See back cover for an English translation of this cover

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91159M

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NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Koiora, Kaupae 2, 2013

91159M Te whakaatu māramatanga ki te whakatinana ira

9.30 i te ata Rāmere 22 Whiringa-ā-rangi 2013
Whiwhinga: Whā

Paetae	Paetae Kaiaka	Paetae Kairangi
Te whakaatu māramatanga ki te whakatinana ira.	Te whakaatu māramatanga hōhonu ki te whakatinana ira.	Te whakaatu māramatanga matawhānui ki te whakatinana ira.

Tirohia mehemea e ōrite ana te Tau Ākonga ā-Motu (NSN) kei tō pepa whakauru ki te tau kei runga ake nei.

Me whakautu e koe te KATOA o ngā pātai kei roto i te pukapuka nei.

Ki te hiahia koe ki ētahi atu wāhi hei tuhituhi whakautu, whakamahia te (ngā) whārangi kei muri i te pukapuka nei, ka āta tohu ai i ngā tau pātai.

Tirohia mehemea kei roto nei ngā whārangi 2–17 e raupapa tika ana, ā, kāore hoki he whārangi wātea.

HOATU TE PUKAPUKA NEI KI TE KAIWHAKAHAERE HEI TE MUTUNGA O TE WHAKAMĀTAUTAU.

TAPEKE

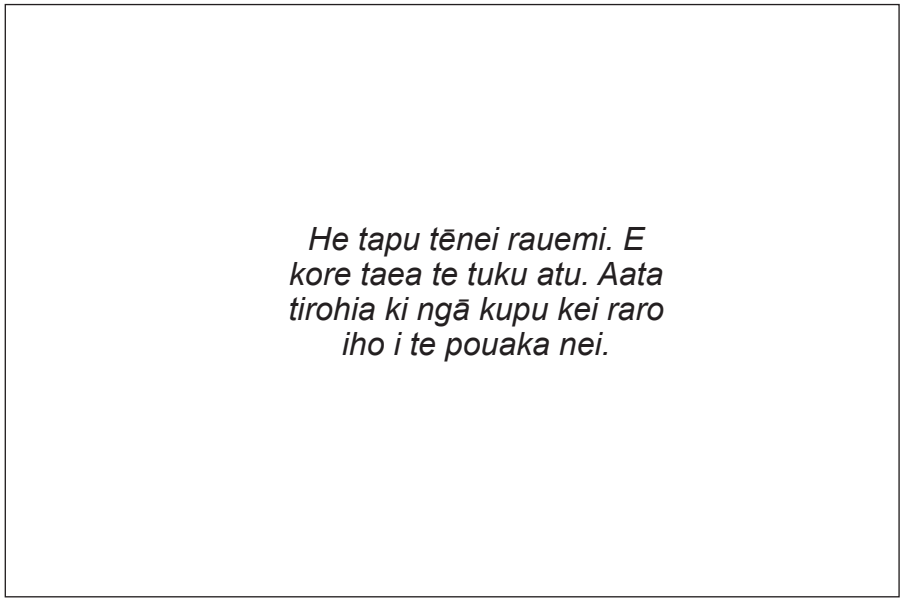
MĀ TE KAIMĀKA ANAKE

Kia 60 meneti hei whakautu i ngā pātai o tēnei pukapuka.

MĀ TE KAIMĀKA ANAKE

PĀTAI TUATAHI: TE PĀNGA O TE TAIAO

Ko tētahi tikanga ārohi i te mahi a te taiao i roto i te taurangitanga rauropi he whakataurite i ngā tohuāhua[1] o ngā huaira rerekē i roto i ngā rauropi ritepū ā-ira. He kararehe pai te amariro mō tēnei momo rangahau, i te mea ka whānau mai ēnei kararehe hei māhanga-whā mai i tētahi hua whakakikiri kotahi. Nō reira nō te raupapa iranga kotahi ngā punua amariro katoa e whā. I roto i ētahi whakamātautau i whakahaerehia e ngā kaipūtaiao i te tekau tau mai i 1960, i kitea ngā rerekētanga tohuāhua nui i roto i ngā amariro ritepū ā-ira ina whai wāhi ai rātou ki te whānuitanga o ngā take taiao.



Puna Pikitia: http://www.nature.com/scitable/nated/content/5884/four_armadillos_83-72_mid_1.jpg

Matapakitia he pēhea te whakamahi i ngā amariro ritepū ā-ira ki te whakaatu i te pātahitanga i waenga i ngā take taiao me te tohuāhua.

