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INTERNATIONAL A-LEVEL

BIOLOGY (9610)

BL03

Unit 3 Populations and Genes

Mark scheme

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Question	Marking guidance	Mark	Comments
01.1	No (natural) predators;	1	Accept reference to better environmental conditions e.g. temperature Accept pesticides used in South America but not in Africa/Asia Accept no pathogens specific to mealybugs

Question	Marking guidance	Mark	Comments
01.2	(**Advantages of wasps**) 1. Specific to one pest **OR** only kill target species; 2. (Reproduce so) repeat application unnecessary **OR** reproduce so more cost effective; 3. No resistance develops; 4. No accumulation of chemicals; (**Disadvantages of wasps**) 5. Speed of action is slower than with chemicals; 6. Wasps may become pests **OR** have no natural predator **OR** may disrupt food chain;	4 max	Must include at least one disadvantage for full marks 2. Do not accept 'cheaper' unqualified 4. Ignore reference to pollution

Question	Marking guidance	Mark	Comments
02.1	Not competing for food / breeding sites / weed cover **OR** occupy different niches;	1	Do not accept 'less competition' unqualified Ignore type of competition

Question	Marking guidance	Mark	Comments
02.2	(Type) disruptive selection and (reason) selecting extremes **or** selecting against mean;	1	Both type and reason needed for the mark

Question	Marking guidance	Mark	Comments
02.3	1. Development of new species from existing species; 2. No geographical barrier **or** in same area;	2	

Question	Marking guidance	Mark	Comments
02.4	1. Mutations occur; 2. Reproductive isolation **or** no interbreeding **or** separate gene pools; 3. Change in allele frequency; 4. Different alleles selected OR different selection pressures; 5. Eventually cannot interbreed to produce fertile offspring;	4 max	2. Accept no gene flow

Question	Marking guidance	Mark	Comments
03.1	1. No glycolysis so less ATP (from glycolysis); 2. Less reduced NAD from glycolysis / link reaction / Krebs cycle; 3. (So) less oxidative phosphorylation **or** less reduced coenzymes to electron transfer chain;	3	2. Accept description of glycolysis / link reaction 3. Accept ETC for electron transfer chain

Question	Marking guidance	Mark	Comments
03.2	1. Oxaloacetate levels decrease; 2. (So) less acetyl CoA enters Krebs cycle **or** less acetyl CoA combines with oxaloacetate; 3. Acetyl CoA produced from glycolysis / link reaction;	3	

Question	Marking guidance	Mark	Comments
03.3	1. Less reduced coenzymes produced; 2. Less electrons/protons to electron transfer chain; 3. (So less oxygen needed as) oxygen is final electron acceptor in electron transfer chain;	3	1 and 2 reject reference to 'No' but once only 2. Accept ETC for electron transfer chain

Question	Marking guidance	Mark	Comments
04.1	1. Correct parental genotypes (female X^RX^r and male X^RY); 2. Correct offspring genotypes matched to phenotypes (female, red eye X^R X^R, female red eye X^RX^r, male red eye X^RY and male white eye X^rY);	2	

Question	Marking guidance	Mark	Comments
04.2	1. Females need two recessive (white) alleles (for it to be expressed); 2. Males only have one allele for gene **OR** recessive (white) allele always expressed in males;	2	2. Accept males only need one allele

Question	Marking guidance	Mark	Comments
04.3	1. Correct gametes (female GN, Gn, gN and gn, male gn); 2. Correct genotypes matched to correct phenotypes (GgNn grey normal, Ggnn grey short, ggNn black normal, ggnn black short) with 1 : 1 : 1 : 1 ratio;	2	

Question	Marking guidance	Mark	Comments
04.4	1. The genes (for body colour and wing length) are linked **or** on the same chromosome; 2. Linked genes are inherited together **OR** high numbers of GN and gn gametes (from GgNn parent); 3. Low number of recombinants **OR** low frequency of crossing over **OR** low numbers of gN and Gn gametes;	3	

Question	Marking guidance	Mark	Comments
04.5	1. With 3 degrees of freedom; 2. $P < 0.05$ or $\chi^2 >$ critical value of 7.82; 3. So difference from expected result not due to chance **or** So this difference from expected result is significant **or** So reject null hypothesis;	3	

Question	Marking guidance	Mark	Comments
05.1	Any **two** from: • Beads may be different size • (Idea of) number of algal cells **or** concentration of algal cells per bead may differ • (Idea of) algal cells could be damaged by chemicals;	2 max	

Question	Marking guidance	Mark	Comments
05.2	(Idea of) carbon dioxide is produced in respiration;	1	Accept pH affected by respiration

Question	Marking guidance	Mark	Comments
05.3	1. (Dry because) water/chemicals could change pH/colour of indicator; 2. (Change in pH/colour) makes the rate of photosynthesis seem faster/slower; 3. (Clean so) light intensity not reduced;	2 max	

Question	Marking guidance	Mark	Comments
05.4	1. Suitable scales and axes labelled; 2. All points correctly plotted; 3. Line of best fit correctly drawn;	3	 3. Ignore extrapolation

