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General Certificate of Education

Biology 1411

BIOL4 Populations and Environment

Mark Scheme

2010 examination - January series

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Question	Part	Marking Guidance	Mark	Comments
1	(a)	Small surface area to volume ratio / more fat; Lose less heat (to the environment) / for insulation; When they are sitting on eggs;	2 max	
1	(b)(i)	The further north/higher the latitude, the higher the percentage (of white snow geese);	1	
1	(b)(ii)	Snow lying longer/melts slower further north/at greater latitudes; White geese better camouflaged (further north); Predation linked to survival/reproductive success;	3	**Q** In order to gain the last marking point, candidates must explain how survival or reproductive success is affected.
1	(c)	Snow melts earlier/snow melts further north / less snow; White geese decreasing as less well camouflaged/at disadvantage/blue geese increasing as better camouflaged/at an advantage;	2	
1	(d)(i)	Stabilising;	1	Do not accept stable
1	(d)(ii)	Few geese survive at the extremes/most survive from the middle of the range;	1	

Question	Part	Marking Guidance	Mark	Comments
2	(a)	Extracellular digestion / releases enzymes; Starch to monosaccharides /glucose/sugars/smaller molecules ; Respire product of digestion; Produce carbon dioxide from respiration;	2 max	
2	(b)	Correct answer of 40;; Incorrect answer showing clearly that a difference in mass has been divided by time;	2	
2	(c)	Lower as plants contain a lower proportion of nitrogen/higher proportion of carbon/ higher C:N ratio; Nitrogen found (mainly) in protein/amino acids / nitrogen used to make protein;	2	

2	(d)	Investigation refers to a single species and other species might not respond in the same way; Investigation carried out in greenhouse where conditions controlled; Accept any other valid answers relating to how an increase in carbon dioxide concentration might increase caterpillar damage, e.g.: Caterpillars may eat more to compensate (for low nitrogen/ protein); Increased temperature (resulting from higher carbon dioxide concentration will increase rate of growth /reduce generation time; Other organisms interfere with results;	2 max	Remember question concerns caterpillar damage

Question	Part	Marking Guidance	Mark	Comments
3	(a)	All organisms of one species in a habitat/area/place/at one time;	1	Accept group
3	(b)(i)	From curve **C**; Find age as a percentage of a maximum/find value when 5000/50% still alive; (Use to) calculate as a percentage of 95/ Answer = 85 years;	3	**Q** This question tests quality of written communication. Marks may be awarded for calculating the answer but this must be supported by adequate explanation making the points listed. If curve A or B are given, figures for last mark point are A 8 B 50 All three +/- 2
3	(b)(ii)	More disease/poor food supplies/poor sanitation/poor medical care; High death rate among the young/in childhood / curve drops steeply at first/in first 40;	2	Overcrowding not enough Ignore ref to years or percentage

Question	Part	Marking Guidance	Mark	Comments
4	(a)(i)	Method of positioning quadrats, E.g. Find direction and distance from specified point/ find coordinates on a grid / split area into squares; Method of generating random numbers; E.g. From calculator/telephone directory/numbers drawn from a hat;	2	Last point represents minimum answer **Q** Do not credit any method that relies on throwing a quadrat
4	(a)(ii)	Calculate running mean/description of running mean; When enough quadrats, this shows little change/levels out (if plotted as a graph); Enough to carry out a statistical test; A large number to make sure results are reliable; Need to make sure work can be carried out in the time available;	2 max	Ignore terms that are not incorrect Regards large numbers as 10/10% +
4	(b)	Coppice different parts of the wood at different times; As data show many daffodils flowering 4/5 years after coppicing;	2	**Q** Second point needs specific reference to the graph, numbers and time after coppicing. Accept any correct answer that does this.
4	(c)	<u>Positive</u> correlation between rainfall and flowering/the higher the rainfall, the more daffodil flowers; <u>Negative</u> correlation/the higher the temperature the fewer daffodils in flower; All statistically significant so not likely to be/not due to chance;	2 max	

Question	Part	Marking Guidance	Mark	Comments
5	(a)	Krebs cycle/link reaction/pyruvate to acetylcoenzyme A;	1	**Q** Accept valid alternative for any of these steps.
5	(b)	(Respiratory reactions controlled by) enzymes; Rate decreases as less kinetic energy/fewer collisions (between substrate and active site) fewer E-S complexes formed;	2	
5	(c)	Requires hydrogen/electrons / is reduction; Hydrogens from reduced NAD/reduced NAD reduces (pyruvic acid) / reduced NAD oxidised;	2	Information may be on diagram
5	(d)	Respiring anaerobically; (Anaerobic respiration/respiration with nitrogen) less efficient/produces less ATP; More anaerobic respiration/ more glucose/substrate must be respired to produce same amount of ATP (so more carbon dioxide produced);	3	

