Assessment Schedule – 2017

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

Evidence Statement

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
One (a)	**DNA** carries genetic information as a base code. A **gene** is a section of DNA that codes for 1 trait – in this case colouration. A **mutation** is a change in the DNA base code, which affects the way a gene is expressed. In this case, a mutation in the colouration gene could produce a new **allele** (form of a gene) – black. This is a new **phenotype** – the physical expression of the gene.	• Describes that a DNA change / mutation results in a new allele / phenotype. Describes (by defining or using in context): • gene = fur colour / the genetic information for a trait • allele = a different form of a gene • phenotype = appearance of a gene / black vs normal • mutation as a DNA change / as a change in the chromosome.	• Explains in depth gene and allele in context. • Explains in depth that a base change / mistake / change in the DNA results in a different appearance / phenotype.	• Explains comprehensively how a **mutation** (base change) on the **DNA** results in a different **allele** – black – for the fur colour **gene** (producing a new **phenotype**(protein).
(b)	Black colour is a change in the DNA, and so is passed on from parents to offspring through the gametes. Scars affect areas of the leopard's body, but not the DNA or the gametes, so cannot be passed on to offspring.	• Describes that scars are caused by environment / not carried on the DNA / genes / in gametes OR that colouration is carried on the DNA / genes / in gametes.	• Explains that colour isgenetic / gametic, whereas scars are not genetic and so cannot be passed on.	

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	1 Achievement points.	2 Achievement points.	3 Achievement points.	4 Achievement points.	1 merit point.	2 merit points.	Uses terms (4)correctly in the full explanation.	Uses terms (5) correctly in the full explanation.

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
Two (a)	<table><tr><td></td><td>Phenotype</td><td>Genotype</td></tr><tr><td>3</td><td>Piebald</td><td>Hh</td></tr><tr><td>8</td><td>Normal</td><td>hh</td></tr><tr><td>9</td><td>Piebald</td><td>HH or Hh</td></tr></table>	• 2 rows or 1 column of table correct.		
(b)	Pure-breeding individuals do not have any hidden information; they are homozygous. Piebald horses could be HH or Hh. Pure-breeding animals would have to be HH. To ensure that they were pure-breeding, the breeder could cross the horses with normal animals (hh). Punnett squares: HH × hh, Hh × hh If any of the offspring are normal, the piebald parent must be heterozygous – this cannot be used for breeding. If all the offspring are piebald she can start to be confident that the horse is a pure-bred. Many offspring are needed to be confident of the genotype but this cannot be proven.	• Defines dominant or recessive correctly in context. • Pure breeding piebald = HH. (inferred). • Describes test cross / x hh / cross unknown with known phenotype “normal”. • Completes any correct Punnett square. • To create pure bred offspring you could cross two piebalds OR cross HH × HH.	• Explains a test cross – hh × unknown / Hh × HH • Explains why a pure bred herd would need to be all HH, but difficult to determine (HH / Hh) to ensure all offspring are piebald. • Explains that one heterozygous parent could result in normal / hh offspring.	• Fully explains how pure breeding could be tested for, and that 2 such animals (HH) would be needed for all offspring to be Piebald. Includes the need for many offspring, to be sure of HH, but not conclusive due to probability, whereas any normal offspring proves parent is Hh. Also correct test cross with hh.

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	1 Achievement point.	2 Achievement points.	3 Achievement points.	4 Achievement points.	1 merit point.	2 merit points.	Excellence point with minor omission.	Excellence point.

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
Three (a)	A **gamete** is a sex cell with one set of chromosomes (instead of the normal 2). **Variation** is the differences within a species. Sexual reproduction involves combining gametes from 2 parents to create a new individual. Each parent contributes a single copy of each chromosome to a gamete. Therefore, when these are combined (forming the zygote), the offspring has the combined information from 2 individuals. As the chromosomes are shuffled randomly during meiosis every gamete is different, and so each individual (even from the same 2 parents) is a unique combination of its parent's alleles. In this way, meiosis increases variation, for example, some bananas might have more or fewer seeds, or bigger fruit, or grow taller.	• Defines variation. • Describes gametes. • Describes variation from mixing 2 parents' DNA (random fertilisation) *[segregation]*. • Describes variation from each parent making many different gametes *[independent assortment, crossing over]*. *[L2 terms are correct but not needed in any answer.]*	• Gametes have 1 set / half normal / 23 / haploid chromosomes *[segregation]*, so can be combined with another individual (unique) gamete from another individual, therefore increasing variation. • Each parent can make many different gametes through chromosomes / gene shuffling *[through independent assortment]* and so each new gamete / individual / zygote is varied.	• Clearly explains a process in the production of gametes and random fertilisation which leads to genetic variation *[either independent assortment or segregation]* and compare the **genetic variation** for both wild and farmed banana and why farmed bananas might be at risk without variation but not the wild banana.
(b)	Farmed bananas are produced asexually – there are no gametes and so they are not varied. That means one disease could potentially harm them all. The world supply of farmed bananas is susceptible to disruption by disease like this. Whereas due to variation (from meosis), the wild bananas may have individuals that are resistant to the disease and pass this on to their offspring. In this way, the wild banana population can become immune / adapt to conditions.	• Describes bananas from asexual / suckers **as** clones / unvaried / same DNA • Limited variation in suckers / farmed could be susceptible to the same disease *(or similar)*. • Some wild bananas may be resistant / show immunity.	• Explains that because the farmed bananas have little / no genetic differences they are susceptible to the same disease *or similar, possible different environmental factor*. OR Explains how wild bananas are genetically varied thus some have immunity / resistance.	

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response or no relevant evidence.	1 Achievement point.	2 Achievement points.	3 Achievement points.	4 Achievement points.	1 merit point.	2 merit points.	One process and problem of lack of variation explained comprehensively.	Both processes explained -all linked comprehensively.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 13	14 – 19	20 – 24