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Mark Scheme (FINAL)
Summer 2008

GCE

GCE Biology (6106/02)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1(a)		**(3)**

	Opening angle / degrees	
Stalk number	Lightly shaded habitat	Heavily shaded habitat
1	70.75	75.75
2	65.33	80.50
3	68.50	68.17
4	52.00	82.33
5	72.25	69.25
6	66.50	74.00
7	71.75	79.00
8	66.67	78.50
9	75.17	81.75
10	58.25	73.33
Mean	66.72	76.26

[shaded optional column]

1. table of values with correct headings and units ;
2. correct calculations of degrees ;
3. correct overall means calculated from those in each habitat ;

OR (using ranked data)

	Opening angle / degrees	
Stalk number	Lightly shaded habitat	Heavily shaded habitat
1	52.00	68.17
2	58.25	69.25
3	65.33	73.33
4	66.50	74.00
5	66.67	75.75
6	68.50	78.50
7	70.75	79.00
8	71.75	80.50
9	72.25	81.75
10	75.17	82.33
Mean	66.72	76.26

Question Number	Answer	Mark
1(b)	**A** axes correct orientation and scale with units and labels ; **F** bar chart with key and points plotted correctly ;	**(2)**

Question Number	Answer	Mark
1(c)	there is no <u>significant</u> difference between the opening angle of leaves in lightly and heavily shaded habitats ;	**(1)**

Question Number	Answer	Mark
1(d)	1. calculated value (3.62) is greater than the critical value at 5% level [95% confidence level](2.10) ; 2. (therefore) there is a <u>significant</u> difference between the opening angle of the leaflets in lightly and heavily shaded habitats ;	**(2)**

Question Number	Answer	Mark
1(e)	1. difficult to read the angle of special protractor against the standard (protractor) ; 2. likely that protractor will cause displacement of leaflet ; 3. not all leaflets will be measured at exactly 20 minutes / eq ; 4. reference to any suitable difference between leaflets on same stalk ; 5. effect may be different in lab conditions compared to field ;	**max (3)**

Question Number	Answer	Mark
2(a)	1. use one site ; 2. two equal areas [size > 10 m^2] ; 3. one stated method of standardising ploughing (e.g. depth, time) ; 4. at least <u>two</u> named abiotic variables considered ; 5. sample(s) of earthworms / casts collected <u>before</u> ploughing /eq ; 6. stated time for sampling after ploughing (minimum of 1 day) ; 7. suitable method of randomising sampling ; 8. number of samples (min. 10) in each area ; 9. technique of collecting casts or earthworms ; 10. in stated area ; 11. dry mass of casts determined ; 12. collect specimen material {in the same season / at same time of year / at same time of day} ; 13. repeat investigation a minimum of three times ; **SPG** Account is concise and well-organised, there is good use of technical vocabulary and almost no spelling errors – **2 marks** There is some lack of organisation, limited vocabulary and a number of spelling errors – **1 mark** The account lacks organisation, there is little or no technical vocabulary and many spelling errors – **0 marks**	**max (8)** **max (2)**

Question Number	Answer	Mark
2(b)	1. table of raw data (to match the method) with accurately labelled rows and columns with units ; 2. reference to calculation of means ; 3. suitable graphical format that matches table and allows comparison ; 4. correctly labelled and orientated axes with units(do not double penalise from first marking point) ; 5. reference to suitable type of statistical test ; 6. use of stated null hypothesis ;	**max (6)**

Question Number	Answer	Mark
2(c)	**Limitations:** 1. difficult to collect all {earthworms / casts} (at each site) ; 2. difficult to ensure same abiotic [**NOT** weather] conditions for all collections / before and after ploughing / eq ; 3. not all earthworms produce worm casts / can be extracted ; 4. different types / species of earthworm in different parts of the field; 5. birds / other predators may remove earthworms ; **Further work:** 6. investigate numbers of earthworms in two sites {in different seasons / over a number of years / eq} [depending on planned investigation] ; 7. investigate numbers of earthworms with no ploughing ; 8. {numbers / proportion} of juveniles (to assess future populations) ; 9. survival of {types /species} of earthworm to (two) ploughing techniques ; 10. investigate earthworm numbers / populations with another named human intervention (e.g. direct drilling, land with and without animal dung);	**[Sub-max 4 marks]** **[Sub-max 4 marks]** **Total: max 5**