WJEC (Wales) Biology A-level Topic 4.4: Variation and Evolution Questions by Topic - Mark Scheme

1.

Question			Marking details	Marks Available
1	*(a)*		All the alleles (of all the genes) in a population;	1
	(b)	(i)	The harder the food the {larger / wider / deeper} the beak/ long beaks for flowers and fruits / wide beaks for eating seeds;	1
		(ii)	The higher the CaM the longer the beak / low CaM results in short beak / ORA;	1
	(c)	(i)	Genetic drift / founder effect / or descriptions of ; Accept mutation	1
		(ii)	Any **4** from: A. Birds with (high) CaM (allele) will have longer beaks; B. (birds with longer beaks) will get <u>more</u> food from cactus flowers / better adapted for feeding; C. (more of) these birds will survive, reproduce and pass on their (high) CaM <u>alleles</u> to the next generation; D. CaM (alleles) will {become more common/ increase in frequency} in the next generation; E. use of {natural selection / selective advantage / survival of the fittest/ selection pressure} anywhere in the account, in the correct context;	4
	(d)	(i)	They are not able {to interbreed / or description of interbreeding} / breed or reproduce <u>with each other</u> and produce fertile offspring;	1
		(ii)	• geographic isolation / correct reference to allopatric speciation; • over time develop adaptations which prevent successful breeding with original population / there is no flow of genes between the two populations / or description of example e.g. courtship behaviour;	2
			Question 1 total	**[11]**

2.	**(a)**	Wolf, dingo, coyote, golden jackal;	
		Interbreed producing fertile offspring;	**2**
	(b)	share same gene pool;	
		Similar physiology;	
		Similar behaviour;	
		Similar genetic makeup/ref DNA;	
		Similar proteins; Similar morphology Similar genetic profile (not: same/same number of chromosomes)	**Max 2**
	(c) (i)	Black backed and side striped jackal (not: jackals/golden jackal)	**1**
	(ii)	reproductive cycles different;	
		Difference in reproductive/courtship behaviour /pheromones;	
		Changes in chromosome numbers/ploidy;	
		Different activity times;	
		Mechanical isolation;	
		Any sensible suggestion e.g. gamete attack by immune system.	**Max 1**
	(d)	Chromosomes not homologous; (not: ref. number)	
		Cannot pair/form bivalents;	
		During prophase 1 (of meiosis);	
		Meiosis does not take place;	
		no gametes produced;	**Max 4**

3.

Question			Marking details	Marks Available
3	(a)	(i)	CGC is replaced by TGC/ C is replaced by T; Amino acid cys has replaced arg;	2
		(ii)	Change in {protein/ tertiary} structure/ different protein is made; MC1R will not be stimulated (by the hormone); {Less/no} eumelanin will be produced;	Max 2
	(b)	(i)	Mice with light fur found in an environment providing {light backgrounds/sandy beaches} **AND** mice with dark fur in {forest /dark backgrounds}/ Dark fur is found in the darker background/ light fur is found in the lighter background; For camouflage/ OWTTE;	2
		(ii)	Small populations (of mice);	1
		(iii)	Mice with light fur {are less easily seen/caught by predators/ correct reference to camouflage/ have a selective advantage}; Light fur mice (survive to) reproduce and pass {allele C/ advantageous allele/ light fur allele} to next generation; Increasing the frequency of the allele; 95% of population (have allele C);	4
		(iv)	{Genetic/behavioural/geographic/allopatric/reproductive/ sympatric/ seasonal/ temporal} isolation;	1
			Question 3 Total	**[12]**

4.

Question			Marking details	Marks Available
4.	(a)	(i)	A. Variation in age at which sexual maturity is reached; B. Caused by mutation; C. Reach sexual maturity earlier/ Small fish {have a selective advantage/ pass through net}/ ora; D. Breed/ reproduce; *reject mate* E. Pass on alleles to offspring; *reject genes* F. Allele frequency for earlier maturity / hence small size at maturity increases; G. Figs quoted from graph (in context);	Max 5
		(ii)	Very few large cod survived/ ORA; *reject none* reduced gene pool; {No/ little} mutation (to increase size) / insufficient time for genetic drift (to increase size) / No gene flow from another gene pool; Small fish produce less gametes/ difficulty in breeding/ few fish remain to reproduce/ reproductive isolation; Not enough food/ increased competition for food/ increased predation/ disease; Change in {temperature/ pH}/ pollution;	Max 3
			Question 4 total	[8]

5.

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Discontinuous -Colour/hairs/smooth/wrinkled coat/shape + Continuous – length/width/size (1) **1 mark FOR BOTH** Continuous - shows a gradation from one extreme to another/controlled by more than one gene (1) Discontinuous-. When characters are clear-cut/controlled by a single gene (1)		3		3		
	(b)	(i)		100			1	1		
		(ii)		mode = 6.45 (1) It is in the {most common class/6.40-6.49 class}/it has the greatest number at 25/it is the highest bar/the median is the middle value which would be the 50th grain which is in the 6.50-6.59 class (1)			2	2		
		(iii)		Mean, Mode and median are not the same/ correct reference to shape not being tallest in the middle/not bell shaped/not symmetrical/skewed to left			1	1		
		(iv)		{Samples/hybrids} have more similar {mean/median/mode} to parent B (than parent A) (1) Null (hypothesis)(1) (students) t test(1) Accept Spearmans rank/Mann Whitney	2	1		3	3	
				Question 5 total	**2**	**4**	**4**	**10**	**3**	