17. Inheritance

17.4 Monohybrid inheritance

Paper 1 and 2

Question Paper

Paper 1

Questions are applicable for both core and extended candidates

1 When white-flowered pea plants are crossed with red-flowered pea plants, the offspring plants all have red flowers.

If these offspring plants are crossed, the next generation of plants contains both red-flowered and white-flowered plants.

Which statement explains this?

A The allele for red flowers is dominant, and the offspring plants are heterozygous.

B The allele for red flowers is dominant, and the offspring plants are homozygous.

C The allele for red flowers is recessive, and the offspring plants are heterozygous.

D The allele for red flowers is recessive, and the offspring plants are homozygous.

2 The inheritance of seed colour in pea plants is controlled by a single gene. The allele for yellow seed colour, Y, is dominant. The allele for green seed colour, y, is recessive.

What are the possible genotypes of a pea seed that is yellow?

A YY or yy only

B YY, Yy or yy

C YY or Yy only

D Yy or yy only

3 Two parents have the genotypes Bb and bb for a particular feature.

What is the probability of these parents having offspring that are homozygous recessive for this feature?

A 100% **B** 75% **C** 50% **D** 25%

4 A genetic cross between two organisms may be shown as Tt × Tt.

What does T represent?

A a dominant allele

B a dominant chromosome

C a recessive allele

D a recessive chromosome

5 A man has three sons.

What is the chance of his next child being a daughter?

A 0% **B** 25% **C** 50% **D** 100%

6 Which human characteristics are inherited?

	blood group	eye colour	language	sex
A	✓	✓	✗	✓
B	✓	✓	✓	✗
C	✗	✓	✗	✓
D	✓	✗	✓	✓

key

✓ = inherited

✗ = not inherited

7 When breeding, which pair of parents will be pure-breeding for a particular characteristic?

A a heterozygous and a homozygous individual

B two heterozygous individuals

C two homozygous individuals

D two individuals with the same phenotype

8 In a pea plant, the allele for round seeds, R, is dominant to the allele for wrinkled seeds, r.

If plants with the genotype Rr are crossed, what are the likely proportions of offspring?

A all with round seeds

B all with wrinkled seeds

C 1 with round seeds : 1 with wrinkled seeds

D 3 with round seeds : 1 with wrinkled seeds

9 In a species of plant, the allele for red flower colour, R, is dominant to the allele for yellow flower colour, r.

What would be the flower colour of the offspring of a cross between a parent with the genotype Rr and a parent with the genotype rr?

A 100% red

B 75% red and 25% yellow

C 50% red and 50% yellow

D 25% red and 75% yellow

10 In one species of plant, the allele for red-coloured fruit is dominant and is represented by the letter R. The allele for white-coloured fruit is recessive and is represented by the letter r.

Two plants that are heterozygous for fruit colour are crossed.

What are the possible genotypes of the offspring plants from this cross?

A RR, Rr and rr

B all Rr

C all rr

D Rr and rr only

11 Beak shape in birds is controlled by genes passed from the parent birds to their offspring.

What is this an example of?

A selection

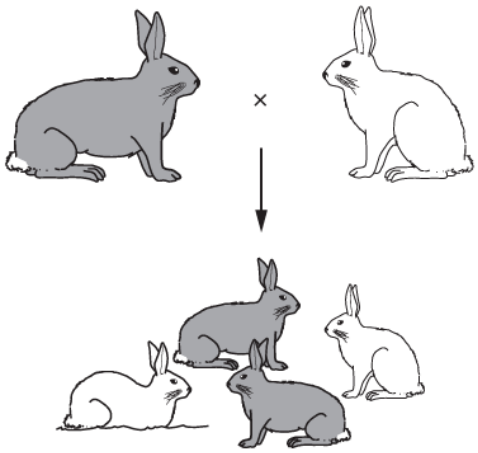
B fertilisation

C mitosis

D inheritance

12 In rabbits, the allele for dark fur, R, is dominant to the allele for white fur, r.

The diagram shows a cross between a rabbit with dark fur and a rabbit with white fur.



