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**BIOLOGY**

**0610/62**

Paper 6 Alternative to Practical

**May/June 2017**

MARK SCHEME

Maximum Mark: 40

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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.

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This document consists of **7** printed pages.

**Mark schemes will use these abbreviations**

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- **ecf** credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- ( ) the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

Question	Answer	Marks	Guidance
1(a)(i)	one table drawn with appropriate lines and number of cells ; correct column and row headings with appropriate units ; ten correct values recorded in correct boxes ; correct conversion of minutes to seconds for all numbers ;	4	R if units are in the body of table
1(a)(ii)	X = 71 s ; Y = 229 s ;	2	A correct times in minutes and seconds <b>ecf</b> from 1(a)(i) for wrong conversion of minutes to seconds  max 1 if not rounded up to nearest whole number max 1 if both correct whole numbers but no units
1(a)(iii)	labelled axes with units ; even scale and at least 50% of grid used for time axis ; two correctly plotted bars ( $\pm\frac{1}{2}$ a small square), of equal width and separated by a space ;	3	<b>ecf</b> from 1(a)(ii)
1(a)(iv)	gas / oxygen (produced) is trapped within the leaf space ; density is reduced / becomes lighter / buoyancy increases ;	1	
1(a)(v)	to identify anomalies / for reliability / for repeatability / to calculate an average ;	1	
1(a)(vi)	<i>measured:</i> time taken for leaf disc to rise / rate of photosynthesis ;  <i>changed:</i> location of plant / growing conditions of plant ;	2	

Question	Answer	Marks	Guidance												
1(a)(vii)	size of leaf disc / AW ; concentration of sodium hydrogencarbonate (solution) / 2% ; volume / height of, sodium hydrogencarbonate / solution ; plant species ; light intensity / distance of the lamp ;	2	I temperature / pH												
1(b)	<table border="1" data-bbox="340 635 1236 1299"> <thead> <tr> <th data-bbox="340 635 752 699"><i>error ;;</i></th> <th data-bbox="752 635 1236 699"><i>improvement ;;</i></th> </tr> </thead> <tbody> <tr> <td data-bbox="340 699 752 868">measuring height / not measuring volume / imprecise volume of sodium hydrogencarbonate</td> <td data-bbox="752 699 1236 868">use same volume (in test-tubes of the same diameter) / measure volume / use a burette / measuring cylinder / graduated pipette</td> </tr> <tr> <td data-bbox="340 868 752 1002">leaf discs different distances from lamp / different light intensities / position of lamp</td> <td data-bbox="752 868 1236 1002">arrange equidistant / do each test-tube separately / AW</td> </tr> <tr> <td data-bbox="340 1002 752 1136">determining when leaf disc starts to rise is subjective</td> <td data-bbox="752 1002 1236 1136">time until leaf disc reaches, the surface / or rises to a particular level</td> </tr> <tr> <td data-bbox="340 1136 752 1200">timing multiple leaf discs</td> <td data-bbox="752 1136 1236 1200">stagger timing</td> </tr> <tr> <td data-bbox="340 1200 752 1299">heating of test-tubes by lamp</td> <td data-bbox="752 1200 1236 1299">heat-shield / LED lamps / water-bath / AW</td> </tr> </tbody> </table>	<i>error ;;</i>	<i>improvement ;;</i>	measuring height / not measuring volume / imprecise volume of sodium hydrogencarbonate	use same volume (in test-tubes of the same diameter) / measure volume / use a burette / measuring cylinder / graduated pipette	leaf discs different distances from lamp / different light intensities / position of lamp	arrange equidistant / do each test-tube separately / AW	determining when leaf disc starts to rise is subjective	time until leaf disc reaches, the surface / or rises to a particular level	timing multiple leaf discs	stagger timing	heating of test-tubes by lamp	heat-shield / LED lamps / water-bath / AW	4	each improvement must relate to the given error  <b>A</b> test-tube rack blocks light / AW
<i>error ;;</i>	<i>improvement ;;</i>														
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2(a)(i)	<p><b>1</b> sun leaf / Fig 2.2, is thicker (overall) / has bigger cells; <b>ora</b></p> <p><b>2</b> sun leaf has a thicker palisade mesophyll layer / thicker spongy mesophyll / thicker mesophyll ; <b>ora</b></p> <p><b>3</b> sun leaf palisade layer is more tightly packed / denser ; <b>ora</b></p> <p><b>4</b> sun leaf has a thicker epidermis ; <b>ora</b></p> <p><b>5</b> sun leaf palisade <u>cells</u> are thinner / taller ; <b>ora</b></p> <p><b>6</b> sun leaf has larger air spaces ; <b>ora</b></p> <p><b>7</b> AVP e.g. sun leaf has a deeper / different shaped, vascular bundle ; <b>ora</b></p>	<b>2</b>	
2(a)(ii)	<p><b>Lines drawn that are clear and continuous ;</b></p> <p><b>Scale: to fill more than half the space ;</b></p> <p><b>Detail: 4 or 5 layers shown ;</b></p> <p><b>Proportion: palisade mesophyll layer is between third to a half of total mesophyll ;</b></p>	<b>4</b>	<b>R shading / stippling / hatching / cells / ruled lines</b>

Question	Answer	Marks	Guidance
2(a)(iii)	19 <u>mm</u> ( $\pm 1$ mm) ;  19 $\div$ 130  = 0.15 mm ;;	3	<b>ecf</b> incorrect measurement of line <b>PQ</b> if answer incorrect, award 1 mark for correct working shown (19 $\div$ 130)
2(b)(i)	(70 – 105 =) 35 (.00) ;  (35 $\div$ 70) $\times$ 100 = 50 (.00) ;	2	<b>ecf</b> from calculated difference
2(b)(ii)	comparative data quote in either section with units at least once ;  <i>supports hypothesis:</i> shade leaves are longer ; <b>ora</b>  <i>does not support hypothesis:</i> sun leaves are thicker ; <b>ora</b>	3	<b>I</b> larger or bigger  <b>A</b> sun leaves may be wider / width not measured / width is not given, so cannot calculate area ;
2(c)(i)	extinguish flame / do <b>not</b> use a Bunsen burner / no flames ;  use a water-bath / place ethanol in a test-tube in boiled water ;	1	

Question	Answer	Marks	Guidance
2(c)(i)	to be able to see colour change / AW ;	1	
2(c)(iii)	<p>1 leaves from the same plant / species ;</p> <p>2 at least three leaves from sun and three from shade ;</p> <p>3 boil / heat in water ;</p> <p>4 heat in ethanol ;</p> <p>5 rinse leaf ;</p> <p>6 spread on a white tile ;</p> <p>7 add iodine solution ;</p> <p>8 positive test gives a blue-black colour ;</p> <p>9 detail of a controlled variable, e.g. heated for same length of time / same volume or concentration of iodine solution / leaves picked at same time ;</p>	5	<p>I de-starching leaves</p> <p>I use of a control</p> <p>I ref to lab safety</p>
	<b>Total:</b>	<b>21</b>	