

# Phys 586 Homework

## Problem Set 1

Due Wednesday, January 27

- $^{131}\text{I}$  ( $\tau_{1/2} = 8.0$  days) is used both diagnostically and therapeutically for thyroid disorders.
  - Write down the principal decay scheme of  $^{131}\text{I}$  to the groundstate of  $^{131}\text{Xe}$ .
  - What is the second most dominant decay mode?
  - Assume a patient is given 0.002g of newly produced  $^{131}\text{I}$ . What is the initial activity?
  - How long does it take for 99% of the  $^{131}\text{I}$  to decay away?
- A prostate  $^{125}\text{I}$  seed implant patient wants to know what fraction of the dose is delivered 10, 30, and 90 days after the implant. Give him an answer.
- A radioactive needle contains  $^{222}\text{Rn}$  ( $\tau_{1/2} = 3.8$  days) in secular equilibrium with  $^{226}\text{Ra}$  ( $\tau_{1/2} = 1600$  years). How long is required for the  $^{222}\text{Rn}$  to decay to half of its original activity?
- $^{18}\text{F}$  is a frequently used radionuclide in medical imaging. Draw its complete decay scheme. Also state which imaging technique makes use of this radionuclide.