To be completed by candidate

NSN

School Code

1

SUPERVISOR'S USE ONLY

92022

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Level 1 Chemistry and Biology RAS 2022

92022 Demonstrate understanding of genetic variation in relation to whakapapa

PILOT ASSESSMENT

Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of genetic variation in relation to whakapapa.	Explain the significance of genetic variation in relation to whakapapa.	Apply knowledge of genomic variation in relation to whakapapa.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ONE of the two questions in this booklet.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (▨). This area may be cut off when the booklet is marked.

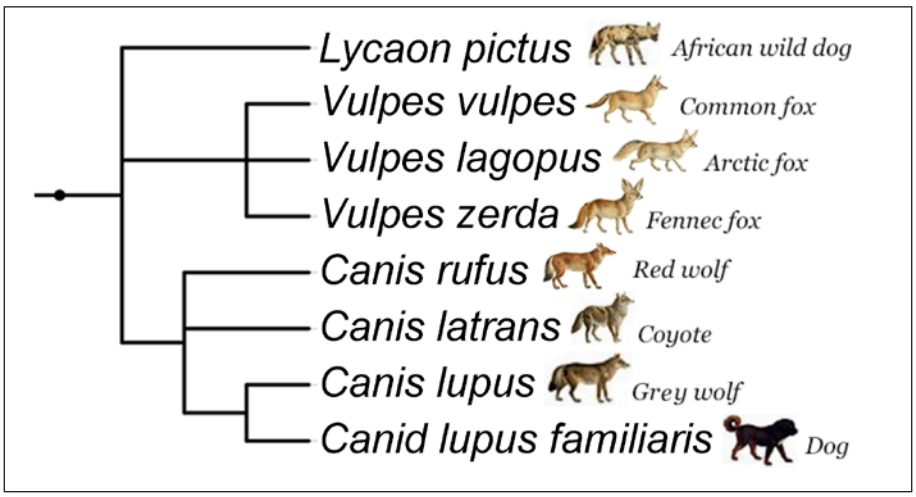
YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION

EITHER: QUESTION ONE – ANIMAL ANCESTORS

Figure 1: The kurī, the now-extinct Polynesian dog (*Canis lupus familiaris*)

Source: www.archaeology.wiki/blog/2015/10/09/otago-researchers-sequence-extinct-dog-genomes/

Figure 2: Dog species



https://www.biologycorner.com/worksheets/phylogenetic-tree-dog-wolf.html

Genetic markers can be used to identify how closely related animals are. The kurī is an example of an animal who is related to other dog species.

Either choose to use the kurī OR an example you have learnt about in class to complete the following questions.

(a) Explain what differences occur in DNA to get different species of dog OR the species related to the animal you have learnt about in class.

(b) Discuss what can happen to DNA over time to create new species.

Your answer should:

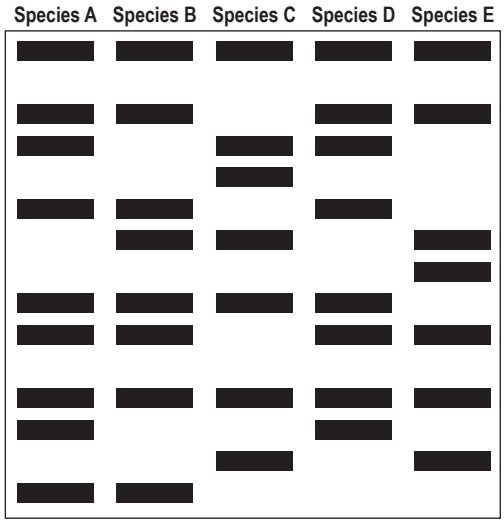
(i) describe what alleles, genes, chromosomes, and mutations are

(ii) explain how mutations change alleles and create new genetic markers

(iii) explain how mutations affect genomic variation AND how mutations can be used to compare changes in species over time.

(c) DNA profiling is a biological technique used to compare genetic markers.

Figure 3: DNA profile comparing individuals of different species



Using the DNA profile above (Figure 3):

(i) describe why each species has a different combination of genetic markers

(ii) explain how a difference between genetic markers can be used to inform the ancestry of modern-day animals

(iii) apply your knowledge to explain how the genetic markers of the different species can be used to trace a species such as the kurī OR your chosen example, back to their ancestors.

OR: QUESTION TWO – WHERE DID KURĪ GO?

Kurī arrived in Aotearoa (New Zealand) with humans. However, they are now extinct. Answer the questions below to help explain what happened to them.

