A-LEVEL
BIOLOGY

BIO6X – Investigative and practical skills in A2 Biology
Mark scheme

2410
June 2014

Version 1.0: Final

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.

Further copies of this Mark Scheme are available from aqa.org.uk

BIO6X: Task 1

Question	Marking Guidance	Mark	Comments
1	Maggot moves more slowly/maggot turns more often/more favourable environment for maggot;	1	Accept 'prevents maggot drying out'. 'Natural/preferred environment' insufficient.
2(a)	Equal distance to edge/same starting point for each maggot;	1	
2(b)	Fold filter paper in half twice and use intersection/draw 2 diameters and use crossing point/measure diameter and use half way;	1	
3	May harm maggot;	1	
4	Maggot's whole body changed direction/maggot turned by x˚;	1	
5	To prevent maggot being influenced by its previous movement;	1	
6	One reading acts as a control for the other/light intensity is the only factor that changes;	1	Allow 'eliminates the variation between maggots'.
7	1. Move more quickly out of bright light/less favourable environment; 2. Reduces chance of predation/drying out;	2	1. Do not accept converse here. 1. Reject any statement that implies 'intent' by the maggot.
	Total	**9**	

BIO6X: Task 2

Question	Marking Guidance	Mark	Comments
8(a)	There is no (rank) correlation between the number of turns the maggot makes and the time it takes to move off the filter paper;	1	Accept 'association/ relationship' for 'correlation'. Do not accept 'The number of turns has no effect on the time it takes to move off the filter paper' or vice versa.
8(b)	Spearman rank;	1	
8(c)	Looking for associations between (different) measurements (from the same sample);	1	Accept 'association/ relationship' for 'correlation'. Accept other ways of expressing 'measurements' e.g. 'my data'.
8(d)	Test statistics calculated correctly;	1	
8(e)	1. Calculated value greater than critical value for 10 pairs/0.65 so reject null hypothesis; 2. ≤0.05 probability that the (correlation in) results occurred by chance/>0.95 probability that the (correlation in) results did not occur by chance; ***OR*** 1. Calculated value less than critical value for 10 pairs/0.65 so accept null hypothesis; 2. >0.05 probability that the (correlation in) results occurred by chance/≤0.95 probability that the (correlation in) results did not occur by chance;	2	1. Credit for mp 1 can be given if partly shown elsewhere on page. 2. Must include greater than/less than. 2. Accept 5%/95% probability but not 0.05%/0.95% probability
	Total	**6**	

BIO6X: Written Test

Section A

Question	Marking Guidance	Mark	Comments
9	1. Light intensity; 2. Temperature; 3. Humidity; 4. Food source;	2 max	1. Allow 'brightness/ wavelength of light'
10	1. A non-directional response to a stimulus; 2. Results in changed rate of movement/turning; 3. Keeps an organism in a favourable environment/until organism is in a more favourable environment;	2 max	1. Allow 'a random response to a stimulus' 2. Idea of rate is required. 3. Do not accept if given with idea of directional movement.
11	1. Draw a line along the path of the maggot and measure this distance; 2. Divide distance moved by maggot in mm by time in seconds;	2	
12(a)	1. To see if there was an association/relationship/correlation between the two variables; 2. Two <u>continuous</u> variables;	1 max	2. Allow 'data are <u>continuous</u>'
12(b)	1. Genetic (variation); 2. (Differences in) age/size/mass; 3. (Different) starting orientation; 4. (Different) sex;	2 max	Reject '(different) species'. 4. Allow '(different) gender'.

12(c)	Yes (because) 1. <u>Positive correlation</u>; 2. More turns does mean the maggot stays in the same area for longer; No (because) 3. No statistics; 4. Don't know if the trend is significant/not due to chance; 5. No evidence here of whether this is linked to conditions being favourable;	3 max	2. Accept 'filter paper' for 'same area'. 4. Do not accept 'results' for 'trend'.

Total	**12**	

BIO3X: Written Test
Section B

Question	Marking Guidance	Mark	Comments
13	Push – legume Pull – grass;	1	Both needed for mark
14	1. Set up tape measures on two sides of the plot/make grid of plot; 2. Use random number table/calculator/generator; 3. To generate coordinates;	3	1. Allow 'Number each plant'. With this approach mp3 cannot be awarded. 2. Allow 'Select from a hat' idea.
15	1. To prevent competition between the maize and the grass; 2. For light/nutrients/water; ***OR*** 3. Idea of limits movement of pest (between grass and maize); 4. Only eating/damaging grass;	2 max	
16	1. Nitrogen-fixing bacteria convert nitrogen (in the air) into ammonium compounds (in the soil); 2. These ammonium compounds are converted into nitrates/nitrification occurs; 3. Maize uses nitrates (in soil) for amino acid/protein/ATP/nucleotide production;	2 max	1 and 2. Accept 'ammonia' for 'ammonium compounds'. 3. Must be in the context of maize. Ignore ionic formulae unless only these are given.

17	1. Reduced % damage to maize plants/increased maize grain yield; 2. Calculation to justify mp 1; 3. Standard deviation shows no overlap but need stats to show significance of this difference; 4. More profit/net income/greater income than additional cost (with push-pull); 5. $322 extra/408% more/$401 v $79 profit;	3 max	5. Accept '$350 extra income compared to $28 extra spend'. Mp5 gains credit for both mp4 and 5
18(a)	Any difference is due to the treatments/push-pull;	1	
18(b)	1. More food eaten without pesticide (than food with pesticide); 2. (Standard error) bars overlap so no significant difference;	2	2. If bars are named then must be standard error bars i.e. do not credit 'standard deviation bars'. 2. Allow 'confidence limits overlap so no significant difference'.
19	Taxis;	1	If more information is given then it must be correct for a positive chemotaxis.
20	1. More food with pesticide eaten when push-pull used; 2. No overlap of standard error bars so (suggests) significant difference; 3. (So) likely to result in death of more insects;	3	

21	1. Keeping pest below economic injury level/controlling pest population rather than eradicating it; 2. Using a combination of pest control strategies with at least two examples eg biological, chemical, mechanical;	2	
22	Agree (because) 1. **Resource A** shows successful control of pest (without use of pesticide); Disagree (because) 2. Only shown for one pest on one crop; 3. May not be a plant to use as pull stimulus/push stimulus; 4. **Resource A** shows no comparison for pesticide use; 5. **Resource B** still uses chemical pesticide to destroy the insect; 6. Push-pull likely to reduce chemical pesticide use not to eliminate it;	3 max	Max 2 for disagree mark points. 3. Accept 'may not be a grass/legume'.

Total	**23**	