Question	Part	Marking Guidance	Mark	Comments
6	(a)	Vegetation consists mainly of low growing species/herbs/annuals/ no/few tress; Species **X** has high rate of photosynthesis at high light intensity; Species **X** grow fastest at high rate of photosynthesis / at high light intensities; Will outcompete other species **Y**/**Z**;	3max	 Do not credit Species **X** is first tree
6	(b)	Produces shade/reduces light intensity; Species **Z** grows best/photosynthesis best/ in low light intensity / Species **Z** does not grow well / low rate of photosynthesis in high light intensity;	2	 Accept answers in terms of CO_2 absorption

Question	Part	Marking Guidance	Mark	Comments
7	(a)(i)	Will work in all weather conditions/hairs will stick to it even if shrew/animal is wet/ withstand rain;	1	
7	(a)(ii)	So shrews come into contact with glue;	1	
7	(b)	Avoids bias/allows statistical tests to be carried out;	1	Allow description
7	(c)(i)	Increases the reliability of the measurements; If measurements are repeatable, differences less likely to be due to measurement/personal error/ anomalies unlikely;	2	Accept advantages of repeatable results. E.g. identifying anomalies/remove errors
7	(c)(ii)	Plot graph/scatter diagram of one set of results against the other; Expect to see points lying close to line / Line should slope upwards/show positive correlation; OR Plot measurement against hair number; Look for overlying / corresponding points;	2	**Q** To gain first marking point, candidates must say what has been plotted. If what is being plotted is not clear, second point cannot be awarded.
7	(d)(i)	One mark for a valid explanation based on individual shrews entering more than one hair tube / many hairs from same shrew/ shrews enter without leaving hair;	1	
7	(d)(ii)	Rules out differences due to changes in population / changes in environmental conditions; That could be produced by births/deaths/migration/specific example of environmental conditions affects results;	2	

7	(e)	(A statistical test) determines the probability of results being due to chance; Enables null hypothesis/description of null hypothesis to be accepted/rejected; Determines whether correlation/result is significant;	2 max	
7	(f)(i)	(Curve/line of best fit shows) positive correlation/ description of positive correlation;	1	
7	(f)(ii)	Curve/line of best fit (almost) parallel to x-axis/horizontal / level/ no correlation / index is independent of number of shrews; Hair tubes with positive results when no shrews trapped; Small size of shrews means shrews may not trigger traps;	2 max	

Question	Part	Marking Guidance	Mark	Comments
8	(a)	1 Light (energy) excites/raises energy level of electrons in chlorophyll; 2 Electrons pass down electron transfer chain; 3 (Electrons) reduce carriers/passage involves redox reactions; 4 Electron transfer chain / role of chain associated with chloroplast membranes / in thylakoids / grana; 5 Energy released / carriers at decreasing energy levels; 6 ATP generated from ADP and phosphate/P_i / phosphorylation of ATP;	5 max	**Q** Accept any reasonable alternative for electron transfer chain. Example such as chemiosmosis;
8	(b)	1 Some light energy fails to strike/is reflected/not of appropriate wavelength; 2 Efficiency of photosynthesis in plants is low/approximately 2% efficient; 3 Respiratory loss / excretion / faeces / not eaten; 4 Loss as heat; 5 Efficiency of transfer to consumers greater than transfer to producers/approximately 10%; 6 Efficiency lower in older animals/herbivores/ primary consumers/warm blooded animals/homoiotherms; 7 Carnivores use more of their food than herbivores;	6 max	**Q** Accept figures below 5%. Accept figures over 5% but below 10% if clearly related to maximum efficiency.

8	(c)	1	Slaughtered when still growing/before maturity/while young so more energy transferred to biomass/tissue/production;	4 max	**Q** The principle here is one mark for identifying a relevant point and offering an explanation. Accept other equivalent answers.
		2	Fed on concentrate /controlled diet /controlled conditions/so higher proportion of (digested) food absorbed/lower proportion lost in faeces / valid reason for addition;		
		3	Movement restricted so less respiratory loss / less energy used;		
		4	Kept inside/heating/shelter / confined so less heat loss / no predators;		
		5	Genetically selected for high productivity;		