Assessment Schedule – 2013

Scholarship Biology (93101)

Question One Chimpanzees: Evidence Statement

Two species (**T**)

	Evidence		**Justification**
TA	Formation of Congo River separates the ancestral population.	**TA_J**	Geographical barrier (prevents gene flow) leading to allopatric speciation / divergent evolution.
TM	Mutations have occurred in the gene pools.	**TM_J**	Resulting in the 0.4% difference in DNA between chimps and bonobos.
TS	Different selection pressures in different environments.	**TS_J1**	Different selection pressures (eg competition / food) have resulted in difference(s) in named structural or behavioural adaptation(s).
		TS_J2	Causes changes in allele frequency between the populations leading to divergence.
TR	Reproductive / behavioural isolating mechanisms (RIMs) develop.	**TR_J**	Behavioural differences, eg social organisation / hierarchy / territoriality. are likely to prevent breeding / acts as a barrier to gene flow.

Reasons for behaviour differences (**B**)

		BM_J	Aggressive behaviour of chimps results from the presence of alleles / mutations (in their ancestral gene pool / gene pool). / Non aggressive behaviour of bonobos results from the absence of alleles / mutations.(in founder gene pool / gene pool).
BF	Founder (small) population of bonobos.	**BF_J**	Resulting in a non-representative / differences in allele frequency due to chance / genetic drift, eg aggressive alleles not present in bonobos.
BG	Chimps and **gorillas** coexist resulting in (interspecific) competition for resources, eg food. OR Vice versa bonobos.	**BG_J**	Competition has led to different behaviours such as male dominated hierarchy / aggressive behaviours / territoriality / cooperative hunting in chimpanzees (to reduce interspecific competition). OR Vice versa bonobos.
BC	Large chimpanzee population or limited resources / food available results in (intraspecific) competition. OR	**BC_J**	Competition has led to different behaviours such as male dominated hierarchy / aggressive behaviours / territoriality / cooperative hunting in chimpanzees (to reduce intraspecific competition). OR

	Smaller population of bonobos or abundant resources results in lack of (intraspecific) competition.		Lack of intraspecific competition, so no need for linear hierarchy / aggressive behaviours.
		BP_J	Phenotypic differences described (eg male chimps larger / more robust / marked sexual dimorphism) AND linked to: the establishment of a male dominated **hierarchy** / **territorial behaviour** in chimps **with comparison to bonobos**.
		BS_J	Social organisation / sexual behaviour differences described (eg male chimps control mating / male hierarchy) **and** linked to the **aggression** of the male chimps **with comparison to non-aggression in bonobos**.
BI	Infanticide occurs in chimps (but not bonobos) as a result of the very aggressive behaviour of males.		
BV	Vocalisation occurs in chimps (but not bonobos) as a result of the need to defend their territory / co-operatively hunt.		

Justification (**Just**)

		Just	**Different species** because the **behavioural differences** of the common chimp and bonobo would ensure they **would not interbreed** in nature so should be classified as separate species. OR **Sub-species** because the **genetic differences** between the common chimp and bonobo are so small and behavioural differences would **not stop them from mating.**

Judgement statement (3 areas are T, B and Just)

8	8J's and 1 description OR 7J's and 3 descriptions Must have 3 J's from each T and B area and the Just. Answer displays: • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication.

7	7J's and 1 description OR 6J's and 3 descriptions Must have 2 J's from each T and B area and the Just. Answer displays aspects of: • perception and insight • sophisticated integration and abstraction • independent reflection and extrapolation • convincing communication.
6	6J's and 1 description OR 5J's and 3 descriptions OR 4J's and 5 descriptions Must have 2 J's from each T 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 and 1 descriptions OR 4J's and 3 descriptions OR 3 J's and 5 descriptions Must have 1 J from each T 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 and 1 description OR 3J's and 3 descriptions OR 2 J's and 5 descriptions.
3	3J's and 1 descriptions OR 2 J's and 3 descriptions OR 1 J and 5 descriptions.
2	2J's and 1 description OR 1J and 3 descriptions OR 5 descriptions.
1	1J OR 2 descriptions.
0	Lack of relevant evidence.

