11.12

In time $\tau = \frac{1}{A}$, $\frac{1}{e}$ of the atoms make a transition ; we have $N_2(\tau) = \frac{N_2(0)}{e} = N_2(0) e^{-\frac{A}{A}}$

In time $t_{1/2}$, $\frac{1}{2}$ of the atoms make a transition $N_2(t_{1/2}) = \frac{N_2(0)}{2} = N_2(0)\, e^{-A \cdot t_{1/2}}$

$$\frac{1}{2} = e^{-A t_{1/2}}$$

$$\ln\left(\frac{1}{2}\right) = -A\, t_{1/2}$$

$$t_{1/2} = \frac{1}{A} \ln(2) = \tau \ln 2$$