Question	Scheme	Marks	AOs
4(a)	$(A =) 55$	**B1**	3.4
		(1)	
(b)	$\left\{\dfrac{dH}{dt} =\right\} -AB\mathrm{e}^{-Bt}$ or $\left\{\dfrac{dH}{dt} =\right\} -"55"B\mathrm{e}^{-Bt}$	**M1**	3.1b
	$-B \times "55" = -7.5 \Rightarrow B = ...$ $\left(\dfrac{3}{22} = \text{awrt } 0.136\right)$	**M1**	1.1b
	$H = 55\mathrm{e}^{-0.136t} + 30$	**A1cso**	3.3
		(3)	

(4 marks)

Notes

(a)
B1: 55 only. Just look for this value e.g. "$A =$" is not required. Ignore any "units" if given e.g. 55 °C
(b)
M1: Differentiates to obtain an expression of the form $\pm AB\mathrm{e}^{-Bt}$ which may have their A already substituted in so allow for $\pm AB\mathrm{e}^{-Bt}$ or $\pm"55"B\mathrm{e}^{-Bt}$

M1: Substitutes $t = 0$ and their A into their $\dfrac{dH}{dt}$, sets $= \pm 7.5$ and proceeds to find a value for B which

may be implied by $\dfrac{3}{22}$ or awrt 0.136

Their $\dfrac{dH}{dt}$ must not be H. i.e. it must be a "changed" function.

A1cso: Correct **equation** which follows **fully correct work** $H = 55\mathrm{e}^{-0.136t} + 30$ but condone $H = 55\mathrm{e}^{-\frac{3}{22}t} + 30$
The final equation must be correct but you can ignore spurious notation within their solution such as integral signs and "$+ c$" which do not affect their solution.

Marking guidance is as follows for particular cases in (b)

Case 1: $\left\{\dfrac{dH}{dt} =\right\} -"55"B\mathrm{e}^{-Bt}$, $-"55"B\mathrm{e}^{-Bt} = 7.5 \Rightarrow B = -0.136 \Rightarrow H = 55\mathrm{e}^{-0.136t} + 30$ scores **M1M1A0**

Error: it should be – 7.5

Case 2: $\left\{\dfrac{dH}{dt} =\right\} "55"B\mathrm{e}^{-Bt}$, $"55"B\mathrm{e}^{-Bt} = -7.5 \Rightarrow B = -0.136 \Rightarrow H = 55\mathrm{e}^{-0.136t} + 30$ scores **M1M1A0**

Error: incorrect derivative

Case 3: $\left\{\dfrac{dH}{dt} =\right\} "55"B\mathrm{e}^{-Bt}$, $"55"B\mathrm{e}^{-Bt} = 7.5 \Rightarrow B = 0.136 \Rightarrow H = 55\mathrm{e}^{-0.136t} + 30$ scores **M1M1A0**

Error: incorrect derivative

Case 4: $\left\{\dfrac{dH}{dt} =\right\} -"55"B\mathrm{e}^{-Bt}$, $"55"B = 7.5 \Rightarrow B = 0.136 \Rightarrow H = 55\mathrm{e}^{-0.136t} + 30$ scores **M1M1A1**

No errors