PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 3: CLASSIFICATION AND BIODIVERSITY

BIODIVERSITY

SCORE	PERCENTAGE
/86	%

STEMUP

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Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • biodiversity decreases (1) • one relevant reason given (1)	Allow • because honeybees will compete with natural pollinators (for pollen /nectar / food) (1) • because populations of wild pollinators decrease (1) • because many wild pollinators will also provide food for other species (so they decline due to lack of food)(1)	**(2)**

Q2.

Question Number	Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to three of thefollowing: • (biodiversity is low) because there are few species (1) • because there is a lot of trampling (1) • because animals are disturbed (by noise) (1) • because grass is mown (makes it difficult for other species to establish themselves) (1)		(3)
(ii)	An answer that makes reference to thefollowing: • calculation of N(N-1) (1) • calculation of sum of n(n-1) (1) • calculation of D (1)	Example calculation 8556 1058 8.1 / 8.09 / 8.087 Correct answer with no working gains full marks	(3)

Question Number	Answer	Additional Guidance	Mark
(iii)	An answer that makes reference to six of the following: • quadrats not placed at random (1) • {size / number} of quadrats not mentioned (1) • plants sampled at various intervals, animals at regular intervals (1) • {animals observed / no mention of how animals are counted} (1) • animals may {hide / move away / be counted twice} (1) • {only path sampled / inner area of woodland not sampled} (1) • not all animals identified to species level (1) • survey done at only one {time of year / time of day} (1)	Allow size of sample area not mentioned Allow description of pitfall traps, sweepnets, mark release recapture etc. couldbe used	(6)

Q3.

Question Number	Answer	Additional Guidance	Mark
(i)	• correct calculation of N(N-1) • correct calculation of ∑n(n-1) • correct division of N(N-1) by ∑n(n-1) 1.5 (3)	Example of calculation = 3906 (1) = 2604 (1) 3906 ÷ 2604 = 1.5 Correct answer with no working gains full marks	3

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to the following: • index accounts for population / numbers of organisms (1) • because numbers of organisms in {each species vary} (1)	**ACCEPT** converse for both Mps **ACCEPT** population sizes can vary for two marks	2

Question Number	Answer	Additional Guidance	Mark
(iii)	An answer that makes reference to four of the following: **THREE from:** • birds are now {extinct / dead / none left} (on Guam) (1) • decrease in (bio)diversity (1) • Marian crow population increased until 1985 / Island collared dove increased until 1984 / white throated ground dove increased until 1983 /1984 (1) • bird species decline at different rates (1) **TWO from:** • loss of some bird species allowed others to increase / loss of some bird species provided niches / food for others (1) • snakes consumed some species before others (1)	**ACCEPT** other correct dates **ACCEPT** Species go extinct at different times **ACCEPT** reduced competition between birds (allows some bird species to increase) / reduced interspecies competition (allows some bird species to increase)	4

Q4.

Question Number	Answer	Additional Guidance	Mark
(i)	A description that makes reference to two of the following: • CITES prevents {exploitation / hunting / sale / trade / poaching} (1) • by countries that sign up to the treaty (1) • by {protecting / conserving} endangered species (1)		(2)

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to two of the following: • (genetic / population) bottleneck (1) • causing reduced {genetic diversity / gene pool / number of different alleles} (in populations) (1) • therefore the chance of inheriting two harmful recessive alleles increases (1)	**Accept** small / restricted gene pool	**(2)**

Q5.

Question Number	Correct Answer	Additional guidance	Mark
(a)	both species look alike and are active at night (1)	morphologically and behaviourally similar	**(1)**

Question Number	Correct Answer	Additional guidance	Mark
(b)	A description that makes reference to the following: • sample of {cells / DNA} (1) • DNA polymerase chain reaction (1) • procedure repeated several times (1) • temperature requirements (1)	e.g. 55 °C, 72 °C, 95 °C	**(4)**

Question Number	Correct Answer	Additional guidance	Mark
(c)	An explanation that makes reference to the following points: • increases biodiversity / index of diversity increases (1) • as the value for {N / numerator} increases in the index of diversity (1)	Accept justification consistent with formula Correct answer gains full marks	**(2)**

Q6.

Question Number	Indicative content
*	Answers will be credited according to candidate's deployment of knowledge and understanding of material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. • with increasing snow depth, there is higher survival of grey owls / fewer brown owls survive / more grey owls D • snow depth has decreased over time D • the percentage of brown owls has increased over time / percentage of grey owls has decreased D For • with less snow, more ground is visible / uncovered / more twigs and trees visible E • with less snow, grey owls more obvious (to predators / prey) / less camouflaged E • with less snow, natural selection would favour brown owls / more brown (advantageous) alleles passed on / fewer grey alleles passed on / brown owls outcompete grey owls E • enhanced greenhouse effect due to carbon dioxide emissions reflecting radiation back / absorbing radiation (causing melting) E Against • no direct measure of greenhouse gas / temperature / fossil fuel emissions A • graphs show correlations not causal links A • data for owl survival with snow depth is scattered / gaps in data / weak correlation A • data for mean snow depth has many outliers / anomalies / not all points are around line / data is scattered A • other factors (named factors) could be affecting the owl population A • reduced snow may not be due to greenhouse gas release A

