Pearson

Mark Scheme (Results)

Summer 2026

Pearson Edexcel International Advanced Level in Biology

WBI16/01

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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)	• measured length of head to abdomen from photograph divided by 15 and correct answer (1)	55mm ÷ 15 3.67 /3.7 (mm) **DO NOT ACCEPT** 3.66 **ACCEPT** 3.66 recurring **ACCEPT** a stated range of 54mm = 3.6 56 mm = 3.73 recurring··	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)	A description that includes six of the following points: • description of dependent variable as number adults produced (1) • use of at least **three** different temperatures in the range 5-60 ˚C (1) • method of control of temperature (1) • use of {same/stated} number of eggs at the start (1) • identify one named variable (1) • identify second named variable (1) • repeats to calculate {mean and SD/perform statistical test} (1)	**IGNORE** refs to time **ACCEPT** record the number of {adults / hatched beetles / hatched eggs} (for each temp) **IGNORE** germination **ACCEPT** thermostatic water bath /TC waterbath /AC /incubator / incubate **ACCEPT** count the eggs at start variables e.g. type of {flour/grain/food}/ mass of {grain/food} humidity / light intensity / oxygen / species / age of eggs / volume of water **IGNORE** pH / salt / age of beetle	**(6)**

Question Number	Answer	Additional Guidance	Mark
1(c)	An explanation that includes three of the following points: • insecticides kill most beetles / insecticide is a selection pressure (1) • some beetles have {resistant / advantageous} **allele**(s) (1) • due to (random) mutation (1) • (these survive and reproduce so) the proportion of offspring with alleles for resistance increase (1)	**DO NOT ACCEPT** gene(s) for 1,2,4 **ACCEPT** adults without the resistant allele die **DO NOT ACCEPT** if there is a selection pressure SO the flour beetle randomly mutates **DO NOT ACCEPT** mutation caused by insecticide or selection pressure **IGNORE** so they mutate **ACCEPT** {survive and) pass on allele to offspring **ACCEPT** allele frequency increases **IGNORE** change in allele frequency note passing on advantageous allele = MP2 +4 together	**(3)**

(Total for question 1 = 10 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)	An answer that refers to the following points: • suitable fieldwork risk identified (1) • description of how risk can be reduced (1)	mark as a whole **DO NOT ACCEPT** allergy unqualified e. g. allergy to plants/risk of infection/sunburn/attacked by wild animals / falling trees or branches/sharp thorns/toxic plants/dehydration / insect bite **IGNORE** uneven ground **note MP2 must relate to MP1** suitable described reduction of stated risk e.g. insect repellent / hat / gloves / wildlife warden / ranger **IGNORE** wear protective clothing unqualified	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	A description that refers to the following points: • Create a grid/use a gridded map (1) • select points (on grid) using a random number generator (1)	**IGNORE** use an app/GPS/map unqualified **ACCEPT** two measuring tapes at right angle =grid **ACCEPT** random co-ordinates **ACCEPT** other valid methods of how to e.g. random number tables / numbers out of a bag / dice	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	A calculation that shows the following points: • correct calculation of numerator and denominator (1) • correct answer to two decimal places (1)	1640 and 480 3.42 Correct answer gains two marks Incorrect answer to 2dp = 1mark e.g. 0.04 (using 5 for N) 2.73×10^{-3} = 0 marks as standard form technically doesn't have it as 2 dp as it is 0.00273	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(iii)	A description that includes any two of the following: • the {diversity / index} has {increased / gone higher} (with time) (1) • 20 year index suggests complete recovery (of biodiversity) (1)	MP 1 needs to be a clear statement **IGNORE** biodiversity/reverse argument **ACCEPT** reached same index as before it was cleared for farming **ACCEPT** both = 5.15 **ACCEPT** the diversity index (D) between the 20 years and mature forest are the **same** (5.15) the forest must recover for {20 years/more than 10 years} (1)	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	Any two of the following: • pH (of water/soil) • light **intensity** • water • soil minerals • temperature	mark first answer on each line **IGNORE** amount **DO NOT ACCEPT** light **ACCEPT** rainfall/ humidity **ACCEPT** soil type/salinity	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	• similar measurements mean the variables have little influence on the results / ORA (1)	candidates will express this in different ways **ACCEPT** so results can be compared / investigation worth doing / to be a valid test **ACCEPT** {results are / investigation is} valid **ACCEPT** assess validity **ACCEPT** taken into account so don't affect validity (of results) **ACCEPT** to determine how valid the investigation **IGNORE** accurate/reliable/precise	**(1)**

