

Question 27 (Answer: C)

- A female has two X chromosomes, so every egg carries an X – statement 2, not statement 1.
- A male has one X and one Y, so a sperm carries either – statement 3.
- It is the sperm, therefore, that determines the sex of the child.

Question 29 (Answer: D)

- Colour blindness is X-linked recessive, so the mother is X^cX^c .
- A son gets his single X from his mother and his Y from his father.
- So he must receive X^c – every son of an affected mother is colour blind, a chance of 100%.

Question 32 (Answer: C)

- White $\times$ black giving speckled offspring means both alleles show in the same bird.
- That is codominance – neither allele is dominant over the other.
- It is not incomplete dominance, because the feathers stay white *and* black rather than blending to grey.

Question 30 (Answer: B)

- A gene occupies a fixed position on a chromosome.
- Alleles are the different versions of that same gene.
- So an organism with two chromosomes of a pair carries two alleles of every gene.

Question 31 (Answer: B)

- Both parents are heterozygous, so the cross is $Pp \times Pp$.
- The four equally likely offspring are PP, Pp, Pp and pp.
- Three of the four carry a dominant allele and so have extra toes; only pp (1 in 4) does not.

Question 32 (Answer: D)

- Red-green colour blindness is caused by a recessive allele on the X chromosome.
- A male has only one X, so one copy of the allele affects him.
- A female needs two copies, which is why it is far more common in males – but it does occur in females.

Question 30 (Answer: B)

- White $\times$ red giving *all* roan offspring shows both alleles are expressed together – codominance.
- Crossing two roan parents then gives red, roan and white in a 1 : 2 : 1 ratio.
- So a quarter of the offspring are red and a quarter white, with a half roan.

Question 31 (Answer: B)

- Look for a child with the condition whose parents do not have it – that shows the allele is recessive.
- If both sexes are affected roughly equally, the gene is not sex-linked.
- Unaffected parents of an affected child must both be carriers.

Question 32 (Answer: C)

- A sex-linked recessive allele is carried on the X chromosome.
- A male has only one X, so a single copy makes him affected.
- A female needs two copies to be affected, so an unaffected female with an affected son must be a carrier.

Question 32 (Answer: B)

- Each parent can pass on I^o , so cross $I^A I^o$ with $I^B I^o$.
- The four equally likely offspring are $I^A I^B$, $I^A I^o$, $I^B I^o$ and $I^o I^o$.
- Only $I^o I^o$ is group O, so the probability is 1 in 4 = 0.25.