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**BIOLOGY**

**9700/52**

Paper 5 Planning, Analysis and Evaluation

**March 2017**

MARK SCHEME

Maximum Mark: 30

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**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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the March 2017 series for most Cambridge IGCSE<sup>®</sup>, Cambridge International A and AS Level components and some Cambridge O Level components.

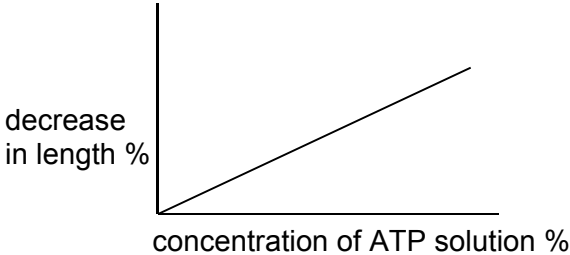
**Mark scheme abbreviations:**

<b>;</b>	separates marking points
<b>/</b>	alternatives answers for the same point
<b>R</b>	do not allow
<b>A</b>	accept (for answers correctly cued by the question, or guidance for examiners)
<b>I</b>	ignore (for answers that include irrelevant information that does not contradict the expected answer)
<b>AW</b>	alternative wording (where responses vary more than usual)
<b>ORA</b>	or reverse argument (for answers which are written as the opposite to the expected answer)
<b><u>underline</u></b>	actual word given must be used by candidate (grammatical variants excepted)
<b>max</b>	indicates the maximum number of marks that can be given

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
1(a)(i)	<i>independent</i> : type of (Ringer's) the solution ; <i>dependent</i> : (change in) length of muscle, strip / fibre / tissue AW ;	<b>2</b>
1(a)(ii)	<i>idea of</i> : the muscle fibres are different (starting) lengths ;	<b>1</b>
1(a)(iii)	to act as a <u>control</u> ; to show that Ringer's solution (alone) cannot cause contraction AW / to show that ATP is responsible for the contraction AW ;	<b>2</b>

Question	Answer	Marks
1(b)	<p><i>six from:</i></p> <p>1 ref. to a method of diluting the 0.5% ATP solution (with Ringer's solution) <b>and</b> to give at least 5 dilutions ;</p> <p>2 ref. to at least 3 concentrations from 0.5% downwards with % units;</p> <p>3 ref. to <u>control</u> using Ringer's solution (alone) ;</p> <p>4 ref. to method for measuring change in length of fibres ;</p> <p>5 ref. to using the <u>same</u> number fibres / strips for each concentration ;</p> <p>6 ref. to adding the same volume of <u>ATP solutions</u> for each concentration ;</p> <p>7 ref. to suitable volume of ATP solutions on a slide ;</p> <p>8 ref. to leaving all fibres for the same / fixed (stated) time ;</p> <p>9 ref. to low risk investigation / hazard <u>and</u> suitable safety precaution ;</p> <p>10 ref. to <u>replicates</u> <b>and</b> a <u>mean</u> OR to identify / eliminate / remove anomalies ;</p>	<b>6</b>

