91159M

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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

2

SUPERVISOR'S USE ONLY

Koiora, Kaupae 2, 2015

91159M Te whakaatu māramatanga ki te whakatinana ira

9.30 i te ata Rāhina 16 Whiringa-ā-rangi 2015
Whiwhinga: Whā

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

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

Mēnā ka hiahia whārangi atu anō koe mō ō tuhinga, 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 2–19 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: TE MAHI PŪMUA

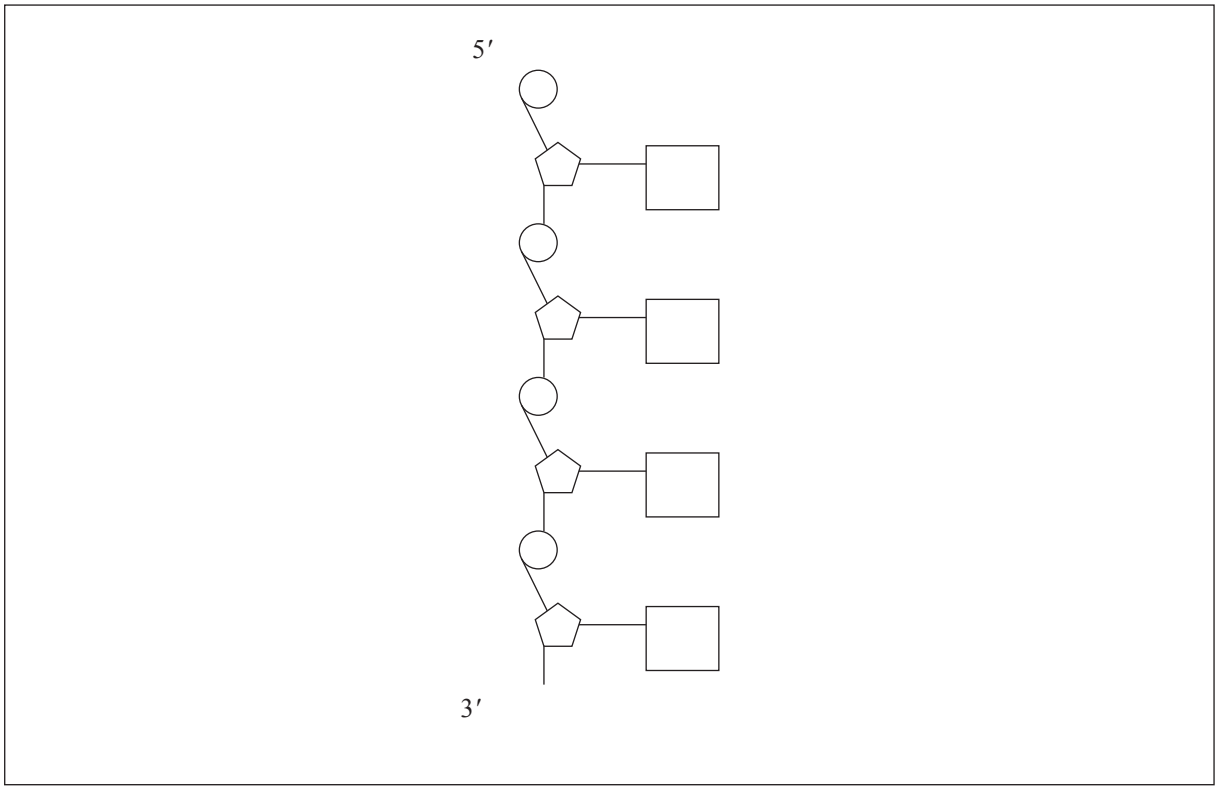
MĀ TE KAIMĀKA ANAKE

(a) Takea mai te hanganga o te pītauira mai i ngā pāpāhua hauota, ngā huka deoxyribose, me ngā pākawa tūtaewhetū.

Tātuhia te aho whakahāngai **whakarara-kōaro** tūrite ki te pouaka i raro.

I tō tuhinga:

- whakakīa te aho tātauira e mau ana ngā pāpāhua adenine (A), thymine (T), guanine (G), me te cytosine (C)
- tātuhia te aho whakahāngai **whakarara-kōaro** tūrite
- tātuhia me te tapa i ngā huka
- tātuhia me te tapa i ngā pākawa tūtaewhetū.