I tō whakautu:

- whakaahuatia mai te tikanga o te ‘tohuāhua’
- whakaahuatia mai te tikanga o te ‘kaiwhakaputa irakēnga’, ka whakamārama mai, mā te whakamahi tauira tōtika, te take ehara ngā take taiao katoa i te kaiwhakaputa irakēnga
- aromātaihia he pēhea e whakaatu ai pea ngā mātai e pā ana ki te amariro ka taea pea e ngā take taiao ‘whakaputa irakēnga-kore’ te huri te tohuāhua me te kore huri i te tohuira[2].

[1] momo-huaira
[2] momoira

MĀ TE KAIMĀKA ANAKE

You are advised to spend 60 minutes answering the questions in this booklet.

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QUESTION ONE: EFFECT OF ENVIRONMENT

One way to examine the role of the environment in variation among organisms is to compare the phenotypes of various traits in genetically identical organisms. Armadillos are ideal animals to use in such research, because they are born as quadruplets derived from a single fertilised egg. This means that all four armadillo pups share the same genetic sequence. In a number of experiments carried out by scientists in the 1960s, genetically identical armadillos were found to show significant phenotypic differences when exposed to a range of environmental factors.

Image Source: http://www.nature.com/scitable/nated/content/5884/four_armadillos_83-72_mid_1.jpg

Discuss how genetically identical armadillos could be used to show the relationship between environmental factors and phenotype.

In your answer:

- describe what is meant by 'phenotype'
- describe what is meant by 'mutagen', and explain, using appropriate examples, why not all environmental factors are mutagens
- evaluate how studies on the armadillos could show that 'non-mutagenic' environmental factors may change phenotype without changing genotype.

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PĀTAI TUARUA: TE KŌTUI PŪMUA

MĀ TE KAIMĀKA ANAKE

Ka whakaritea e te raupapa pītauira te hanganga o tētahi pūmua me te āhua o te whakaputa i taua pūmua.

(a) **Tūtohi o ngā CODON mRNA**

HUĀNGA CODON TUATAHI	HUĀNGA CODON TUARUA: U	C	A	G	HUĀNGA CODON TUATORU
U	PHE	SER	TYR	CYS	U
	PHE	SER	TYR	CYS	C
	LEU	SER	STOP	STOP	A
	LEU	SER	STOP	TRP	G
C	LEU	PRO	HIS	ARG	U
	LEU	PRO	HIS	ARG	C
	LEU	PRO	GLU	ARG	A
	LEU	PRO	GLU	ARG	G
A	ILE	THR	ASPN	SER	U
	ILE	THR	ASPN	SER	C
	ILE	THR	LYS	ARG	A
	MET	THR	LYS	ARG	G
G	VAL	ALA	ASP	GLY	U
	VAL	ALA	ASP	GLY	C
	VAL	ALA	GLU	GLY	A
	VAL	ALA	GLU	GLY	G

Mā te whakamahi i ngā mōhiohio i runga, whakaotihia te papatau i raro.

Kia mōhio: Ki te papatau i raro, me homai e koe kia kotahi anake te codon ka taea mō ia mRNA.

DNA				
mRNA				
Waikawa Amino	MET	GLU	TYR	STOP

Whakamāramahia mā tētahi tauira mai i te papatau, te take he nui atu i te kotahi te codon e taea ana mō te waikawa amino ōrite.

QUESTION TWO: PROTEIN SYNTHESIS

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The DNA sequence determines the structure of a protein and how that protein is produced.

(a)

Table of mRNA CODONS

FIRST CODON ELEMENT	SECOND CODON ELEMENT: U	SECOND CODON ELEMENT: C	SECOND CODON ELEMENT: A	SECOND CODON ELEMENT: G	THIRD CODON ELEMENT
U	PHE	SER	TYR	CYS	U
	PHE	SER	TYR	CYS	C
	LEU	SER	STOP	STOP	A
	LEU	SER	STOP	TRP	G
C	LEU	PRO	HIS	ARG	U
	LEU	PRO	HIS	ARG	C
	LEU	PRO	GLU	ARG	A
	LEU	PRO	GLU	ARG	G
A	ILE	THR	ASPN	SER	U
	ILE	THR	ASPN	SER	C
	ILE	THR	LYS	ARG	A
	MET	THR	LYS	ARG	G
G	VAL	ALA	ASP	GLY	U
	VAL	ALA	ASP	GLY	C
	VAL	ALA	GLU	GLY	A
	VAL	ALA	GLU	GLY	G

Using the information provided above, complete the table below.

Note: In the table below, you need only to give one possible codon for each mRNA.

DNA				
mRNA				
Amino Acids	MET	GLU	TYR	STOP

Explain with an example from the table why there is more than one possible codon for the same amino acid.

