14 **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

The concentration of a chemical in a lake is being monitored.

The concentration, x mg L^{-1}, of the chemical in the lake, t hours after monitoring began, is modelled by the differential equation

$$\frac{\mathrm{d}x}{\mathrm{d}t} = x(A - t) \qquad t \geqslant 0$$

where A is a positive constant.

Given that

- initially $x = 0.3$
- $x = 21$ when $t = 4$

(a) find the particular solution of the differential equation, giving the answer in the form $x = \mathrm{f}(t)$.

(5)

Use the model to answer parts (b) and (c).

(b) Find, to 3 significant figures, the maximum concentration of the chemical in the lake.

(3)

When $t = T$, the concentration of the chemical in the lake is 0.1 mg L^{-1}

(c) Find the value of T, giving the answer to 3 significant figures.

(3)