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Level 1 Science, 2018

90948 Demonstrate understanding of biological ideas relating to genetic variation

9.30 a.m. Thursday 15 November 2018
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 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 2–8 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.

Achievement

TOTAL 07

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QUESTION ONE

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Single comb on a chicken
https://pixabay.com/en/hahn-cockscomb-comb-teeth-farm-66341/

Rose comb on a chicken
www.flickr.com/photos/archer10/7815488864

The allele for rose comb (R) is **dominant** to the allele for single comb (r) in chickens.

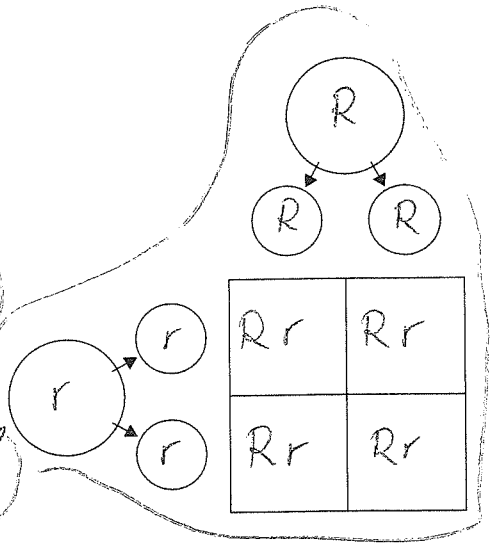
(a) Two rose comb chickens produce a single comb offspring.

Explain how it is possible for two rose comb chickens to produce a single comb offspring.

In your answer you should:

- define dominant allele
- explain the genotypes of the parents and offspring
- use a Punnett square to help your explanation.

Dominant allele is the alleles that are stronger and are more likely to pass down to offspring. Single comb chickens have Rr ~~[illegible]~~ The R is dominant and r is recessive. Recessive is only expressed if present. Dominant alleles are always expressed if present.



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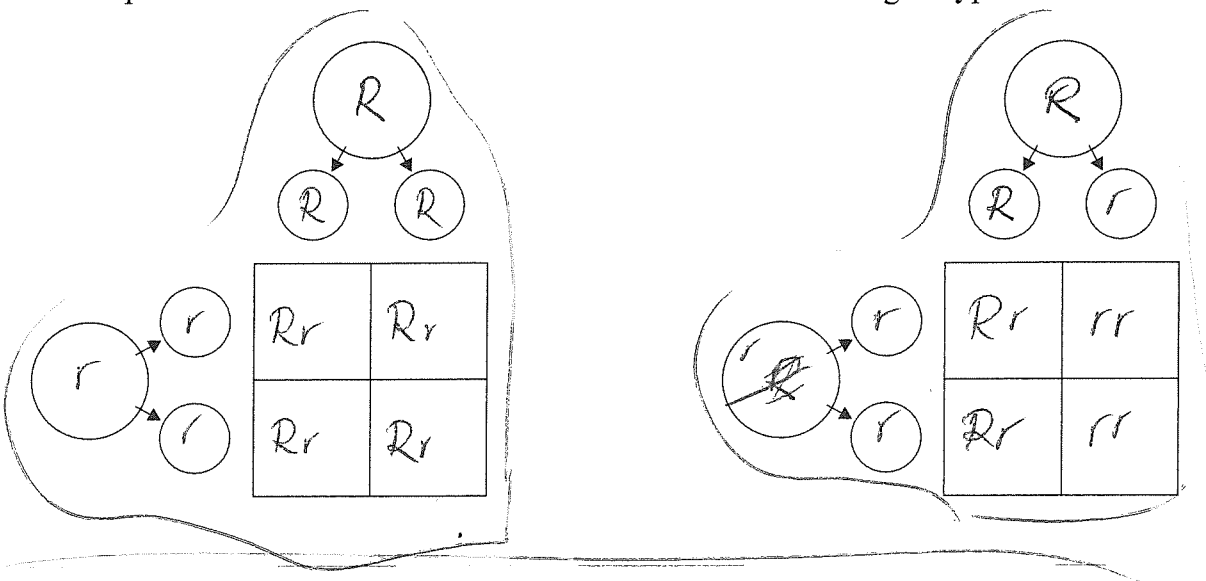
(b) Explain how a breeder could use crosses to find out if a rose comb chicken has a pure breeding genotype for the trait.

