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1 An experiment is carried out by a biomedical engineer using a certain type of bacterial medium. If the experiment is commenced with 20 bacteria

a develop a model for the system
$$\frac{dy}{dt} = ky$$

$$\frac{dy}{y} = k dt$$

$$\ln y = kt + c$$

$$y = e^{kt+c}$$

$$y = e^c \cdot e^{kt}$$

$$e^c = y_0$$

$$y = y_0 e^{kt}$$

but

$$y = 2y_0 \text{ when } t = 5 \text{ hrs}$$

$$2y_0 = y_0 e^{kt}$$

$$\ln 2 = kt$$

$$k = \frac{(\ln 2)}{5}$$

$$y = y_0 e^{0.139t}$$

Use the model to estimate the population of the bacteria in $1\frac{1}{2}$ day
Sol

$$24 \text{ hrs} = 1 \text{ day}$$

$$\alpha = 1.5 \text{ day}$$

$$\alpha = 24 \times 1.5 \\ = 36 \text{ hrs}$$

$$\text{Where } y_0 = 20, t = 36$$

$$y = 20 e^{0.139 \times 36}$$

$$y = 2980.2 \\ = 2980 \text{ bacteria}$$

Based on the results gotten in 1. The population of the bacteria increases with time irrespective of the initial bacteria.