(b) Ko te kōtui pūmua te tukanga o te mahi pūmua. He wāhanga hira ngā torutanga, ngā pūihokarihi (codon), me ngā pūihokarihi-kōaro (anti-codon) i roto i taua tukanga.

Matapakitia te whanaungatanga i waenga i ngā torutanga, ngā pūihokarihi, me ngā pūihokarihi-kōaro, ā, he pēhea te pāhekoheko kia puta ai he pūmua.

Me whakauru ki roto i tō tuhinga:

- he whakaahuatanga o tētahi torutanga, tētahi pūihokarihi me tētahi pūihokarihi-kōaro
- he whakamāramatanga he aha te pūihokarihi tīmata me te pūihokarihi whakamutu
- he matapakitanga he pēhea te pāhekoheko o ngā torutanga, ngā pūihokarihi me ngā pūihokarihi-kōaro i te wā o te tauwhaituhi me te tauhuringa kia puta ai he pūmua.

Ka whakaaetia te whakamahi hoahoa hei tautoko i tō tuhinga.

MĀ TE KAIMĀKA ANAKE

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

QUESTION ONE: MAKING PROTEINS

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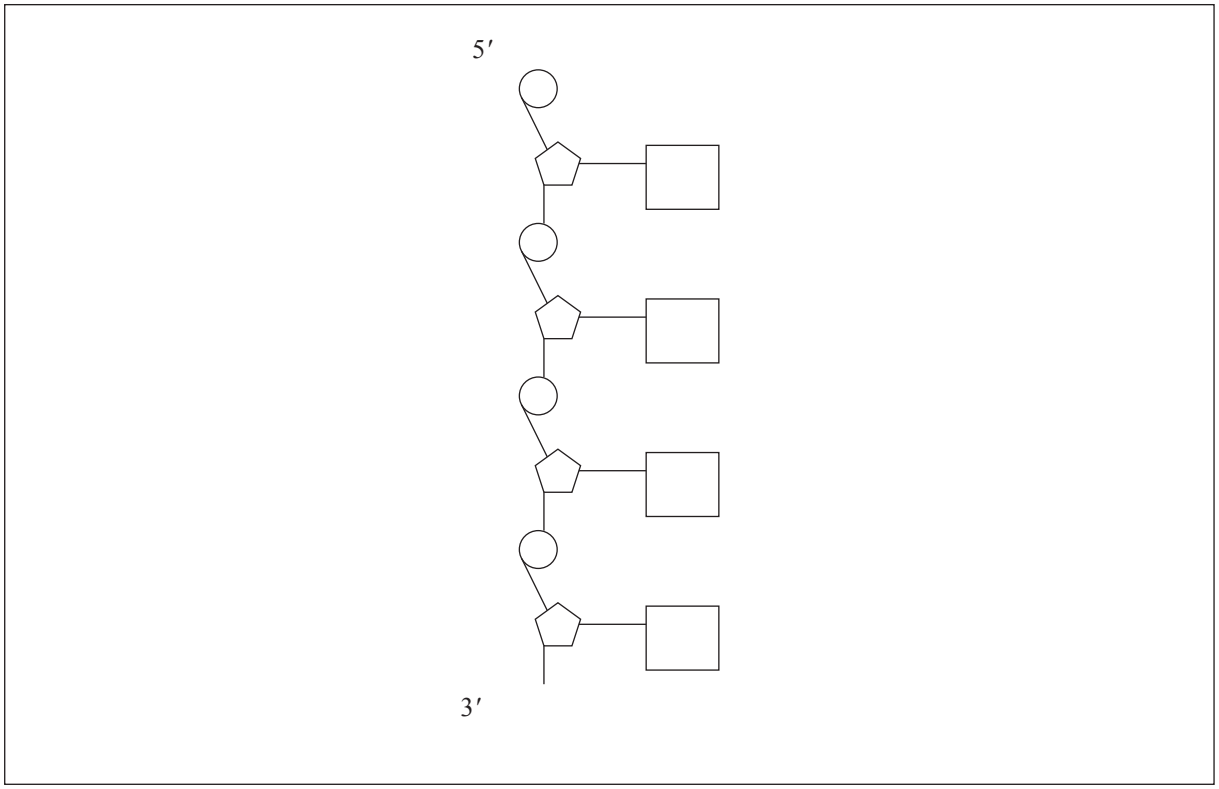
(a) The structure of DNA is made up of nitrogen bases, deoxyribose sugars, and phosphates.

