Assessment Schedule – 2014

Scholarship Biology (93101)

Evidence Statement

Question One Bulldogs: Evidence Statement

Human manipulation in evolution of bulldogs from wolves **(E)**

	Evidence		**Justification**
EW	wolves obtain scraps / humans adopted wolf pups	**EW_J**	Wolves followed / stayed close to humans
EB	Selectively bred / encouraged non aggressive wolves to humans	**EB_J**	Benefit explained eg keep other predators away, don't harm / attack humans, for hunting
EG	Small gene pool / founder effect (genetic drift)	**EG_J**	Unfavourable traits / alleles lost / favourable traits / alleles fixed in **wolves** OR favourable traits / alleles lost / unfavourable traits / alleles fixed / high frequency in **bulldogs**
	Bulldogs ferocious and insensitive to pain selected OR Thick-set, low in stature, broad and powerful selected OR Short broad face inclined upwards / wrinkles / powerful jaw selected	**EP_J1** **EP_J2**	Enables the bulldog to subdue animals / drive cattle / bullbaiting without being injured / killed Causes frequency of the alleles for these phenotypes to increase
ET	Selectively bred for docile temperament after 1835 / bullbaiting	**ET_J**	Enabled them to be suitable family pets that would not be a risk (to children) / for dog shows
EI	Inbreeding within bulldogs	**EI_J**	Increased chances of harmful recessive alleles coming together
		EL_J	Linked genes: a gene with disorder with a gene humans have selected for

how selective breeding **(B)** could be further used to eliminate **each** of the named disorders **and** evaluate how effective this might be

	Evidence		**evaluation**
BS	**Brachycephalic Syndrome** selectively breed for a long / longer face OR **Dermatitis** breed for no folds / wrinkles or fewer / less deep folds / wrinkles	**BS$_J$**	Will be effective but removes / reduces bulldog characteristic from standard (so impractical)
BR	**Brachycephalic Syndrome** breed only short faced dogs with limited respiratory problems		
BH	**Hip dysplasia** only breed those who show no symptoms of dysplasia	**BH$_J$**	Limited success with many genes causing disorder (so may be impossible to eliminate)
BV	**VSD** only breed individuals who do not have VSD	**BV$_J$**	Heterozygote parents will have 25% chance of VSD offspring / 75% chance of no VSD so will be very effective (as inheritance is due to a recessive allele)
BT	**VSD** carry out test cross / genetic testing to identify homozygous dominant individuals	**BT$_J$**	Will be most effective but takes time / is expensive
BC	**Cryptorchidism** do not breed males who have the disorder / females with male offspring with the disorder	**BC$_J$**	Since females are carriers this will be effective over time / generations
BO	**Out breeding / cross breeding** with other dog breeds	**BO$_J$**	Effective as long as bulldog standard can be maintained / Ineffective as will only maintain dominant bulldog standard traits
		BL$_J$	Disorder gene may be on same chromosome as bulldog standard gene / linked genes and so may be impossible to / can't eliminate without losing standard

Judgement statement (2 areas are E and B)

8	8J's OR 7J's and 2 descriptions Must have 3 J's from each E and B area Answer displays: • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication
7	7J's OR 6J's and 2 descriptions Must have 2 J's from each E and B area Answer displays aspects of: • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication
6	6J's OR 5J's and 2 descriptions OR 4J's and 4 descriptions Must have 2 J's from each E and B area Answer displays: • analysis and critical thinking; • integration, synthesis and application of highly developed knowledge, skills and understanding • logical development, precision and clarity of ideas
5	5J's OR 4J's and 2 descriptions OR 3 J's and 4 descriptions Must have 1 J from each E and B area Answer displays aspects of: • analysis and critical thinking • integration, synthesis and application of highly developed knowledge, skills and understanding • logical development, precision and clarity of ideas
4	4J's OR 3J's and 2 descriptions OR 2 J's and 4 descriptions
3	3J's OR 2J's and 2 descriptions OR 1 J and 4 descriptions
2	2J's OR 1J and 2 descriptions OR 4 descriptions
1	1J OR 2 descriptions
0	Lack of relevant evidence

Question Two: North Island Weta: Evidence Statement

Evolutionary processes and patterns resulting in **T**wo groups of weta (**T**)

	Evidence		**Justification**
TE	Weta evolutionary rate is **punctuated equilibrium**	**TE_J**	Many / 70 species arose in the last 90 million years / since Gondwana split OR Many species of Giant and tree weta in last 2-5 million years
TA	Weta groups / species have undergone an **adaptive radiation** in NZ OR Giant weta and tree weta groups / species **diverged** from a common ancestor	**TA_J1** **TA_J2**	Different groups / species inhabit different habitats / niches available in NZ with two named examples such as urban, coastal, lowland forests, food sources **allopatric** speciation due to named geographical barrier OR **Sympatric** speciation due to niche differentiation
TS	Different selection pressures (e.g. types of plants for food) in each environment	**TS_J**	Caused changes in allele frequency between the populations leading to divergence
TR	RIM's develop between giant weta and tree weta groups / species as a result of changes to behaviours / courtship pheromones / mating sounds	**TR_J**	Different numbers of stridulatory ridges causes different sounds not recognised by the other group so **no gene flow** OR Different pheromones meant tree weta did not recognise giant weta **so no gene flow** OR Behaviour such as burrowing explained **preventing gene flow** OR Physical differences in mating organs would **prevent gene flow** (leading to speciation)
TF	Founder / bottleneck effect on offshore islands	**TF_J**	changes in gene pool / allele frequency (due to genetic drift)
TM	Mutations occurred in each (isolated) population		

