COMPONENT 2 - Applications in Biology

FOUNDATION TIER

MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statement.

Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)	(i)		Proportion of lumen (1) Line quality(1)	2			2		2
		(ii)		Correct lumen label (1) Correct muscle label (1)	2			2		2
		(iii)		$\frac{13}{50}$ (1) 0.26 mm (1)		2		2	2	2
	(b)			Thickness of muscular wall (1) Relative size / shape of lumen (1)	2			2		
				Question 1 total	**6**	**2**	**0**	**8**	**2**	**6**

Question				Marking details	Marks available					
					AO1	**AO2**	**AO3**	**Total**	**Maths**	**Prac**
2	(a)	(i)		303+272+270+264+256+253(1) 1618/6 = 269.7 (1)		2		2	2	
		(ii)		0-350 Scale (1) Bar heights (1) Placement and labels (1)		3		3	3	
	(b)	(i)		Person 1 (1) Smaller value = quickest response(1)			2	2		2
		(ii)		Increase in age associated with increase in reaction time			1	1		
		(iii)		Decreased reaction time until minimum level reached			1	1		1
	(c)	(i)		Use of computer to log data /results –accuracy (1) Small unit of measurement (ms) precision (1)		2		2		2
		(ii)	I	same investigator and subjects - further repeats	1			1		1
			II	Different investigator(s) carry out same method	1			1		1
		(iii)		Much larger sample size/ equal number of males and females			1	1		1
				Question 2 total	**2**	**7**	**5**	**14**	**5**	**8**

<table>
<tr><th colspan="4" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks Available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>3</td><td>(a)</td><td>(i)</td><td></td><td>Cut pieces with sharp knife measuring length/width /size with ruler (1)
so all chips of uniform size (1)</td><td>1</td><td>1</td><td></td><td>2</td><td></td><td>2</td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>Dry chip</td><td>1</td><td></td><td></td><td>1</td><td></td><td>1</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>I</td><td>One chip in test tube, below surface of solution (1)
Labels – sugar solution of (any) concentration, chip (1)</td><td>2</td><td></td><td></td><td>2</td><td></td><td>2</td></tr>
<tr><td></td><td></td><td></td><td>II</td><td>Solutions of different sugar concentrations</td><td></td><td>1</td><td></td><td>1</td><td></td><td>1</td></tr>
<tr><td></td><td></td><td>(iv)</td><td></td><td>All correct for 1 mark
<table>
<tr><th>Hazard</th><th>Risk</th><th>Control measure</th></tr>
<tr><td>Sharp knife could cut you</td><td>cutting skin when cutting potato</td><td>cut away from body onto tile</td></tr>
</table></td><td>1</td><td></td><td></td><td>1</td><td></td><td>1</td></tr>
<tr><td></td><td>(b)</td><td></td><td></td><td>6.7% (from graph) (1)
No change in mass, no net movement of water by osmosis (1)</td><td></td><td>1</td><td>1</td><td>2</td><td>1</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>Question 3 total</td><td>5</td><td>3</td><td>1</td><td>9</td><td>1</td><td>7</td></tr>
</table>

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)	(i)		leaves from same sycamore tree (1) soil taken from same field(1) left for same length of time / 6 weeks (1)	3			3		3
		(ii)		used graph paper to measure area of leaf remaining (1) results were numerical / quantitative (1)	2			2		2
	(b)			**Indicative Content:** Higher temperature and larger mesh size results in a higher rate of decomposition as there is less leaf remaining after 6 weeks. At lower temperature mesh size does not seem to affect the rate of decomposition as about the same area of leaf remains after 6 weeks. Explains that decomposition is carried out by microorganisms, e.g. bacteria / fungi, and involves enzymes which are more active at a higher temperature. Large mesh size would allow larger decomposers / detritivores to enter the mesh bags which would speed up rate of decomposition. At lower temperatures these organisms would be less active. **5-6 Marks** Recognises that rate of decomposition is highest with high temperature and large mesh size but that at low temperature, mesh size has no affect – answers are related to area of leaf remaining after 6 weeks. Clear understanding of the role of microbes, giving examples of bacteria or fungi, in decay and that they use enzymes to digest leaf material. Links made to the effect of temperature on enzyme activity. Understands that larger organisms also place a part in decomposition and that larger mesh gives them access to leaf material but that low temperature will also reduce their level of activity. *There is a sustained line of reasoning which is coherent, substantiated and logically structured. The information included in the response is relevant to the argument.*		6		6		

				3-4 Marks Understands the combined effects of mesh size and temperature and relates their conclusion to leaf area remaining after 6 weeks. Recognises the role of microbes in decay and attempts to link effect of temperature on enzymes to rate of decomposition. Identifies that larger organisms are also involved in decomposition and that larger mesh size allows access to the leaf material but is unclear regarding how low temperature affects them. *There is a line of reasoning which is partially coherent, supported by some evidence and with some structure. Mainly relevant information is included in the response but there may be some minor errors or the inclusion of some information not relevant to the argument.* **1-2 Marks** Can conclude the relationship between temperature and mesh size at the higher temperature investigated and recognises the role of microbes in decay but does not make a clear link to the effect of temperature on enzymes. A basic understanding of larger mesh size allowing greater access to the leaf material for larger organisms but is unable to explain results at lower temperatures. *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. There may be significant errors or the inclusion of information not relevant to the argument.*						
	(c)			No leaf decay (1) at either temperature or mesh size (1) microbes / decomposers in soil killed / dead (1)			3	3		
				Question 4 total	**5**	**6**	**3**	**14**	**0**	**5**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)	(i)		$\frac{80}{100}$ x 600 = 480 (1) 480 + 600 = 1 080 (1)		2		2	2	
		(ii)		Aliens are continually invading/ more arriving each year/ original was only an estimate	1			1		1
	(b)			**Any 4 (x1) from:** • Over the time period the number of invasive marine species increased from 6 to 19. • There is an upward trend in the number of species within 10 km of their source. • There is an upward trend in the number of species within 10% of the territory. • Until 1990 there were no species occupying more than 10% of the territory/between 1990 and 2008 the number of species occupying between 10-50% of territory has increased. • In 2000 one species established itself in over 50% of territory.		4		4	4	
	(c)	(i)		Deliberately transported by boat	1			1		
		(ii)		A number of black swans are captured marked and released back into the wild (1) Later another sample captured and population is estimated using two sets of data (1)	2			2		2
	(d)			Decreases biodiversity Overgrowth of algae	2			2		
	(e)			Pike population will decline due to more competition for/less food. (1) Cygnets compete for insect species/beetles so less food for pike (1) Adult swans compete for plants and algae so less food for snail / caddis fly / fleas /tadpole (1)			3	3		
				Question 5 total	**6**	**6**	**3**	**15**	**6**	**3**