Mark Scheme (Results)

Summer 2024

Pearson Edexcel International Advanced Subsidiary Level In Biology (WBI13)
Paper 01 Practical Skills in Biology I

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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
1(a)	An explanation that includes two of the following points (in order): • because the surface area needs to be the same (1) • so they have the same {number / amount / substrate} of protein (molecules) (1) • to produce valid {(set of) data / results / experiment / test / comparisons} / for validity (1)	ACCEPT substrate / protein concentration Ignore reliable, accurate, precise, fair test	**(2)**

Question number	Answer	Additional guidance	Mark
1(b)(i)	• water / same solvent (as used to dissolve the enzymes) / buffer	Accept boiled enzyme Denatured enzyme Ignore any qualification of water, e.g., salt water	**(1)**

Question number	Answer	Additional guidance	Mark
1(b)(ii)	• so that any effect can be attributed to the enzymes (and not the solvent) / allows comparisons (1)	ACCEPT as a baseline ACCEPT reverse argument	**(1)**

Question number	Answer	Additional guidance	Mark
1(c)	• (same) temperature **and** (same) {time / length / duration} (1)	DO NOT ACCEPT pH, size of pieces IGNORE volumes, concentration	**(1)**

Question number	Answer	Additional guidance	Mark
1(d)(i)	• 12.5 (cm^3)	IGNORE other units than cm^3	**(1)**

Question number	Answer	Additional guidance	Mark
1(d)(ii)	A description that includes two of the following points: • both enzymes decrease the pH (more than in the control) / at higher concentration the decrease in pH is more than at lower concentration / decrease in pH in bromelain more (than in papain) (1) • bromelain is more effective at breaking down the protein (than papain) (1) • at the higher concentration both enzymes are more effective at breaking down the protein (than at lower concentration) (1)	ACCEPT lower pH {in bromelain than papain / at high concentration than at low concentration} ACCEPT there is a negative corelation between pH and enzyme concentration	**(2)**

Question number	Answer	Additional guidance	Mark
1(e)	A description that includes four of the following points: • use biuret reagent / do biuret test (1) • remove meat from solution(s) / take sample of solution(s) / filter solution(s) (1) • use {known / same/ equal} volume of (meat) solution / use {known / same/ equal} volume of (biuret) reagent (1) • produce (colour) standards using known protein concentrations / compare the {colour / result} to colour standards (1)	ACCEPT biuret described correctly ACCEPT make calibration curve / a description of using a colorimeter to compare colours	**(4)**

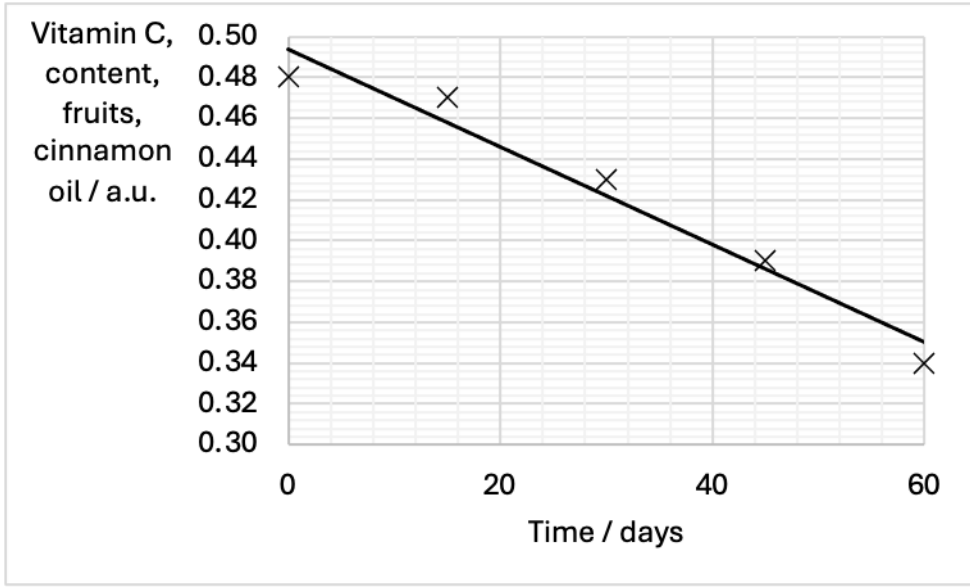
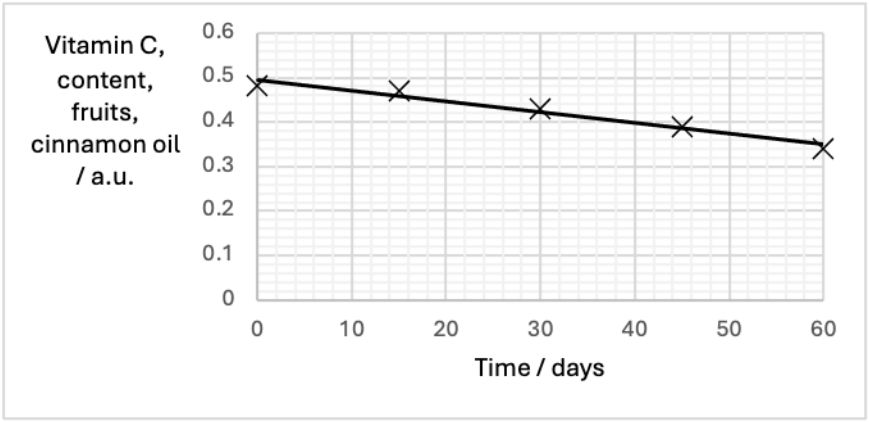
Question number	Answer	Additional guidance	Mark
2(a)	• 0.989 / 0.99 / 1.0 / 1 (m)	ACCEPT 0.994	**(1)**

