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90948



Level 1 Science, 2015

90948 Demonstrate understanding of biological ideas relating to genetic variation

9.30 a.m. Tuesday 10 November 2015 Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of biological deas 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.

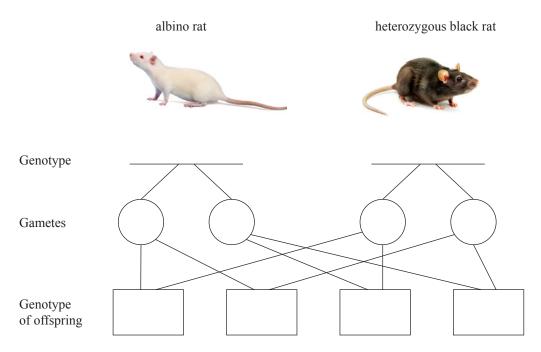
Check that this booklet has pages 2–10 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

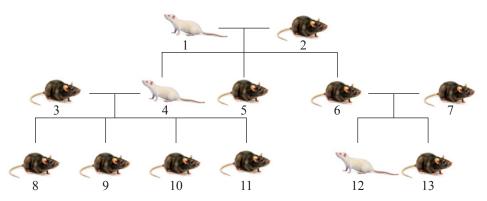
Albinism in rats results in white fur and pink eyes. Albinism is caused by a recessive allele a.

(a) Complete the following diagram:



 $Sources: \ www.janvier-labs.com/rodent-research-models-services/research-models/per-species/outbred-rats/product/sprague-dawley.html\\ \ www.nobuggy.com/pest-wiki/rats$

(b) The albino rat and the heterozygous black rat produced the following two generations of offspring, as shown in the pedigree chart below.



What are the genotypes of the following rats?

Rat 4:			

Rat 6:			

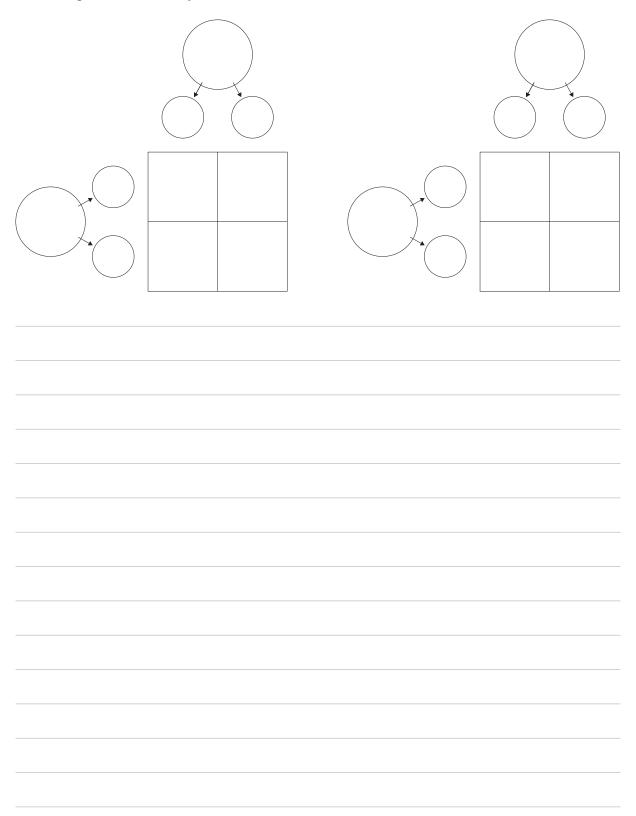
(c) Rat 3 was **not** an offspring of Rat 1 and Rat 2 in the family tree.

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Give the possible genotypes for Rat 3 and explain which is the most likely genotype for Rat 3. In your answer you should:

- state the possible genotypes for Rat 3
- explain why both genotypes are possible but one is more likely
- explain what you could do to be more certain about the genotype of Rat 3.

Punnett squares will be useful.



QUESTION TWO: DNA, ALLELES, GENES, AND CHROMOSOMES

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A snail known as *Cepaea nemoralis* can have either a plain shell or a banded shell.

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Plain shell

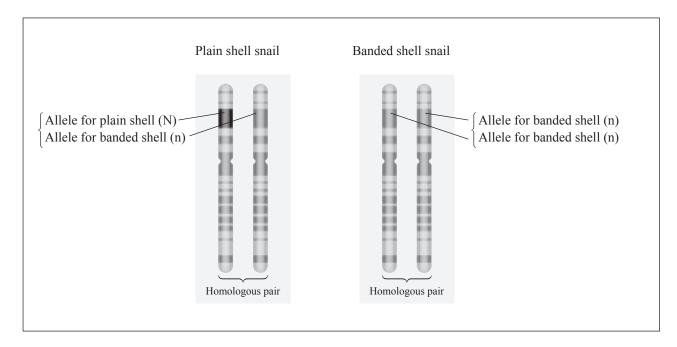
http://en.wikipedia.org/wiki/List_of_non-marine_molluscs of Ireland

Banded shell

http://de.wikipedia.org/wiki/Hain-B%C3%A4nderschnecke

The diagrams below show the homologous chromosomes that contain the gene for shell pattern for each of the snails in the photographs above.

Assume the allele for plain shell (N) is dominant over the allele for banded shell (n).



(a)) In	the dia	igram a	ibove, v	which	snail	is l	heterozy	gous	for s	hell	pattern's	?
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Explain why you chose this snail.

34	llele and a gene.	
Γhe	se two snails were produced by sexual reproduction from the same male and female.	
	cuss how they have inherited different alleles for shell pattern.	
	our answer you should:	
,	explain where the homologous chromosomes have come from	
•	give the possible genotypes of both parents and explain how you determined these possible genotypes.	
	TL 1	
	There are more space and Punnett squares for your answer to this question on	

the following page.

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QUE	STIC	ON THREE: VARIATION IN PLANTS
The	photog	graph below shows a large number of plants that are all the same species.
		For copyright reasons, this resource cannot be reproduced here.
		http://blogs.ext.vt.edu/soybean-update/files/2013/08/Brown-Stem-Rot-IMAG0159.jpg
(a)	prese	yellow-brown colour in some of the plants has been caused by a disease. The disease is ent throughout the field, but affects only some plants. This is because of variation in the is. ain why variation means not all the plants get the disease.
(b)		plants in the photograph were grown from seeds. Seeds are the result of sexual oduction. Name one process that occurs during sexual reproduction, and explain how it results in variation.

(ii)	Discuss the advantages of sexual reproduction for a species when the environment changes.	ASSESSO USE ON
	In your answer you should:	
	• give examples of a changing environment	
	 explain the impact of changing environments on a population 	
	 consider the importance of variation in a population in a changing environment. 	
	consider the importance of variation in a population in a changing environment.	
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