Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

BIOLOGY **9700/05**

Paper 5 Planning, Analysis and Evaluation **For Examination from 2016**

SPECIMEN MARK SCHEME

1 hour 15 minutes

MAXIMUM MARK: 30

This document consists of **6** printed pages.

CAMBRIDGE International Examinations

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Mark scheme abbreviations:

;	separates marking points
/	alternative answers for the same point
R	do not allow
A	allow (for answers correctly cued by the question, or guidance for examiners)
AW	alternative wording (where responses vary more than usual)
underline	actual word given must be used by candidate (grammatical variants excepted)
max	maximum number of marks that can be given
ora	or reverse argument

Numbers against mark points are for examiner reference only; they do not reflect relative importance of answers or a required sequence of answers.

Question	Expected answer	Extra guidance	Mark
1 (a) (i)	*independent variable* – quantity / percentage of *Fucus spiralis*; *dependent variable* – numbers of *Littorina littorea* / mollusc;	**A** seaweed / algae **R** 'number of *Fucus spiralis*'	[2]
(ii)	ref. to using the same size quadrat / using the same quadrat; ref. to line / transect parallel to sea; ref. to repeat lines / transects at same distance from the sea; ref. to systematic counting / quadrats at fixed intervals along the transect;	*Ignore in all cases reference to means / climate / same beach / weather.* ignore ref. to repeating the investigation or repeating the measurements **A** descriptions e.g. every metre intervals	[max 2]
(iii)	*any two of:* light (intensity); temperature; humidity / rainfall; wind / air movement;	ignore weather / climate / tide	[max 1]
(b) (i)	*answers must relate to specific data in the table* samples at 6 / 7 / 15 all have similar percentage of *Fucus* **and** have molluscs present; percentage of *Fucus* is high so should have molluscs; does not fit a general correlation / does not follow trend ;	**A** sample at 16 without any *Fucus* cover has molluscs; **A** all the others have some molluscs	[max 1]
(ii)	*x*-axis – mean percentage of *Fucus spiralis*; *y*-axis – mean number of *Littorina littorea*;	**A** % sign **A** mean quantity / amount of seaweed / algae **A** mean number molluscs	[2]
(iii)	ref. to no relationship (because data is scattered); ref. to there is a slight / partial (positive) correlation;	**A** described pattern e.g. as steps / increases unevenly or increase in *Fucus* does not mean an increase in *Littorina*	[max 1]
(c) (i)	the data is not normally distributed; data points are independent of each other; the data can be converted to ordinal data;	**A** data is ordinal / ordered	[max 1]
(ii)	**D** = 9 and $\mathbf{D^2}$ = 81;		[1]
(iii)	correct substitution of values; correct subtraction to give r_s;	$(r_s) = 1 - \left\lvert \frac{6 \times 787 / (4722)}{8000 - 20 / 7980} \right\rvert$ $= 1 - 0.6 = 0.4$ **A** 1 – 0.59(2)	[2]

[Turn over

Question	Expected answer	Extra guidance	Mark
(iv)	there is a weak positive correlation between the distribution of the two species;		[1]
(d)	*abiotic factor any one of:* temperature; idea of exposure; light availability; presence of rocks / rock pools; distance from sea; pollution; *biotic factor any one of:* predation; competition other species for food source; human activities AW;	allow heat / cold; e.g. desiccation / drying out / wave action allow named predators e.g. dog whelk / sea birds e.g. trampling / collecting for food / litter	[max 2]
			[Total: 16]

Question	Expected answer	Extra guidance	Mark
2 (a)	*independent variable:* 1. ref. to using same mass of tissue to homogenise; 2. ref to using same volume of osmotic buffer to make suspensions; 3. same volume of each suspension added to each of the test-tubes; *dependent variable:* 4. ref. to checking regular intervals until blue disappears; 5. ref. to colour comparison / control without methylene blue added;	**A** equilibrate at same temperature as suspensions	
	control variables: (max 2) 6. ref. to adding known volume methylene blue solution; 7. ref. to equilibrating methylene blue at 20 °C before using; 8. ref. to a method of keeping the temperature constant;	8. e.g. water-bath / incubator. **A** temperature controlled room. Ignore air conditioning	
	procedure: 9. ref. to inverting / stirring to mix indicator with extract; 10. ref. to a method of excluding air after adding methylene blue;	10. e.g. adding oil to surface / filling tubes and closing with a cork. **A** injecting methylene blue through an oil layer / sealed tube	
	safety: 11. ref. to a low risk experiment;	11. **A** ref. to possible toxicity of methylene blue and suitable precaution e.g. wearing gloves	
	reliability: 12. ref. to 10 replicates for each suspension;		[max 8]

Question	Expected answer	Extra guidance	Mark

(b) (i) *any two of:*

	time for methylene blue to become colourless s^{-1}									
	test 1	test 2	test 3	test 4	test 5	test 6	test 7	test 8	test 9	test 10
Tissue **A**	70	56	59	54	52	56	55	75	59	50
Tissue **B**	124	126	136	126	122	125	121	123	124	125

both for one mark; [1]

(ii) *idea of* difficulty in judging the disappearance of the colour; [1]

(iii) add all the values together excluding anomalous results and divide by the total number of samples;

A as formula $\frac{\sum \text{sample values} - \text{anomalous results}}{\text{number of samples}}$ [1]

(iv) use an oxygen probe to measure the fall in oxygen concentration over time;
use a carbon dioxide probe to measure the increase in carbon dioxide;
use of pH meter to decrease in pH due to hydrogen ions;

A oxygen meter

[1]

(c) *any two of:*
tissue **A** takes less time than tissue **B** to reduce methylene blue / rate of reaction of tissue **A** is faster than tissue **B**;
time for tissue **A** to reduce methylene blue / rate of reaction of **A** is 2.25 times faster than tissue **B**;
tissue **A** has faster rate of respiration than tissue **B**;
results from tissue **B** are more reliable than those of tissue **A** ora;

A stated time –69s less for **A** ora
A stated rate 10 s^{-1} more for **A** ora

A standard deviation of tissue **B** is less than that of tissue **B** ora

[max 2]

[Total: 14]