PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



MARK SCHEME

TOPIC 10: ECOSYSTEMS

CHANGES IN ECOSYSTEMS

SCORE	PERCENTAGE
/92	%

STEMUP

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Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to five of the following points: • {pioneer species / mosses / lichens arrive} (after glaciers melt and colonise bare rock) (1) • {decomposition /decay} increases the soil depth / humus content / minerals / nutrients (1) • therefore (larger) plants can grow (due to soil depth / minerals / nutrients) (1) • leaf litter increases after 40 / 100 years as more herbaceous plants / shrubs / trees are present (1) • • (steep) increase in nitrate after 40 / 100 years as more leaves / plants / animals / faeces (1) • leaf litter falls (towards the end / from 150 – 250 years) as climax community has emerged (1)	**Accept** animals arrive / increased niches **Accept** larger plants **Accept** increase from 12.8 to 277 as equivalent to 40/100 **Accept** increase from 5.3 to 21.8 as equivalent to 40 / 100 **Accept** nitrate continues to increase due to presence of animals / faeces (as leaf litter falls)	**5 exp**

Q2.

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**

Q3.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to four of the following: • lichens are pioneer species (1) • they break down surface of rocks to create soil (1) • therefore other plants are able to {grow / be established}(1) • death and decay helps to {create humus / recycle minerals} (1) • therefore providing niches for either plants or animals (1)	Allow soil {becomes deeper / containsmore minerals / more fertile} Allow wider variety of plants or animalscan live there. Allow description of {trees / shrubs} growing Allow climax community develops	**(4)**

Q4.

Question Number	Indicative content	
*	Answers will be credited according to candidate's deployment of knowledge and understanding ofmaterial 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 thematerial which is indicated as relevant. Additional content included in the response must be scientific and relevant. **Descriptions** • crop yield is highest between 5 m and 10 m from hedgerow D • crop yield is lowest next to the hedgerow / crop yield is lower than the centre of the field upto 2.5 m • crop yield increases up to between 5 m and 10 m from the hedge and then decreases D • wind speed is lowest by the hedge D • wind speed increases with distance from the hedge D • temperature is higher by hedgerow / falls with distance D • hedgerows can increase crop yields, but fields need to be smaller D • hedgerows can take up land that could be used to grow crops D **Abiotic Explanations** • humidity is higher by the hedgerow A • reduced wind speed (by the hedge) increases the temperature A • transpiration /water loss / evaporation will be lower around hedgerow A • hedgerow acts as a wind break A • less than 2m from hedgerow productivity is lower due to competition / shading reducingphotosynthesis A • between 5m and 15 m, higher temperature will increase	**6**

	photosynthesis rate A • higher temperature is closer to optimal enzyme temperatures A • wind can affect crops pollinated by wind A **Biotic Explanations** • pollinating species and predators increase productivity B • predators consume herbivores / pests B • pollinators are essential for seeded crops / example B • hedgerow may compete for nutrients / water / light B • less need for pesticides to be used when predator species live in hedgerows B		
Level	**Marks**		
Level 0	Marks	No awardable content	
Level 1	1-2	Limited scientific judgement made with a focus on mainly just one method, with a fewstrengths/weaknesses identified. A conclusion may be attempted, demonstrating isolated elements of biological knowledge and understanding but with limited evidence to support the judgementbeing made. **Descriptions of factors** **one mark: any two from D** **two marks: three from D**	
Level 2	3-4	A scientific judgement is made through the application of relevant evidence, withstrengths and weaknesses of each method identified. A conclusion is made, demonstrating linkages to elements of biological knowledge andunderstanding, with occasional evidence to support the judgement being made. **Descriptions and explanations** **three marks: any four points from D, A or B** **four marks: any five points from D, A or B and**	
Level 3	5-6	A scientific judgement is made which is supported throughout by sustained applicationof relevant evidence from the analysis and interpretation of the scientific information. A conclusion is made, demonstrating sustained linkages to biological knowledge andunderstanding with evidence to support the judgement being made. **Detailed explanation of all factors and how use of hedges can be beneficial** **Descriptions and explanations** **five marks: any six points from D, A and B** **six marks: any seven points from D, A and B**	

Q5.

Question Number	Answer	Additional Guidance	Mark
(i)	**Effects on plants:** 1. { loss / eq } of (existing) species / extinction ; 2. idea of changes in distribution (of plants / species) ; 3. idea of changes in {numbers / size / growth / eq } (of plants / species) ; **Explanations (max 3):** 4. idea that there will be changes in rainfall patterns ; 5. idea of a change in growing seasons ; 6. idea that temperature may become too hot for some species OR credit a link made between temperature and enzyme activity ; 7. idea of increased carbon dioxide results in more {photosynthesis / GPP / NPP / biomass / eq} ; 8. idea of fall in pH in {oceans / rivers / eq} ;	**NB** any link to an affect must be correct 4 **ACCEPT** droughts 5 **ACCEPT** flowering times	**(4)**

Question Number	Answer	Additional Guidance	Mark
(ii)	1. idea of reduction of {herbivore / primary consumer} ; 2. idea that this would result in a reduction of {predator / secondary consumer / tertiary consumers} ; 3. idea that a change in {distribution / numbers / types / eq} of plants could result in a change in distribution of {herbivores / eq} ; 4. idea of loss of {habitat / eq} decreasing {breeding rate / numbers / eq } ; 5. idea of loss of {shelter / camouflage / eq} provides more food for predators so they would increase in {size / number} ;	**ACCEPT** converse for increase in plant {number / size / eq} 1 **ACCEPT** idea of loss of animals because of reduction in food supply 2 **ACCEPT** idea of loss of animals that feed on the herbivores 4 **ACCEPT** named example e.g. nesting place	**(3)**

Q6.

