Mark Scheme (Results)

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Pearson Edexcel International Advanced Level
In Biology (WBI16)
Paper 01 Practical Biology and Investigative Skills

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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	A description that includes six of the following points: • (compare) pollen grains with and without stigma extract • method of measuring growth of pollen tube (1) • identification of one variable with suitable method of control (1) • identification and method of control of a second variable (1) • stated time (intervals) for measuring length of pollen tube (1) • method for calculating rate of growth (1) • repeats (for each treatment) and calculate a mean (1)	 **Accept** with extract and with sucrose as control **Accept** different concentrations of extract as long as one is zero Need to mention microscope **Accept** use of rule, squared paper, stage micrometer **Accept** {temperature / pH / volume of water / light intensity / age of plant / age of pollen grains / time after ripening of stamens, **Ignore** size of pollen grains **Accept** measure after a single suitable interval eg after 30 mins min, max 12 hours; or at suitable intervals eg 10-30 mins <u>Change in length</u> time **Accept** repeats and calculate SD	**6**

Question Number	Answer	Additional Guidance	Mark
1(b)	A description that includes four of the following: • starch is {digested / broken down / hydrolysed} to release glucose (1) • condensation reactions are used to form pectin (1) • pectin {secreted into / enclosed in / transported in} vesicles (1) • vesicles fuse with the {tip / cell membrane} to release {pectin / contents} (1) • (respiration in) mitochondria releases {ATP / energy} for production of {vesicles / pectin / enzymes / other relevant molecules} (1)	**Accept** release monosaccharides **Accept** glucose joined by glycosidic bonds to form pectin/polysaccharide **Accept** reference to exocytosis releasing contents **Accept** energy used for movement of vesicles / exocytosis **Piece together mp5**	**4**

Question Number	Answer	Additional Guidance	Mark
2 ai	• calculation of mean distance (1) • correct use of r^2 (1) • correct answer (1)	Allow ECF for MP2 and MP3 L = 4.4 (mm) r^2 = 0.01 (mm^2) 0.14 (mm^3 min^{-1}) 0.138 gets 2 marks correct answer with no working gains (3) marks	**3**

Question Number	Answer	Additional Guidance	Mark
2aii	• <u>volume of carbon dioxide produced</u> (1) volume of oxygen used • RQ value calculated (1)	$0.11 \div 0.14$ 0.786/0.79 / 0.8/0.80 Allow ecf of wrong rate of oxygen from 2ai $0.11 \div 0.138 = 0.797$ / 0.80 $0.11 \div 0.55 = 0.20$	**2**

Question Number	Answer	Additional Guidance	Mark
2aiii	• soda lime absorbs carbon dioxide so must be removed so carbon dioxide produced can be measured.	Accept glass beads do not absorb carbon dioxide so carbon dioxide produced can be measured Ignore ref to measuring RQ	**1**

Question Number	Answer	Additional Guidance	Mark
2bi	An answer that includes two of the following: • mass of maggot (1) • species (1) • age (1)	One abiotic and two biotic = 1mk two abiotic =0 **Accept** source **Ignore** size, sex, type, genetic variation, microbes in tube, competition, disease	**2**

Question Number	Answer	Additional Guidance	Mark
2bii	A description that includes the following: • variable with suitable control method described (1) • results are not valid / description of expected effect on the dependent variable (1)	Must give detail not just eg use the same mass Must be directional if giving expected effect	**2**

Question Number	Answer	Additional Guidance	Mark
3a	• there is no (significant) **difference** between the (mean) **diameter** of the zone of inhibition between samples from **village B and village A**	Three parts to this answer: can be expressed in many different ways	**1**

Question Number	Answer	Additional Guidance		Mark

3bi

	Answer	{Diameter / length} of zone of inhibition /mm		Mark
		Village A	**Village B**	
	• suitable table format with data (1) • correct column headings with units (1) • means correctly calculated to same number of places as data table (1)	15.9	17.2	
		16.2	17.0	
		14.5	17.3	
		17.1	15.8	
		15.3	17.3	
		15.4	18.9	
		16.2	19.1	
		16.8	19.3	
		14.4	16.9	
		16.8	14.8	
		18.2	16.7	
		16.1	17.4	
		16.9	17.8	
		16.6	17.4	
		16.4	16.8	
	Mean	**16.2**	**17.3**	**3**

