Question	Scheme	Marks	AOs
5(a)	$p = 10^{0.5}$ (or $\log_{10} p = 0.5$)　or　$q = 10^{0.03}$ (or $\log_{10} q = 0.03$)	M1	1.1b
	p = awrt 3.162　or　q = awrt 1.072	A1	1.1b
	$p = 10^{0.5}$ (or $\log_{10} p = 0.5$)　and　$q = 10^{0.03}$ (or $\log_{10} q = 0.03$)	dM1	3.1a
	$A = 3.162 \times 1.072^t$	A1	3.3
		(4)	
(b)(i)	The initial mass (in kg) of algae (in the pond).	B1	3.4
(b)(ii)	The ratio of algae from one week to the next.	B1	3.4
		(2)	
(c)(i)	5.5 kg	B1	2.2a
(c)(ii)	$4 = "3.162" \times "1.072"^t$　or　$\log_{10} 4 = 0.03\,t + 0.5$	M1	3.4
	awrt 3.4 (weeks)	A1	1.1b
		(3)	
(d)	• The model predicts unlimited growth. • The weather may affect the rate of growth	B1	3.5b
		(1)	
		(10 marks)	

Notes

(a)

M1: A correct equation in p **or** q. May be implied by a correct value for p or q.
　　Also score for rearranging the equation to the form $A = 10^{0.5}...10^{0.03t}$

A1: For p = awrt 3.162 or q = awrt 1.072. May be embedded within the equation.

dM1: Correct equations in p **and** q. Also score for rearranging the equation to the form
　　$A = 10^{0.5} \times 10^{0.03t}$

A1: Complete equation with p = awrt 3.162 and q = awrt 1.072. **Must be seen in (a)**
　　If p and q are just stated but the equation is not written with the values embedded then
　　withhold this mark.
　　Withhold the final mark if the correct values for p and q result from incorrect working
　　such as $A = 10^{0.5} + 10^{0.03t} \Rightarrow A = 3.162 \times 1.072^t$.
　　If p and q are stated the wrong way round, take the stated equation as their final answer
　　and isw.

(b)
(i)
B1: Must reference mass of algae and relating to initially/at the start/beginning
　　Examples of acceptable answers:
　　The mass of algae originally (in the pond)
　　p is the mass of algae when $t = 0$
　　Examples of answers we would not accept
　　p is how much algae there is at the beginning
　　The relationship between algae and number of weeks

(ii)	
B1:	Must reference the rate of change/multiplier and the time frame eg per week/every week/each week. **Examples of acceptable answers:** q is the rate at which the mass of algae increases for every week The amount of algae increases by 7.2% each week (condone amount for mass in ii) The proportional increase in mass of the algae each week **Examples of answers we would not accept:** q is how much algae will increase when t increases by 1 The amount that grows per unit of time The rate at which the mass of algae in the small pond increases after t number of weeks The rate in which the algae mass increases
(c)	
B1:	cao (including units)
M1:	Setting up a correct equation to find t using the given equation or their part (a) Substitution of $A = 4$ into their equation for A or the given equation is sufficient for this mark.
A1:	awrt 3.4 (weeks). Accept any acceptable method (including trial and improvement) Condone lack of units. isw if they subsequently convert to weeks and days. Allow awrt 3.5 (weeks) following p = awrt 3.16 and q = awrt 1.07. An answer of only awrt 3.4 is M1A1, but an answer of 4 (weeks) with no working is M0A0
(d)	
B1:	Any reason why the rate of change, growth or the mass of algae might change or why the model in not realistic. Be generous with the awarding of this mark as long as the answer has engaged with the context of the problem or the model **Examples of acceptable answers:** Seasonal changes (which would affect the growth rate) Overcrowding (as it is a small pond) Algae may stop growing (the model predicts unlimited growth) Algae may die / be removed / eaten (so the rate of growth may not continue at the same rate) **Examples of answers we would not accept:** There could be other factors that affect the amount of algae (too vague) The mass of algae might change