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**BIOLOGY**

**9700/05**

Paper 5 Planning, Analysis and Evaluation

**For Examination from 2016**

SPECIMEN MARK SCHEME

**1 hour 15 minutes**

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**MAXIMUM MARK: 30**

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

**Mark scheme abbreviations:**

<b>;</b>	separates marking points
<b>/</b>	alternative answers for the same point
<b>R</b>	do not allow
<b>A</b>	allow (for answers correctly cued by the question, or guidance for examiners)
<b>AW</b>	alternative wording (where responses vary more than usual)
<b><u>underline</u></b>	actual word given must be used by candidate (grammatical variants excepted)
<b>max</b>	maximum number of marks that can be given
<b>ora</b>	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) <i>independent variable</i> – quantity / percentage of <i>Fucus spiralis</i> ; <i>dependent variable</i> – numbers of <i>Littorina littorea</i> / mollusc;	A seaweed / algae R 'number of <i>Fucus spiralis</i> '	[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;	<i>Ignore in all cases reference to means / climate / same beach / weather.</i> ignore ref. to repeating the investigation or repeating the measurements A descriptions e.g. every metre intervals	[max 2]
	(iii) <i>any two of:</i> light (intensity); temperature; humidity / rainfall; wind / air movement;	ignore weather / climate / tide	[max 1]
(b)	(i) <i>answers must relate to specific data in the table</i> samples at 6 / 7 / 15 all have similar percentage of <i>Fucus</i> <b>and</b> have molluscs present; percentage of <i>Fucus</i> is high so should have molluscs; does not fit a general correlation / does not follow trend ;	A sample at 16 without any <i>Fucus</i> cover has molluscs; A all the others have some molluscs	[max 1]
	(ii) x-axis – <u>mean percentage</u> of <i>Fucus spiralis</i> ; y-axis – <u>mean number</u> of <i>Littorina littorea</i> ;	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 <i>Fucus</i> does not mean an increase in <i>Littorina</i>	[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) <b>D</b> = 9 and <b>D</b> <sup>2</sup> = 81;		[1]
	(iii) correct substitution of values; correct subtraction to give $r_s$ ;	$(r_s) = 1 - \left( \frac{6 \times 787 / (4722)}{8000 - 20 / 7980} \right)$ $= 1 - 0.6 = 0.4$ A 1 – 0.59(2)	[2]

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

Question	Expected answer	Extra guidance	Mark
2 (a)	<p><i>independent variable:</i></p> <ol style="list-style-type: none"> <li>1. ref. to using same mass of tissue to homogenise;</li> <li>2. ref to using same volume of osmotic buffer to make suspensions;</li> <li>3. same volume of each suspension added to each of the test-tubes;</li> </ol> <p><i>dependent variable:</i></p> <ol style="list-style-type: none"> <li>4. ref. to checking regular intervals until blue disappears;</li> <li>5. ref. to colour comparison / control without methylene blue added;</li> </ol> <p><i>control variables: (max 2)</i></p> <ol style="list-style-type: none"> <li>6. ref. to adding known volume methylene blue solution;</li> <li>7. ref. to equilibrating methylene blue at 20°C before using;</li> <li>8. ref. to a method of keeping the temperature constant;</li> </ol> <p><i>procedure:</i></p> <ol style="list-style-type: none"> <li>9. ref. to inverting / stirring to mix indicator with extract;</li> <li>10. ref. to a method of excluding air after adding methylene blue;</li> </ol> <p><i>safety:</i></p> <ol style="list-style-type: none"> <li>11. ref. to a low risk experiment;</li> </ol> <p><i>reliability:</i></p> <ol style="list-style-type: none"> <li>12. ref. to 10 replicates for each suspension;</li> </ol>	<p><b>A</b> equilibrate at same temperature as suspensions</p> <p>8. e.g. water-bath / incubator. <b>A</b> temperature controlled room. Ignore air conditioning</p> <p>10. e.g. adding oil to surface / filling tubes and closing with a cork. <b>A</b> injecting methylene blue through an oil layer / sealed tube</p> <p>11. <b>A</b> ref. to possible toxicity of methylene blue and suitable precaution e.g. wearing gloves</p>	[max 8]

Question	Expected answer	Extra guidance	Mark
(b) (i) any two of:			

	time for methylene blue to become colourless s <sup>-1</sup>									
	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<sup>-1</sup> more for A ora

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

[max 2]

[Total: 14]