Question	Scheme	Marks	AOs
3 (a)	$\{t = 0, \theta = 75 \Rightarrow 75 = 25 + A \Rightarrow A = 50\} \Rightarrow \theta = 25 + 50\mathrm{e}^{-0.03t}$	B1	3.3
		(1)	
(b)	$\{\theta = 60 \Rightarrow\} \Rightarrow 60 = 25 + "50"\mathrm{e}^{-0.03t} \Rightarrow \mathrm{e}^{-0.03t} = \dfrac{60-25}{"50"}$	M1	3.4
	$t = \dfrac{\ln(0.7)}{-0.03} = 11.8891648 = 11.9$ minutes (1 dp)	A1	1.1b
		(2)	
(c)	A valid evaluation of the model, which relates to the large values of t. E.g. • As $20.3 < 25$ then the model is not true for large values of t • $\mathrm{e}^{-0.03t} = \dfrac{20.3-25}{"50"} = -0.094$ does not have any solutions and so the model predicts that tea in the room will never be 20.3 °C. So the model does not work for large values of t • $t = 120 \Rightarrow \theta = 25 + 50e^{-0.03(120)} = 26.36\ldots$ which is not approximately equal to 20.3, so the model is not true for large values of t	B1	3.5a
		(1)	
			(4 marks)

Question 3 Notes:

(a)

B1: Applies $t = 0, \theta = 75$ to give the complete model $\theta = 25 + 50\mathrm{e}^{-0.03t}$

(b)

M1: Applies $\theta = 60$ and their value of A to the model and rearranges to make $\mathrm{e}^{-0.03t}$ the subject.

Note: Later working can imply this mark.

A1 Obtains 11.9 (minutes) with no errors in manipulation seen.

(c)

B1 See scheme