Question Number	Correct Answer	Additional guidance	Mark
(a)	An answer that makes reference to one of the following: • poached by humans for their horn (1) • *Arenga pinnata* outcompetes the food source/less food for rhino (1) • disease (1)		**(1)**

Question Number	Correct Answer	Additional guidance	Mark
(b)	An explanation that makes reference to two of the following: • difficulty in finding mates (1) • so population growth is affected (1) **or** • loss of genetic diversity / small gene pool (1) • so less resistance to environmental change (1)		**(2)**

Question Number	Correct Answer	Additional guidance	Mark
(c)	An answer that makes a reference to two of the following: • habitat maintenance / restoration / clearing *Arenga pinnata* (1) • locate breeding sites for reproduction (1) • protect the rhinos from poachers (1) • ensuring that the food source is maintained/plant more food source (1) • breeding programme outside of national park (1)		**(2)**

Q7.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • high light intensity promotes growth due to increased photosynthesis / high temperature promotes growth due to rapid rates of reaction (1) • however lack of { rainfall / water } limits { photosynthesis / transpiration } rate (1) • however { wind / high temperature } increases { transpiration rate / water loss } (1) • however wind results in soil erosion therefore poor soil quality (1)	Accept converse statements	**(4)**

Q8.

Question Number	Correct Answer	Additional guidance	Mark
	An explanation that makes reference to the following: • sea plantain (1) • idea of different latitudes have different (mean) temperatures (1) • sea plantain grows {better / eq} at all (three) temperatures / bog sedge does not grow very well at {lower temperatures / 10 °C and 14 °C} (1) • credit appropriate comparative manipulated figures (1)		**(4)**

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 the following: • (interactions) of {organisms / biotic factors / communities / living} and {environment / abiotic factors / non-living factors} (1)	**IGNORE** habitat / area	**1**

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to five of the following: • colonisation (of bare rock) by pioneer species / extremophiles / by organisms that withstand {low water / dry / low soil} (1) • (primary) succession occurs (1) • soil / humus produced (1) • therefore provides {water / minerals / nutrients / anchorage} for plants to grow (1) • provides niches / food / habitats for animals (1) • herbaceous plants / shrubs / trees become established / climax community emerging (1)	**ACCEPT** founder	5

Q12.

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

Q13.

Question Number	Answer	Additional Guidance	Mark
(i)	• calculate rate of growth for both treatments (1) • subtraction (1)	rate for weeds 11 ÷ 5 = 22 rate for herbicide 180 ÷ 5 = 36 36 - 22 = 14 (cm year^{-1}) Correct answer gains full marks, with no working shown	(2)

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to the following: • herbicide is more effective at removing weeds (1) • therefore there is less competition for {light / carbon dioxide / mineral ions / water} (1)	**ACCEPT** converse **e.g.** herbicide kills all the weeds but removing by hand lets them grow again **DO NOT ACCEPT** nutrients	(2)

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation that makes reference to two the following: • same species of tree because trees grow at different rates (1) • {animals / pests / disease / herbivores / insects} as they {affect growth / feed on trees} (1) • same {number / spacing} of trees to control (intraspecific) competition (1)	**ACCEPT** trees get same light / mineral ions / water	**(2)**

Q14.

Question Number	Answer	Additional Guidance	Mark
(a)	C ; nucleus and large (80S) ribosomes		**(1)**

Question Number	Answer	Additional Guidance	Mark
(b)	A ; algae have chloroplasts, the fungi do not		**(1)**

Question Number	Answer	Additional Guidance	Mark
(c)	1. (advantage of sexual reproduction / meiosis) {genetically different / greater gene pool / greater genetic diversity /eq} ; 2. (advantage of asexual reproduction / mitosis) faster / one of each organism needed / conserves advantageous alleles ;	**2. Accept** don't need a mate	**(2)**

Question Number	Answer	Additional Guidance	Mark
(d)(i)	C ; area exposed to bright sunlight and protected from the wind		**(1)**

Question Number	Answer	Additional Guidance	Mark
(d)(ii)	1. idea of using a quadrat ; 2. idea of {random / systematic} sampling (of wall) ; 3. {count number of squares/ determine area} containing lichen /eq ; 4. credit an indication of how the percentage was calculated ;	**1. Accept** description of quadrat, use of photo and a grid **3. NB** reference to measuring percentage cover only is too vague as it is repeating stem of question	**(3)**

Question Number	Answer	Additional Guidance	Mark
(d)(iii)	1. ref to use of light {probe / sensor /eq} ; 2. idea of taking several measurements ;	**1 Accept** description of a light sensor 2. Accept ref to places or times of day	**(2)**

Question Number	Answer	Additional Guidance	Mark
(d)(iv)	1. plot a (scatter) graph of light intensity against lichen / eq ; 2. reference to looking for a correlation ; 3. reference to use of statistics test ; 4. appropriate named test eg Spearman's rank, Pearson ;	**2. Accept** ref to line of best fit, ref to correlation coefficient also gets Mp 3	**(3)**

Q15.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An explanation that makes reference to four of the following: • colonisation by pioneer species (1) • which contribute dead organic matter to form soil (1) • therefore creating suitable conditions for other species to establish (1) • leading to { succession / a sequence of changes } in {a community / organisms / species / plants} (1)	Allow lichens	**(4)**
	• the final { stage / sere / community } is { self-sustaining / stable } (1)		