Question number	Answer	Additional guidance	Mark
2(b)	<table><tr><th>Hazard</th><th>How to reduce the risk</th></tr><tr><td>(using / cutting oneself with) {knife / scissors / scalpel} OR (contact with / allergy to) fish (1)</td><td>cut {away from fingers / hands / oneself / on a board or tile / wearing gloves} (1) wear {gloves / mask}</td></tr><tr><td>(use of / inhalation of / spilling of) **formalin** (1)</td><td>use in a well-ventilated room / use in a fume cupboard / wear gloves / wash hands / wear protective eye wear / wear mask (1)</td></tr></table>	ACCEPT preservative liquid for formalin	**(4)**

Question number	Answer	Additional guidance	Mark
2(c)	An answer that includes the following points **to include 1 similarity and 1 difference:** SIMILARITIES: • both (hearts) have atrium(a) **and** ventricle(s) (1) • (in both) ventricle wall(s) thicker (than atrium wall(s)) (1) • both have valves (1) DIFFERENCES: • fish heart has one {atrium / ventricle} whereas a mammalian heart has two {atria / ventricles} / fish has only one side to the heart, mammals have two / mammalian heart has septum, fish does not (1) • fish heart has a {sinus venosus / bulbus arteriosus}, but a mammalian heart does not (1)	Must be a clear statement ACCEPT Reverse argument ACCEPT fish has single, mammal has double circulation / fish has 2 chambers, mammal has 4 ACCEPT …but mammals have arteries and veins	**(3)**

Question number	Answer	Additional guidance	Mark
2(d)	An answer that includes 6 of the following points: • use minimum of five fish (1) • (of) different sizes (1) • measure the {length / mass / volume} of each fish (1) • measure the {length / mass/ volume} of each heart (1) • detail of fish standardisation of measurement (1) • detail of standardisation of heart {measurement / dissection} (1) • plot a graph of fish size vs heart size / calculate ratios (1) • carry out a (correctly named) correlation test / compare ratios (1)	ACCEPT more than one quoted size, minimum a big one and a small one ACCEPT diameter ACCEPT diameter **e.g.,** between same points on each fish, preparation of fish prior to measurement (e.g., remove parasites) **e.g.,** length from end of sinus venosus to start of bulbus arteriosus each time, preparation of heart prior to measurement (e.g. empty of blood, remove extraneous tissues)	**(6)**