Draw the corresponding **anti-parallel** complementary strand in the box below.

In your answer:

- fill in the template strand containing the bases adenine (A), thymine (T), guanine (G), cytosine (C)
- draw the corresponding **anti-parallel** complementary strand
- draw and label the sugars
- draw and label the phosphates.



(b) Protein synthesis is the process of making proteins. Triplets, codons, and anti-codons are important components in the process.

Discuss the relationship between triplets, codons, and anti-codons, and how they interact to form a protein.

In your answer include:

- a description of a triplet, codon, and anti-codon
- an explanation of what a start codon and a stop codon are
- a discussion of how triplets, codons, and anti-codons interact during transcription and translation to form a protein.

You may use diagrams in your answer.

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

MĀ TE KAIMĀKA ANAKE

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TŪMAHI TUARUA: NGĀ ARA WHAKARAU PŪNGAO

MĀ TE KAIMĀKA ANAKE

I te tau 1941 i huraina e ngā kaimātai koiora George Beadle rāua ko Edward Tatum te pūhekaheka parāoa *Neurospora crassa* ki te iraruke. I ngaro te kaha o ngā pūhekaheka irakē ki te whakaputa i tētahi waikawa amino (arginine), ā, nā tēnei i āta haere, i mutu rānei te tipu. Ēngari, i kitea ina whakaratohia te waikawa amino arginine ki te pūkehaheka, i hoki mai te tipu. Ko te whakatau ka whakahohekoretia e tētahi irakētanga tētahi pūmua whākōkī e hiahiatia hei kōtuiui i te waikawa amino i roto i te ara whakarau pūngao.

I runga i ngā here manatārua, kāore e whakaaetia te whakaaturanga o tēnei rauemi i konei.

www.dnaftb.org/16/

(a) Whakaahuatia he aha te irakētanga.

QUESTION TWO: METABOLIC PATHWAYS

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In 1941 biologists George Beadle and Edward Tatum exposed the bread mould *Neurospora crassa* to radiation. The mutated moulds lost their ability to produce an amino acid (arginine), and this slowed or stopped their growth. However, they found when they provided the mould with the amino acid arginine, growth was restored. They concluded that a gene mutation inactivates an enzyme needed to synthesise the amino acid in a metabolic pathway.

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www.dnaftb.org/16/

(a) Describe what a gene mutation is.

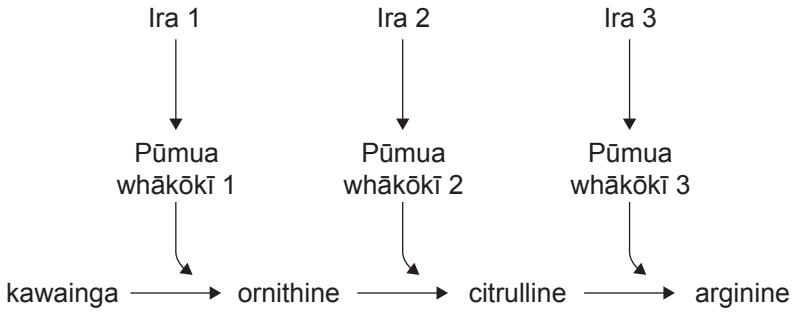
(b) I whakahaerehia e ngā kaimātai koiora he rangahau atu anō, ā, i kitea e toru ngā irakētanga i ārai i te putanga o te waikawa amino arginine.

MĀ TE KAIMĀKA ANAKE

Mā te whakamahi i te ara whakarau pūngao *Neurospora crassa* i raro, matapakitia te take e toru ngā irakētanga ka pā mai kia kore ai e puta te waikawa amino arginine.

I tō tuhinga:

- whakamāramahia he aha te ara whakarau pūngao
- matapakitia te take ki te pā he irakētanga ki tētahi o ngā ira kāore e puta he arginine
- matapakitia te take i whakatau ai ngā kaimātai koiora 'Kotahi Te Tūtohu Ira mō te Pūmua Kotahi'.



