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90948M



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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

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Tohua tēnei pouaka
mēnā kāore he tuhituhi
i roto i tēnei pukapuka

Pūtaiao, Kaupae 1, 2020

90948M Te whakaatu māramatanga ki ngā ariā koiora e pā ana ki te rerekētanga ā-ira

9.30 i te ata
Rāmere 27 Whiringa-ā-rangi 2020
Whiwhinga: Whā

Paetae	Kaiaka	Kairangi
Te whakaatu māramatanga ki ngā ariā koiora e pā ana ki te rerekētanga ā-ira.	Te whakaatu māramatanga hōhonu ki ngā ariā koiora e pā ana ki te rerekētanga ā-ira.	Te whakaatu māramatanga matawhānui ki ngā ariā koiora e pā ana ki te rerekētanga ā-ira.

Tirohia mēnā e rite ana te Tau Ākongā ā-Motu (NSN) kei runga i tō puka whakauru ki te tau kei runga i tēnei whārangi.

Me whakamātau koe i ngā tūmahi KATOĀ kei roto i tēnei pukapuka.

Mēnā ka hiahia whārangi atu anō koe mō ō tuinga, whakamahia ngā whārangi wātea kei muri o tēnei pukapuka, ka āta tohu ai i te tau tūmahi.

Tirohia mēnā e tika ana te raupapatanga o ngā whārangi 2–21 kei roto i tēnei pukapuka, ka mutu, kāore tētahi o aua whārangi i te takoto kau.

ME HOATU RAWA KOE I TĒNEI PUKAPUKA KI TE KAIWHAKAHAERE Ā TE MUTUNGA O TE WHAKAMĀTAUTAU.

TAPEKE

MĀ TE KAIMĀKA ANAKE

TŪMAHI TUATAHI

Ko te mate Huntington he mate iranga i roto i te tangata.

Pā mai ai tēnei nā tētahi irarā tāpua¹ e pāngia ana (H). He ngoikore² te irarā māori (h).

(a) Tuhia ngā tohuira me ngā tohuāhua ka taea mō te mate Huntington.

Tohuira	Tohuāhua
1 ____	1 _____
2 ____	2 _____
3 ____	3 _____

(b) Whakamāramahia mai he pēhea te tōpū o ngā irarā e rua, H me h, kia puta ai ngā tohuāhua rerekē e rua.

I tō tuhinga, me:

- tautuhi he aha te tohuāhua me te tohuira
- whakamārama ka pēhea e whakawaehere ai ngā tohuira e toru mō ngā tohuāhua e rua anake.

¹ irarā ngoi

² huna

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.

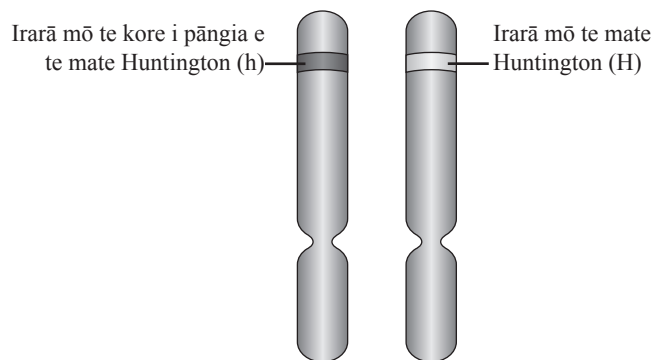
Genotype	Phenotype
1 ___ ___	1 _____
2 ___ ___	2 _____
3 ___ ___	3 _____

- (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) Pā mai ai te mate Huntington ina puta ai he irarā tāpua (H) e pāngia ana nā tētahi irakētanga. He ngoikore te irarā māori (h).

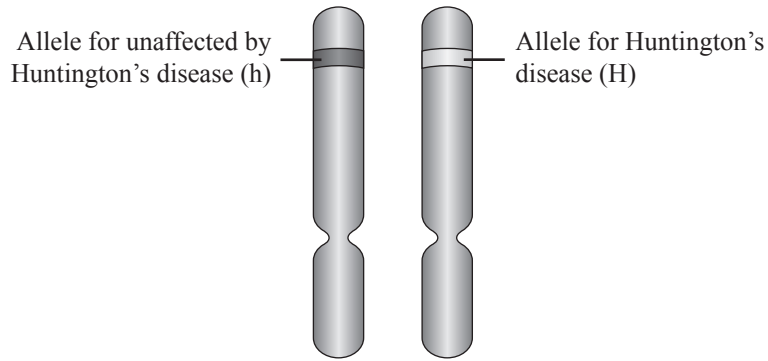


Mā te whakamahi i te mate Huntington hei tauira me te hoahoa i runga ake, whakamāramahia mai te **pānga** i waenga i te pītau ira, ngā ira, ngā irarā, ngā irakē me ngā tohuāhua.

