Assessment Schedule – 2023

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

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	1. Chromosome 2. DNA or Base or A, T, G, C	BOTH correct.		
(b)	A mutation is a change in the order of DNA bases, which may lead to the formation of a new allele.	• Mutation as a change in DNA base sequence	• Explains mutation as a change in order of DNA bases and links to new allele / phenotype / trait / colour change. • Shows in-depth understanding of relationship between all 3 terms- (DNA, genes, allele).	• Explains mutation as a change in order of DNA bases and links to new allele which leads to phenotype / trait / colour change. AND • Shows in-depth understanding of relationship between all 3 terms (DNA, genes, allele).
(c)	A mutation is a change in the order of DNA bases, which causes a new version of the gene, called an allele. The new allele codes for the phenotype "Pink colouration". DNA carries genetic information as a base code. A gene is a section of DNA that codes for colouration. An allele is a different form / version / expression of a gene.	• Defines DNA as genetic material. • Gene as a section of DNA that codes for a trait/protein. • Allele is a different form of a gene. • Define phenotype (physical expression of genotype / gene / pink / normal colouration).		
(d)	The flamingo colouration was due to the pink food they eat. This type of colouration was caused by 'environment', not genetics. So pink colouration in flamingos cannot be passed onto the next generation. A mutation of the manta ray DNA can be passed onto offspring because genetic traits can be inherited. Reproductive cells (gametes) can pass on only genetic information, not environmental factors. Manta rays can inherit pink colouration mutation, but flamingos cannot, because they were caused by the food.	• States pink flamingo colouration is caused by environment / not genetics. • States only genetic traits / information / mutations can be passed on.	• A genetic mutation can only be passed on if it occurs in the gametes. • Manta ray colour is a genetic mutation, and it can be passed onto the next generation. • Pink colour of flamingo is cause by the environment and therefore not genetic and cannot be passed on.	• A mutation can only be passed on if it occurs in the gametes. AND Manta ray colour is a genetic mutation and can be passed onto the next generation. OR Pink colour of flamingo is cause by the environment and therefore not genetic and cannot be passed on.

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.	TWO Merit points.	THREE Merit points.	TWO Excellence points (only uses one example)	TWO Excellence points.

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	Black, Black, Striped	• All THREE.		
(b)	Individual 3 bb Individual 4 Bb.	• Both correct.		
(c)	Individual 4 is black, so must have one B allele. Individual 7 is striped and has genotype bb. One allele comes from each parent 3 and 4, which means that individual 4 must pass a b allele to 7, so 4 must be Bb. Individual 2 has stripes and the genotype bb, so can only pass down a b to all offspring, including individual 4.	• States that one allele comes from each parent. • Only one B needed for black. OR Two b needed for striped.	• Explains both alleles in individual 4 (B and b) using parents. • Explains both alleles in individual 4 using offspring.	• Explains both alleles in individual 4 (B and b) using parents. AND Explains both alleles in individual 4 using offspring.
(d)	A pure-breed sheep is (homozygous) either BB or bb and genotype defined as combination of alleles. The farmer would need to mate the sheep with only striped bb. If the sheep was pure breeding, then no lambs will be born striped. If any of the lambs born are striped, then the sheep must contain the striped allele. The chance of producing offspring with bb is 50% from cross Bb × bb and because fertilisation is random. By chance, the farmer may only produce black sheep and so can only be confident in the genotype once a striped sheep bb has been produced. If a striped sheep is never seen, they still cannot be certain whether it is BB or Bb. The chance of producing offspring with bb is 0% from cross BB × bb. *See last page*	• Defines pure breeding as bb or BB • Defines genotype as combination of alleles • Mate unknown black sheep with striped sheep (test / back cross). • One Punnett square correct.	• Explains a test cross and the possible outcomes (or Bb). AND Both punnet squares correct Explains that many crosses are needed to be sure sheep is pure breeding / BB.	• Explains a test cross and the possible outcomes (or Bb) with both punnet squares correct. AND Explains that many crosses are needed to be sure sheep is pure breeding / BB. • If a striped sheep offspring is never seen, we cannot be sure BB or Bb because fertilisation is random.

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.	TWO Merit points.	THREE Merit points.	TWO Excellence points	THREE Excellence points.

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	Genetic variation is diversity in genetic information amongst a group of penguins	• States definition for genetic variation		
(b)	Sexual reproduction produces penguins that are all genetically different; for example, some can dive deeper than others. Process of meiosis: The random assortment of chromosomes in meiosis produces new combination of alleles that change how deep individuals can dive. Process of fertilisation: Random male and female gametes fuse, each with unique DNA, producing a genetically unique offspring that change how deep individuals can dive.	• Alleles / chromosomes / genes are shuffled during meiosis. • Defines random fertilisation OR States gametes fuse during fertilisation. • State gametes are genetically unique. • States gametes have half the chromosome number	• Explains meiosis creates genetic variation by random assortment (OR crossing over) of chromosomes during meiosis. • Explains fertilisation, and how its random nature creates genetic variation (egg and sperm). • Explains fertilisation, and how DNA/genes from two parents create genetic variation.	• Discusses how meiosis AND fertilisation cause genetic variation (all three merit points) AND So some penguins can dive deeper (use oxygen efficiently).
(c)	Some individuals in the penguin population have the combinations of genes to dive deeper. The advantage of genetic variation in penguins is that some penguins have the ability to dive deeper to obtain more food. These penguins will survive to reproduce, passing these genes onto the next generation. Over many generations, the frequency of these combination of genes will rise in the population.	• States all penguins are genetically different / range of traits / abilities. • States some penguins have combinations of genes to dive deeper / use oxygen more efficiently. • Diving deeper means penguins are better suited to the environment / are more likely to survive / can catch more food.	• Variation in penguins means that some are better suited to the changing environment (warming oceans) and survive OR reproduce. • Penguins that can dive deeper are more likely to survive OR reproduce and pass on their genes / alleles.	• Variation in penguins means that some are better suited to the (changing) environment and more likely to survive and reproduce. • These better adapted penguins will pass on these alleles / genes so over generations these genes / abilities will become more common.

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.	TWO Merit points.	THREE Merit points.	TWO Excellence points	THREE Excellence points.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 13	14 – 18	19 – 24