In your answer:

- define pure breeding and genotype
- use Punnett squares to help you explain
- explain when the breeder could be confident of the chicken's genotype.



Pure breeding means homozygous and genotype is the code. The breeder could be confident of the chicken's genotype when dominant alleles are present. Then he will know which alleles are most likely to get passed down to the offspring.

N2

QUESTION TWO

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Italian ryegrass in a cornfield

http://agfaxweedsolutions.com/2017/02/03/mississippi-corn-control-italian-ryegrass-planting/

Herbicides are chemicals that are used to kill weeds. Over many years, Italian ryegrass (a common weed) has developed a resistance to some herbicides (it is no longer killed by them).

(a) Explain how **variation** in the Italian ryegrass **population** can help the population develop herbicide resistance.

~~Variation in the Italian ryegrass population can help the population develop herbicide resistance. This is because~~ If the Italian ryegrass is bred with different plants or weed it can develop resistance. With variation present the Italian ryegrass will survive. Herbicide resistance will continue in the population if different types of plants will be bred together. Different genes will help ryegrass to survive!

(b) Explain how sexual reproduction increases variation in the Italian ryegrass population.
Your answer should include **gamete formation** and **fertilisation**.

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Sexual reproduction increases variation in the Italian ryegrass population. In meiosis cells divide and the 4 daughter cells are genetically unique. Half the number of chromosomes from each parent gets passed down to the offspring. Gametes are sex cells that occur in meiosis. ~~[illegible]~~ fertilisation is part of the plant life cycle.

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QUESTION THREE

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A coloured tūī
https://www.flickr.com/photos/sidm/6557924841

A white tūī
http://mandyart.blogspot.co.nz/2009/07/white-tui-albino-slug.html

Leucism is a genetic condition caused by a gene mutation that results in some (or all) of an animal being white.

(a) How could a change in a **gene** result in the **phenotype** of the white tūī shown above?

Your answer should include the terms **DNA** and **allele**.

Punnett squares are not required.

A change in a gene results in the phenotype of the white tūī. Since the parents genes get passed down to the offspring there can be a change. In DNA the genetic code for the offspring changes. The alleles that are more dominant from the parents are most likely to get passed down to the offspring. Mutation can only occur in a sex cell.

(b) Explain whether the white colouration would be inheritable or not.
Your answer should include the terms **inheritable** and **non-inheritable**.

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The white colouration can be inheritable if the alleles are dominant. Because dominant alleles are most likely to get passed down to the offspring. And if the white colouration turns out recessive it's most likely to be non-inheritable.