Ka āwhina pea tētahi hoahoa tapanga i a koe.

**He wāhi anō mō tō tuhinga
mō tēnei tūmahī kei te
whārangi 6.**

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



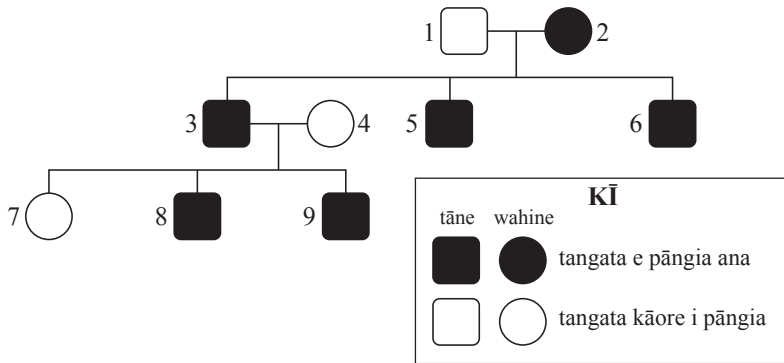
Using Huntington's disease as an example and the diagram above, explain the **relationship** between DNA, genes, alleles, mutations, and phenotype.

A labelled diagram may assist you.

There is more space for your answer to this question on page 7.

TŪMAHI TUARUA

He tūtohi kāwai kei raro mō tētahi whānau me te mate iranga, te mate tākihi whēwhērau.

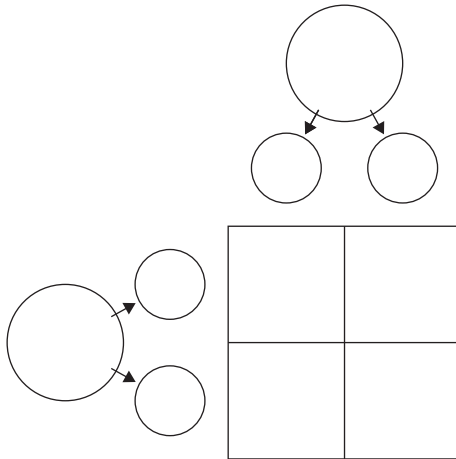


He mea urutau mai: <https://pdfs.semanticscholar.org/a910/3db712e5773776ec97789225704991f6fd15.pdf>

https://en.wikipedia.org/wiki/Polycystic_kidney_disease#/media/File:Polycystic_kidneys,_gross_pathology_CDC_PHIL.png

Pā mai ai te mate tākihi whēwhērau e tētahi irarā tāpua (D), ā, he ngoikore te irarā kāore i pāngia (d).

- (a) Whakaotihia te tapawhā Punnett mō te whakawhiti i waenga i te tangata 1 (ngoikore iraruarite) me te tangata 2 (iraruakē) mō te mate tākihi whēwhērau.

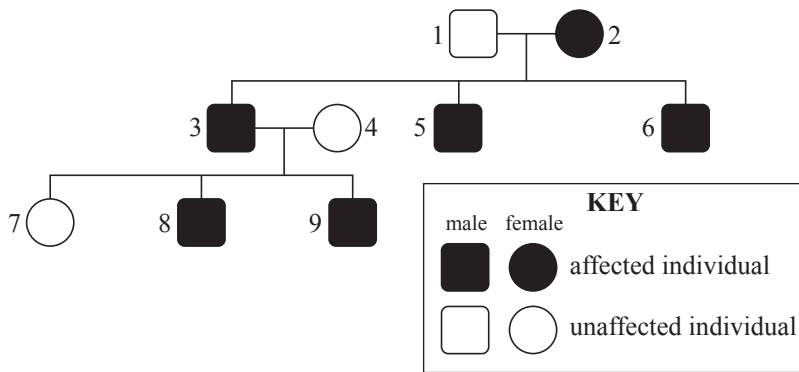


- (b) Tuhia mai ngā tohuira o ngā tāngata e rua e whai ake:

tangata 3 _____ tangata 4 _____

QUESTION TWO

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

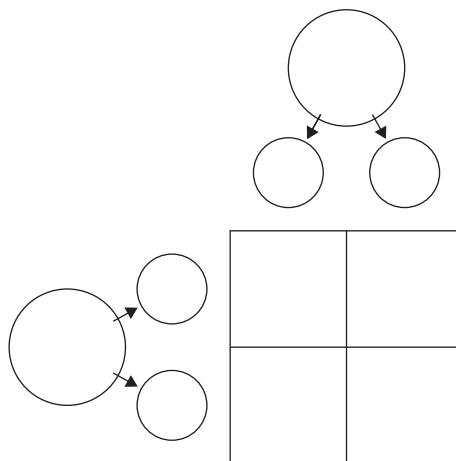


Adapted from: <https://pdfs.semanticscholar.org/a910/3db712e5773776ec97789225704991f6fd15.pdf>

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 _____

(c) Whakamāramahia mai i pēhea tō whiriwhiri i te tohuira mō te tangata 3.

