OXFORD
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INTERNATIONAL A-LEVEL

BIOLOGY

BL03 (9610)

Unit 3 Populations and Genes

Mark scheme

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2 2 1 X B L 0 3 / M S

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 Examiner.

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.

Further copies of this mark scheme are available from oxfordaqaexams.org.uk

Question	Marking guidance	Mark	Comments
01.1	(Fatty acids) more reduced coenzymes **OR** more reduced NAD **OR** reduced FAD present **OR** More acetyl coenzyme A **or** more CoA **OR** More (turns of the) Krebs cycle **OR** More hydrogen for electron transfer chain **or** more hydrogen for electron transport chain **or** more hydrogen for oxidative phosphorylation;	1	*Allow more hydrogen for ETC*

Question	Marking guidance	Mark	Comments
01.2	1. pyruvate not produced **OR** fatty acids converted directly to acetyl coenzyme A; 2. NAD not regenerated;	2	

Question	Marking guidance	Mark	Comments
01.3	Moles;	1	Accept mol dm^{-3}

Question	Marking guidance	Mark	Comments
01.4	(RQ =) 0.76; Idea that RQ is in between fatty acids and amino acids **OR** fatty acids and glucose;	2	*Allow 0.8*

Question	Marking guidance	Mark	Comments
01.5	1. Lipids/fatty acids have a low(er) RQ; 2. (So) less CO_2 produced;	2	

Question	Marking guidance	Mark	Comments
02.1	Same area so environmental/abiotic factors similar **OR** Large study area so representative **or** reduces sampling bias **OR** Several sample sites so representative **OR** 25 years so sufficient time for succession;	1	

Question	Marking guidance	Mark	Comments
02.2	1. Significant difference after 15/16 years because error bars do not overlap **OR** No significant difference when error bars overlap e.g. 5 to 12/15 years; 2. No error bars for clearcut in some years e.g. 13 to 15 years; 3. No data for pasture in some years e.g. 25 to 30 years;	3	

Question	Marking guidance	Mark	Comments
02.3	1. (Initial colonisation by) pioneer species **or** colonisation by organisms adapted to initial conditions; 2. These organisms change the environmental/abiotic conditions; 3. Less hostile / more favourable conditions allow other organisms to become established;	3	2. Accept named abiotic condition 3. Accept more niches **or** more habitats **or** more types of food

Question	Marking guidance	Mark	Comments
02.4	1. Nitrates from soil absorbed by plants **OR** nitrates (from soil) used to make plant protein; 2. Nitrogen removed through cattle grazing **OR** nitrates removed faster than replaced **OR** Less remains of dead plants/animals to return nitrogen-containing compounds to soil;	2	Accept named nitrogen-containing compound

Question	Marking guidance	Mark	Comments
02.5	1. (*Cecropia* succession facilitator because) more types of animals so more types of seeds; 2. *(Vismia* succession inhibitor because*)* less light to ground so less growth/photosynthesis of new plant species;	2	1. Accept converse for *Vismia* 2. Accept converse for *Cecropia*

Question	Marking guidance	Mark	Comments
03.1	(DNA) Code for the proteins needed for chloroplast function(s); (Ribosomes) synthesise the proteins needed for chloroplast function(s);	2	For full marks, must mention chloroplast function(s) at least once e.g. photosynthesis

Question	Marking guidance	Mark	Comments
03.2	1. (Energy from electron transfer used) to pump protons into the thylakoid space **OR** to establish a proton gradient (described); 2. (Protons/H^+) diffuse from thylakoid space **OR** diffuse into stroma **OR** move down concentration gradient; 3. (Protons/H^+ diffuse) through ATP synthase; 4. Energy released used to join ADP with P_i/inorganic phosphate;	3 max	4. Do not allow energy produced

Question	Marking guidance	Mark	Comments
03.3	(Total area =) 476.8875 μm^2;;	2	Award 2 marks for: correct rounding of the correct answer e.g. 477, 476.9 correct use of π button or π to different number of dp e.g. 477.129 or 477.19 Award 1 mark for: area of one thylakoid = 0.317925 incorrect area x 25 x 60 1907.55 (use of diameter) 2119.5 (use of *r* not r^2)

Question	Marking guidance	Mark	Comments
03.4	1. Large area of thylakoids/membrane so more chlorophyll; 2. (So) more light absorbed for light dependent reaction; **OR** 3. Large area of thylakoids/membrane so more proteins in electron transfer chain **or** so more ATP synthase; 4. More ATP produced;	2	

Question	Marking guidance	Mark	Comments
04.1	1.5 (°C);	1	

Question	Marking guidance	Mark	Comments
04.2	1. Both show overall increase; 2. Specific year(s) identified where rainfall and yield correlated; 3. Fluctuations and/or years identified when no correlation; 4. Correlation doesn't mean causation / other factors affect yield;	3 max	Max 2 if no data used

Question	Marking guidance	Mark	Comments
04.3	Spearman rank / correlation coefficient; Testing for a (significant) correlation/relationship/association between (two sets of) data;	2	Allow testing for a correlation/relationship/association between temperature/rainfall and maize yield

