Mark Scheme (Results)

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Pearson Edexcel International Advanced Level
In Biology (WBI16)
Paper 01
Unit 6: Practical Skills in Biology II

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Additional Guidance	Mark
1a	• 23	Allow 23.0 Ignore % Mark only the first answer on the answer line Correct answer anywhere 1mk	**1**

Question Number	Answer	Additional Guidance	Mark
1b	A description that includes six of the following points: • **store** fruits at same temperature (for both time intervals) (1) • another stated variable about {storage / fruits} (1) • {same / standardised} extraction method used (1) • {stated / same} {volume / concentration} of DCPIP (1) • titrate fruit juice against DCPIP **and** record volume (1) • juice turns DCPIP from blue to {colourless/red/juice colour} (1) • method of calculating Vit C content (1)	Allow store juice Allow incubate eg same humidity /mass / volume / source / age Allow crush / blend / filter / pestle and mortar allow description of titration /adding DCPIP into fruit juice allow colourless to blue if DCPIP titrated into juice eg use of {standard / calibration} curve or $C_1 \times V_1 = C_2 \times V_2$ ignore compare to standard solution of Vit C	**6**

Question Number	Answer	Additional Guidance	Mark
1c	A description that includes three of the following points: • {polypeptide / amino acids} (1) • formed into an {alpha / triple} helix (1) • held together by H bonds (1) • the molecule is {fibrous / a straight chain} (1) • glycine is every 3rd amino acid (1)	Not beta pleated sheet Ignore other bonds Allow fibrils linear / unbranched	**3**

Question Number	Answer	Additional Guidance	Mark
2a	• suitable risk identified (1) • reduction of risk identified to the volunteer (1)	Mark first risk identified e.g. risk of infection / carbon dioxide not absorbed/ CO_2 poisoning / breathing difficulties /named condition / {soda lime / carbon dioxide absorber} is irritant e.g. sterilise or replace mouthpiece (after each use) / replace carbon dioxide absorber / medical questionnaire / do not take part if at risk / wear gloves / goggles Ignore clean unqualified	**2**

Question Number	Answer	Additional Guidance	Mark
2b	• answer in the correct range (1) • use of appropriate units (1)	Range of 6.1 to 6.5 $\times 10^{-3}$ ((if the units are $dm^3\ s^{-1}$) Allow any number of decimal places Allow minus values | **Units**	**Acceptable range**
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$dm^3\ s^{-1}$	6.1×10^{-3} - 6.5×10^{-3}
$dm^3\ min^{-1}$	3.7×10^{-1} - 3.9×10^{-1}
$cm^3\ s^{-1}$	$6.1 - 6.5$
$cm^3\ min^{-1}$	$366 - 390$	 Not dm^3/s or dm^3/min Allow per second or per minute Allow $m^3\ s^{-1}$ acceptable range is 6.1 to 6.5 $\times 10^{-6}$ $m^3\ min^{-1}$ acceptable range is 3.7 to 3.9 $\times 10^{-4}$	**2**

Question Number	Answer	Additional Guidance	Mark
2ci	An answer that includes two of the following points biotic • age (1) • {BM1 / mass / height} (1) • medical history (1) • sex (1) • {lung capacity / named example of lifestyle factor affecting this} (1)	**List rule applies** Allow weight for mass obesity eg. asthma, cystic fibrosis, heart disease Allow gender eg smoking, exercise, playing wind instrument etc	**2**

Question Number	Answer	Additional Guidance	Mark
2cii	• description of an appropriate method of control (1)	ECF for inappropriate variable chosen	**1**

Question Number	Answer	Additional Guidance	Mark
2d	An answer that includes the following points • chemoreceptors detect (change of) {pH / carbon dioxide concentration/level} (in blood) (1) • (nerve) impulses sent to {intercostal muscles / diaphragm} (1) • rate of breathing increases with {increased CO_2 / lower pH} (1)	 Allow converse statement	**3**

Question Number	Answer	Additional Guidance	Mark
3a	• There is no (significant) difference between the (mean) mass of leaves eaten of variety A and variety B	Candidates can express this in different ways	1

3b	• suitable table format with correct column headings and units (1) • all data correctly entered (1) • means correctly calculated (1)	**Mass of leaves eaten** (in 24 hours) **/ g** | (variety) A	(variety) B
17.3	17.8
17.2	17.9
17.5	17.7
17.0	17.6
16.7	17.8
16.9	17.4
Mean 17.1	Mean 17.7		3

