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1a. For bacteria growth, we use $dy/dt = ky$

Let y = quantity of bacteria
t = time (hr).

$dy/dy = k\,dt$

$\int dy/dy = \int k\,dt$

$\ln y = kt + c$

$y = e^{kt + c}$

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

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

$y = Ce^{kt}$

at initial time $t = 0, y = 20$

$20 = Ce^{k \cdot 0}$

$20 = C$

at $t = 5, y = 2(20)$

$t = 5, y = 40.$

$40 = Ce^{k \cdot 5}$

$40 = 20 \cdot e^{5k}$

$e^{5k} = 2.$

$5k = \ln 2$

$5k = 0.6931$

$k = 0.1386$

$\therefore y = 20e^{0.1386t}$ (The ~~of~~ required model).

1b At $t = 1\frac{1}{2}$ day

$t = 24 + 12$ (1 day = 24hrs, $\frac{1}{2}$ day = 12hrs).

$t = 36$hrs

$y = 20e^{36 \times 0.1386}$

$y = 20 \times 146.8777$

$y = 2937.55.$

d. At $y=10$, and $t=0$

$10 = Ce^{k,0}$

$c = 10$

at $t=5$, $y=20$

$\therefore 20 = 10e^{5k}$

$e^{5k} = 2$

$5k = \ln 2$

$K = 0.1386$

For inital value, 10 we have $y = 10e^{0.1386t}$

For inital value, 30, we have $y = 30e^{0.1386t}$

For inital value, 50 we have $y = 50e^{0.1386t}$

c. The inital amount of bactera affected the exponential growth of bacteria. The higest initial amont had the higest final amount.