Question Number	Answer	Additional Guidance	Mark
3bii	• bar graph with linear scale, correct axis labels including units (1)	Mean diameter of zone of inhibition (mm) and bars labelled A and B **Accept** broken scale	
	• means plotted correctly (1)	16.2 and 17.3 ALLOW ecf from 3bi	
	• range bars plotted correctly (1)	A 14.4 to 18.2 B 14.8 to 19.3	**3**

Question Number	Answer	Additional Guidance	Mark
3biii		Example of calculation	
	• correct calculation of numerator (1)	17.3 - 16.2 = (-) 1.1 **Accept** 17.31 – 16.19 = 1.12	
	• correct substitution of given $\frac{(S_A)^2}{n}$ and $\frac{(S_B)^2}{n}$ (1)	$\frac{0.99}{15}$ + $\frac{1.39}{15}$	
	• correct answer (1)	t = 2.76 **Accept** - 2.76 / 2.81 / - 2.81 Allow mp 2 and 3 only if incorrect means used correct answer with no working gains (3) marks	**3**

Question Number	Answer	Additional Guidance	Mark
3biv	An answer that includes the following:		
	• t value greater than critical value so {difference is significant / reject the null hypothesis} (1)	**Accept** correct numbers 2.76 > 2.05 Ref to correlation & difference = no mark	
	• Bacteria from village A are (significantly) more resistant to ampicillin than bacteria in village B (1)	**Accept** appears that resistance has developed in village A (as ZOI is significantly bigger) **Accept** that bacteria in village B have not developed resistance compared to bacteria in village A	
	• Cannot comment on development of resistance in village B as do not have any data to compare {before ampicillin given / with another village where ampicillin has not been given} (1)		
			2

Question Number	Answer	Additional Guidance	Mark
3c	An answer that includes two of the following: • more samples from each village (1) • compare with villages not using {antibiotic / ampicillin} (1) • control of biotic factors (1)	**Accept** repeat the study / larger sample size / samples from more villages eg {age / variety / species / diet / spacing} of chickens **Ignore** reference to genetic variation in chickens / mass / gender **Ignore** reference to testing different concentrations of ampicillin	2

Question Number	Answer	Additional Guidance	Mark
4a	A description that includes three of the following: • find a suitable concentration range for ABA (1) • find a suitable method for measuring starch digestion (1) • find a suitable {temperature/pH} (for starch digestion) (1) • find a suitable timescale (for starch digestion) (1)	**Accept** suitable concentrations of ABA **Accept** suitable method for measuring amylase production **Accept** species (of wheat) **Accept** find a suitable time for soaking endosperm in ABA (1)	3

Question Number	Answer	Additional Guidance	Mark
4b	An answer that includes eight of the following: • clear statement of the dependent variable e.g. size of clear area (1) • some description of aseptic technique e.g. rinse endosperm in {sodium hypochlorite/sterile water} (1) • soak the endosperm with ABA and place on starch agar (1) • stated time for incubation 24-72hrs (1) • method of determining clear area e.g. trace for total area or take (several) diameter measurement(s) (1) • identify one variable to be controlled and description of how this variable is controlled (1) • identify second variable to be controlled and description of how this variable is controlled (1) • repeats at each ABA concentration or repeat the whole experiment (1) • test at 5 different concentrations of ABA (1)	**Accept** absorbance / transmission using colourimeter **Accept** using disinfectant (of wheat or apparatus, but not bench) **Accept** place endosperm in tube containing starch solution **Accept** use colorimeter to measure {transmission / absorbance} (if starch in tube method used) **Accept** pH temperature humidity light intensity species / variety, age of seed, mass / size of seed	**8**

Question Number	Answer	Additional Guidance	Mark
4c	• raw data table with headings and means calculated from repeats (1)	**Accept** any header with units even if incorrect Accept description of calculating mean Do not accept units in the body of the table	
	• line graph format with labelled axes (1)	**Accept** scatter graph	
	• use of an appropriate statistical test (1)	**Accept** correlation test or named correlation test	**3**

Question Number	Answer	Additional Guidance	Mark
4d	• difficult to measure small clear areas (1)	Accept difficulty in using the colourimeter or judging an end point	
	• difficult to maintain aseptic conditions (1)	**Accept** {seeds / agar} may be contaminated with bacteria	
	• {growth regulators / chemicals} in seed may affect amylase production	**Accept** genetic variation in seeds affects {amylase production / size of endosperm}	**2**