Question Number	Answer	Additional Guidance	Mark
3c	• bar graph with linear scale and axes labelled, with units (1) • means plotted correctly (1) • range bars plotted correctly (1)	Mean mass of leaves (eaten) /g A B ALLOW ECF from 3bi for plotting incorrect means 16.7 to 17.5 17.4 to 17.9	3

Question Number	Answer	Additional Guidance	Mark
3di	• correct substitution of given $(S_A)^2$ and $(S_B)^2$ (1) • correct answer (1)	0.084 and 0.032 t = 4.3 / 4.32 / 4.315 / 4.3152 Correct answer gains 2 marks Ignore minus signs Allow ECF using incorrect means Denominator is 0.139	2

Question Number	Answer	Additional Guidance	Mark
3d ii	• the calculated value of *t* (4.3152) is **more than** the critical value **2.23** (1) • therefore reject the null hypothesis, so there is a difference in the mass (of leaves) eaten between variety A and variety B (1)	**Do not allow -ve values** / *t* < critical value if *t* value not given Ignore p = 0.01 Allow ECF for MP2	2

Question Number	Answer	Additional Guidance	Mark
3e	An answer that includes two of the following points: • use different temperatures (1) • use different {species / ages / stages of locust} (1) • leave for longer than 24 hrs (1) • use both varieties at once so locust can select diet (1)	Ignore repeat the expt / use more locusts Allow different humidities Ignore types	2

Question Number	Answer	Additional Guidance	Mark
3f	An answer that includes one of the following points: • locusts {eat more at higher temperatures / have a faster metabolism / respire faster so they grow faster} (1) • {locusts complete their life cycle faster / more locusts produced} (1)	Allow environmental answers e.g. increase in drought / temperature too hot for plant growth / more extreme weather such as severe storms	**1**

(Total for question 3 = 14 marks)

Question Number	Answer	Additional Guidance	Mark
4a	A description that includes two of the following points: • find a suitable {mass / length} of plant to use (1) • find a suitable method to **change** light intensity (1) • find a suitable {temperature / time} to collect {gas / O_2} (1) • find suitable {method / apparatus} to measure **volume** of {gas / O_2} (1)	A method to provide quantitative results Collection of gas / O_2 needs only be mentioned only once Allow suitable rage of light intensities Ignore wavelength Allow optimum temperature Ignore number of bubbles rate of photosyn	**2**

Question Number	Answer	Additional Guidance	Mark
4b	An answer that includes nine of the following points:	ALLOW different valid methods.	
	• clear statement of the **dependent** variable e.g. the **volume** of {gas / O_2} released (1)	Do not allow carbon dioxide Ignore reference to time	
	• description of method of measuring volume of gas (1)	Allow (labelled) diagram / photosynthometer	
	• method of standardising plants (1)	Allow length / mass / preconditioning Ignore age / species / size	
	• method of producing two different light intensities (1)	eg moving lamp / wattage of bulb / darkened room and light room	
	• use of (sodium) hydrogencarbonate (1)		
	• allow plant time to acclimatise (1)		
	• {standardised / stated} time for gas collection (1)	Allow 5 mins to 24 hrs	
	• one variable that need to be controlled and its method of control (1)	eg temperature – TC waterbath / heatshield / LED bulb Ignore AC room wavelength of light – filter / bulb pH – buffer	
	• {repeats / repeat the whole experiment} to give mean **and** SD (1)		
	• method of calculation of rate (1)	eg $\dfrac{\text{volume}}{\text{time}}$ / $\dfrac{\pi r^2 d}{t}$ / gradient of graph	**9**

Question Number	Answer	Additional Guidance	Mark

4c	An answer that includes the following points:
	
	• table for raw data with headings and units, with means calculated from repeats (1)
	AND
	  • bar graph format with labelled axes (1)
	
	• use of a t test for difference (with a bar graph showing only two different light intensities)
	OR
	  • {line / scatter} graph format with labelled axes (1)
	
	• use of a correlation test difference (with a line graph showing more than two different light intensities)
		Allow a description of how to calculate mean in text or as part of an axis label
		
		Allow other valid tests
		
		Allow named test e.g. Spearmans Rank
			3

Question Number	Answer	Additional Guidance	Mark
4d	An answer that includes two of the following points: • difficult to measure (small) {volumes / distances} of {gas / O_2} (with precision) (1) • difficult to control temperature (1) • difficult to control surface area of leaves (1) • idea that actual growing conditions in the river change during the day so the results may not be a fair representation (1)	Allow {some O_2 dissolved / some O_2 used in respiration / some gas may be CO_2} Ignore bubbles / escape of gas / errors in measuring Allow example of change	2

Total for question 4 = 16