He wāhi anō mō tō tuhinga mō tēnei tūmahi kei te whārangi 12.

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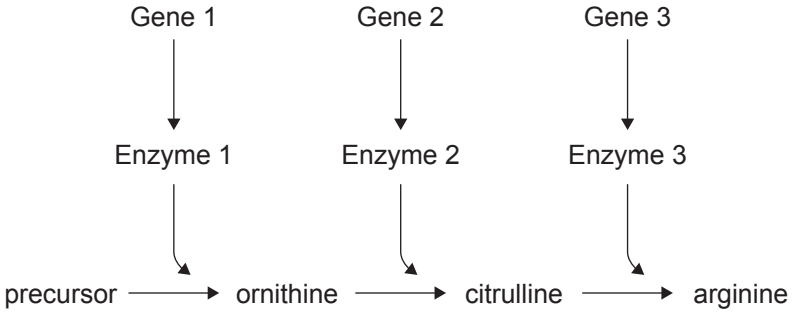
(b) The biologists carried out further experiments and found three mutations prevented the amino acid arginine from being made.

Using the *Neurospora crassa* metabolic pathway below, discuss why there are three mutations that can occur for the amino acid arginine not to be produced.

In your answer:

- explain what a metabolic pathway is
- discuss why a mutation to any one of the genes can result in arginine not being produced
- discuss why the biologists concluded 'One Gene Codes for One Protein'.



There is more space for your answer to this question page 13.

MĀ TE KAIMĀKA ANAKE

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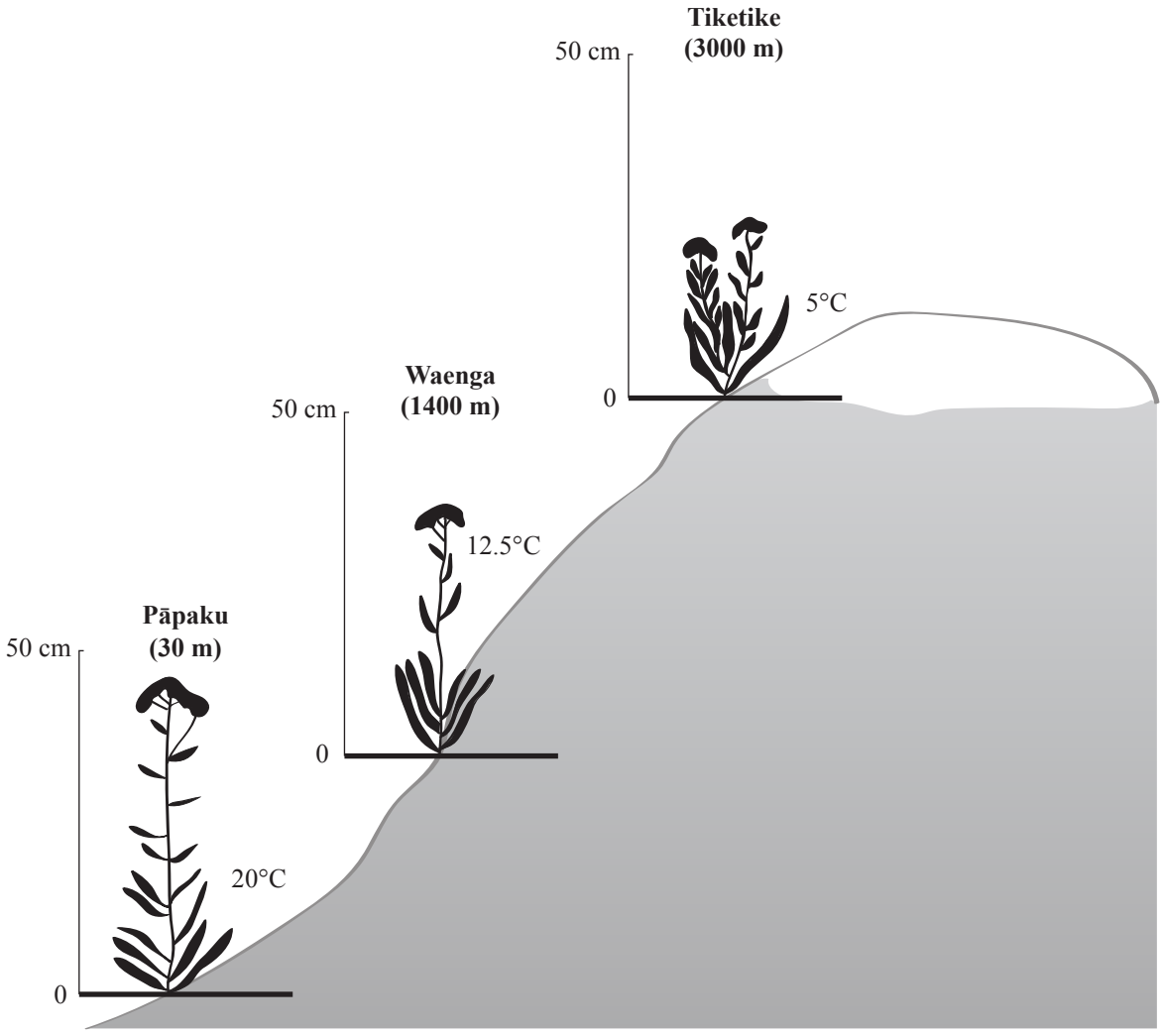
TŪMAHI TUATORU: NGĀ PĀHEKOHEKO I WAENGA I TE TAIAO ME TE TOHUIRA