Question Two California Condors: Evidence Statement

Critically Endangered (**E**) – **contributing factors**

Evidence		**Justification**	
EF	Food available for condors was greatly reduced by the extinction of megafauna during last ice age.	**EF$_J$**	Reduced food lead to **increased competition** increasing mortality / many died / great reduction of condor population.
ER	**Slow rate of reproduction** resulting from TWO of**:** • young not reaching sexual maturity until 6 years of age • only one egg / chick laid at a time • reproduce every alternate year (not every year) • birds mate for life / monogamous so if one dies the other may not reproduce.	**ER$_J$**	Leads to a much greater population decrease / there is slow population growth so numbers cannot build up as rapidly.
EC	Embyos inheriting homozygous recessive genotypes for chondrodystrophy die / don't survive.	**EC$_J$**	Heterozygous birds are carriers so breeding between two heterozygote parents gives a 25% probability of producing homozygous recessive chick inheriting lethal condition (or explained using a labelled Punnett square).
EB	The condor population is going through an evolutionary **bottleneck**.	**EB$_J$**	The small population left increases the frequency of harmful alleles (eg chondrodystrophy) coming together (as a result of inbreeding / genetic drift). OR The small population left has reduced genetic diversity so is less able to adapt to a changing environment.
EH	Human (impact) kills condors e.g. cyanide poisoning from eating dead coyotes / flying into power lines / lead poisoning from bullets / habitat destruction.	**EH$_J$1** **EH$_J$2**	Habitat destruction reduces suitable nest / breeding sites for condors (reducing reproductive success). Condors eat the carrion / carcasses of animals that have been shot**.** Lead **accumulates / builds up** in their bodies and birds die from lead poisoning.
EP	The pecking order means the dominant / fitter birds get first access to poisoned kill and will die.	**EP$_J$**	This removes the breeding / fitter birds from the population so population reduces further / does not increase / gets less fit OR leaves only younger / less fit birds who are less likely to breed so population numbers do not increase / remain low.

Goals **(G)**

	From the resource material the goals are: • to establish two geographically isolated self-sustaining populations of condors 700km apart • each population will have 150 birds with at least 15 breeding pairs.	**GI$_J$**	Populations are geographically isolated (700km apart) so that if one population 'crashes' eg disease, disaster there is another remaining population (reducing the chance of extinction).
		GG$_J$	Isolated populations experience different selection pressures in each geographical region which increases genetic diversity (of species overall).
		GL$_J$	Population needs to be large enough / sufficient breeding pairs to (reduce effects of inbreeding / genetic drift) ensure sufficient genetic variation (in gene pool) / decreases chances of bringing together harmful recessive alleles.
		GC$_J$	Captive breeding removes many of the risk factors e.g. predators / lack of food / adverse weather so increasing their chances of survival until adolescence / time of release.
		GD$_J$	Double clutching greatly increases / doubles condor numbers as it increases the number of chicks / speeds up reproduction compared to the wild.
		GP$_J$	Puppet feeding chicks reduces the chances of imprinting on humans / more likely to behave as a condor in the wild (so survive / mate / breed / raise young successfully)..
		GA$_J$	Condors are released as adolescents as releasing younger chicks are at higher risk of dying / not surviving eg predation.

Future Management: (M)

	Condors remain at risk from: • ongoing lead poisoning • the high frequency of the lethal chondrodystrophy allele in the gene pool.	**ML$_J$**	As lead poisoning is still killing a significant number of condors, need to legislate against / ban lead bullets or have no hunting zones around condor population.
		MA$_J$	To reduce deaths by lethal allele: genome analysis / DNA screening to identify birds carrying the allele and then removing (culling) heterozygotes (carriers) from breeding population / selective breeding using birds that are not carriers (homozygous dominant).
		MR$_J$	Continue captive breeding and releasing adolescents into wild until populations are large enough (at least 150 in each) to be self-sustaining.
		MT$_J$	Transfer of birds / have gene flow between the two populations to maintain / increase genetic diversity / stop divergence (leading to speciation).

