N 8.1

$$\partial_t n = D\,\partial_x^2 n - \alpha n$$

$$n(0,t) = 0$$

$$n = \exp(-\alpha t)\,V$$

$$\partial_t n = -\alpha V \cdot \exp(-\alpha t) + \exp(-\alpha t)\,\partial_t V = D\exp(-\alpha t)\,\partial_x^2 V - \alpha \exp(-\alpha t) \cdot V$$

$$\Rightarrow \partial_t V = D\,\partial_x^2 V \Rightarrow V(x,t) = \frac{1}{\sqrt{4\pi D t}} \cdot \left[\exp\left(-\frac{(x-L)^2}{4Dt}\right) - \exp\left(-\frac{(x+L)^2}{4Dt}\right)\right]$$

$$P_{surv} = \int_0^\infty n(x,t)\,dx =$$

$$= \frac{\exp(-\alpha t)}{\sqrt{4\pi D t}} \int_0^\infty \left[\exp\left(-\frac{(x-L)^2}{4Dt}\right) - \exp\left(-\frac{(x+L)^2}{4Dt}\right)\right] dx =$$

$$= \exp(-\alpha t) \cdot \operatorname{erf}\left(\frac{L}{2\sqrt{Dt}}\right)$$

$$\langle T \rangle = \int -\frac{\partial P_{sur}}{\partial t}\, t \, dt =$$

$$\left\{ \frac{L}{2\sqrt{D}} = a \right\}$$

$$= \int_0^\infty \left(-\frac{a e^{-a^2/t}}{\sqrt{\pi}} - t^{3/2} \operatorname{erf}\left(\frac{a}{\sqrt{t}}\right) \right) \exp[-\alpha t] / \sqrt{t}\, dt$$

$$= \frac{1 - e^{-2a\sqrt{\alpha}}}{\alpha} = \frac{1}{\alpha}\left[1 - \exp\left[-\frac{L\sqrt{\alpha}}{\sqrt{D}} \right] \right]$$