What are the genotypes of the parents?

A Rr and rr **B** RR and rr **C** RR and Rr **D** R and r

13 What is the transmission of genetic information from generation to generation called?

A fertilisation

B inheritance

C meiosis

D reproduction

14 Both parents in a family have a characteristic caused by the dominant allele of a gene. They have two children.

The pedigree diagram of the family is shown.

Which row describes the genotypes of the parents in relation to this gene?

	female parent	male parent
A	heterozygous	heterozygous
B	heterozygous	homozygous
C	homozygous	heterozygous
D	homozygous	homozygous

15 Which term is used to describe alleles that are always expressed when they are present in the genotype?

A dominant

B heterozygous

C homozygous

D recessive

16 Pea plants produce either yellow or green seeds. Yellow (Y) is dominant to green (y).

What are the most likely phenotypes of the offspring of a cross between YY and Yy plants?

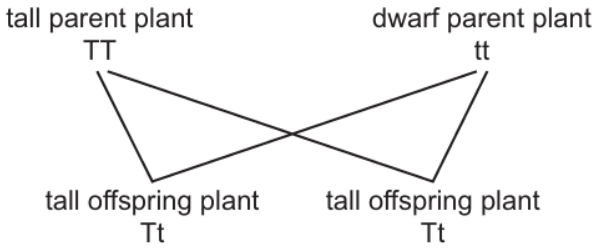
A 50% yellow and 50% green

B 75% yellow and 25% green

C 100% yellow

D 100% green

17 The diagram shows the inheritance of height in pea plants.



Which plants have a heterozygous genotype?

A both parent plants

B dwarf parent plant only

C both offspring plants

D tall parent plant only

18 A mouse with grey hair breeds with a mouse with white hair, producing offspring with genotypes Bb, Bb, bb and bb. (B represents the dominant allele for grey hair, and b represents the recessive allele for white hair.)

Which correctly describes the genotypes of the parents?

A both heterozygous

B both homozygous dominant

C one heterozygous and one homozygous dominant

D one heterozygous and one homozygous recessive

19 A man has three sons.

What is the chance of his next child being a daughter?

A 0% **B** 25% **C** 50% **D** 100%

20 In a plant species, the allele for red flowers, R, is dominant to the allele for white flowers, r. Homozygous red-flowered plants, RR, are crossed with homozygous white-flowered plants, rr.

What is the colour of the flowers produced by the offspring of this cross?

A all red

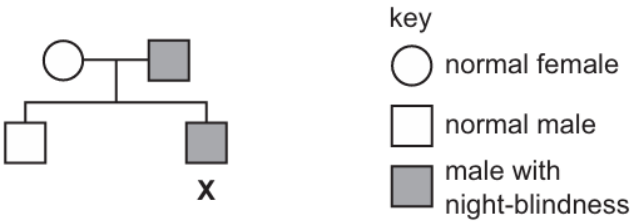
B all white

C equal numbers of red and white

D three white to one red

21 One type of night-blindness is an inherited condition, caused by a dominant allele.

The chart shows how this condition was passed on in one family.

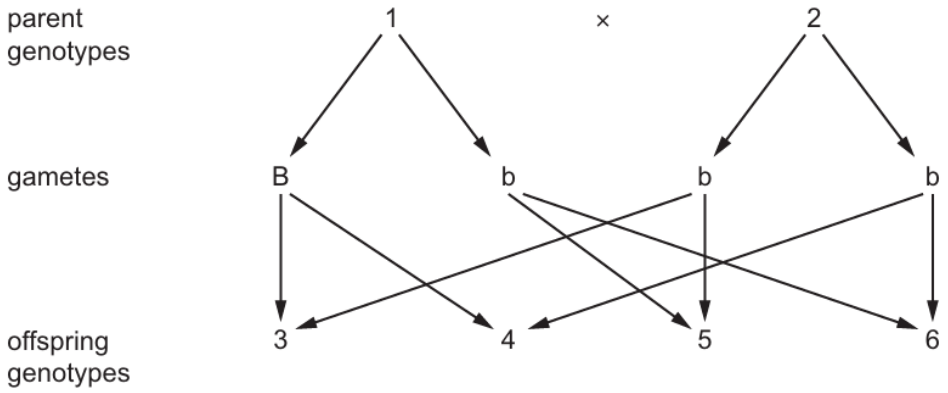


Person **X** marries someone with normal sight.

