

10 Zac is measuring the growth of a culture of bacteria in a laboratory. The initial area of the culture is 8 cm^2 . The area one day later is 8.8 cm^2 .

At first, Zac uses a model of the form $A = a + bt$, where $A \text{ cm}^2$ is the area t days after he begins measuring and a and b are constants.

(a) Find the values of a and b that best model the initial area and the area one day later. [2]

(b) Calculate the value of t for which the model predicts an area of 15 cm^2 . [1]

(c) Zac notices the area covered by the culture increases by 10% each day.

Explain why this model may not be suitable after the first day. [1]

Zac decides to use a different model for A . His new model is $A = Pe^{kt}$, where P and k are constants.

(d) Find the values of P and k that best model the initial area and the area one day later. [3]

(e) Calculate the value of t for which the area reaches 15 cm^2 according to this model. [2]

(f) Explain why this model may not be suitable for large values of t . [1]