Assessment Schedule – 2018

Science: Demonstrate understanding of biological ideas relating to genetic variation (90948)

Evidence Statement

<table>
<tr><th>Q</th><th>Evidence</th><th>Achievement</th><th>Merit</th><th>Excellence</th></tr>
<tr><td>ONE
(a)</td><td>Dominant alleles are always expressed if present, whereas recessive alleles can be hidden (by a dominant allele).
The single comb offspring must be rr to show the recessive phenotype.
Both of the parents have to have a dominant allele (R), as they have rose combs. They must also have the recessive allele (r) to be able to pass on an r to the rr offspring.
In this way, the hidden allele (single) can be passed on from the parents to show up in the offspring.
<table><tr><td></td><td>R</td><td>r</td></tr><tr><td>R</td><td>RR</td><td>Rr</td></tr><tr><td>r</td><td>Rr</td><td>rr</td></tr></table></td><td>• Describes dominant OR recessive allele.
• Single comb is rr.
• Parents must be Rr.
• Correct Punnett square from either part a or b.</td><td>• Explains that each parent must have an R to have a rose comb.
OR
Explains that each parent must have an r to pass it on to the single comb offspring.</td><td rowspan="2">• Fully explains how the recessive allele can be (hidden) and how the presence of it can be determined with crossing, including limitations.</td></tr>
<tr><td>(b)</td><td>Pure breeding means homozygous for the rose comb trait / RR.
Genotype means the alleles present for a trait.
A rose comb chicken must be either RR or Rr. To find if it has a recessive allele, it should be crossed with a single comb chicken (rr). [*or a Rr chicken]
An RR × rr cross will give 100% rose comb, whereas an Rr × rr cross will give 50% rose and 50% single.
[*or equivalent for RR × Rr (0%) and Rr × Rr (25%).]
If any of the offspring are single combed, the rose comb parent must be Rr. If all the many offspring are rose combed, the parent is likely to be RR (pure breeding).
<table><tr><td></td><td>R</td><td>r</td></tr><tr><td>r</td><td>Rr</td><td>rr</td></tr><tr><td>r</td><td>Rr</td><td>rr</td></tr></table><table><tr><td></td><td>R</td><td>R</td></tr><tr><td>r</td><td>Rr</td><td>Rr</td></tr><tr><td>r</td><td>Rr</td><td>Rr</td></tr></table></td><td>• Pure breeding is homozygous / has no hidden allele.
• Genotype is the alleles present.(definition).
OR
Provides a link to * or equivalent in evidence statement.
Gives an example of a genotype.
• Describes a test cross.</td><td>• Uses two correct (annotated or explained) Punnett squares to compare an Rr x rr cross with an RR x rr cross, and explains the outcome.
• Explains that you would have to carry out MANY crosses to be sure that the chicken is RR.
OR
Explains that ANY single comb offspring proves Rr.</td></tr>
</table>

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response, or no relevant evidence.	ONE Achievement point.	TWO Achievement points.	THREE Achievement points.	FOUR Achievement points.	ONE Merit point.	TWO Merit points.	ONE Excellence point; minor error or omission.	ONE Excellence point; comprehensive discussion.

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	**Variation** is differences within a species, such as some Italian ryegrass plants being more resistant to herbicides than others. Those that are better suited to the conditions, in this case herbicide resistant, will survive better. These better suited plants are more likely to produce more offspring, and pass on their successful alleles / DNA / genes. The next generation will therefore be better suited than the previous generation. Over time, the population of Italian ryegrass will contain more plants that are herbicide resistant. This will lead to an increase in number of plants able to resist herbicides and an increase in plant numbers. If all Italian ryegrass plants were the same, they would all die from the herbicide.	• Describes variation. • Describes increased survival. • Consequence of little or no variation.	• Explains how variation increases survival chances for some of the Italian ryegrass and so benefits the **population** / species. Must talk about passing on / reproduction of DNA (genetic material) passed on.	• Fully explains the role (process) of gamete formation and fertilisation in producing varied gametes and therefore offspring and how this helps survival by producing herbicide resistance in future Italian ryegrass generations. (Inference of increasing numbers of resistant plants in population)
(b)	Sexual reproduction is producing offspring by combining DNA from two parents using gametes. These gametes (sex cells) are formed during meiosis. Parents have two sets of chromosomes in each cell. The gametes produced in sexual reproduction have only one set of chromosomes, and so these can be combined with another parent to make a unique individual. This is called fertilisation. When these gametes are formed, one of each chromosome pair is passed on. These chromosomes are randomly assorted, meaning there are many different gametes that one plant can produce.	• Describe sexual reproduction as involving two parents / using meiosis / producing gametes / combining DNA (to produce offspring). • Describes gametes as having one set (half the number) **of** chromosomes (genetic information). • Describes fertilisation as fusing gametes to produce a (2n) offspring. • Describes one process increasing variation, e.g. during meiosis the chromosomes get mixed up.	• Explains one process in sexual reproduction leading to varied offspring / gametes, e.g. meiosis is the formation of gametes with one set of genetic information instead of the normal two. This way, information can be combined into unique combinations, increasing variation. (eg random assortment/crossing over etc producing unique gametes). • Explains fertilisation, e.g. fertilisation is where two gametes fuse / join (one from each parent) AND combine to form unique / different offspring / individuals with information from both parents.	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response, or no relevant evidence.	ONE Achievement point.	TWO Achievement points.	THREE Achievement points.	FOUR Achievement points.	ONE Merit point.	TWO Merit points.	ONE Excellence point with minor error or omission.	ONE Excellence point, including both processes.

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	A gene is a section of DNA that codes for a trait, e.g. feather colour. A phenotype is the appearance of the gene / genotype / DNA information / alleles, e.g. white feathers. A mutation can cause a change in the DNA (base code) for a gene. This results in a change in how the genetic information is read and can create a gene form (allele) / different protein, and so changes the phenotype. In this case, the white tūī would have a different base sequence to normal tūī.	• Defines gene. • Defines phenotype. • A difference in the DNA base / mutation produces new allele / phenotype / appearance / protein. OR A mutation causes a change to DNA (of the gene).	• Explains how the **gene** /allele determines **protein** / **phenotype**, e.g. gene produces normal allele/protein normal colour tūī • Explains how a **mutation** could change the **gene**, using the example, e.g. a change in the DNA base code is a mutation. This changes the genetic information for the gene. E.g. a change in the gene results in a new allele / changed protein and so the gene is expressed as a different protein / phenotype.	• Fully explains how a change in the base sequence (mutation) in a gene leads to a different allele being produced, which may produce a new phenotype, and how this can be passed on to offspring because it is in the DNA (if the information is in the gametes) – using the tūī example (normal and white).
(b)	Inheritable means that information can be passed on to the offspring. It must affect the genetic information in the gametes. As the white information is due to a change in the gene / genetic information / allele / DNA, it may be inheritable if the information is (also) carried in the gametes.	• Describes inheritable as a change / information in the DNA that can be passed on. • Non-inheritable as a change in the somatic cells / due to environment. • Information can be passed on (as long as) it is in the gametes.	• Explains that the white tūī has the information in the DNA affecting its colour and so this can therefore be passed on to its offspring if the information affects the gametes.	

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No response, or no relevant evidence.	ONE Achievement point.	TWO Achievement points.	THREE Achievement points.	FOUR Achievement points.	ONE Merit point.	TWO Merit points.	ONE Excellence point; ONE minor error or omission.	ONE Excellence point; comprehensive discussion.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 18	19 – 24