MĀ TE KAIMĀKA ANAKE

Ko te tipu yarrow, *Achillea millefolium*, ka tāea te tapahi ki ngā wāhanga maha, ā, ka tipu taihemakore ia wāhanga (ka whakaputa uri me te kore kikiritanga, te kore whakawhiti tohuhema rānei) ina onotia ki te oneone. I roto i tētahi whakamātau, ka tapahia e ngā kaimātai koiora tētahi tipu yarrow ki ngā wāhanga e toru, ā, ka whakatōkia ia wāhanga ki ngā teitei rerekē kia mōhiotia ai he pēhea te pānga o te tohuāhua e te taiao. Tirohia te hoahoa i raro.

Urupare tiputanga ki ngā teitei rerekē o te *Achillea millefolium*



He mea urutau mai i http://www.flyfishingdevon.co.uk/salmon/year3/psyc364evolutionary_psychobiology/psy364_genotype_phenotype/psy364_genotype_phenotype.htm

(a) Whakaahuatia te rerekētanga i waenga i te tohuira me te tohuāhua.

(b) Whakamāramahia te take i whakamahia e ngā kaimātai koiora ngā topenga ira ritepū, ki ngā teitei rerekē.

He wāhi anō mō tō tuhinga mō tēnei tūmahi kei te whārangi 16.

