COMPONENT 2 - Applications of Biology

HIGHER 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. Award the middle mark in the level if most of the content statements are given and the communication statement is partially met. Award the lower mark if only the content statements are matched.

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)		$\frac{80}{100}$ 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		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 (1) Overgrowth of algae (1)	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 1 total	**6**	**6**	**3**	**15**	**6**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			Light	1			1		1
	(b)	(i)		As distance from lamp increases time taken for disc to float increases		1		1		1
		(ii)		Further away light intensity decreases (1) (Less light) for photosynthesis (1) so less oxygen produced (1) longer time taken for discs to float (1)		1 1 1	 1	4		4
	(c)			To provide carbon dioxide (1) Which is required for photosynthesis to occur (1)	2			2		2
	(d)			Temperature (1) Heat filter/ beaker of water (1)	1		 1	2		2
				Question 2 total	**4**	**4**	**2**	**10**	**0**	**10**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			to absorb carbon dioxide (1) so that any changes in volume can only be due to decrease in oxygen(1)	2			2		2
	(b)	(i)		to act as a control/to see if the peas were responsible for oxygen uptake	1			1		1
		(ii)		total volume of peas		1		1		1
	(c)	(i)		$\frac{(0.94-0.63)}{20}$ (1) 0.016 (1)		2		2	2	
		(ii)		increase in temp increases diffusion of oxygen into seeds (1) increase activity of enzymes (1)		2		2		2
	(d)			starch (1) digested/broken down to glucose (1) by enzymes (1)	3			3		
				Question 3 total	**6**	**5**	**0**	**11**	**2**	**6**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Both hormones cause greater {growth/elongation} than the control (1) Gibberellin causes the least increase in elongation (1) IAA causes double or a much greater increase than GA (1) Greatest growth is caused by the combined effect of GA and IAA. (1)		4		4		4
	(b)			Promote root growth in stem cuttings (1) Breaks dormancy in seeds or buds/bulbs (1) Controls fruit ripening/growth (1) Promotes cell division in tissue cultures (1)	4			4		
				Question 4 total	**4**	**4**	**0**	**8**	**0**	**4**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
5	(a)			Rate of uptake plant with roots = 6/60 = 0.1cm^3 cm^{-2} (1) Plant without roots = 6/100 = 0.06 cm^3 cm^{-2} (1) Presence of roots increases rate of uptake (1) Even though less leaf area in plant with roots (1)		1 1	 1 1	4	2	4
	(b)			oil prevents evaporation from water surface (1) so only route for water loss is through leaves (1)	2			2		2
	(c)			not repeated + repeat to increase reliability in the results (1) Different leaf surface area + therefore different rates of transpiration and photosynthesis (1) use same plants with roots and then remove roots / use plants with same / similar leaf area (1) {Temperature / wind speed / air humidity / light intensity } not controlled + keep under same environmental conditions to prevent different transpiration / photosynthesis rates (1)			4	4		4
				Question 5 total	**2**	**2**	**6**	**10**	**2**	**10**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6				**Indicative content:** Add biuret reagent to urine sample to check for protein – colour change from pale blue to purple without heating. Add Benedict's solution to urine sample and heat strongly to check for glucose – colour change from blue to brick red if high concentration of glucose, green if low concentration. Expect: Healthy urine to have no colour change with either test. Kidney disease to show positive result with biuret Diabetes to have a positive result with both tests Healthy person would not excrete proteins as they would be too large to pass through glomerular membrane and all glucose would be reabsorbed by proximal convoluted tubule so no glucose. Kidney disease would excrete protein as damage to glomerular membrane would allow large molecules to pass through; glucose should still be reabsorbed by pct. In uncontrolled diabetes both protein and glucose would be present in urine due to damage to glomerular membranes and lack of reabsorption by pct.	2	3	1	6		3

				5 – 6 marks: Correct details of both biuret and Benedict's tests are given including colour changes expected if protein / glucose present in urine samples. Explains why healthy person would have no colour change and relates this to intact and fully functioning glomeruli and pct's. Explains why large molecules / proteins will be found in urine of kidney disease patients and why both protein and glucose would be present in urine of a diabetic. *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.* **3 – 4 marks**: Correctly describes both biuret and Benedict's tests including colour changes. Correctly describes the expected results for each urine sample and provides some explanation of why protein / glucose could appear in urine. *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**: Describes how to carry out biuret and Benedict's tests with some omissions, e.g. colour changes or need to heat / not to heat. Attempts to relate expected results to effects of complaints on kidney function. *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.* **0 marks:** *No attempt made or no response worthy of credit.*						
				Question 6 total	**2**	**3**	**1**	**6**	**0**	**3**