Question Number	Answer	Additional Guidance	Mark
1(a)(i)	1. closely-related lions mated with each other / a small gene pool / eq ; 2. reference to inbreeding depression ; 3. idea of increased chance of homozygous recessive genotypes for genetic defects ;	2. NOT interbreeding 3. NOT homologous ACCEPT recessive alleles more likely to be expressed	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	1. selection of { unrelated / genetically different } mates / eq ; 2. use of stud books / records of mating / DNA profiling / eq ; 3. exchange of animals between zoos / eq ; 4. exchange of gametes between zoos / eq ; 5. IVF / AI / eq ;		**(4)**

Question Number	Answer	Additional Guidance	Mark
1(b)	1. idea of { genetic cause / genetic mutations } ; 2. idea that a change in diet had no effect ; 3. reference to {monoamine oxidase (A) / MAOA} ; 4. idea of behaviour learnt from mother ;		**(2)**

Question Number	Answer	Mark
2 (a)	1. {position / location / eq} of {gene / allele}; 2. on a chromosome / eq ;	**(2)**

Question Number	Answer	Mark
2 (b)(i)	C ;	**(1)**

Question Number	Answer	Mark
2(b)(ii)	1. higher number of alleles (per locus) / 7.7 compared with 4.6 for Q ; 2. (means) higher genetic variation / greater genetic diversity / more allele combinations / eq ; 3. idea that {greater variety of alleles / eq} in gene pool/larger gene pool ; 4. idea that {alleles / genotypes} may give a selective advantage for changes in the environment / eq ; 5. (therefore) more likely to survive and breed / eq ; 6. passing on these favourable allele combinations / eq ; 7. ref to natural selection ; 8. ref to (change in allele frequency) over many generations ;	**(5)**

Question Number	Answer	Mark
2(c)	1. chance / eq ; 2. ref to difference in sample size, e.g. more dogs in Group 1 than in Group 2 ; 3. ref to rare alleles in group 1 ; 4. idea of how representative the samples are of the whole breeding population ;	**(2)**

Question Number	Answer	Mark
2(d)	D ;	**(1)**

Question Number	Answer	Mark
3(a)(i)	(the total of) all the alleles in a {population / eq} ;	**(1)**

Question Number	Answer	Mark
3(a)(ii)	the {proportion of / number of times occurring / eq} for one allele within a {gene pool / population / eq) ;	**(1)**

Question Number	Answer	Mark
3(b)(i)	1. if allowed to interbreed / eq ; 2. sub-species could (probably) produce fertile offspring / eq ;	**(2)**

Question Number	Answer	Mark
3(b)(ii)	(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence) 1. reference to a few *(ancestral)* boar reaching the island ; 2. reference to (two populations) {*geographical* separation / separated by the sea / volcanic eruptions / eq} ; 3. populations {cannot *interbreed* / eq} ; 4. idea of gene flow between populations {prevented / restricted} ; 5. only a small number (on island) of other boar for breeding / reference to *founder* effect / eq ; 6. reference to {restricted / limited / eq} variety of *alleles* / eq ; 7. reference to *mutations* ; 8. different {*environmental* conditions / *selection pressures* / eq} on island different from mainland ; 9. reference to changes in *allele frequencies* ; 10. (leads to) {*phenotypic / physiological / physical / behavioural*} changes ; 11. reference to possibility of (*allopatric*) *speciation* ;	**max (5)**

Question Number	Answer	Mark
3(b)(iii)	1. reference to {bands / eq} produced ; 2. reference to {bands / eq} at certain {positions / eq} ; 3. common {bands / eq} contain similar {DNA fragments / eq} ; 4. idea that the more similar the patterns the {closer the relationship / more likely to have {recent / eq} common ancestor} ; 5. idea that very few differences if still a sub-species ;	**max (3)**

Question Number	Answer	Additional guidance	Mark
4(a)	idea of found in only one specific geographical location ;	ACCEPT reference to {one / the} area / place IGNORE habitat or environment	(1)

Question Number	Answer	Additional guidance	Mark
4(b)	1. idea that genetic diversity {will be low / decreases / stays the same } OR idea of smaller gene pool ; 2. closely related wolves mating / inbreeding / eq ; 3. risk of inbreeding depression / more chance of homozygous recessive genotypes / eq ; 4. risk of genetic drift / eq ;	2. NOT inTERbreeding Do not give this mark for "inbreeding depression" 3. ACCEPT gr ter risk of genetic disorders 4. ACCEPT reference to loss of alleles	(2)

Question Number	Answer	Additional guidance	Mark
4(c)	1. idea that this increases the gene pool ; 2. idea that this increases potential for the species to { adapt / survive } ; 3. description of how this will increase survival e.g. better hunters, disease resistance ;	1. A EPT introduction of genetically different individuals, { new / different } alleles introduced into population 2. A EPT population but not individuals	(2)

Question Number	Answer	Additional guidance	Mark
4(d)(i)		**ACCEPT in the cells indicated a cross or tick**	**(3)**

Adaptation for the Ethiopian wolf	Behavioural	Anatomical	Physiological
Small sharp teeth widely spaced to cope with small prey		X	
Narrow snout to fit into small gaps when hunting small prey		X	
Hunting alone, as prey too small to share with other wolves	X		

Question Number	Answer	Additional guidance	Mark
4(d)(ii)	**(QWC– Spelling of technical terms must be correct and the answer must be organised in a logical sequence)** 1. genetic variation in population / variation due to mutation / eq ; 2. description of selection pressure ; 3. idea that some individuals possessed { advantageous / beneficial / eq } characteristics ; 4. (therefore) survived to adulthood / survived to breed ; 5. passing on {advantageous alleles / eq} (to offspring) / eq ; 6. change in allele frequency (over generations) / eq ; 7. idea of {geographical / reproductive} isolation ;	**QWC emphasis is clarity of expression** 2. ACCEPT small prey 5. NOT just passing on a characteristic or genes	**(4)**