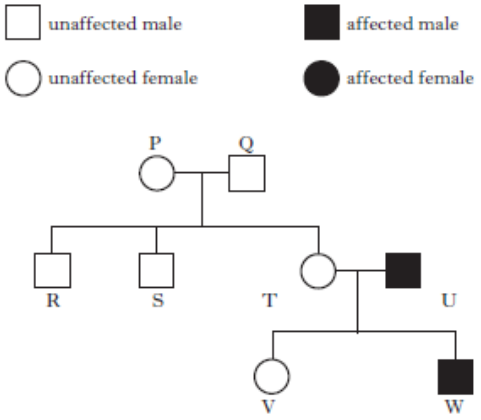
AH Unit 2.3

Variation and sexual reproduction

#2

16. Red-green colour deficiency is X-linked. The diagram below shows a family tree in which this condition occurs.



Which other individuals passed on the allele responsible for red-green colour deficiency in individual W?

A T only
B U only
C T and U
D T and P

Describe three factors that can determine the sex or sex ratio of organisms

1

2

3

19. In birds, **females** are heterogametic. The gene for feather-barring in chickens is sex-linked and the allele for barred feathers is dominant to the allele for non-barred feathers.

What ratio of offspring would be expected when a non-barred male is crossed with a barred female?

A 1 barred male : 1 non-barred female
B 1 non-barred male : 1 non-barred female
C 1 barred female : 1 barred male
D 1 non-barred male : 1 barred female

3. Coat colour in cats is determined by several genes. One of these is an X-linked gene that has two alleles. One allele (X^G) determines orange coat colour; when only the other allele (X^g) is present, coat colour is black. Although the orange allele is dominant, female cats inheriting both alleles are not orange. Instead, the coat is a patchwork of orange and black, a condition known as tortoiseshell.

orange black tortoiseshell

(*a*) A female tortoiseshell cat mates with a stray male and gives birth to the following kittens: two males, one orange and one black; three females, two tortoiseshell and one orange.

(i) State the genotype and phenotype of the stray male. **1**

(ii) State the genotypes of the orange kittens. **2**

(*b*) X inactivation occurs in the cells of female embryos.

(i) Why is X inactivation necessary? **1**

(ii) Explain how "patchiness" arises during development of tortoiseshell cats. **2**

(*c*) State the term used to describe an individual able to produce gametes that differ in their sex chromosomes. **1**

(7)

7. (*a*) Describe the features of chromosomes in homologous pairs. **3**

(*b*) In *Drosophila*, the genes for wing length (W), eye colour (E), body colour (B) and presence of bristles (P) are linked.

The table below gives the frequency of recombination obtained in crosses involving different pairs of the linked genes.

Gene pair in cross	*Frequency of recombination*
Wing length × Eye colour	12%
Wing length × Body colour	18%
Wing length × Presence of bristles	15%
Eye colour × Body colour	6%
Body colour × Presence of bristles	3%

Using the letters W, E, B, and P to identify them, give the sequence in which the genes would be arranged on the chromosome. **1**

(4)