	• data for owl survival with snow depth is scattered / gaps in data / weak correlation A • data for mean snow depth has many outliers / anomalies / not all points are around line / data is scattered A • other factors (named factors) could be affecting the owl population A • reduced snow may not be due to greenhouse gas release A

Level 0	Marks	No awardable content
Level 1	1-2 (1-3)	Limited scientific judgement made with a focus on mainly just one method, with a few strengths/weaknesses identified. A conclusion may be attempted, demonstrating isolated elements of biological knowledge and understanding but with limited evidence to support the judgement being made . **1 mark : any 1 from D, E, A** **2 marks : any 2 from D, E, A**
Level 2	3-4 (4-6)	A scientific judgement is made through the application of relevant evidence, with strengths and weaknesses of each method identified. A conclusion is made, demonstrating linkages to elements of biological knowledge and understanding, with occasional evidence to support the judgement being made. **D and, E OR A** **3 marks : at least 3 points. Any combination of D, plus E, or A** **4 marks : at least 4 points. Any combination of D, plus E, or A**
Level 3	5-6 (7-9)	A scientific judgement is made which is supported throughout by sustained application of relevant evidence from the analysis and interpretation of the scientific information. A conclusion is made, demonstrating sustained linkages to biological knowledge and understanding with evidence to support the judgement being made. **D, E, AND A** **5 marks : at least 5 points. Must have combination of D, E, and A** **6 marks : at least 6 points. Must have combination of D, E, and A**

Q7.

Question Number	Answer	Additional Guidance	Mark
	An answer that makes reference to three of the following: • both change the frequency of alleles / change genetic diversity (1) • both select against (less well adapted) phenotypes (1) • disruptive selection selects against {middle / mean / median} phenotypes but stabilising selection selects against extreme phenotypes (1) • disruptive selection leads to {two distinct populations / bimodal distribution} but stabilising selection maintains one population (1)	**Accept** change gene pool **Accept** converse **Accept** alleles for phenotypes **Do not accept** genes **Accept** converse **Accept** alleles for phenotypes **Do not accept** genes **Accept** clear labelled diagrams	**(3)**

Q8.

Question Number	Answer	Additional Guidance	Mark
(a)	An explanation that makes reference to four of the following: • {seed viability / germination} high in metal containers (1) • glass containers have similar properties to metal containers (1) • because {metal / glass} containers keep {air / moisture} out (1) • therefore seed water content is kept below 8% (1) • can see through glass without removing lid (1)	**Accept** converse for paper / cellophane	**(4)**

Question Number	Answer	Additional Guidance	Mark
(b)	• to produce valid (measure of seed viability / results / data)	**Accept** allows identification of anomalous result **Do not accept** if in list	**(1)**

Question Number	Answer	Additional Guidance	Mark
(c)	• difference calculated • how many times better calculated with units	<u>Example of calculation:</u> 90 – 16 = 74 74 ÷ 2 = 37 % year^{-1} or 74 ÷ 24 = 3.08 % month^{-1} / 3.1 % month^{-1} / 3 % month^{-1}	**(2)**

Question Number	Answer	Additional Guidance	Mark
(d)(i)	An explanation that makes reference to the following: • {viability test / germination} requires similar conditions as the country (1) • because germination is affected by {temperature / pH / light intensity / wavelength / humidity / vernalisation} (1) • if correct conditions not used seeds would not germinate even if viable (1)	**Accept** other relevant abiotic factor	(3)

Question Number	Answer	Additional Guidance	Mark
(d)(ii)	An explanation that makes reference to the following: • because flowering is affected by {day length / photoperiod / light and dark period} (1) • because flowering involves {phytochrome / P_R / P_{FR}} (1)	**Accept** florigen	(2)

Q9.

Question Number	Answer	Additional Guidance	Mark
(i)	• (index of diversity) takes into account populations (of each species) (1)	**Accept** considers abundance / number of each species **Accept** because an area could have many different species but different populations	1 exp

Question Number	Answer	Additional Guidance	Mark
(ii)	An answer that makes reference to two from the following points: • other species are also conserved (in the ecosystem) (1) • animals are not humanised / behaviours are natural / no change to behaviour (1) • less inbreeding occurs (1)	**Accept** converse for *in situ* **Accept** other species are protected / food webs are maintained / maintains biodiversity / maintains links in ecosystem **Accept** more space for animals **Accept** no need to transport animals **Accept** less inbreeding depression / maintain gene pool	**2 grad**

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation that makes reference the following points: • biodiversity has increased (in the paper project area) **more** (than the protected area) (1) • as less / no grassland is burnt / less poaching (1) • (more) niches are available / habitats are not destroyed / elephants transfer plant seeds (1) • local people make money from the paper project / if the elephants are not present, local people lose a source of income (1)	**Accept** biodiversity has increased but {did not increase / went down} in area where people are banned **Accept** grassland burning / poaching still occurs in unprotected area **Accept** converse for protected area **Accept** converse for protected area **Accept** people have a vested interest in the elephants / make a profit	**4 exp**

Q10.

