Q	Marking Instructions	AO	Marks	Typical Solution
12(a)	Uses model to form one correct equation (PI by a=200) (ACF) Accept $1.105a + 1.221b = 331$	AO3.1b	M1	$290 = a + b$ $331 = ae^{0.1} + be^{0.2}$
	Forms a second correct equation (ACF)	AO1.1a	M1	$290e^{0.1} = ae^{0.1} + be^{0.1}$ $b = \frac{(331-290e^{0.1})}{(e^{0.2}-e^{0.1})} = 90.3 = 90$ to the nearest integer
	Obtains correct a AWRT 200 and b AWRT 90 (AG) Only award if **both** previous M1's achieved. Do not award marks retrospectively for correct values of a and b used in part (b)	AO1.1b	A1	so $a = 200$
(b)	Substitutes t = 3 and evaluates CAO	AO3.4	B1	$200e^{0.3} + 90e^{0.6} = 434$
(c)	Forms inequality (accept < or >) (condone use of equation) FT 'their' value of a, but b must be 90	AO1.1a	M1	$90e^{0.2t} > 200e^{0.1t}$ $e^{0.1t} > \frac{200}{90}$
	Uses logs or calculator to solve 'their' inequality (or equation) If using trial and error must see t=7 and t=8 tested	AO1.1a	M1	$0.1t > \ln\left(\frac{200}{90}\right)$ $t > 10\ln\left(\frac{200}{90}\right) = 7.985$
	Interprets final result. (Do not accept 2025)	AO3.2a	A1	Just less than 8 so during 2024
(d)	Gives one limitation of the model. Eg. Model must break down as both n_A and n_B will tend to infinity / model assumes nothing changes / no attempt to control the diseases / all the trees have died / finite number of trees / cure for the disease might be found / other factors such as drought could affect the model / etc.	AO3.5b	E1	Eventually all of the trees will die so the model will no longer be accurate.
	Total		**8**	