Judgement statement (3 areas are E, G and M)

Judgement statement

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7	7J's OR 6J's and 2 descriptions Must have 2 J's from each or the 3 areas **E,G,M.** 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. Must have 1 J's from each or the 3 areas **E,G,M.** 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. Must have 1 J from each or the 3 areas **E,G,M.** 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 2J's and 4 descriptions.
3	3J's OR 2 J's and 2 descriptions.
2	2J's OR 1J and 2 descriptions.

1	1J OR 2 descriptions.
0	Lack of relevant evidence.

Question Three The primrose: Evidence Statement

Composition (**C**)

	Changes in community composition (C)		**Ecological and / or evolutionary concepts that account for these observations**
	More dandelions in **sprayed** plot.	**CH_J1**	The abundance of dandelions in sprayed plots is explained by the herbivores / *beetle G. punctiger*, which eats (the seeds of) the dandelion has been killed by the insecticide.
		CH_J2	Lack of primrose is explained by the herbivores / caterpillar *M.brevivitella*, which eats the(seeds of) the primrose are not (all) being killed by the spray (less susceptible / more resistant to spray).
		CH_J3	Insects involved in primrose pollination have been killed / insects involved in dandelion pollination are still present.
CO	Idea that Dandelion outcompeted Primrose in **sprayed** plots.	**CO_J1**	Dandelion grows faster (so shades primrose) so reduces photosynthesis / growth / seedling growth of primrose.
		CO_J2	Dandelion (has a more vigorous root system so it) accesses nutrients / water at the expense of primrose.
	Primrose is the more abundant plant species in **control plots**. / Dandelions are less abundant in the control plots	**CC_J1**	Beetle *G. punctiger* is naturally more abundant(than caterpillar *M. breviitella)* in control plot so reduces dandelions / *M. breviitella* is naturally less abundant (than beetle *G. punctiger*), so more primrose.
		CC_J2	Caterpillar *N. pronuba* (preferably) feeds on the dandelion leaves so dandelion was more heavily eaten in control plots than primrose.
		CC_J3	Primrose produces Oenothein A which protects it against herbivory and dandelion does not produce Oenothein A so dandelions are eaten.

Phenotype (**P**)

	Changes in the phenotype of primrose plants (P)		**Ecological and / or evolutionary concepts that account for these observations**
	Flowering in primrose is earlier in sprayed plots.	**PF_J**	In the sprayed plot earlier flowering genotypes (and thus phenotype) flower before the dandelion increasing the chances of these primroses successfully reproducing.
	Primrose are faster growing in sprayed plots.	**PG_J**	In sprayed plots faster growing primroses are able to gain nutrients / light / survive so are competitive / not outcompeted by dandelions. OR In sprayed plots slower growing primroses are outcompeted by dandelions so are unable to gain nutrients / light / do not survive / selected against.
PO	There is lower amounts of Oenothein A in primrose in sprayed plots compared to	**PO_J1**	In control plots production of Oenothein A is higher because it is **selected for** as it prevents herbivory or vice versa. In sprayed plots lower production of Oenothein A saves energy which can be used for e.g. photosynthesis / growth /

	control plots or vice versa.	**PO_J2**	reproduction.
PL	No significant difference in the concentration of Oenothein A in primrose **leaves** between both plots.	**PL_J**	leaf-eating moth *N. pronuba* in naturally low abundance in control / preferably eats dandelion leaves / is less affected by spray.
PD	Significant difference in the concentratin of Oenothein A in primrose **fruits** between both plots.	**PD_J**	Differences in selection pressures between control and sprayed plots, in control plot higher concentrations of Oenothein A are selected for as seeds eaten by moth *M. brevivittela*.
PC	There is a higher conc. of Oenothein A in primrose fruit than in the leaves (regardless of sprayed / controlled) or vice versa.	**PC_J**	Unlike leaves fruit is essential to the plant for successful reproduction / passing on genes.
PX	The concentration of Oeneothein A has decreased much more in fruit than leaves.		
		PA_J	Faster growing / earlier flowering / concentration of oenothein A linked to change in genotype / allele frequency in gene pool.

Judgement statement (2 areas are C and P)

Judgement statement

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