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1a) for bacteria growth, $dy/_{dt} = ky$

let y = quantity of bacteria
t = time (hr)

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

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

$\ln y = kt + c$

$y = e^{kt+c}$

$y = e^{kt+c}$

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

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

$y = Ce^{kt}$

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

$20 = Ce^{kt}$

$20 = C$

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

$t = 5$, $y = 40$

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

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

$e^{5k} = 2$

$5k = \ln 2$

$5k = 0.6931$

$k = \frac{0.6931}{5}$

$k = 0.1386$

$\therefore y = 20e^{0.1386t}$ (required model) b At $t = 1\frac{1}{2}$ day

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

$t = 36$ hrs

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

$y = 20 \times 146.8777$

$y = 2937.55$

a At $y = 10$, and $t = 0$

$10 = Ce^{k0}$

$C = 10$

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

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

$e^{5k} = 2$

$5k = \ln 2$

$k = 0.1386$

For initial value (10), we have $y = 10e^{0.1386t}$

For initial value (30), we have $y = 30e^{0.1386t}$

for initial value (50), we have $y = 50e^{0.1386t}$

c The initial amount of bacteria affected the expermental growth of bacteria. The highest initial amount had the highest final amount.