Question	Answer	Marks
1(c)	1 axes correctly orientated and labelled ; 2 % / percentage on each axis ; 3 correct line ; 	<b>3</b>
1(d)	<i>two from:</i> 1 muscle strips used are, from a dead animal / <i>in vitro</i> (so response may be different) ; 2 <i>idea that</i> in a living organism muscle contraction is under nervous control ; 3 thickness of the muscle strips used are variable / not testing individual muscle fibres ; 4 <i>idea that:</i> concentration of ATP is not the same as <i>in vivo</i> ;	<b>2</b>
1(e)	<i>two from:</i> 1 <i>idea of:</i> making Ringer's solution(s) with glucose and ATP ( <b>and</b> repeating the measurements) ; 2 ( <b>then</b> ) comparing them with the solutions made with Ringer's solution(s) and ATP ; 3 <i>idea that</i> ATP concentration must be standardised, i.e. the same in both solutions ;	<b>2</b>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
2(a)	<p><i>two from:</i></p> <ol style="list-style-type: none"> <li>1 the number of times traps used ;</li> <li>2 the type of trap used ;</li> <li>3 time (of day) moths were trapped ;</li> <li>4 time of year moths were trapped ;</li> <li>5 ref. to positioning / spacing of traps ;</li> <li>6 number of traps used ;</li> <li>7 size of area from which samples taken ;</li> <li>8 method of counting ;</li> </ol>	<b>2</b>
2(b)	<p><i>three from:</i></p> <p><i>description:</i></p> <ol style="list-style-type: none"> <li>1 (melanic moths) increase in frequency more in area <b>X</b> than in area <b>Y</b> ;</li> <li>2 melanic moths in area <b>X</b> increase, most rapidly/linearly, and then starts to slow <b>and</b> <b>Y</b> increases more slowly at first and then increases more rapidly ;</li> </ol> <p><i>explanation:</i></p> <ol style="list-style-type: none"> <li>3 area <b>X</b> more polluted than <b>Y</b> so selection acts more strongly AW/OR A ;</li> <li>4 some non-melanics remain in population <b>X</b> because of breeding between heterozygotes ;</li> </ol>	<b>3</b>

Question	Answer	Marks
2(c)	line starting from generation 10  <b>and</b> below <b>X</b>  <b>and</b> above <b>Y</b>  <b>and</b> to 24 generations ;	<b>1</b>
2(d)	<i>two from:</i> <i>melanic forms/they:</i>  1 less predated by species other than birds/named likely predator ;  2 less susceptible / (more) resistant, to poisoning by toxins/ pollutants ;  3 higher fitness / produce more offspring ;  4 more resistant to disease ;  5 better at competing with, new / alien / introduced species ;  6 reference to climate change ;	<b>2</b>

Question	Answer	Marks																
2(e)(i)	<table border="1" data-bbox="828 217 1458 636"> <thead> <tr> <th data-bbox="828 217 1023 327">category</th> <th data-bbox="1023 217 1146 327"><math>O</math></th> <th data-bbox="1146 217 1270 327"><math>E</math></th> <th data-bbox="1270 217 1458 327"><math>\frac{(O - E)^2}{E}</math></th> </tr> </thead> <tbody> <tr> <td data-bbox="828 327 1023 430">melanic</td> <td data-bbox="1023 327 1146 430">56</td> <td data-bbox="1146 327 1270 430">52</td> <td data-bbox="1270 327 1458 430">0.31</td> </tr> <tr> <td data-bbox="828 430 1023 534">non-melanic</td> <td data-bbox="1023 430 1146 534">48</td> <td data-bbox="1146 430 1270 534">52</td> <td data-bbox="1270 430 1458 534">0.31</td> </tr> <tr> <td colspan="3" data-bbox="828 534 1270 636"><math>\chi^2 =</math></td> <td data-bbox="1270 534 1458 636">0.62</td> </tr> </tbody> </table> <p data-bbox="383 671 887 703">correct expected numbers, <u>52 and 52</u> ;</p> <p data-bbox="383 738 792 770">correct values for <math>(O - E)^2 / E</math> ;</p> <p data-bbox="383 805 663 837">correct values for <math>\chi^2</math> ;</p>	category	$O$	$E$	$\frac{(O - E)^2}{E}$	melanic	56	52	0.31	non-melanic	48	52	0.31	$\chi^2 =$			0.62	<b>3</b>
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melanic	56	52	0.31															
non-melanic	48	52	0.31															
$\chi^2 =$			0.62															
2(e)(ii)	difference between expected and observed is not significant because the value for chi-squared is less than the critical value at $p = 0.05 / 5\%$ or $p = 0.10 / 10\%$ ;	<b>1</b>																