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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2009 question paper

for the guidance of teachers

9700 BIOLOGY

9700/05 Paper 5 (Planning, Analysis and Evaluation), maximum raw mark 30

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 must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

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- **;** separates marking points
- **/** alternatives answers for the same point
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- **AW** alternative wording (where responses vary more than usual)
- **underline** actual word given must be used by candidate (grammatical variants excepted)
- **max** indicates the maximum number of marks that can be given

Question	Expected answer	Extra guidance	Mark	AO
1 (a) (i)	ref. to cutting sections of the stem; ref. to use of microscope **and** to find the location of the dye (in water conducting tissue/xylem);	must be the idea of a section, not just a cut or looking at the cut end. allow abbreviations TS/LS allow idea of magnification allow idea of colour If any other marker used, then must have a method of locating the marker	[2]	M
(ii)	2 of: ref. to root system not fitting into apparatus; ref. to idea that dye may not be able to pass into/across roots (to xylem)/the solution enters the xylem directly; ref. to partially permeable membrane/aw;	ignore ref. to time/easier ignore ref. to other tissues in root do not allow ora in the context of time e.g. it is faster allow any ref. to a membrane transport system/property not available for dye – **must be cell/root hair NOT root** ignore drowned/killed roots	[2]	M

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Question	Expected answer	Extra guidance	M	
(b) (i)	6 of: *Method of measuring independent variable* 1. ref. to suitable method of measuring time and distance; e.g. cut sections/observing dye through stem, at known time interval and known distances / known distance and record time for dye to reach it. 2. ref. to accuracy measuring distance; e.g. using thread to measure stem and ruler in cm/mm, vernier callipers *Procedure:* 3. ref. to using several shoots/sequential measurements on the same shoot; 4. ref. to cutting under water/dye (to avoid air entering); *Method for controlling external variables: max 2 examples* 5. ref. to number/surface area of leaves; 6. temperature and suitable method e.g. temperature controlled room; 7. (light and) suitable method e.g. dark room with light of fixed illumination/ light at fixed distance; 8. (air flow and) suitable method e.g. fan set at constant speed; 9. ref to volume/concentration (dye) solution: *Reliability:* 10. ref. to making at least 3 measurements and taking a mean; *Safety:* 11. ref. to a low risk investigation;	*The question specifies **this apparatus** – if any other is used max 2. for external variables standardised/controlled plus 1 mark for correct ref. to reliability* allow: measuring distance to leaf/cutting all stems to same length and timing for appearance of dye allow timing dye movement visually do not allow dye exuding from leaves do not allow dye concentration in leaf if any other marker used then must have a way of locating it *Assume the name of the variable if the method of controlling a variable is correct* ignore mass allow incubator do not allow water bath/air conditioning allow any standard method of standardising light allow keep out of drafts/close windows/ doors do not allow amount do not allow unqualified repeats allow ref. to a safety issue and prevention e.g. toxic dye + wear gloves	[6]	
(ii)	(mean) distance moved by dye; (mean) time	allow as a description allow ecf for respirometer/fall in dye methods	[1]	D
(iii)	the rate of water movement would be unchanged;	do not allow if qualify unchanged	[1]	P
			[Total: 12]	10M 1D 1P

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<table>
<tr><th>Question</th><th>Expected answer</th><th>Extra guidance</th><th>Mar</th><th></th></tr>
<tr><td>2 (a) (i)</td><td>Independent – predation (by birds);
Dependant – (number of) snails of each type/banded and unbanded (eaten);</td><td>allow number of broken shells each type</td><td>[2]</td><td></td></tr>
<tr><td>(ii)</td><td>3 of:
idea that birds predate by sight/find their prey by vision;
banded snails more strongly predated/killed than non-banded;
banded snails more obvious to predators/unbanded able to camouflage better;
ref. to figures/control;</td><td>must be a feature of the <u>birds</u>

271 banded and 149 unbanded/approx. double banded/no difference number of banded and unbanded in the unpredated area</td><td>[3]</td><td>C</td></tr>
<tr><td>(b) (i)</td><td><table><tr><td>number of molluscs</td><td>Investigation 1</td><td>Investigation 2</td></tr><tr><td>first sample</td><td>255</td><td>200</td></tr><tr><td>total second sample</td><td>400</td><td>360</td></tr><tr><td>marked second sample</td><td>150</td><td>30</td></tr><tr><td>total population</td><td>680</td><td>2 400</td></tr></table></td><td></td><td>[1]</td><td>D</td></tr>
<tr><td>(ii)</td><td>marking may make the molluscs more obvious to predators;

1 of:
72 hours means that more molluscs will be eaten (so the proportion is too low);
immigration/emigration/migration may have occurred/72 hours is long enough for more movement of snail population;</td><td>allow the marks may have faded

ignore references to numbers marked in the two investigations
allow reference to breeding</td><td>[1]

[1]</td><td>E

D</td></tr>
<tr><td></td><td></td><td></td><td>[Total: 8]</td><td>2P
2D
3C
1E</td></tr>
</table>

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Question	Expected answer	Extra guidance	Mar	
3 (a) (i)	yeast maintained in exponential phase/most rapid growth;	allow reference to primary metabolite	[1]	
(ii)	2 of: temperature; nutrient concentration; flow rate through fermenter; oxygen/air supply;	allow rate of nutrient supply; do not allow amount/level of nutrient do not allow pH	[2]	P
(b) (i)	mean value calculated by adding all the values and dividing by the number in the sample; allow formula $\bar{x} = \frac{\Sigma x}{n}$	allow if describe in terms of the question information, e.g. add up all the growth rates and divide by 20	[1]	D
(ii)	ref. to spread of data around the mean; ref. to difference between the data and reliability, e.g. 5.2 is less reliable as the spread is greater;	allow variation from the mean do not allow if refer to accuracy	[2]	D
(iii)	idea of: there is no overlap between the sets of data; (assume it's yes if the answer is correct.)	allow if given in terms of standard deviation/standard deviation used to show no overlap/confidence intervals/error bars do not allow percentage values	[1]	D
(iv)	38;	ignore any formulae	[1]	D
(c)	2 of: only three pH values tested/only 2 pH values (used for T-test); no data between pH 4 and 5.2/5.2 and 7; only growth measured; yield of enzyme might be higher at different pH than optimum growth;	allow the range of values is too small allow did not measure the enzyme do not allow errors in measurement due to small values/differences	[2]	E
		[Total: 10]		2P 5D 3E