

Name of the Student: _____

Max. Marks : 24 Marks

Time : 24 Minutes

Q1.

- (a) What is the name of a position of a gene on a chromosome?

(1)

- (b) What is meant by genetic diversity?

(1)

A geneticist investigated genetic diversity in four different breeds of dog. She compared DNA base sequences of the same genes from a large number of dogs from each breed.

The geneticist calculated the mean genetic diversity for each breed of dog. The value of this mean was between 0 and 1.

- A mean value of 1 shows maximum genetic diversity.
- A mean value of 0 shows no genetic diversity.

Her results are shown in the table

Breed of dog	Mean genetic diversity	Standard deviation
Airedale terrier	0.51	± 0.03
Bull terrier	0.38	± 0.02
Jack Russell terrier	0.76	± 0.01
Miniature terrier	0.47	± 0.02

- (c) What do these data show about the differences in genetic diversity between these breeds of dog?

- (d) Miniature terriers were first bred from bull terriers in the 19th century.

Suggest **one** explanation for the observed difference in genetic diversity between miniature terriers and bull terriers.

(2)

(Total 7 marks)

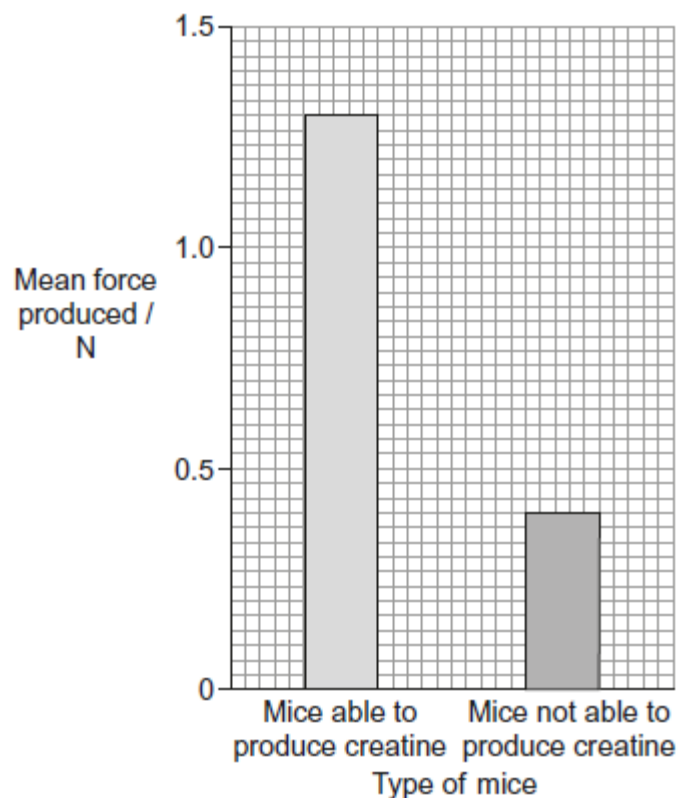
Q2.

- (a) What is the role of ATP in myofibril contraction?

(2)

- (b) Scientists investigated the effect of not being able to produce creatine on the force produced by muscle. They used mice with a mutation that made them not able to produce creatine. The force produced when these mice gripped with their paws was compared with the force produced by normal mice that were able to produce creatine.

The graph shows the scientists' results.



- (i) What was the percentage fall in the mean force produced by mice not able to produce creatine, compared with the normal mice? Show your working.

Answer _____ %

(2)

- (ii) Suggest an explanation for these results.

(2)

- (c) The mice that were not able to produce creatine were homozygous for a recessive allele of a gene. Mice that are heterozygous for this allele are able to produce forces similar to those of normal mice that are homozygous for the dominant allele of the same gene.

Explain why the heterozygous mice can produce forces similar to those of normal mice.

(2)

(Total 8 marks)

Q3.

- (a) Give **three** ways in which courtship behaviour increases the probability of successful mating.

1. _____
2. _____
3. _____

(3)

Male field crickets produce a courtship song by vibrating their wings. The natural song contains seven low-pitched 'chirps' followed by two high-pitched 'ticks'.

Scientists recorded this song and used a computer program to change the number of chirps and ticks. Different versions of the song were then played back continuously to females in the presence of a male. This male had previously had one wing removed so he could not produce a courtship song. The scientists determined the percentage of females that showed courtship behaviour within 5 minutes of hearing each recorded song.

The results of the scientists' playback experiments are shown in the table below.

Version of recorded song played	Number of chirps	Number of ticks	Percentage of females that showed courtship behaviour within 5 minutes
K	No song played		30
L (natural)	7	2	83
M	7	0	70
N	0	2	65
O	7	1	83
P	7	4	82

- (b) The scientists wanted to know if the recorded natural song was less effective than the natural song in stimulating courtship behaviour.

Suggest how the scientists could determine if the recorded natural song (L) was less effective than the natural song.

(2)

- (c) A student concluded from the data in the table above that the number of chirps and ticks is essential for successfully stimulating courtship behaviour.

Do these data support this conclusion? Explain your answer.

(4)
(Total 9 marks)