1. A freshly prepared sample of a certain radioactive isotope has an activity of 10 mCi. After 4 h, the activity is 8 mCi.

a) Find the decay constant and half-life of the isotope.

b) How many atoms of the isotope were contained in the freshly prepared sample?

c) What is the sample' s activity 30 h after it is prepared?

2. One method of treating cancer of the thyroid is to insert a small radioactive source directly into the tumor. The radiation emitted by the source can destroy cancerous cells. Why do your suppose  ${}^{1,3,1}_{5,3}$  is used for this treatment?

3. Given the example image file (Note: This is an abdominal CT image. Although JPEG is not the proper format to store medical images, we used it here just to save memory space), please test any two 5x5 spatial filters by using mathematics software programs such as Matlab. State clearly how you did it and append your program codes. Compare the performance. For those of you who use Matlab, the following is a list of useful commands: help, imread, imwrite, colormap, imshow. Also note that for "imshow", you need to pay attention to the data format. "uint8" (unsigned integer with 8 bits) is completely different from "int" (integer) and certainly different from "double" (double precision).