What is the chance that their first child will have night-blindness?

A 0% **B** 25% **C** 50% **D** 75%

22 The genetic diagram shows a monohybrid cross. B is the dominant allele and b is the recessive allele.



Which of the parents and offspring are heterozygous?

A 1, 3 and 4 **B** 1, 5 and 6 **C** 2, 3 and 4 **D** 2, 5 and 6

23 The allele for detached earlobes is dominant to the allele for attached earlobes.

Two parents are heterozygous for detached earlobes.

What is the probability of their first child having attached earlobes?

A 0% **B** 25% **C** 50% **D** 75%

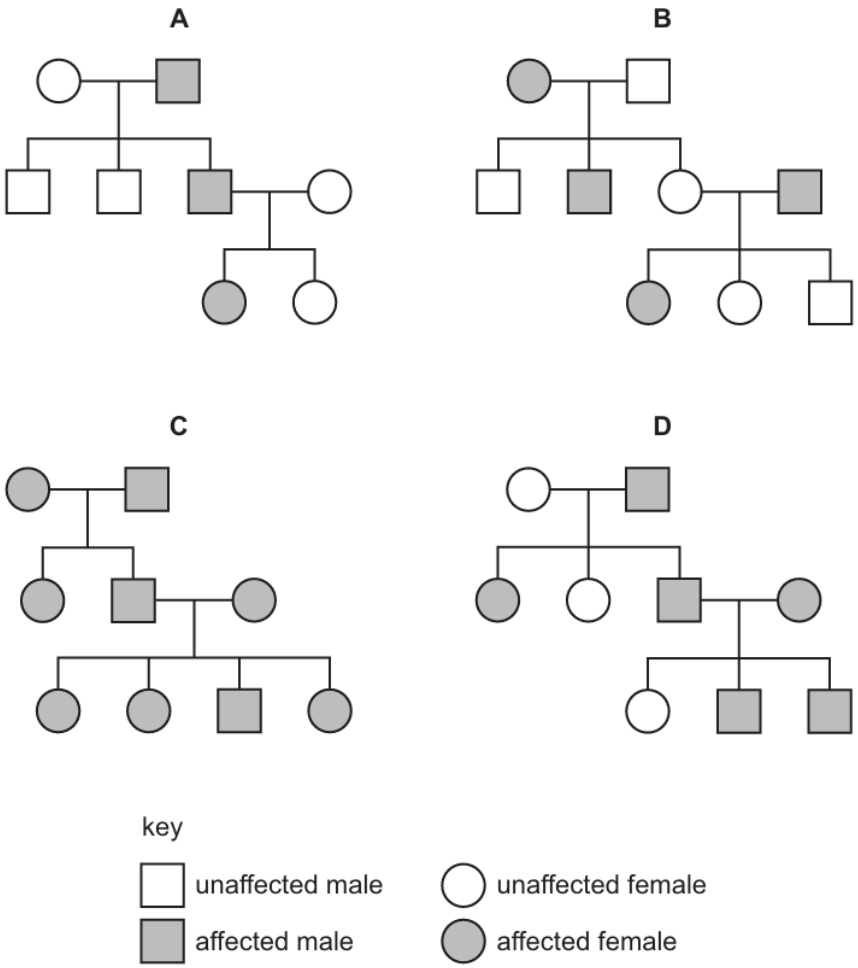
Paper 2

Questions are applicable for both core and extended candidates unless indicated in the question

24 The pedigree diagrams show the pattern of inheritance of a genetic disorder in four families.

This genetic disorder is **not** sex-linked.

Which pedigree diagram proves that the genetic disorder **must** be caused by a dominant allele?