(b) Matapakitia ngā wāhanga matua o te kōtuitanga pūmua.

I tō whakautu, whakaurua ēnei mea katoa e whai ake:

- te mahi a te tātauira pītauira me ngā aho whakatohu
- te hanganga RNA me ana mahi
- te pātahitanga i waenga i ngā codon ME ngā anticodon
- te wāhi ki ngā codon tīmata ME ngā codon whakamutu
- te pūtake o te tuipūmua.

MĀ TE KAIMĀKA ANAKE

He wāhi anō mō tō whakautu ki te Pātai Tuarua (b) kei te whārangi 10.

(b) Discuss the major stages of protein synthesis.

In your answer, include each of the following:

- the role of the DNA template and coding strands
- RNA structure and function
- the relationship between codons AND anticodons
- the role of start AND stop codons
- the purpose of the ribosome.

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There is more space for your answer to Question Two (b) on page 11.

MĀ TE KAIMĀKA ANAKE

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PĀTAI TUATORU: NGĀ IRAKĒTANGA

MĀ TE KAIMĀKA ANAKE

Hua ai te mate hūware tāpiapia i tētahi irāketanga i roto i te ira CFTR (cystic fibrosis transmembrane conductance regulator). Ko te irakētanga e tino kitea ana ko te whakakoretenga o ngā pūiokarihi (nucleotide) e toru ka hua i te ngaronga o tētahi waikawa amino i te pūwāhi 508 o te pūmua. Ko tēnei irakētanga te pūtake o ngā mate hūware tāpiapia 66–70% puta noa i te ao. **He mate ngoikoretanga tuku iho.**

He tapu tēnei rauemi. E kore taea te tuku atu. Aata tirohia ki ngā kupu kei raro iho i te pouaka nei.

Puna Pikitia: https://www.boundless.com/physiology/the-respiratory-system/respiratory-system-disorders-and-clinical-cases/cystic-fibrosis/

(a) Whakamāramahia te kupu **irakētanga**.

(b) Tautohua ngā rerekētanga i waenga i ngā irakētanga kakapinga, komotanga, tangohanga hoki, ka whakamārama mai ko tēhea te momo irakētanga e whai pānga nui ana ki te tohuāhua o tētahi rauropi.

Ka haere tonu te Pātai Tuatoru ki te whārangi 14.

QUESTION THREE: MUTATIONS

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Cystic fibrosis is caused by a mutation in the gene CFTR (cystic fibrosis transmembrane conductance regulator). The most common mutation is a deletion of three nucleotides that results in a loss of an amino acid at the 508th position on the protein. This mutation accounts for approximately 66–70% of cystic fibrosis cases worldwide. **It is an inheritable recessive condition.**

Image Source: https://www.boundless.com/physiology/the-respiratory-system/respiratory-system-disorders-and-clinical-cases/cystic-fibrosis/

(a) Define the term **mutation**.

(b) Identify the differences between substitution, insertion and deletion mutations, and explain which type of mutation has the most significant effect on an organism's phenotype.

Question Three continues on page 15.

(c) E ai ki te mate hūware tāpiapia me tētahi atu tahumaero ka whakaingoatia e koe, whakatauritea ngā irakētanga tuku iho ki ngā irakētanga ka pā i te wā oranga o tētahi rauropi.

Whakaurua ki tō whakautu:

- tētahi whakaahuatanga o ngā momo irakētanga e rua
- tētahi whakamāramatanga o ngā pūtake pea ka taea o ēnei irakētanga, ā, me te take e rerekē ai ō rāua pānga ki te rauropi
- tētahi matapakinga o ia momo irakētanga, e pā ana ki ngā tahumaero e rua, ā, mēnā he mea tuku iho ngā tahumaero.

MĀ TE KAIMĀKA ANAKE

(c) With reference to cystic fibrosis and another named disease, compare and contrast inherited mutations with mutations that occur during the organism's lifespan.

In your answer include:

- a description of both types of mutation
- an explanation of possible causes of these mutations and why they are different in terms of their effect on the organism
- a discussion of each type of mutation, in relation to the two diseases, and whether the diseases are inherited.

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He puka anō mēnā ka hiahiatia.
Tuhia te (ngā) tau pātai mēnā e hāngai ana.

TAU PĀTAI

MĀ TE KAIMĀKA ANAKE

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

QUESTION NUMBER

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English translation of the wording on the front cover

Level 2 Biology, 2013

91159 Demonstrate understanding of gene expression

9.30 am Friday 22 November 2013
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of gene expression.	Demonstrate in-depth understanding of gene expression.	Demonstrate comprehensive understanding of gene expression.

91159M

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 space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–17 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.