

PHYS 512 Problem Set 3

2. Radio decay: $N = N_0 e^{-kt}$ k : constant

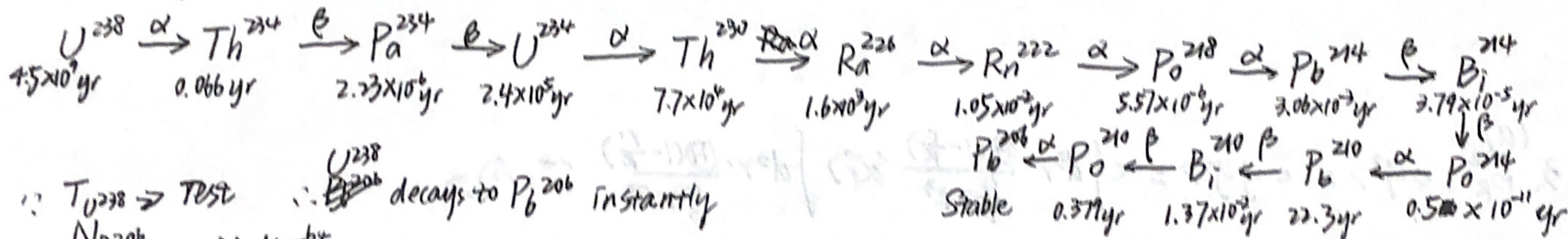
$$\frac{dN}{dt} = -kN$$

half life: $N = \frac{N_0}{2} = N_0 e^{-kT_{1/2}} \Rightarrow k = \frac{\ln 2}{T_{1/2}}$

In radio decay chain, for example: $A \rightarrow B \rightarrow C$

$$\Delta N_B = \Delta N_{A \rightarrow B} - \Delta N_{B \rightarrow C} \Rightarrow \left(\frac{dN}{dt}\right)_B = \left(\frac{dN}{dt}\right)_{A \rightarrow B} - \left(\frac{dN}{dt}\right)_{B \rightarrow C} = k_A - k_B$$

U^{238} decay chain



$$\Rightarrow \frac{N_{Pb^{206}}}{N_{U^{238}}} = \frac{N_0 - N_0 e^{-kt}}{N_0 e^{-kt}} = e^{kt} - 1 \quad k = k_{U^{238}}$$