Question	Marking guidance	Mark	Comments
04.4	1. Temperature and rainfall have significant correlation with crop yield in maize, sugar beet and sunflower; 2. (Because) $p < 0.05$/5%; **OR** 3. Temperature and rainfall have no significant correlation with crop yield in soybean; 4. (Because) $p > 0.05$/5%;	2	1. Accept the correlation between temperature and rainfall on crop yield in maize, sugar beet and sunflower is not due to chance; 3. Accept the correlation between temperature and rainfall on crop yield in soybean is due to chance; Allow ECF from test selected in **04.3**

Question	Marking guidance	Mark	Comments
05.1	1. To prevent contamination with mould or bacteria; 2. (Mould or bacteria) compete with seeds (for resources) **OR** (mould or bacteria) kill the seeds **OR** (mould or bacteria) cause disease in seeds **OR** (mould or bacteria) prevent germination;	2	1. Allow to sterilise (the seeds/forceps) 1. Do not allow mould or bacteria 'removed'

Question	Marking guidance	Mark	Comments
05.2	Any **two** from: Type **or** age **or** species **or** size of seed Concentration **or** composition of agar e.g. nutrient content, pH Volume/depth of agar Temperature;;	2 max	

Question	Marking guidance	Mark	Comments
05.3	(So) not competing for light **OR** do not receive different amounts of light;	1	

Question	Marking guidance	Mark	Comments
05.4	1. Prevent germination **or** slow germination; 2. Reduced rate of reaction (described) **or** enzymes inactive;	2	2. Allow below optimum temperature for enzymes

Question	Marking guidance	Mark	Comments
05.5	1.00; 1.36;	2	Award 1 mark for both correct values to incorrect numbers of decimal places

Question	Marking guidance	Mark	Comments
05.6	To allow comparison (between Petri dishes with different numbers of seeds);	1	

Question	Marking guidance	Mark	Comments
05.7	1. Suitable scales, axes labelled and correct orientation; 2. All points plotted correctly; 3. Points joined **OR** line of best fit;	3	Marking points 1 and 2 can be awarded for a bar chart 1. Orientation: x-axis = sowing density and y-axis = % germination 2. Using values from Table 4 2. Points plotted ± half one small square 3. Allow reasonable extrapolation

Question	Marking guidance	Mark	Comments
05.8	1. 0.44 seeds cm^{-2} gives highest percentage germination; 2. No repeats; 3. Only one type of seed; 4. Artificial conditions **OR** in laboratory **OR** agar not soil; 5. Intermediate sowing densities not tested (idea of); 6. No statistical test;	3 max	Must have marking point 1 for full marks 6. Allow no standard deviation

Question	Marking guidance	Mark	Comments
06.1	1. Stabilising selection; 2. Selects against extremes;	2	Accept 1. directional selection only if sensible reason for choice given 2. e.g. few nests have large clutch sizes or converse

Question	Marking guidance	Mark	Comments
06.2	(Yes) 1. (Clutch size of 7) has highest percentage of eggs that hatched; (No) 2. Only one nest with a clutch size of 7; 3. No clutch size of 8; 4. Only 1 population; 5. Only 1 year;	3 max	Must have marking point 1 for full marks 4. Allow only one group of geese or only in one location

Question	Marking guidance	Mark	Comments
06.3	1. Too many eggs for female to keep warm; 2. Too many young for parents to protect; 3. More competition for food;	3	2. Allow more eggs/young attract more predators

Question	Marking guidance	Mark	Comments
07.1	1. Community **or** biotic components (of an area); 2. Named example relationship from Figure 10 e.g. feeding relationship; 3. Non-living **or** abiotic components (of an area); 4. Correct example of abiotic factor from Figure 10 e.g. salt concentration, light intensity, temperature, pH;	4	3. Allow habitat Allow 1 mark for ecosystem = abiotic + biotic factors unqualified

Question	Marking guidance	Mark	Comments
07.2	Population size can be reduced by: 1. Intraspecific competition occurs **or** individuals of the same species compete with one another for resources e.g. food, mates; 2. Interspecific competition occurs **or** individuals of different species compete for resources e.g. food; 3. Predation; 4. Human activity e.g. hunting, pesticides; 5. Disease or parasites;	5	1 and 2 Accept examples of competition between named organisms from Figure 10 3. Allow population size of predator/prey may fluctuate due to predator-prey cycles

Question	Marking guidance	Mark	Comments
07.3	1. Increasing light intensity increases rate of photosynthesis (until another factor becomes limiting); 2. More electrons excited from chlorophyll **OR** more electrons from photolysis of water **OR** more energy (from excited electrons) to generate ATP and reduced NADP; 3. Increasing carbon dioxide concentration increases rate of photosynthesis (until another factor becomes limiting); 4. More carbon dioxide to react with ribulose bisphosphate/RuBP **OR** more carbon dioxide to combine with rubisco **OR** more carbon dioxide to form glycerate 3-phosphate GP; 5. Increasing temperature increases rate of photosynthesis (until optimum reached) **OR** rate of photosynthesis decreases at high temperatures; 6. More collisions between rubisco/enzymes and carbon dioxide/substrates **OR** rubisco/enzymes denatured at high temperatures;	6	Accept converse 3. Allow increasing concentration of named mineral ion increases rate of photosynthesis e.g. magnesium, nitrates, phosphates 4. Allow example of use of mineral ion e.g. more nitrate for production of chlorophyll/enzymes