Distribution difference **(D)**

	Evidence		**Justification**
DR	Large, widespread ancestral population of north island giant weta was reduced by mammalian predation / competition or habitat destruction		
DV	Giant weta have little amount of genetic variation in their population **compared** to tree weta OR tree weta have a large amount of genetic variation in their population compared to giant weta	**DV_J**	Prevents giant weta populations adaptation to a wide range of habitats unlike the tree weta
DA	Giant weta show no aggressive response to being threatened OR Tree weta show an aggressive response to being threatened: leg spikes up, jaws open, biting	**DA_J**	Giant weta less likely to survive attack by a predator OR tree weta more likely to survive an attack by a predator
DP	Giant weta are more likely to be eaten by (introduced mammalian) predators (such as rats, stoats, cats, hedgehogs) due to TWO of ; • Relatively slow moving • Cannot jump (to escape predation) / freeze • are larger (so more visible / appealing meal for predators) • are more exposed during the day / not in burrows • mate locked together for 4 hours / move sluggishly afterwards OR Tree weta are less likely to be eaten by predators due to TWO of: faster moving, can jump, are smaller, not exposed, mate quickly.	**DP_J**	leads to decreased survival / reproductive success of giant weta and so only found as three isolated populations OR leads to increased survival / reproductive success of tree weta and so have a widespread distribution
DE	Giant weta eggs are more likely to be predated upon as on forest floor (rather than in the ground) OR Tree weta eggs less likely to be predated upon as in the ground	**DE_J**	leads to decreased survival of giant weta and so only found as three isolated populations OR leads to increased survival of tree weta and so widespread
DH	Giant weta mating behaviour / no "harem" **compared with** tree weta mating behaviour / 'harems'	**DH_J**	Strongest / dominant males are more likely to mate and pass on alleles beneficial for survival
DL	Giant weta don't eat lichen so are competing with introduced pests for food OR Tree weta eat lichen so not competing with introduced pests for food	**DL_J**	Leads to decreased survival of giant weta so not widespread OR leads to increased survival of tree weta and so widespread

Judgement statement (2 areas are T, and D)

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Question Three DNA analysis in Evolution: Evidence Statement

	Evidence		**Justification**
ML	MYH16 allowed alarger brain	**ML_J**	allowed increased communication / abstract thought / make better tools / plan hunts linked to a consequence
MR	MYH16 allowed reduction in mandible / zygomatic arch / saggital crest	**MR_J**	Energy saved from the reduction can be used for brain development aiding cultural evolution
S	SRGAP2 Connections increased brain complexity / developed areas of the brain	**S_J**	Greater brain complexity allowed: more successful cooperative hunting or tool making / greater creativity (art, spirituality) / the start of tool use / teaching and learning **CAN ONLY GET 1 OF S_J AND F_J1**
F	FOXP2 Allowed speech / language	**F_J1** **F_J2**	Speech / language allowed greater communication related to 1 of: making or using tools / clothing / food gathering or hunting / building shelter From birth able to communicate facilitating learning (cultural evolution)
GB	Glucose transporters Greater energy production / supply to the brain through **respiration**	**GB_J**	larger / greater development of brain led to 1 of cultural evolution: make tools, use fire, clothing, building shelter, hunting, planning (communicating / art)
GM	Glucose Transporters led to smaller muscles	**GM_J**	Bipedalism becomes more efficient (compared to quadrapedalism)
HH	HACNS1 Greater manipulation of hand / opposable thumb	**HH_J**	precision grip / fine motor control contributed to being able to make more refined tool / shelters / clothing / art
HF	HACNS1 Foot arched / big toe larger / aligned	**HF_J**	Enables greater bipedal efficiency
A	Salivary Amylase Allows more starch digestion (in the mouth)	**A_J1** **A_J2**	Greater efficiency of starch digestion gave domestication of plants / wheat / rice / agriculture an adaptive advantage Greater supply of simple sugar (glucose) for growing / larger brain
SP	Any named mutation(s) are selected for by the environment eg living in an area with high starch foods selects for salivary amylase mutation	**SP_J**	Increases allele frequency of mutation / prevalance of mutation in gene pool
	Links 2 of MYH16 / SRGAP2 / FOXP2	**L_J1**	Explains how the combined effects of two of the mutations increase communication / cultural evolution
	Links glucose transporters to 1 of MYH16 / SRGAP2	**L_J2**	Explains how glucose is required for energy via respiration for the larger brain due to MYH16 / greater number of neurons due to SRGAP2
	Links salivary amylase to glucose transporters	**L_J3**	Explains how more efficient breakdown of starch by amylase means more glucose is available to the brain via glucose transporters

	Links MYH16 / SRGAP2 to salivary amylase	**L_J4**	Explains how larger brain / greater neuron connectivity led to use of fire to cook starchy food which could be better utilised due to more amylase
	Links HACNS1 with MYH16 / SRGAP2	**L_J5**	Explains how the greater manipulation of the hand / precision grip facilitates the making of eg tools enabled by the larger brain

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