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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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SUPERVISOR'S USE ONLY

Level 1 Science, 2012

90948 Demonstrate understanding of biological ideas relating to genetic variation

9.30 am Monday 19 November 2012
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 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 2–10 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

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

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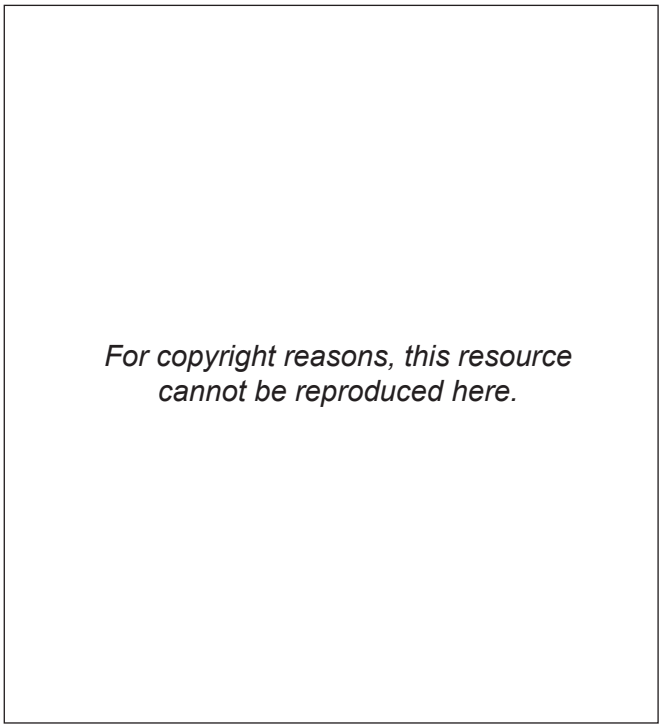
QUESTION ONE: GENETIC STRUCTURE

The diagram below shows the relationship between chromosomes, genes, and DNA (deoxyribonucleic acid).



http://www.newbornscreening.info/Pro/genetics.html

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

You may add notes and labels to the diagram above to support your answer.

(b) Explain how the relationships in your answer to (a) lead to different characteristics and how this contributes to **genetic variation**.

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QUESTION TWO: PATTERNS OF INHERITANCE

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A blood disorder caused by red blood cells with an unusual curved (sickle) shape is inherited through a single gene with two possible alleles, normal and sickle.

For copyright reasons, this resource cannot be reproduced here.

normal red blood cell sickle-shaped blood cell

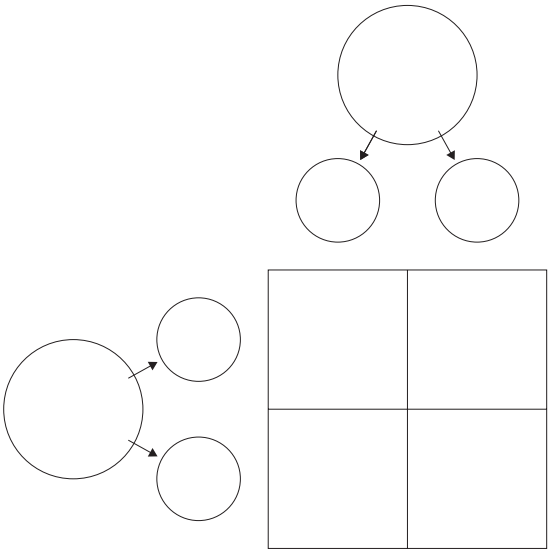
www.lifebridgeblogs.org/2011/09/16/national-sickle-cell-awareness-month/

Use '**H**' to represent the dominant 'normal' allele, and '**h**' to represent the recessive 'sickle' allele.

(a) Explain how two parents with normal blood cells can have a child with sickle-shaped blood cells.

In your answer, you should:

- state the genotype of a child with the sickle-shaped blood cells
- state the genotypes of **both** normal parents
- draw a Punnett square to show how two normal parents can produce a child with sickle-shaped blood cells.



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(b) The parents in part (a) have four children all with sickle-shaped blood cells. They are expecting a fifth child.

(i) Explain how normal parents could have produced FOUR children with sickle-shaped blood cells.

You should refer to your Punnett square in (a).

(ii) Explain what the chances are of the fifth child having sickle-shaped blood cells.

QUESTION THREE: SEXUAL REPRODUCTION AND SURVIVAL

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Explain how sexual reproduction causes genetic variation AND how this leads to increased survival of the species.

In your answer you should consider:

- the processes of gamete formation (meiosis) and fertilisation
- how sexual reproduction leads to variation in the population
- the link between genetic variation and survival of a species.

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

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QUESTION FOUR: GENETIC VARIATION

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Light-coloured tree
www.sciencephoto.com/media/371575/enlarge

Dark-coloured tree
http://amusedartichoke.wordpress.com/2011/04/15/egos-and-evolution/

A species of moth has two phenotypes, light and dark. Both light and dark moths are eaten by birds.

Explain how the two phenotypes of the species of moth help the population to survive if the **environment changes** and all the trees on which the moths live become darker.

In your answer you should:

- define phenotype
- explain how colour helps individual moths to survive
- explain why the environmental change to darker trees, affects the ratio of the phenotypes in the moth population over time.

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

QUESTION NUMBER

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