer.

White/Grey fur is dominant because _____

| | | |
|--|--|--|
| | | |
| | | |
| | | |

2. Explain how mouse 1 and mouse 2 on the pedigree chart, who are both white, could have one white mouse and one grey mouse as offspring. Use the punnet square to help you explain your answer.

Explanation: _____

| | | |
|--|--|--|
| | | |
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| | | |

3. Explain why the genotype of mouse 7 on the pedigree chart is heterozygous. Use a punnet square to help you explain your answer.

Explanation: _____

| | | |
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| | | |