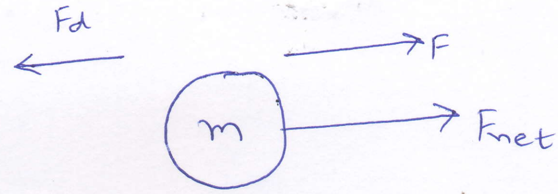

$$m\frac{dv}{dt} = F_{net} = F - F_d = F - \gamma v$$

or, $$m\frac{dv}{dt} + \gamma v = F$$

Given at $t=0$, $F=0$ and $v=v_0$

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

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

$$\Rightarrow \quad \int_{v_0}^{v}\frac{dv}{v} = -\frac{\gamma}{m}\int_0^t dt$$

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

$$\ln\frac{v}{v_0} = -\frac{\gamma}{m}t$$

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

where $\tau = \frac{m}{\gamma}$

Now $$\tau = \frac{m}{\gamma} = \frac{\frac{4}{3}\pi r^3\rho}{6\pi\eta r} = \frac{2}{9}\frac{\rho r^2}{\eta}$$

for bacterium $$\tau = \frac{2\times5\times10^{3}\times0.5\times10^{-6}\times0.5\times10^{-6}}{9\times10^{-3}} = \frac{2.5\times10^{3-6-6}}{9\times10^{-3}} = \frac{2.5}{9}\times10^{-6}\,s \simeq 0.28\,\mu s$$

for pufferfish $$\tau = \frac{2\times5\times10^{3}\times0.5\times10^{-3}\times0.5\times10^{-3}}{9\times10^{-3}} = \frac{2.5\times10^{3-3-3}}{9\times10^{-3}} = \frac{2.5}{9}\times10^{0} \simeq 0.28\,s$$

Distance travelled before stopping is given by

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

$\therefore$ stopping distance for bacterium $= 10\times10^{-6}\,\frac{m}{s}\times0.28\times10^{-6}\,s = 2.8\times10^{-12}\,m$

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

stopping distance for pufferfish $= 10\times10^{-3}\,\frac{m}{s}\times0.28 = 2.8\times10^{-3}\,m$

$\simeq 2.8\,mm$