Question number	Answer	Additional guidance	Mark
3(a)(i)	• percentage decrease of fruit coated with chitosan calculated (1) • difference calculated correctly and given to given to 2 significant figures (1)	34.69387755, or any correct rounding (34.6938776, 34.693878, 34.69388, 34.6939, 34.694, 34.69, 34.7) for the calculation ACCEPT 35 for one mark only e.g. 43.75 – 34.69 = 9.06 = 9.1 to 2 sig figs Incorrect rounding at any intermediate stage can only have 1 mark.	**(2)**

Question number	Answer	Additional guidance	Mark
3(a)(ii)	An answer that includes the following points: • A-axes correct (x- time, y - Vit Conc,) (1) • L-both axes labelled with suitable title and units (x, Time / days, y, Vitamin C content of fruits coated with cinnamon oil / a.u. (1) • points plotted correctly on linear scale (1) • appropriate line of best fit (1)	 	**(4)**

Question number	Answer	Additional guidance	Mark
3(a)(iii)	A description that includes the following points: • repeat {for all 3 groups / experiment} (1) • (calculate) mean **and** standard deviation (1) • plot (mean and) {standard deviation / error bars} (on a graph) (1)	IGNORE formula ACCEPT SD ACCEPT find ACCEPT range bars ACCEPT present in a table described e.g. with SD column	**(3)**

Question number	Answer	Additional guidance	Mark
3(a)(iv)	A description that includes three of the following points: • describe method to standardise coating method (1) • repeat the investigation under the same conditions as before (1) • use of DCPIP (1) • description of titration (1)	e.g. dip in it for standard time / do as done in original investigation / same concentrations as in original investigation ACCEPT e.g. temperature, length of time, 60 days, size of fruit, type of fruit IGNORE colour change e.g. titrate dropwise / using burette / pipette	**(3)**

Question number	Answer	Additional guidance	Mark
3(b)(i)	A description that includes the following points: • take readings at the (bottom of the) meniscus (1) • hold the pipette at eye level when taking the readings (1)	ACCEPT reverse argument ACCEPT avoid parallax error ACCEPT perpendicular	**(2)**

Question number	Answer	Additional guidance	Mark
3(b)(ii)	• 1×10^5 / 1.0×10^5	ACCEPT $1 \cdot 10^5$ $1.0 \cdot 10^5$	**(1)**

Question number	Answer	Additional guidance	Mark
3(b)(iii)	An explanation that includes two of the following points: • {aseptic technique / description of aseptic technique} *to* avoid contamination of {cultures with other bacteria / ourselves with bacteria (which could be pathogenic)} (1) • {leave the lid loose / only partially seal lid} (of Petri dish onto base) *so* that {conditions are aerobic / anaerobic bacteria (which could be pathogenic) do not grow} (1) • growing bacteria at temperatures {slightly below 37°C / no higher than 35°C / body temperature} *to* decrease growth of pathogenic bacteria (1)	ACCEPT harmful, disease causing for pathogenic IGNORE irritant, allergy IGNORE to kill microbes ACCEPT infection ACCEPT taped vertically ACCEPT forming pathogenic	**(2)**

Question number	Answer	Additional guidance	Mark
3(b)(iv)	An answer that includes the following points: • different types of agar used as bacteria and fungi have different nutritional requirements (1) • higher temperature for bacteria because the {enzymes / metabolism} of bacteria have a higher optimum (temperature than the enzymes of fungi) (1) • fungi cultured for longer as they have a slower {growth / reproductive} rate (than bacteria) (1)	ACCEPT food ACCEPT reverse argument ACCEPT enzyme / metabolism optima different ACCEPT reverse argument ACCEPT growth rates different ACCEPT fungi take more time to grow	**(3)**

Question number	Answer	Additional guidance	Mark
3(b)(v)	An answer that includes the following points: • uses {a range / more than one species} (of microorganism) / bacteria and fungi} *so* conclusion is (more) representative • uses only four microbes *so* conclusion is not representative (1) • no {data given for uncoated fruit / control} *so* do not know if either coating has an (antimicrobial) effect (1) • no {error bars / SDs / repeats} *so* cannot judge if the {differences are statistically significant / there is no measure of variability (1) • measures diameter, direct area measure would be better *because* zone not always circular (1) •no indication of concentration of coating substance *so* may not be {representative / optimal} (1)	ACCEPT the differences are small *so* cannot judge if the differences are statistically significant	**(4)**

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