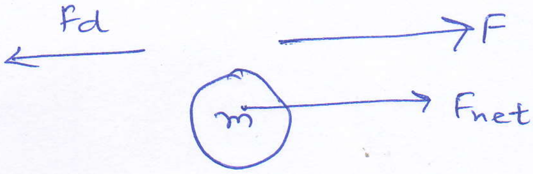

$$F_{net} = m\frac{dv}{dt} \Rightarrow F - F_d = m\frac{dv}{dt}$$

$$F - \gamma v = m\frac{dv}{dt}$$

Given at $t=0$, $F=0$ and $v=v_0$
Hence, equation of motion is

$$m\frac{dv}{dt} = -\gamma v$$

$$\Rightarrow \frac{dv}{v} = -\frac{\gamma}{m}dt$$

$$\Rightarrow \int_{v_0}^{v}\frac{dv}{v} = -\frac{\gamma}{m}\int_0^t dt \Rightarrow \left[\ln v\right]_{v_0}^{v} = -\frac{\gamma}{m}\left[t\right]_0^t$$

$$\Rightarrow \ln\frac{v}{v_0} = -\frac{\gamma}{m}t \Rightarrow \boxed{v = v_0 e^{-\frac{\gamma}{m}t} = v_0 e^{-t/\tau}}$$ where $\tau = \frac{m}{\gamma}$

Now, $\tau = \frac{m}{\gamma} = \frac{\frac{4}{3}\cancel{\pi} r^{\cancel{3}2}\rho}{6\cancel{\pi}\eta \cancel{r}} = \frac{4\rho r^2}{18\eta}$

$$= \frac{4\times5\times10^3\times0.5\times10^{-6}\times0.5\times10^{-6}}{18\times10^{-3}}$$

$$= \frac{4\times5\times10^3\times0.25\times10^{-12}}{18\times10^{-3}} = \frac{5\times10^{-9}}{18\times10^{-3}} = \frac{5}{18}\times10^{-6}\,s \simeq 0.28\times10^{-6}\,s$$

$$= 0.28\,\mu s$$

Distance travelled by bacteria before stopping is given by

$$x = \int_0^\infty v\,dt = v_0\int_0^\infty e^{-t/\tau}dt = \left[-v_0\tau e^{-t/\tau}\right]_0^\infty = -v_0\tau e^{-\infty} - (-v_0\tau e^{-0})$$

$$\Rightarrow x = v_0\tau = 10\times10^{-6}\,\frac{m}{s}\times0.28\times10^{-6}\,s = 2.8\times10^{-12}\,m$$

$$\simeq 0.028\times10^{-10}\,m \simeq 0.028\,\mathring{A}$$