N1

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

QUESTION NUMBER

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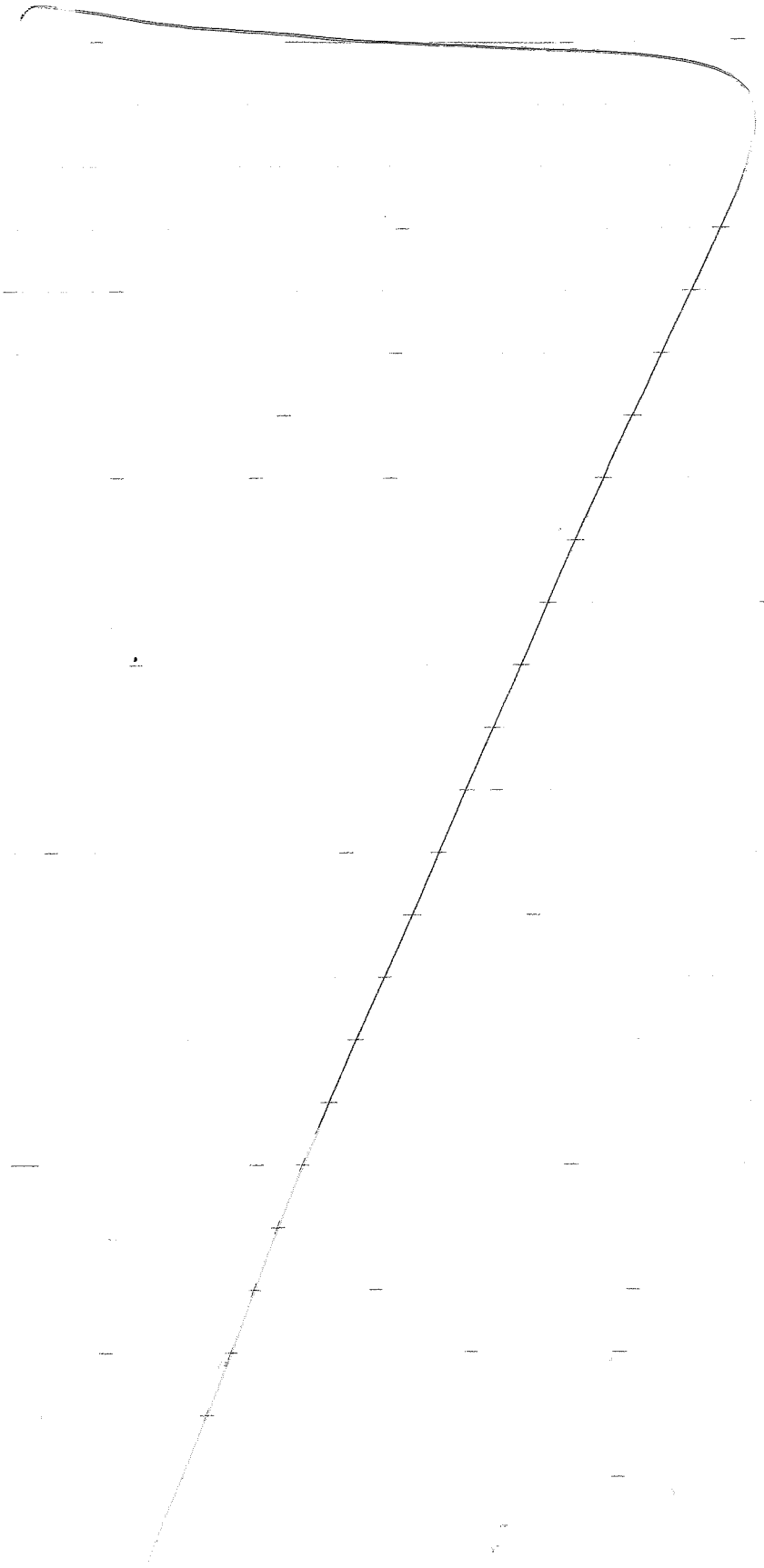

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Annotated Exemplar Template

Subject	Science	***Standard***	90948	***Total score***	07

Q	***Grade score***	***Annotation***
1	A3	The candidate describes dominant alleles as being expressed when present (A). The candidate did not demonstrate understanding that each parent needed to have a recessive allele to produce singe comb. The punnet square was also incorrect.
2	A3	The candidate describes that the rye grass with the resistance would survive (A). The candidate describes herbicide resistance as breeding different types of plants. (This can be seen as meaning different plants within the ryegrass species). In (b) the candidate describes meiosis as part of sexual reproduction (A). The candidate also describes how gametes with half the number of chromosomes get passed down (A). There was no description of fertilisation or how the haploid cells were produced.
3	N1	The candidate describes how genetic information gets passed down to the offspring (A). The candidate does not describe a gene or phenotype of a mutation in the tui. In (b) the description of recessive alleles being non-inheritable indicated that the candidate did not fully understand inheritance.