Pearson Edexcel

Mark Scheme (Results)

October 2023

Pearson Edexcel International Advanced Level In Biology (WBI16)

Paper 01

Unit 6: Practical Skills in Biology II

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**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>2b</td><td>

- answer in the correct range (1)
- use of appropriate units (1)

</td><td>

Range of 6.1 to 6.5 x 10^{-3} ((if the units are $dm^3\ s^{-1}$)
Allow any number of decimal places
Allow minus values

<table>
<tr><th>Units</th><th>Acceptable range</th></tr>
<tr><td>$dm^3\ s^{-1}$</td><td>6.1 x 10^{-3} - 6.5 x 10^{-3}</td></tr>
<tr><td>$dm^3\ min^{-1}$</td><td>3.7 x 10^{-1} - 3.9 x 10^{-1}</td></tr>
<tr><td>$cm^3\ s^{-1}$</td><td>6.1 – 6.5</td></tr>
<tr><td>$cm^3\ min^{-1}$</td><td>366 - 390</td></tr>
</table>

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 x 10^{-6}

$m^3\ min^{-1}$ acceptable range is 3.7 to 3.9 x 10^{-4}

</td><td>2</td></tr>
</table>

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