

8.

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

A scientist is studying the mass of a compound produced during a chemical reaction.

The mass of the compound, M grams, t minutes after the scientist starts the study, is modelled by the equation

$$M = \frac{200}{5 + ke^{-0.15t}}$$

where k is a constant.

Given that there were 25 g of the compound at the start of the study,

(a) find a complete equation for the model.

(2)

Given that T minutes after the start of the study, there were 35 g of the compound,

(b) find the value of T , giving the answer to 3 significant figures.

(3)

The model predicts that there is an upper limit, L grams, for the mass of the compound.

(c) Find the value of L , giving a reason for your answer.

(2)