Question Number	Indicative content
*	Answers will be credited according to candidates' deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. <u>Succession (S)</u>: • succession begins with seeds / roots (from previous crops etc), followed by herbaceous plants, shrubs and trees • increased plant diversity increases number of niches for animals, resulting in an increase in index of diversity • steep increase in diversity at approximately 20 years with herbaceous plants / shrubs providing high numbers of niches • index of diversity stabilises and then decreases as trees shade area • shade reduces herbaceous / shrub plant species reducing niche number and index of diversity <u>NPP (N):</u> • NPP increases as more herbaceous plants and shrubs with higher leaf areas grow • NPP reduces as the community ages due to increase in proportion of non-photosynthetic tissue (wood / roots) reducing photosynthesis rate compared to respiration rate • reduced mineral ion content due to lack of decay of leaves may reduce NPP <u>Mineral ions (M):</u> • starting mineral ions are low due to farming • mineral ions in soil increase with time due to humus / dead organic material from plants and animals • organic material is decomposed by microbes to release minerals • mineral ion content decreases in climax community as few leaves are dropped from pine trees so there is less decay

Level	Marks	Descriptor
0	0	No awardable content
1	1-2	Limited scientific judgement made with a focus on mainly just one method, with a few strengths/weaknesses identified. A conclusion may be attempted, demonstrating isolated elements of biological knowledge and understanding but with limited evidence to support the judgement being made. **Level 1: Description of succession (S) with little / no reference to graph**
2	3-4	A scientific judgement is made through the application of relevant evidence, with strengths and weaknesses of each method identified. A conclusion is made, demonstrating linkages to elements of biological knowledge and understanding, with occasional evidence to support the judgement being made. **Level 2: Explanation of succession (S) as shown in the graph linked to either N or M with some errors.**
3	5-6	A scientific judgement is made which is supported throughout by sustained application of relevant evidence from the analysis and interpretation of the scientific information. A conclusion is made, demonstrating sustained linkages to biological knowledge and understanding with evidence to support the judgement being made. **Level 3: Detailed explanation of succession (S) as shown in the graph over 50 years using N and M with only minor errors.**

Q11.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer that makes reference to two of the following: • less distribution of seeds (1) • fewer {mineral / ions / fertiliser / nutrients} from faeces / excretion (1) • less predation / eating of insects (1) • less pollination / birds are pollinators (1)	**ACCEPT** less nutrient recycling **ACCEPT** not fertilised by faeces	**2**

Question Number	Answer	Additional Guidance	Mark
(ii)	A description that makes reference to four of the following: • variety of seeds from each {species / type} are kept / seeds from many {species / types / varieties} are kept / seeds with high genetic diversity are kept (1) • kept at {low / cold / frozen} temperature (1) • kept in {low humidity / low moisture / dry} (1) • kept in {airtight / sealed / low oxygen} containers (1) • seeds tested for viability / X-ray seeds to detect embryos / sterilise (1)	**ACCEPT** cryogenics	**4**

Q12.

Question Number	Acceptable Answer	Additional Guidance	Mark
(i)	An explanation that makes reference to the following: • high value of horn incentivised hunters to break the law (1) • because trade ban led to black market and increase in price of horn (1) **OR** • demand for horn remained high (1)		

	• because CITES did not help to educate consumers / increasing disposable income in consuming nations / used for traditional medicine in some cultures (1) **OR** • ineffective enforcement (1) • because large areas of habitat are difficult to police / lack of resources available for enforcement / high value of horn funding bribery or corruption (1)		**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to the following: • fewer alleles in the gene pool due to smaller number of individuals (1) • greater frequency of homozygous genotypes due to mating of related individuals (1)		**(2)**

Q13.

Question Number	Answer	Additional Guidance	Mark
	N		**(1)**

Q14.

Question Number	Answer	Additional Guidance	Mark
(i)	different {alleles} in a gene pool / species / population OR different {species} in an {area / habitat / environment / ecosystem / community}	**ACCEPT** genetic variation within a species	**(1)**

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to the following: • only small number / 10 introduced / {founder effect / genetic bottleneck} has occurred / (1) • (resulting in a) limited gene pool / few different alleles / inbreeding in zoos / no other lynx present to provide new alleles (1)	**ACCEPT** converse for lynx in protected area **ACCEPT** converse for lynx in protected area **DO NOT ACCEPT** diversity of alleles	**(2)**

Q15.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to four of the following: any **two** from • {use of zoos / seed banks / captivity} to {prevent extinction / protect endangered species} (1) • {education about /raising money for / raise awareness}importance c conservation (1) • {breeding programmes / controlled feeding / removing predation / protect from poaching / veterinary care} to increase {numbers / population} (1) and any **two** from • need to avoid inbreeding by use of stud books / frozen sperm (1) • **ethical** issues (1) • loss of normal behaviours (1)	**e.g** safari park **ACCEPT** any correct method **e.g**. cannot hunt / domesticated / reliant on humans	**(4)**