(Total for question 2 = 10 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)	• there is no (significant) difference between the oxygen consumption of {group **A** / trained} and {group **B /** untrained} (volunteers) (1)	Candidates will express this in different ways **DO NOT ACCEPT** no correlation	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)	An answer that includes the following points: • suitable table drawn with headings and units (1) • all data entered correctly to two decimal places (1) • correct both means calculated to two or three decimal places (1)	**IGNORE** extra columns Oxygen consumption/**dm^3 min^{-1}** Group A / Group B 0.24 / 0.22 0.25 / 0.20 0.21 / 0.19 0.18 / 0.22 0.18 / 0.18 M=0.21(2) / M=0.20(2)	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(c)	An answer that includes the following points: • bar graph with linear scale starting at zero and axes labelled, with units (1) • data plotted correctly (1) • correct range bars plotted (1)	A 0.25 to 0.18 B 0.22 to 0.18 Y axis **mean** oxygen consumption **dm^3 min^{-1}** X axis {A and B / trained and untrained} **IGNORE** bars touching **ACCEPT** an ECF for plotting incorrect means from 3b	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(d)(i)	A calculation that includes the following points: • correct substitution into formula (1) • correct answer (1)	0.6(0) 0.59976014 correct denominator is 0.016673 If they square Sa and Sb the square root of the denominator is 0.0004898 If they divide this into 0.01 they get 20.4164 Or 20.02164 For 1 mark	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(d)(ii)	A description that includes three of the following points: • mean values are similar (1) • the calculated value of t (0.6108) is less than the critical value **2.31** therefore accept the null hypothesis (1) • there is no significant difference between the resting oxygen consumption of {A and B / trained and untrained volunteers} (1) • (14 days of) training has no effect on resting oxygen consumption (1)	**IGNORE** repeat the experiment **ACCEPT** reverse statement if calc t value larger than 2.31 **ACCEPT** reverse statement if calc t value larger than 2.31 do not accept no correlation **ACCEPT** reverse statement if calc t value larger than 2.31	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(e)	A description that includes two of the following points: • ({lactate / lactic acid} transported) to the liver (in blood) (1) • {lactate / lactic acid} is {oxidised / converted / changed / broken down} to pyruvate (1) • pyruvate to link reaction (1)	**IGNORE** stored in liver **DO NOT ACCEPT** reduced **ACCEPT** converted to glucose / Acetyl-CoA / **ACCEPT** enters aerobic respiration **DO NOT ACCEPT** pyruvate to Krebs cycle	**(2)**

(Total for question 3 = 14 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	• bacteriocidal antibiotics kill bacteria whereas bacteriostatic antibiotics prevent bacteria increasing in numbers (1)	**ACCEPT** inhibits growth/reproduction/stops cell division/binary fission	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(b)(i)	An answer that includes the following points: • clear statement of the **dependent** variable (1) • use of aseptic technique (1) • create {a lawn / (even) spread} of bacteria on agar plates (1) • (incubate) **stated** temperature **and** time (after adding antibiotic) (1) • method of applying antibiotic (1) • same size of disc / same volume of antibiotic **in well** (1) • same concentration of antibiotic (1) • use same {type / strain / species} of {*E. coli* / bacteria} (1) • appropriate method of measuring zone of inhibition (1) • repeats to give mean values **and** SD (1)	**IGNORE** amount e.g. **dependent variable** is the {diameter / area} of the zone of inhibition **ACCEPT** a description of one technique / use of sterile equipment **IGNORE** taping plate e.g. spread over / spread / pour plate **IGNORE** streak temp range 20 - 35˚C and time 24hr to 96hrs dip disc into antibiotic / add antibiotic to well / add antibiotic disc **IGNORE** known concentrations e.g. ruler, graph paper, more than 1 orientation	**(9)**

	OR a liquid culture method • clear statement of the **dependent** variable e.g. measure turbidity /count colonies at the same (incubation) time (1) • use of aseptic technique (1) • create a liquid culture (1) • incubate at same/stated temperature to allow growth of bacteria (1) • method of shaking the culture (1) • Same volume of antibiotic (1) • same concentration of antibiotic (1) • use same type/strain of *E. coli* (1) • method of measuring turbidity /dilution plating (1) • repeats to give mean values **and** SD (1)		

Question Number	Answer	Additional Guidance	Mark
4(b)(ii)	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 treatments (1) **OR** • {line / scatter} graph format with labelled axes (1) • use of a correlation test (difference with a line graph showing more than two different treatments (1)	Depends on table shown if several concentrations of antibiotic used **DO NOT ACCEPT** rate units **ACCEPT** description of mean calculated in text or mean on one graph label **DO NOT ACCEPT** bar graph with third bar for control	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(b)(iii)	An explanation that includes three of the following points: • (L) difficult to prevent contamination • (E) reason poor aseptic technique (1) • (L) difficult to measure the zone of inhibition • (E) reason irregular shape (1) • (L) cannot investigate at human body temperature (37˚C) • (E) reason because of the increased risk of infection to the student (1) • (L) results don't apply to other bacteria • (E) reason only one {strain / type / species} of *E. coli* tested (1)	just two limitations described = 1 mark **MAX** but one limitation and two **supporting** reasons = two marks for the reasons (L) difficult count bacteria/colonies (E) Reason large numbers (1) or (L) difficult to measure mass (E) as really small change (1) **ACCEPT** valid limitation and reason for a turbidity method e.g. (L) difficult to {record change in light / measure turbidity} (E) because not shaken enough	**(3)**

		Guidance 1 limitation = 0 mks 2 limitations = 1mks 1 limitation + 1 explanation =1mk 1 limitation + 2 explanations = 2mks 2 limitations + 1 explanation = 2mks 2 limitations + 2 explanations = 3 mks	

(Total for question 4 = 16)