



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

BIOLOGY

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Paper 6 Alternative to Practical

May/June 2017

MARK SCHEME

Maximum Mark: 40

Published

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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 **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 ecf 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	ecf 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><tr><td><i>error</i> ;;</td><td><i>improvement</i> ;;</td></tr><tr><td>measuring height / not measuring volume / imprecise volume of sodium hydrogencarbonate</td><td>use same volume (in test-tubes of the same diameter) / measure volume / use a burette / measuring cylinder / graduated pipette</td></tr><tr><td>leaf discs different distances from lamp / different light intensities / position of lamp</td><td>arrange equidistant / do each test-tube separately / AW</td></tr><tr><td>determining when leaf disc starts to rise is subjective</td><td>time until leaf disc reaches, the surface / or rises to a particular level</td></tr><tr><td>timing multiple leaf discs</td><td>stagger timing</td></tr><tr><td>heating of test-tubes by lamp</td><td>heat-shield / LED lamps / water-bath / AW</td></tr></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
<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														
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Question	Answer	Marks	Guidance
2(a)(i)	<p>1 sun leaf / Fig 2.2, is thicker (overall) / has bigger cells; ora</p> <p>2 sun leaf has a thicker palisade mesophyll layer / thicker spongy mesophyll / thicker mesophyll ; ora</p> <p>3 sun leaf palisade layer is more tightly packed / denser ; ora</p> <p>4 sun leaf has a thicker epidermis ; ora</p> <p>5 sun leaf palisade <u>cells</u> are thinner / taller ; ora</p> <p>6 sun leaf has larger air spaces ; ora</p> <p>7 AVP e.g. sun leaf has a deeper / different shaped, vascular bundle ; ora</p>	2	
2(a)(ii)	<p>Lines drawn that are clear and continuous ;</p> <p>Scale: to fill more than half the space ;</p> <p>Detail: 4 or 5 layers shown ;</p> <p>Proportion: palisade mesophyll layer is between third to a half of total mesophyll ;</p>	4	R shading / stippling / hatching / cells / ruled lines

Question	Answer	Marks	Guidance
2(a)(iii)	19 <u>mm</u> (± 1 mm) ; 19 $\div$ 130 = 0.15 mm ;;	3	ecf incorrect measurement of line PQ if answer incorrect, award 1 mark for correct working shown (19 $\div$ 130)
2(b)(i)	(70 – 105 =) 35 (.00) ; ((35 $\div$ 70) $\cdot$ 100) = 50 (.00) ;	2	ecf 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 ; ora <i>does not support hypothesis:</i> sun leaves are thicker ; ora	3	I larger or bigger A sun leaves may be wider / width not measured / width is not given, so cannot calculate area ;
2(c)(i)	extinguish flame / do not 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>
	Total:	21	