25 In a family, the two parents have blood groups of A and B and the three children have blood groups of B, B and O.

What are the genotypes of the parents? **(extended only)**

A I^AI^A and I^BI^B

B I^AI^B and I^Ai^o

C I^Ai^o and I^Bi^o

D I^Bi^o and I^Bi^A

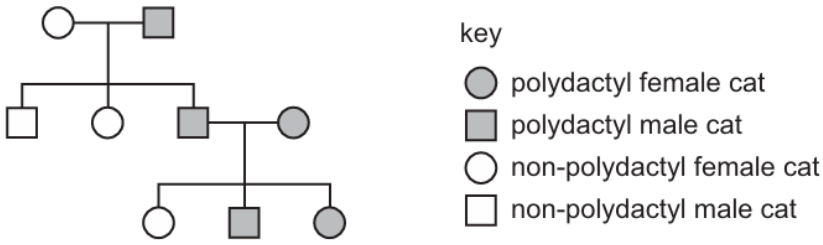
26 A woman who has blood group AB has a child with a man who has blood group B and is heterozygous.

What is the chance of the child having blood group B? **(extended only)**

A 0% **B** 25% **C** 50% **D** 100%

27 Polydactyly is a condition that can occur in cats and results in affected individuals having extra toes.

The diagram shows the inheritance of the condition in a family of cats.



What does the family tree show about the allele for polydactyly?

A It is codominant.

B It could be dominant or recessive.

C It is dominant.

D It is recessive.

28 In guinea pigs, the allele for black fur is dominant and the allele for white fur is recessive.

A test cross can be used to determine the genotype of a guinea pig with black fur.

What would be the expected result of the test cross if the guinea pig with black fur was homozygous? **(extended only)**

A 50% black, 50% white

B 25% black, 75% white

C 100% black

D 100% white

29 Red-green colour blindness is a sex-linked characteristic caused by a recessive allele.

Which prediction can be made about the children of a woman who is colour-blind and a man with normal vision? **(extended only)**

A Boys will be colour-blind, and girls will have a 50% chance of being colour-blind.

B Boys will be colour-blind, and girls will have normal vision.

C Girls will be colour-blind, and boys will have a 50% chance of being colour-blind.

D Girls will be colour-blind, and boys will have normal vision.

30 Which parents could produce offspring with blood group O? **(extended only)**

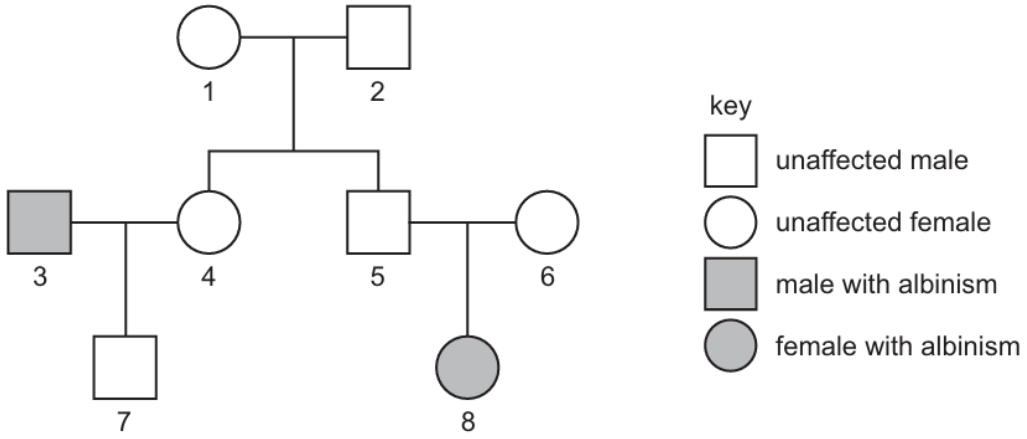
A heterozygous father with blood group A and heterozygous mother with blood group B

B heterozygous father with blood group A and homozygous mother with blood group B

C homozygous father with blood group A and heterozygous mother with blood group B

D homozygous father with blood group A and homozygous mother with blood group O

31 The diagram shows the inheritance of albinism in one family. Albinism is an inherited condition caused by a recessive allele.