Whakamahia ngā taunakitanga hei tautoko i tō tuhinga mai i ngā mātua, mai i ngā tamariki HOKI a tangata 3.

(d) Kei te tino mate te tākihi o tētahi o te whānau nā tētahi whakapokenga.

Matapakitia mēnā ka taea tēnei momo mate tākihi te heke iho ki ngā tamariki ka puta i a ia.

- (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.



TŪMAHI TUATORU

He mate pirinoa te mate eku³ manu ka pā ki ngā hoiho (yellow-eyed penguins), ā, ko te mutunga atu pea ko te mate.



Mātāpuna: <http://nzbirdsonline.org.nz/species/yellow-eyed-penguin>

(a) Whakaahuatia mai te rerekētanga ā-ira i roto i ngā hoiho.

**Ka haere tonu te Tūmahi
Tuatoru i te whārangi 16.**

³ marerea

QUESTION THREE

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



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

(a) Describe genetic variation in hoiho.

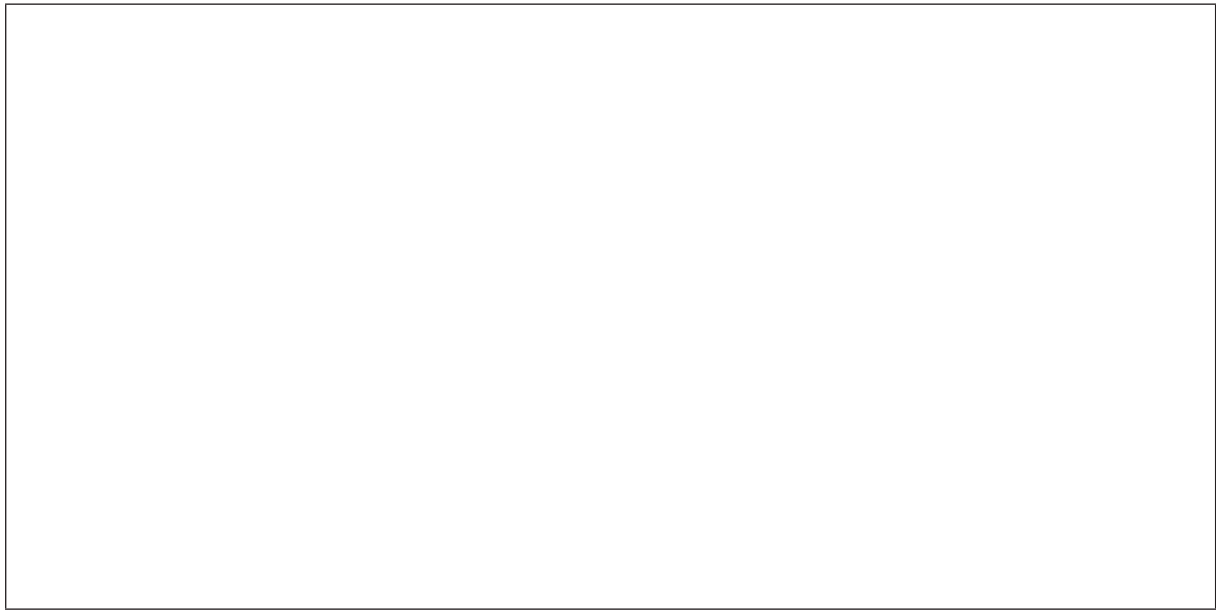
**Question Three continues
on page 17.**

(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.



There is more space for your answer to this question on page 19.

- (c) Matapakitia te take ka nui ake pea te oranga tonutanga o te taupori hoiho nā te rerekētanga ā-ira ina pā mai te mate eku manu.

- (c) Discuss how genetic variation could lead to increased survival of the hoiho population when faced with avian malaria.

**He whārangi anō ki te hiahiatia.
Tuhia te (ngā) tau tūmahi mēnā e tika ana.**

TAU TŪMAHI

MĀ TE
KAIMĀKA
ANAKE

English translation of the wording on the front cover

Level 1 Science 2020

90948 Demonstrate understanding of biological ideas relating to genetic variation

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

90948M

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 2–21 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.