



BIOLOGY

9790/02

Paper 2 Data Analysis and Planning

May/June 2018

MARK SCHEME

Maximum Mark: 60

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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This document consists of **12** printed pages.

PUBLISHED**Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Notes:

The following abbreviations may be used in mark schemes:

;	separates marking points
/	alternative and acceptable answers for the same marking point
allow/accept/ A	answers that can be accepted
not/reject/ R	answers that are not worthy of credit
ignore/ I	statements that are irrelevant – applies to neutral answers
AW/owtte	credit alternative wording / or words to that effect
ecf	error carried forward
(words)	bracketed words that are not essential to gain credit
<u>words</u>	underlined words must be present in answer to gain credit
max	indicates the maximum number of marks that can be given
ORA	or reverse argument
AVP	any valid point – marking points not listed on the mark scheme but which are worthy of credit

Question	Answer	Marks
1(a)	<p>Any 4 of:</p> <ol style="list-style-type: none"> 1 concentration of (both) pesticides greater in bread (than bees) / more pesticides transferred to bread (than bees) ; 2 concentration of Pristine is less than CPF (in pollen) and bees (only) ; 3 no pesticide residue found when fed type C pollen OR no Pristine residues when fed type A pollen ; 4 in pollen / bread / bees, there is, no / little, difference in concentration of CPF, if given A or B / if Pristine is also given ; 5 relevant data <u>manipulation</u> ; 6 idea of, high <u>relative</u> SD in bees ; 7 ref. to overlap in SD qualified ; <p>If <u>none</u> of the above credited, allow 1 mark for CPF and Pristine found in (pollen), bread and bees ;</p>	4
1(b)	<p>Any 4 of:</p> <ol style="list-style-type: none"> 1 less queen larvae complete development when given, pesticides / A and B / A or B ; 2 A has greater effect on development than B ; 3 idea of, Pristine blocks / inhibits effect of CPF ; 4 significant difference when CPF given between A and C ; 5 detail of significance (very low p / high χ^2 value) ; 6 no stats for A vs B or B vs C ; 	4

Question	Answer	Marks
1(c)	Any 3 of: 1 CPF / pollen A, decrease % queens developing relative to C ; 2 CPF + Pristine / pollen B, decrease % queens developing, relative to C ; 3 pollen B / presence of pristine, has greatest effect on development ; 4 effect of A then to C is less than B to C ; 5 effect of changing to uncontaminated greater if fed pollen B ; 6 moving to C improves development (in contrast to A and B) ;	3
1(d)	<i>blocking G-protein</i> idea of, (G-proteins) involved in cell signalling ; <u>immune response</u> depends on cell signalling + example of ; <i>inhibiting the electron transport chain</i> reduced <u>aerobic</u> respiration / less ATP ; actions of <u>immune system</u> require ATP / example ;	4
1(e)(i)	effect on species affects rest of community / ecosystem / food chains / food webs / energy flow ; impact on the community greater than would be expected ; presence, maintains / impacts / promotes / affects, <u>biodiversity</u> (of ecosystem) ;	3

Question	Answer	Marks
1(e)(ii)	Any 3 of: 1 bee populations cannot, recover / be maintained, if <u>queens</u> do not develop ; 2 pollination reduced ; 3 reduction in food crop productivity ; 4 reduced honey production ; 5 AVP ;	3

Question	Answer	Marks
2(a)(i)	Any 2 of: 1 only one seed at each concentration / no repeats / no replicates ; 2 seeds all from same papaya ; 3 idea of, unknown, mass / concentration, of active ingredient in extract ; 4 (control) variables not stated ;	2
2(a)(ii)	Any 2 of: 1 idea of, delays its own germination (until conditions right) ; 2 reason for MP1 ; 3 prevents other plants / species germinating near to itself ; 4 reason for MP3 – idea of, reduces competition for a <u>named</u> factor ; 5 AVP ;	2
2(b)(i)	1 Axes – fully labelled with units ; 2 Scale – suitable linear scale, both axes, plots to cover at least half grid ; 3 Plots – points plotted correctly $\pm \frac{1}{2}$ small square ; 4 Line – suitable curve of best fit / dot to dot ;	4
2(b)(ii)	correct interpolation from graph ;	1
2(b)(iii)	allows comparison with different drugs ;	1

Question	Answer	Marks
2(b)(iv)	inhibition of <u>named</u> stage of, cell cycle / mitosis / cytokinesis ; ref. to possible mechanism ; ;	2
2(b)(v)	Any 2 of: yes: 1 effective at reducing ability to divide at this concentration ; 2 not (normally) harmful to skin / people can, touch / eat, papaya, so, OK on the skin / can be topically applied ; no: 3 because it is, not / only 46%, effective ; 4 may affect people <i>in vivo</i> / unknown side effects ; 5 skin tumour cells different ; 6 idea that, skin / membranes, may not be permeable to it / unknown concentration arrives at cells ; 7 no idea of stats to support, 20 over other concentrations / any concentrations ; 8 AVP ;	2

Question	Answer	Marks
3	<p><i>hypothesis & variables</i></p> <ol style="list-style-type: none"> 1 Hypothesis or prediction ; e.g. rate of photosynthesis will be affected by the concentration of atrazine / the rate of photosynthesis will decrease as the concentration of atrazine increases 2 theory to support hypothesis or prediction ; e.g. atrazine blocks the electron transport chain so blocking electron transport to, NADP / DCPIP 3 dependent variable identified ; colour change of DCPIP with time recorded 4 independent variable identified ; concentration range of atrazine 5 at least two controlled variables identified ; temperature, pH, chloroplast age, density, species of plant, vol / conc. of DCPIP, light intensity 	25

Question	Answer	Marks
3	<p><i>methods:</i></p> <p>6 dilution method / dilution table ;</p> <p>7 suitable range ; 0%–1% atrazine with at least 5 values (including 1 and 0)</p> <p>8 reference to labelling tubes ;</p> <p>9 atrazine added to chloroplast extract ;</p> <p>10 idea of, need for equilibration (with inhibitor or at correct temperature) ;</p> <p>11 mixing / stirring, of solutions ;</p> <p>12 addition of DCPIP ;</p> <p>13 idea of, keep in dark / under foil / under black paper ;</p> <p>14 use of lamp ;</p> <p>15 stated distance of lamp ;</p> <p>16 method of controlling temperature ;</p> <p>17 record time taken for colour change / end-point ;</p> <p>18 use of colour standard / reference to end-point tube ;</p> <p>19 use of white card to help judge end point ;</p> <p>20 & 21 a control identified ; ; no / boiled chloroplasts, no atrazine, no light</p> <p>22 repeat each concentration (at least) 2 × more ;</p>	

Question	Answer	Marks
3	<p><i>Risk</i></p> <p>23 risk assessment ; ref to hazard <u>and</u> precaution</p> <p>24 ref to disposal consideration for atrazine ;</p> <p><i>presentation and analysis of results:</i></p> <p>25 calculation of means ;</p> <p>26 description of / show, how to calculate rate (e.g. in table) ;</p> <p>27 calculation of SD ;</p> <p>28 use of suitable statistical test ;</p> <p>29 correct description of statistical test analysis ;</p> <p>30 suitable table described ;</p> <p>31 suitable graph described ;</p>	