QUESTION THREE: ENVIRONMENT, GENOTYPE INTERACTIONS

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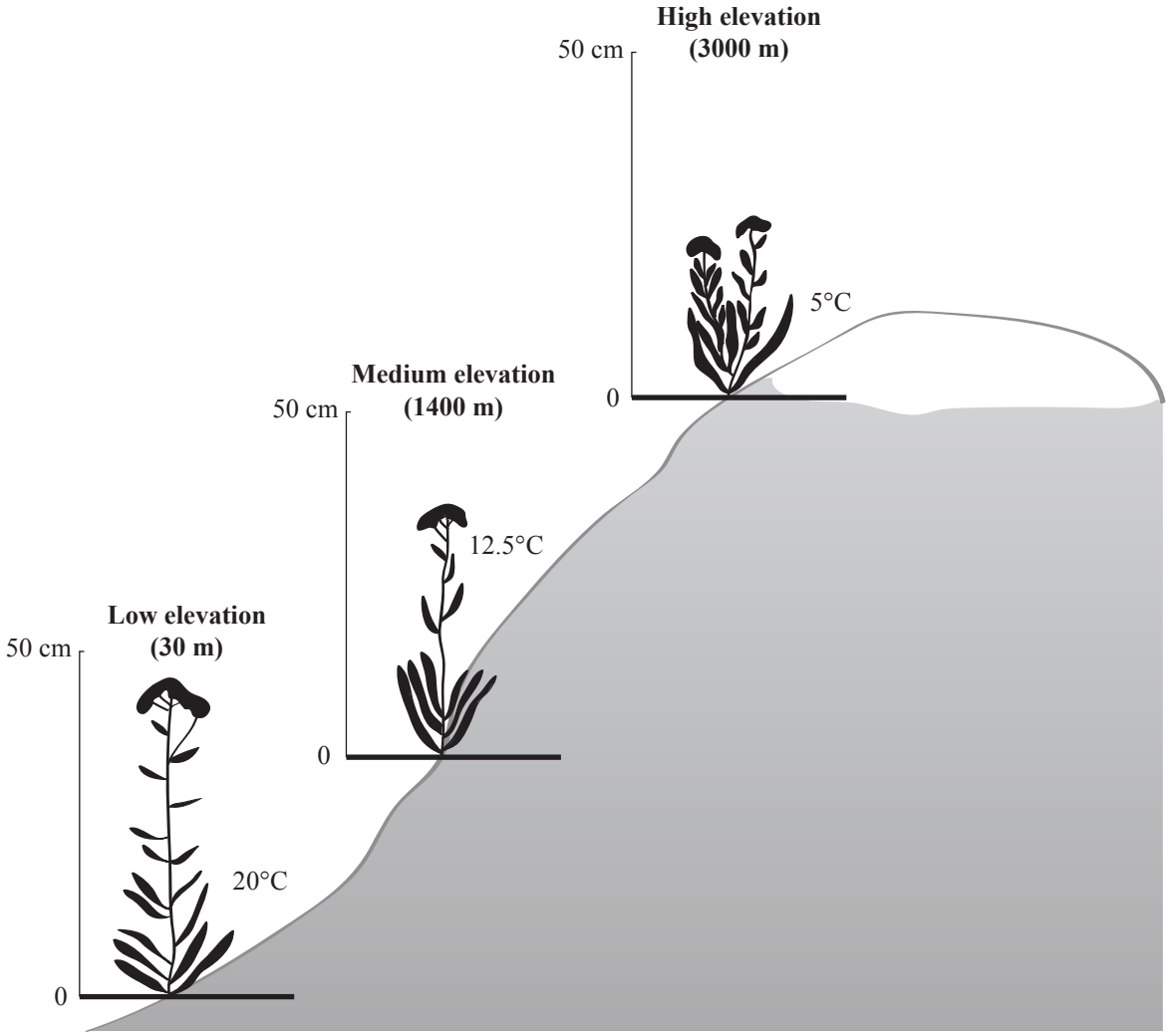
The common yarrow plant, *Achillea millefolium*, can be cut into several sections, and each section will grow asexually (reproduces without fertilisation or exchanging gametes) when put into soil. In an experiment, biologists cut one yarrow plant into three sections and planted each section at a different elevation to determine how phenotype is affected by the environment. See figure below.

***Achillea millefolium* growth response to different elevations**



Adapted from http://www.flyfishingdevon.co.uk/salmon/year3/psyc364evolutionary_psychobiology/psy364_genotype_phenotype/psy364_genotype_phenotype.htm

(a) Describe the difference between genotype and phenotype.

(b) Explain why the biologists used genetically identical cuttings, at the different elevations.

There is more space for your answer to this question page 17.

MĀ TE KAIMĀKA ANAKE

(c) Tātarihia ngā otinga e whakaaturia ana ki te hoahoa kei te whārangi 14.

Me whakauru ki roto i tō tuhinga:

- he whakamāramatanga mō te take ka rerekē pea te tipu o ngā tipu i ngā teitei rerekē
- he matapakitanga mō te pāhekoheko i waenga i te pāmahana, te tohuira, me te whakatinana tohuāhua
- he matapakitanga mō ngā take taiao e whakaawe ana i te whakatinana ira o ngā tipu yarrow.

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(c) Analyse the results shown in the figure on page 15.

In your answer include:

- an explanation of why plants may grow differently at different elevations
- a discussion of the interaction between temperature, genotype, and phenotype expression
- a discussion of environmental factors that would influence the yarrow plants' genetic expression.

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

TAU TŪMAHI

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, 2015

91159 Demonstrate understanding of gene expression

9.30 a.m. Monday 16 November 2015
Credits: Four

91159M

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.

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 2–19 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.