

5 Genetic diversity is important for the long term survival, adaptation and evolution of organisms. Genetic diversity can be considered as the number of different alleles found at each gene locus in a population of organisms.

(a) Explain what is meant by the term **gene locus**.

(2)

(b) The genetic diversity of two breeds of dog, P and Q, was investigated. The total number of different alleles found at 31 gene loci was recorded for each breed.

The results are shown in the table below.

Breed of dog	Total number of different alleles at 31 gene loci
P	239
Q	144

(i) The mean number of different alleles per gene locus for both breeds was calculated. Place a cross ☐ in the box next to the mean for breed P.

(1)

- ☐ **A** 5.7
- ☐ **B** 7.2
- ☐ **C** 7.7
- ☐ **D** 31.0



- (ii) Breed Q has a mean of 4.6 different alleles per gene locus.
If their environment changed, breed P would be more likely to survive and evolve than breed Q.

Using information on mean number of different alleles per gene locus and your own knowledge, explain why breed P is more likely to survive and evolve than breed Q.

(5)

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(c) Two groups of dogs, of breed P, were taken from the same population.
The total number of different alleles at the same 31 gene loci was recorded for each of these two groups.

The results are shown in the table below.

Group	Number of dogs of breed P	Total number of different alleles at 31 gene loci
1	40	239
2	20	215

Suggest why the total number of different alleles in group 1 was greater than in group 2.

(2)

(d) Adaptation can be behavioural, physiological or anatomical.
Place a cross ☒ in the box that correctly identifies a **behavioural adaptation** in humans.

(1)

- ☒ **A** Long necks are more common in people living in hot dry conditions
- ☐ **B** More red blood cells in people living high up a mountain
- ☐ **C** More white blood cells in people with an infection
- ☐ **D** Taking a rest in the heat of the day

(Total for Question 5 = 11 marks)

