Level 2 Biology: practice paper 2026

AS 91157 Demonstrate understanding of genetic variation and change · Vertex Academy practice paper, not an NZQA paper

Attempt ALL the questions. Show ALL working. Write your answers on lined paper, or in the space under each question.

QUESTION ONE

(a) In a Romney sheep flock, white fleece (W) is dominant to black fleece (w). Two white sheep, both Ww, are mated.
Use a Punnett square to give the expected genotype and phenotype ratios of their lambs.

	W	**w**
W	WW	Ww
w	Ww	ww

(b) A farmer has a white ram and wants to know whether it is WW or Ww before using it for breeding. Explain how a test cross would show the ram's genotype.

(c) In Shorthorn cattle, coat colour is codominant: C^RC^R is red, C^WC^W is white and C^RC^W is roan (red and white hairs mixed). Polled (no horns, P) is dominant to horned (p). The two genes are on different chromosomes.

Two roan, heterozygous polled cattle (C^RC^W Pp) are mated many times. Discuss the expected phenotypes of their calves and the ratio, and why the actual calves may not match this ratio.

QUESTION TWO

(a) Mutations are the original source of new alleles.
Describe what a mutation is, and the difference between a gametic mutation and a somatic mutation.

(b) Brothers and sisters with the same two parents look different from each other.
Explain how crossing over and independent assortment during meiosis produce genetically different gametes.

(c) Red-green colour blindness is caused by a recessive allele (X^b) on the X chromosome. A woman with normal vision whose father was colour-blind has children with a man with normal vision. Discuss the chance that their sons and daughters will be colour-blind, and why red-green colour blindness is much more common in males than in females.

	X^B (father)	**Y (father)**
X^B (mother)	X^BX^B	X^BY
X^b (mother)	X^BX^b	X^bY

QUESTION THREE

(a) In a model population of 250 birds, a gene has two alleles, A and a. There are 160 AA birds, 70 Aa birds and 20 aa birds.
Describe what is meant by a gene pool and by allele frequency, and calculate the frequency of allele a.

(b) The Chatham Island black robin was saved from extinction. By 1980 only five birds were left, with only one breeding pair. Today there are around 250 birds, all descended from that one pair.
Explain how this bottleneck affected the genetic diversity of the black robin, and how genetic drift acts in a small population.

(c) Some female black robins lay eggs on the rim of the nest, where the eggs fail. During the rescue in the 1980s, conservation workers pushed these rim eggs back into the nest so they could hatch. The trait is partly inherited. By 1989 about half of all females laid rim eggs. After the workers stopped pushing eggs back, the proportion of rim-laying females fell.
Discuss how natural selection and the conservation workers' actions changed the frequency of the alleles linked to rim-laying.

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