Question	Marking guidance	Mark	Comments
05.5	Result of 0.57 **or** 40 000 lux identified and does not lie on curve of best fit **or** does not fit the pattern/trend;	1	

Question	Marking guidance	Mark	Comments
05.6	Bottle too far from lamp **OR** contamination with water **OR** fewer algae in beads **OR** left for less than 45 minutes **OR** temperature lower;	1	Accept smaller number of beads

Question	Marking guidance	Mark	Comments
05.7	1. (Decrease in temperature) decreases rate of reaction; 2. Less organic compound produced; **OR** 3. (Temperature too high) enzymes denatured; 4. Less organic compound produced;	2 max	Mark as pairs 1 and 2 accept converse 2 and 4 accept named organic compound e.g. glucose

Question	Marking guidance	Mark	Comments
05.8	1. Higher mean dry mass at higher concentration of CO_2; 2. Significant difference in dry mass as error bars do not overlap; **BUT** 3. Only used two concentrations of CO_2; 4. Only used radish plants; 5. In lab not outside; 6. Dry mass only measured for 6/7 days **OR** investigation only for 21/22 days; 7. Plants in high CO_2 had higher mean dry mass at start;	4 max	Must have marking point 1 or 2 for full marks 2. Do not accept results are significant

Question	Marking guidance	Mark	Comments
06.1	Grazing (by livestock) OR (removal of shrubs/trees by) mowing or burning or dredging;	1	Accept use of weedkiller/herbicide Accept cutting down trees

Question	Marking guidance	Mark	Comments
06.2	1. (Idea of) prevents (existing) species from being outcompeted; 2. (So) prevents development of climax community;	2	

Question	Marking guidance	Mark	Comments
06.3	One species will be outcompeted;	1	Accept one species may become extinct Do not accept competition unqualified

Question	Marking guidance	Mark	Comments
06.4	(-)0.647 / 0.65 ;;	2	Award **two marks** for answer of 1 (rounded up to whole number of breeding pairs) Award **two marks** for correct answer to any number of decimal places e.g. 0.6 Award **one mark** for an answer of 283 / 283.5 [decrease per year 4252/15] or for 9.7 [decrease per km^2 4252/438]

Question	Marking guidance	Mark	Comments
06.5	(**Supporting conclusion**) 1. (Table 7 shows) decline in NW and S; 2. Decline in S is significant (as P < 0.05); 3. (Figure 8 shows) significant decrease (in breeding density) with conservation management in NW; 4. Change measured over long time period; (**Against conclusion**) 5. (Table 7 shows) decline in NW is not significant (as P > 0.05); 6. (Figure 8 shows) significant decrease in South without management OR non-significant decrease with management; 7. No data about other regions e.g. East; 8. Error bars overlap between no conservation management and conservation management so no significant difference; 9. Only measured in two years (1996 and 2011);	4 max	Must have at least one supporting and one against conclusion for maximum mark Do not accept results significant for marking points 2, 3, 5 and 6

Question	Marking guidance	Mark	Comments
07.1	1. Nitrogen-fixation or nitrogen-fixing bacteria; 2. (Nitrogen-fixing bacteria) convert nitrogen (gas) into nitrogen-containing compounds/ammonia/ammonium ions; 3. (Free-living) in soil **OR** in root nodules (of legumes); 4. Nitrification or nitrifying bacteria convert ammonia/ammonium ions to nitrites **OR** nitrification or nitrifying bacteria convert nitrites to nitrates; 5. Denitrification or denitrifying bacteria; 6. (Denitrifying bacteria) convert soil nitrates into nitrogen (gas); 7. Water-logged conditions **OR** lack of oxygen **OR** anaerobic conditions;	6 max	2 and 4 Accept NH_3 / NH_4^+ for ammonia / ammonium ions 4 and 6 Accept NO_2^- / NO_3^- for nitrites / nitrates

Question	Marking guidance	Mark	Comments
07.2	1. Light-independent reaction of photosynthesis uses carbon dioxide (so decreases concentration in atmosphere); 2. Link reaction **or** Krebs cycle **or** anaerobic respiration produces carbon dioxide (so increases concentration in atmosphere); 3. During day rate of photosynthesis greater than rate of respiration so carbon dioxide removed from atmosphere; 4. At night respiration only so carbon dioxide released into atmosphere; 5. Seasonal fluctuations in carbon dioxide described e.g. concentration higher in winter than in summer;	4 max	1. Accept Calvin cycle or description of light-independent reaction

Question	Marking guidance	Mark	Comments
07.3	1. Deforestation / cutting down trees means less carbon dioxide is removed (from the atmosphere); 2. Burning fuels releases carbon dioxide into the atmosphere; 3. Farming techniques / cattle grazing / rice fields release methane into the atmosphere; 4. Destruction of carbon sinks e.g. peat bogs, releases carbon dioxide (into atmosphere); 5. Increased concentrations of carbon dioxide / methane increase the greenhouse effect;	5	4. Accept deforestation as destruction of carbon sinks 5. Accept description of increased greenhouse effect