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INTERNATIONAL A-LEVEL

BIOLOGY (9610)

BL03

Unit 3 Populations and genes

Mark scheme

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196XBL03/MS

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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Question	Marking guidance	Mark	Comments
01.1	Graph shows two distinct peaks (less light brown, more white and dark brown); White and dark limpets are better camouflaged; Less predation (of white + dark) / more predation of light brown;	1 1 1	If incorrect graph done, accept correct description of graph for 2 max e.g. White visible on darker rock / dark limpets better camouflaged on darker rock; More predation of white/light brown / less predation of dark; Accept idea that more visible to predators/birds for 'more predation'
01.2	(Not allopatric because) populations not geographically isolated; Sympatric speciation may occur / (so) speciation will not occur; **OR** Populations not separated / can still interbreed; (so) speciation will not occur;	1 1 1 1 Max 2	Accept description of geographical isolation e.g. mountain, river Mark as pairs
01.3	(Nail polish) may be toxic/harmful to limpet / may increase (chance of) predation;	1	

Question	Marking guidance	Mark	Comments
02.1	Complete set of <u>alleles</u> for a gene / all <u>alleles</u> of all genes; In a (single) population;	1 1	 Need idea of one/single
02.2	1. (Very) low population size at start / small founder population; 2. Reduction in gene pool / less (genetic) diversity / fewer alleles / alleles beneficial for survival in low frequency / lacking; 3. Less able to adapt to environmental change / more susceptible to disease;	1 1 1	 3. Allow other factor – eg climate extremes (heat/cold) / parasites / predators
02.3	63;;	2	Allow 1 mark for 2 correct figures from graph (400 animals in 2005 and 245 animals in 1975) Allow 1 mark for incorrect rounding (63.3/63.27/63.265) Do not allow 63.2

Question	Marking guidance	Mark	Comments
03.1	2850(kJ);;	2	1 mark for $\frac{38 \times 30 \times 100}{40}$
03.2	**Z;**	1	
03.3	No glycolysis (in isolated mitochondria) / glycolysis occurs in cytoplasm; Glycolysis produces pyruvate; OR Pyruvate enters mitochondria / glucose does not enter the mitochondria; (Pyruvate) used to produce acetate/acetyl coenzyme A/any Krebs cycle substrate;	1 1 1 1 Max 2	Mark as pairs
03.4	Prevent inhalation/contact with antimycin A; Respiratory inhibitor so dangerous / (respiratory inhibitor so) insufficient energy release (in cells) / risk of death;	1 1	
03.5	Oxygen final electron acceptor / oxygen after complex 4; Electrons do not reach end of chain/to complex 4 / electrons do not reach oxygen;	1 1	

Question	Marking guidance	Mark	Comments
04.1	Any **two** from: • Random sampling; • Large sample size; • Collect data from different locations / collect data at different times of year;	2 Max	
04.2	H < C;	1	
04.3	4.19% ;;	2	Allow 1 mark for (67÷1600) × 100 / 4.1875 / 4.188 / 4.2
04.4	More energy available for transfer / shorter food chain / less energy lost;	1	

Question	Marking guidance	Mark	Comments
05.1	Phenotype: (Expression of) genotype/genetic constitution **and** (its) interaction with the environment; Dominant: allele that always expresses itself when present / allele expressed in the heterozygote/in the presence of the other allele;	1 1	
05.2	a^t a^t **and** a^t a;	1	
05.3	(Male) a^y a **and** (Female) a^t a;	1	(Both genotypes must be correct)
05.4	Correct genetic diagram e.g. Punnett square; Correct numbers of offspring (8 light brown, 4 dark brown, 4 black);	2	
05.5	Due to chance/random variation / due to chance / because numbers of offspring are low;	1	
05.6	(Both) parents only have a^t or a alleles / parents do not have a^y allele;	1	

Question	Marking guidance	Mark	Comments
06.1	To prevent trampling/damage to eggs/young/nests;	1	
06.2	So predators (in trees/hedges) cannot see eggs/young / so predators cannot nest in trees/hedges / so predators cannot see when adult lapwings leave the nest;	1	

