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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2009 question paper for the guidance of teachers

9700 BIOLOGY

9700/52 Paper 52 (Practical 2), 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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Mark schemes abbreviations:

- **;** separates marking points
- **/** alternative 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

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Question	Expected answer	Extra guidance	Mark	
1 (a)	*For each factor, allow both marks anywhere in the answer. If two factors given in one answer, mark the first unless nothing is written in no.2.* *For 1 and 2 – ignore amount for the variable, but not for the method of control* 2 × 2 of: 1. ref. to nutrient / substrate; ref. to suitable context e.g. concentration / volume / flow rate / composition; 2. ref. to bacteria culture added; ref. to suitable context e.g. volume or mass of (immobilised) cells / volume of culture; 3. pH; use buffer / named buffer; 4. ref. to anaerobic conditions; ref. to a suitable method of providing condition in a fermenter; e.g. nitrogen / carbon dioxide, atmosphere;	Ignore type of fermentation system unless qualifications apply only to batch culture. Reject food as variable, but allow method if reference to concentration or mass in solution. Ignore mass of nutrient unless in terms of making up solutions. Allow ref. to, oxygen / air supply / aerobic bubbling air/oxygen / use of sparger / air lift.	[2] [2]	P M
(b)	*Assume that the answer is about immobilised cells unless the answers says otherwise. Allow marking points expressed as figures in the correct context.* 3 of: 1. immobilised cells have lower survival rates than control cells on day 3; 2. immobilised cells have higher survival rates in gastric juice than in intestinal juice; 3. (immobilised cells) survival increases with time of fermentation; 4. decrease in temperature increases survival ; 5. not all cells survive / some die ; 6. allow: idea that survival in intestinal juice and gastric juice become almost the same by day 12 / 15 ;	1. Allow reverse argument. 2. Survival rate in gastric juice in control cells is lower than in intestinal juice; 3. Allow day 3 is the lowest / 15 days max. 4. Allow temperature has little effect on the increase in survival.	[3]	C

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Question	Expected answer	Extra guidance	Mark	
(c)	idea of: number of samples (for each condition tested); mean value (for each condition tested);	Allow any word that implies samples e.g. readings / values / repeats / sample size. Do not allow number of cells surviving. Allow marks on a labelled formula. Ignore any other ref. to figures / measurements / undefined symbols.	[2]	D
		Total:	**[9]**	P2 M2 D2 C3

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Question	Expected answer	Extra guidance	Mark	
2 (a)	*If carried out in Glasshouse / room do not award. points 9,10 and 11* 8 of: *independent variable* 1. ref. to exposing slide / apparatus for period of time in different light intensities to include dark (zero intensity) / to light and dark conditions; *dependent variable* 2. ref. to counting pollen in field of view; 3. ref. to counting at least 3 areas of the slide; 4. ref. measuring diameter of field of view using graticule; 5. ref. to calculating area of field of view (using formula πr^2) ; *control variables – max 4* 6. ref. time of exposure constant; 7. ref. same location for all readings; 8. ref. to removing any pollen on opening between each slide ; 9. ref. to outside location; 10. detail of location; e.g. no walls/hedges/trees in the way / facing wind; 11. ref. to an attempt to control environmental factors / some environmental variable cannot be controlled ; *reliability* 12. ref. to repeating the whole investigation on 3 different days and taking mean; *safety: max 1* 13. low risk investigation ; pollen allergy and use of mask; electrical safety and ref. to water ;	1. Allow ref to range of times covering light and dark periods. 3. Allow using 3 traps (at the same time) and taking counts. 7. Room / Glasshouse – need precise ref. to same location. 10. Allow specified place – on roof, wall, field. 11. Ignore wind speed if related to pump. 12. Allow if take 3 repeats on the same day plus mean. Several = 3 or more.	[8]	M

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Question	Expected answer	Extra guidance	Mark	
(b) (i)	*If the total number of pollen grains is correct and the volume of air is correct from a calculation, give both marks. Allow any method of calculation that give the expected values.* *Calculations of values e.g.* total pollen collected = number of pollen per mm^2 × surface area collection strip (1/0.25 × 6 = 24) × 420 (10 × 42) = 10080; volume of air m^3 in 6 hours = volume per min × min in 1hour × no. hours ÷ 1000 (10 dm^3 × 60x 6 ÷ 1000 = 3.6 m^3); *Use of calculated values:* pollen in 1 m^3 = $\frac{10080}{3.6} = 2800$;	*allow marks either for words or figures* *allow 'back' calculations* *allow other calculations e.g.* $\frac{420}{0.25}$ = *1680 × 6 = 10080* $\frac{10080}{60 \times 6}$ = 28 pollen per minute 28 × 100 or $\frac{28}{10}$ × 1000 = 2800 in 1 m^3 Allow ecf if either of the values calculated incorrectly, but used correctly in the formula.	[3]	D
(c) (i)	there is no difference in the number of pollen grains in (hot)dry air and (hot)wet air ; humidity / dryness / wetness does not affect the number of pollen grains;	do not allow alternative hypothesis do not allow if differences in light given	[1]	D
(ii)	ref. to the data being categoric / discrete;	Allow discontinuous, but NOT discontinuous variation. Allow expressed as ref. to significance between observed and expected data.	[1]	D
(iii)	there are two conditions counted, so 2-1= 1	Allow 2 sets of data or two conditions sampled. Reject 2 – 1 = 1 unqualified	[1]	D
		Total:	**[14]**	M8 D6

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<table>
<tr><th>Question</th><th>Expected answer</th><th>Extra guidance</th><th>Mark</th><th></th></tr>
<tr><td>3 (a) (i)</td><td>ethanol concentration;
temperature;</td><td>Allow alcohol concentration.</td><td>[2]</td><td>P</td></tr>
<tr><td>(ii)</td><td>pigment released / light absorbance;</td><td>Ignore membrane permeability.</td><td>[1]</td><td>P</td></tr>
<tr><td>(b) (i)</td><td>2 of:
<table>
<tr><td></td><td colspan="6">absorbance at each ethanol concentration / %</td></tr>
<tr><td></td><td>0</td><td>20</td><td>40</td><td>60</td><td>80</td><td>100</td></tr>
<tr><td>student 1</td><td>0</td><td>0.12</td><td>0.21</td><td>0.35</td><td>0.65</td><td>0.70</td></tr>
<tr><td>student 2</td><td>0.10</td><td>0.10</td><td>0.22</td><td>0.32</td><td>0.60</td><td>0.75</td></tr>
<tr><td>student 3</td><td>0</td><td>0.18</td><td>0.20</td><td>0.38</td><td>0.59</td><td>0.72</td></tr>
<tr><td>student 4</td><td>0</td><td>0.18</td><td>0.35</td><td>0.35</td><td>0.65</td><td>0.76</td></tr>
<tr><td>student 5</td><td>0.15</td><td>0.10</td><td>0.18</td><td>0.34</td><td>0.62</td><td>0.75</td></tr>
</table></td><td>If more than 2 given – allow marks if all correct, lose 1 for every incorrect.</td><td>[2]</td><td>E</td></tr>
<tr><td>(ii)</td><td>2 of:
ref. to insufficient data:
ref. to idea that cannot make comparisons between ethanol and temperature;
ref. to needing all the temperature and ethanol concentrations;</td><td>allow if refers to comparing like with like
allow if refers to only 0% ethanol and 30°C being comparable</td><td>[2]</td><td>E</td></tr>
<tr><td></td><td></td><td>Total:</td><td>[7]</td><td>3P
4E</td></tr>
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