





## Level 1 Science, 2013

# 90948 Demonstrate understanding of biological ideas relating to genetic variation

9.30 am Monday 18 November 2013 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 2–12 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.

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

## QUESTION ONE: PEDIGREES AND PUNNETT SQUARES

Huntington's disease is a genetic disorder in humans. It is caused by a dominant allele (H). The normal allele is recessive (h).

### **Pedigree chart**



- (a) Using H and h, give the two possible genotypes for an individual who has Huntington's disease:
- (b) State the genotype of individual 9 in the pedigree chart above.

State the genotype of individual 10 in the pedigree chart above.

Explain how you worked out the genotype for individual 10.

You should support your answer using evidence from BOTH the parents AND children of individual 10.



(c) Draw a Punnett square to show the **possible** genotypes of the children from parents 9 and 10.



(i) From **your** Punnett square, predict what fraction of the children would have Huntington's disease and what fraction would not have Huntington's disease.

Fraction of children with Huntington's disease:

Fraction of children without Huntington's disease:

(ii) Using your Punnett square, complete the box below to show the expected phenotype ratio for the children.

	Huntington's disease : Without Huntington's disease
Phenotype ratio from Punnett square	•

(d) In the pedigree chart the phenotype ratio of Huntington's disease in the children of parents 9 and 10 is not the same as the predicted ratio you have given on the previous page.

Give reasons why the predicted ratio in the Punnett square and the observed ratio in the children may NOT be the same.



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(a) Use the diagram above to help you explain the relationship between chromosomes, genes, alleles, phenotype, genotype, and the molecule DNA.

A labelled diagram may assist you.

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

(b) The allele for brown eyes (B) is dominant over the allele for blue eyes (b) in humans.

Discuss how it would be possible for a child to have blue eyes, even though both their parents have brown eyes.

In your answer you should:

- use labelled Punnett squares
- link the genotypes and phenotypes of the child, parents, AND grandparents.

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## QUESTION THREE: SEXUAL REPRODUCTION

For both plants and animals, there are advantages and disadvantages to sexual reproduction.

(a) Identify TWO **disadvantages** of sexual reproduction in **animals** and explain why they are disadvantages.

(1.)	
(2.)	

(b) Explain how sexual reproduction contributes to variation in a population of **animals**.In your answer you should refer to gametes, meiosis and fertilisation.



(c) Discuss why variation caused by sexual reproduction in a population of plants or animals is an advantage in a changing environment, such as a period of drought (a period of time of very dry weather, when there is no or very little rain).

Support your answers with examples.

## QUESTION FOUR: THE TASMANIAN DEVIL

Read the information below to help you answer the questions.



The Tasmanian devil is known for its aggressive behaviour. Aggressive behaviour is **inherited** in Tasmanian devils.

The aggressive behaviour means that they fight and bite each other leading to injury and possible death. This behaviour has caused Tasmanian devils to become endangered (in danger of dying out). ASSESSOR'S USE ONLY

Tasmanian devil http://animals.nationalgeographic.com/animals/ mammals/tasmanian-devil/

(a) Variation in phenotype can assist survival. Explain how variation in phenotype may assist the Tasmanian devil to survive in the wild and therefore avoid the species completely dying out (becoming extinct).

In your answer you should:

- define phenotype
- explain how difference in phenotype can aid survival of an individual
- explain why the LESS aggressive phenotype (Tasmanian devils that do not fight and bite) may have a survival advantage for the species.

Explain how the s population can ch within the species	Explain how the survival of certain individuals in the wild within the Tasmanian devil population can change the ratio of aggressive to less aggressive types of Tasmanian devil within the species over time AND relate this to the species avoiding extinction.				

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