06.3	1. Comment on animals and tussocks e.g. (No because) highest proportion of field use with occasional tussocks and sheep grazing gives rare tussocks. (Yes because) sheep grazing gives rare tussocks but still high proportion of field use. (Yes because) low proportion of field use with cattle/horse grazing which gives frequent/abundant tussocks. 2. (SD overlap so) no significant difference in field use with rare and occasional tussocks / difference in field use with rare/occasional tussocks is due to chance; 3. Comment on animals and grass height e.g. (No because) highest proportion of field use at about 7.5 cm and sheep grazing gives 4 – 6 cm (No because) highest proportion of field use at about 7.5 cm and cattle grazing gives 5 – 8 cm (Yes because) high proportion of field use at 5 cm and sheep grazing gives 4 – 6 cm; 4. (SD overlap so) no significant difference between 5 cm and 7.5 cm / any difference between field use at 5cm and 7.5cm is due to chance; 5. No data on field use for < 5 cm and horse grazing gives 2-3 cm/sheep grazing gives 4 cm; 6. No data on lapwing population;	1 1 1 1 1 1 Max 4	

06.4	Effect on other plants/animals suggested e.g. ideal conditions for lapwings, but what about conservation of other organisms; Effect on biodiversity suggested e.g. (succession prevented so) no increase in biodiversity;	1 1	

Question	Marking guidance	Mark	Comments
07.1	bottle in beaker of water / glass screen/tank of water between lamp and bottle;	1	
07.2	Temperature is limiting factor; Light independent reactions are enzyme-controlled; OR Increasing temperature increases kinetic energy (of molecules); More successful collisions increases rate of reaction;	2	
07.3	1.8; 0.6;	2	
07.4	1 Axes correct way round, linear scales, both axes labelled (no units); 2 five points correctly plotted; 3 Smooth curve drawn;	3	
07.5	0.81 – 0.84;	1	

07.6	(Bottle 1) All wavelengths of light so high rate of photosynthesis / rate of photosynthesis greater than rate of respiration; CO_2 removed from solution / CO_2 is used in photosynthesis / concentration of CO_2 in solution decreases (increasing pH); (Bottle 5) No light so no photosynthesis / only respiration; CO_2 added to solution / concentration of CO_2 increases (so pH decreases);	1 1 1 1	

07.7	red; (because) rate of photosynthesis is higher than bottle 3/green light and lower than bottle 4/blue light;	2	

07.8	(these) wavelengths of light correspond to green light; (green light) not absorbed (by chlorophyll) / (green light) reflected (by chlorophyll);	2	

Question	Marking guidance	Mark	Comments
08.1	(advantages) 1. More time feeding so more conversion to biomass; 2. More time resting so less energy lost through movement and more conversion to biomass; 3. Flies may transmit disease / increase risk of infection so healthier/better growth; (disadvantages) 4. Economic consideration – cost of pesticide vs gain in biomass / productivity / have to be reapplied so expensive; 5. Horn fly may develop resistance to pesticide; 6. Safety of pesticide – harmful effects on animal/meat; 7. Effects on environment – harmful to other organisms/beneficial insects / accumulate in food chain;	Max 5	

08.2	1 Decomposers/saprophytic microorganisms (in soil) hydrolyse/breakdown/digest animal waste/faeces; 2 Ammonium ions/NH_4^+ released (into soil) / description of ammonification; 3 (Ammonium ions) converted to nitrites/nitrates / description of nitrification / description of nitrifying bacteria; 4 Nitrates taken up by producers/grass and used in amino acid/protein synthesis; 5 (Cattle) eat grass and proteins broken down to amino acids by hydrolysis**;** 6 Amino acids used to produce animal protein;	1 1 1 1 1 1	 2. Allow ammonia/NH_3 5. Allow clear description of hydrolysis e.g. digested using protease enzymes.

08.3	Nitrates/urea/nitrogen-containing compounds/other named ions are washed into pond; (Increased nitrates) cause increased growth of algae / cause algal bloom; Algae contain chlorophyll/photosynthetic pigments so green colour;	1 1 1	