

# Answers to end-of-chapter questions

## Chapter 18: Inheritance

- 1 a a large letter for the smooth fur allele and a matching small letter for the rough fur allele, using letters that look different from each other, e.g. **A** and **a** (not **S** and **s**)
- b **AA**, **Aa** and **aa**
- c **AA** smooth fur, **Aa** smooth fur, **aa** rough fur
- 2 a a large letter for the red colour allele and a matching small letter for the white colour allele, using letters that look different from each other, e.g. **R** for the red colour allele and **r** for the white colour allele
- b **R** is dominant, because this is the allele that has an effect in a heterozygous plant.
- c **RR**, red; **Rr**, red; **rr**, white
- 3 a A gene is a length of DNA that codes for a particular protein; an allele is one of two or more forms of a gene.
- b A dominant allele shows its effect in a heterozygous organism; a recessive allele only has an effect when no dominant allele is present.
- c A homozygous organism has two identical alleles of a gene, e.g. **AA**; a heterozygous organism has two different alleles of a gene, e.g. **Aa**.
- d The genotype shows the alleles of a gene that an organism possesses; the phenotype describes the characteristics of the organism.
- e Mitosis is a type of nuclear division in which genetically identical daughter cells are produced; meiosis is a type of nuclear division that produces daughter cells with only half the full number of chromosomes, and that are genetically different from one another. Mitosis is used in growth, repair and asexual reproduction; meiosis is used to produce gametes.
- f A haploid cell has one full set of chromosomes; a diploid cell has two full sets.
- g The base sequence is the sequence of bases A, C, G and T found in a DNA molecule; amino acid sequence is the sequence of amino acids found in a protein. The base sequence on a DNA molecule determines the sequence in which amino acids are linked together to build a protein.
- h DNA is found in the nucleus; its molecules are made up of two strands of bases, linked together by pairing between A and T, C and G, and wound into a double helix. mRNA is made in the nucleus and travels out into the cytoplasm; it is made of one strand of bases and is not wound into a helix.
- 4 a *symbols should be the same letter, large and small, and easily distinguishable, e.g.*  
**EE** for indented edges;  
**ee** for smooth edges; [2]
- b
- | parents' phenotypes                | indented                  | smooth       |
|------------------------------------|---------------------------|--------------|
| parents' genotypes                 | <b>EE</b>                 | <b>ee</b>    |
| gametes                            | ( <b>E</b> )              | ( <b>e</b> ) |
| offspring genotypes and phenotypes | all <b>Ee</b><br>indented |              |
- parents' genotypes correct;  
 gametes correct and placed inside circles;  
 offspring genotype and phenotype correct;  
 entire genetic diagram laid out correctly with all headings. [4]
- c
- | parents' phenotypes | indented                      | indented                      |
|---------------------|-------------------------------|-------------------------------|
| parents' genotypes  | <b>Ee</b>                     | <b>Ee</b>                     |
| gametes             | ( <b>E</b> ) and ( <b>e</b> ) | ( <b>E</b> ) and ( <b>e</b> ) |

	<b>E</b>	<b>e</b>
<b>E</b>	<b>EE</b> indented	<b>Ee</b> indented
<b>e</b>	<b>Ee</b> indented	<b>ee</b> smooth

	$C^W$
$C^B$	$C^B C^W$ grey
$C^W$	$C^W C^W$ white

parents' genotypes  $X^bY$   $X^BX^b$

gametes  $(X^b)$  and  $(Y)$   $(X^B)$  and  $(X^b)$

offspring genotypes and phenotypes

	$\text{X}^{\text{B}}$	$\text{X}^{\text{b}}$
$\text{X}^{\text{b}}$	$\text{X}^{\text{B}} \text{X}^{\text{b}}$ carrier female	$\text{X}^{\text{b}} \text{X}^{\text{b}}$ colour-blind female
$\text{Y}$	$\text{X}^{\text{B}} \text{Y}$ male with normal vision	$\text{X}^{\text{b}} \text{Y}$ colour-blind male

d the allele for colour-blindness is on the X chromosome;  
man passes on a Y chromosome to his sons; [2]

8 first woman's genotype could be  $I^A I^A$  or  $I^A I^o$ ;  
her husband's genotype must be  $I^o I^o$ ;  
second woman's genotype must be  $I^A I^B$ ;  
her husband's genotype could be  $I^A I^A$  or  $I^A I^o$ ;  
baby with blood group O must be  $I^o I^o$ ;  
so must have inherited an  $I^o$  allele from both its  
mother and its father;  
so its parents must be the first couple;  
baby with blood group B could be  $I^B I^o$  or  $I^B I^B$ ;

and must have inherited an  $I^B$  allele from at least  
one its parents;  
so its parents must be the second couple;  
so the women have been given the correct  
babies;  
use of correctly set out genetic diagram; [max 8]