90948



NEW ZEALAND QUALIFICATIONS AUTHORITY MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD KIA NOHO TAKATŪ KI TŌ ĀMUA AO! Tick this box if there is no writing in this booklet

SUPERVISOR'S USE ONLY



Level 1 Science 2020

90948 Demonstrate understanding of biological ideas relating to genetic variation

9.30 a.m. Friday 27 November 2020 Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence		
Demonstrate understanding of biological ideas relating to genetic variation.	Demonstrate in-depth understanding of biological ideas relating to genetic variation.	Demonstrate comprehensive understanding of biological ideas relating to genetic variation.		

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 ALL the questions in this booklet.

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

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

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

TOTAL	
	ASSESSOR'S USE ONLY

No part of this publication may be reproduced by any means without the prior permission of the New Zealand Qualifications Authority.

QUESTION ONE

Huntington's disease is a genetic disorder in humans.

It is caused by a dominant affected allele (H). The normal allele is recessive (h).

(a) State the possible genotypes and phenotypes for Huntington's disease.

Genotype	Phenotype
1	1
2	2
3	3

2

- (b) Explain how the two alleles, H and h, combine to produce different phenotypes. In your answer you should:
 - define phenotype and genotype
 - explain how the three genotypes code for only two phenotypes.

(c) Huntington's disease occurs when a mutation causes a dominant affected allele (H). The normal allele is recessive (h).



Using Huntington's disease as an example and the diagram above, explain the **relationship** between DNA, genes, alleles, mutations, and phenotype.

A labelled diagram may assist you.

There is more space for your answer to this question on the following page. ASSESSOR'S USE ONLY

ASSESSOR'S
USE ONLY

This page has been deliberately left blank.

The examination continues on the following page.

QUESTION TWO

Below is a pedigree chart for a family with the genetic disorder, polycystic kidney disease.



https://en.wikipedia.org/wiki/Polycystic_ kidney_disease#/media/File:Polycystic_ kidneys,_gross_pathology_CDC_PHIL.png

Polycystic kidney disease is caused by a dominant allele (D) and the unaffected allele is recessive (d).

(a) Complete the Punnett square for the cross between individual 1 homozygous recessive and individual 2 heterozygous for polycystic kidney disease.



(b) List the genotypes of the following two individuals:

individual 3 _____ individual 4 _____

ASSESSOR'S USE ONLY

You should support your answer using evidence from BOTH the parents AND children of individual 3.

(c)

8

ASSESSOR'S USE ONLY

(d) One of the family members has kidney failure as a result of an infection.

Discuss if this type of kidney failure can be inherited by any future children they have.

QUESTION THREE

Avian malaria is a parasitic disease affecting hoiho (yellow-eyed penguins), which can lead to death.

1			

Source: http://nzbirdsonline.org.nz/species/yellow-eyed-penguin

(a) Describe genetic variation in hoiho.

Question Three continues on the following page.

- (b) Explain how sexual reproduction causes genetic variation in the hoiho population. In your answer you should consider:
 - the processes of gamete formation (meiosis) and fertilisation.

You may use labelled diagrams, with notes, to support your answer.

ASSESSOR'S USE ONLY

	U
Discuss how genetic variation could lead to increased survival of the hoiho population when faced with avian malaria.	

		E	Extra paper if red	quired.		ASSESSOR'S
		Write the q	uestion number	r(s) if applicable.		USE ONLY
NUMBER					1	