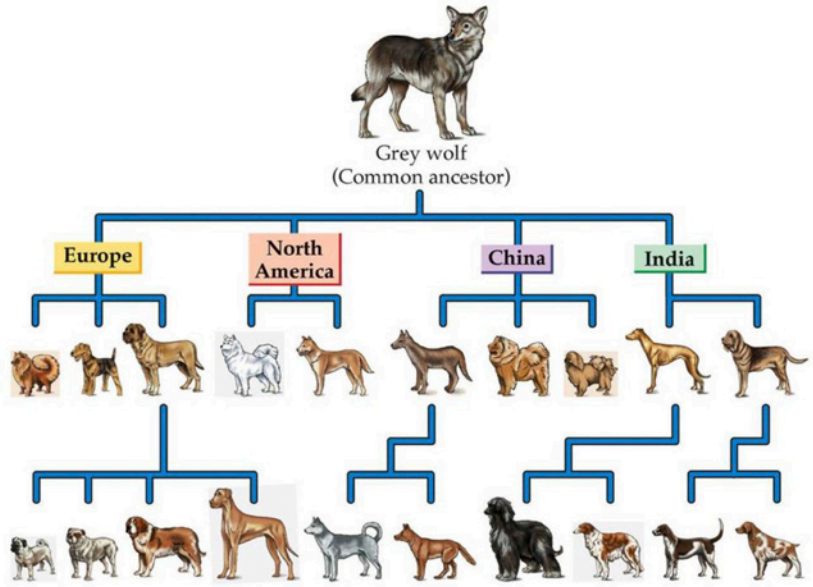
Figure 1: The kurī, the now-extinct Polynesian dog (*Canis lupus familiaris*)

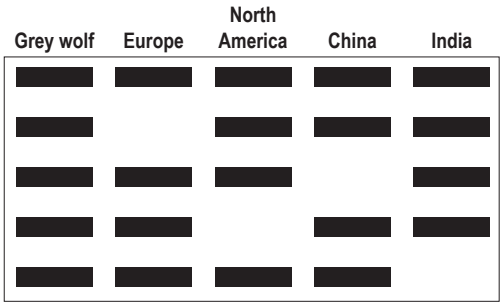
Source: www.archaeology.wiki/blog/2015/10/09/otago-researchers-sequence-extinct-dog-genomes/

(a) Explain the relationship between DNA, chromosomes, genes, and alleles.

(b) Explain the difference between individual dog breeds.

Figure 2: Modern dog breeds and simplified DNA profile





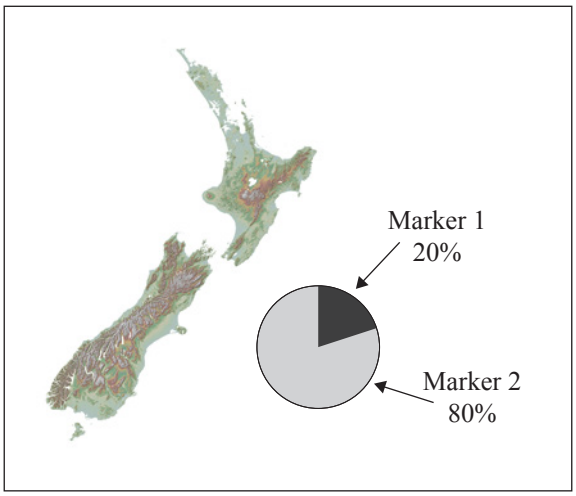
https://danspetcare.com/impact-of-exercise-of-life-and-longevity-of-your-dog

Your answer should:

- explain the differences between dog breeds
- explain how differences in DNA create genetic markers
- discuss how genetic markers can be used to study the kurī and dog breeds.

(c) In 2015, scientists looked at the DNA sequences taken from extinct kurī. All the kurī sampled had 2 distinct genetic markers known as Marker 1 and Marker 2.

Figure 3: Simplified data showing genetic marker frequency (amount) in kurī DNA samples from Aotearoa



Adapted from: Greig, Karen, et al. "Complete mitochondrial genomes of New Zealand's first dogs." PloS one 10.10 (2015): e0138536.

Kurī became extinct in the mid-to-late 1800s. There are two ideas how this happened. The kurī were killed by farmers, or they interbred with other dogs.

Using Marker 1 and Marker 2 above, discuss how scientists could figure out what happened to the kurī.

Your answer should:

- describe a mutation
- explain how mutations create new alleles and affect genomic variation
- explain how scientists could figure out if modern dogs interbred with the extinct kurī.

Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER

Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER

Extra space if required.
Write the question number(s) if applicable.

QUESTION NUMBER