Which individuals **must** be heterozygous for this condition?

A 1 and 2 **B** 4 and 7 **C** 5, 6 and 7 **D** 5 and 6 only

32 A man of genotype I^AI^o and woman of genotype I^BI^o have a child.

What is the chance that the child will have the same blood group as one of its parents? **(extended only)**

A zero **B** 1 in 4 **C** 1 in 2 **D** 3 in 4

33 A man who has red-green colour blindness has a child with a woman who does **not** have red-green colour blindness. The child has red-green colour blindness. The man and woman decide to have another child.

What is the percentage probability that their next child will have red-green colour blindness? **(extended only)**

A 0% **B** 25% **C** 50% **D** 100%

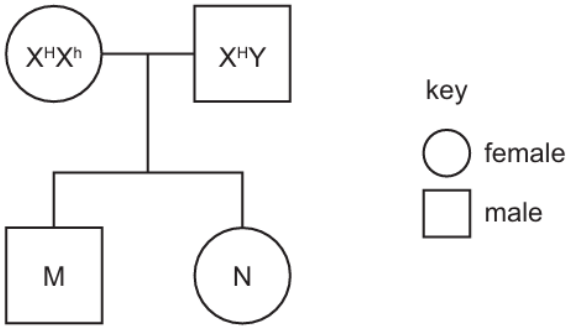
34 A man of genotype I^AI^B and woman of genotype I^BI^o have a child.

What is the chance that the child will have the same blood group as one of its parents? **(extended only)**

A zero **B** 1 in 4 **C** 1 in 2 **D** 3 in 4

35 The gene for haemophilia is found on the X chromosome and the allele for haemophilia is recessive.

In the pedigree diagram the dominant allele is shown as X^H and the recessive allele is shown as X^h.



What is the probability of child M having haemophilia? **(extended only)**

A 0.00 **B** 0.25 **C** 0.50 **D** 1.00

36 Colour blindness is a characteristic that is sex-linked.

Which statement about colour blindness is correct? **(extended only)**

A The gene for colour blindness is located on the Y chromosome and colour blindness is more common in males than in females.

B The gene for colour blindness is located on the X chromosome and colour blindness is more common in males than in females.

C The gene for colour blindness is located on the X chromosome and colour blindness is more common in females than in males.

D The gene for colour blindness is located on the Y chromosome and colour blindness is more common in females than in males.

37 Coat colour in cattle is controlled by two codominant alleles.

The genotype C^RC^R results in cattle with a red coloured coat. The genotype C^WC^W results in cattle with a white coloured coat. The genotype C^RC^W results in a roan coat; these cattle have a mixture of red hairs and white hairs in their coat.

A mating occurs between a red cow and a roan bull.

What is the expected ratio of coat colour in the offspring? **(extended only)**

A 50% red, 50% white

B 100% red

C 50% red, 50% roan

D 100% roan

38 Red-green colour blindness is a condition that occurs more frequently in men than in women.

Which statement about this condition is correct? **(extended only)**

A It can pass from father to son.

B It is a sex-linked characteristic.

C It shows co-dominance.

D The gene is on the Y chromosome.

39 In guinea pigs, the allele for black fur is dominant and the allele for white fur is recessive.

A test cross can be used to determine the genotype of a black guinea pig.

What would be the expected result of the test cross if the black guinea pig was heterozygous? **(extended only)**

A 50% black, 50% white

B 25% black, 75% white

C 100% black

D 100% white

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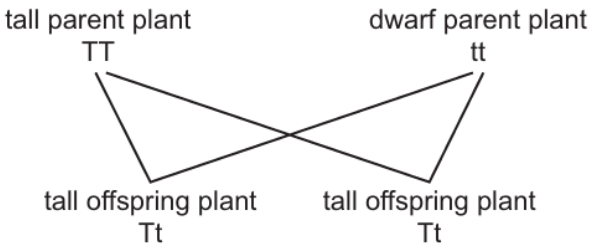

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