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Mark Scheme (Results)
Summer 2007

GCE

GCE Biology (6106/02)

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General Principles

Symbols used in the mark scheme

Symbol	Meaning of symbol
; semi colon	Indicates the end of a marking point.
eq	Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting. It is used because it is not always possible to list every alternative answer that a candidate may write that is worthy of credit.
/ oblique	Words or phrases separated by an oblique are alternatives to each other.
{} curly brackets	Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion.
() round brackets	Words inside round brackets are to aid understanding of the marking point but are not required to award the point.
[] square brackets	Words inside square brackets are instructions or guidance for examiners.

Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
  e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
  e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
  e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
  e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not

- candidates must make their meaning clear to the examiner to gain the mark.

- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark – irrelevant material should be ignored.

Question 1 **Maximum mark**

(a)

First internode length mms	Sheltered side		Windward side	
10-29	//	2		0
30-49	//////	6		0
50-69	////	4	///	3
70-89	//	2	///////	7
90-109	//	2	////	4
110-129		0	//	2

First internode length mms	Sheltered side		Windward side	
10-39	////	5		0
40-69	///////	7	///	3
70-99	////	4	/////////	9
100-129		0	////	4

[Tally columns are optional]

Rows and columns with correct headings and units:

Suitable size classes (9 mm min with no overlap) ;

All windward tally totals correct ;

3 marks

(b) F Histogram format ;

A Axes, scale, orientation and labelled with units ;

P All plotted correctly ;

L Sheltered/windward columns paired and clearly keyed ;

4 marks

(c) Any of the following:

Overlap between both data sets ;

Sheltered range = 10-90 Windward range 50-115/Sheltered has greater range of data the windward ;

Both have large range of data (showing other factors may affect length) ;

1 mark

Question 1 continued **Maximum mark**

(d) The calculated value of t/4.09 is greater than the critical value/2.04 ;

At the 5% significant level / 0.05 probability level ;

There is a significant difference between (the means of) the lengths of first internodes on the sheltered and windward sides of the dunes ;

3 marks

Total 11 marks

Question 2 **Maximum mark**

(a) 1 Different colours on same species of flower / size card ;

2 Sugar of {stated concentration / nectar from same source} ;

3 Standardise source / species of bees / eq ;

4 (Solutions put in) the same {shaped / sized} {dishes /flowers} ;

5 Method of controlling TWO other factors related to site (e.g. scent, location, shade of/brightness of colours) **OR** stated physical condition standardised/controlled (e.g. time of day, sunny, warm, still , clear, equal distance apart) ;

6 Put {sugar / nectar) on one of colours ;

7 Leave dishes / flowers for fixed time after set-up ;

8 Rearrange dishes / coloured flowers / plots (to randomise) ;

9 Count number of honeybees visiting each colour over stated time period/on each colour at specified time ;

10 Detail of what counts as a visit (e.g. only count bees that land on colour) ;

11 Repeat at least twice more ;

12 Ref. to humane treatment of bees / care of environment ;

8 marks

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

2 marks

Question 2 continued **Maximum mark**

(b) Table of raw data with suitable labelled rows and columns with units ;

Calculation of means suggested/totals counted ;

Suitable graphical format which matches data and method, including correctly labelled axes ;

Graphical presentation allows comparison ;

Reference to suitable type of statistical test {(for significant difference)} between means/for association ;

Use of stated null hypothesis (ref. to significance required) ;

6 marks

(c) **Limitations**

1. Difficult to standardise environmental conditions ;

2. Difficult to {standardise a visit/record exact honeybees' response (they may visit more than one colour) ;

3. Insufficient numbers of honeybees visit OR difficult to {train/attract/eq} honeybees ;

4. Honeybees do not recognise the colours used ;

5. Honey bees visiting (after training/eq.) may be different (from those making original visit(s) ;

6. Despite control of variables, other sense(s) are attracting bees to colours ;

7. Interactions between bees and other insects may affect colour choice ;

Further work

Investigate:

8. The precision to which honeybees respond to colour ;

9. The range of colour vision in honeybees ;

10. Colour vision in different types of bee/wasps/hymenoptera ;

11. Time period over which attraction to colour (without sugar) continues ;

5 marks

Total 21 marks