**ECEN 489: MRI Lectures Homework Questions**

1. Compute the resonant frequency of $^{31}P$, $^{1}H$, and $^{2}H$ at 2.0 Tesla and at 4.7 Tesla

2. How many Gauss is 4.7 Telsa?   What is the Earth's magnetic field in Tesla and Gauss.

3. Explain why CSF shows up dark in a T1 weighted image and dark in a T2 weighted image.

4. What are the relative signal intensities for Grey and White matter using the T1 and T2 values given in the lecture,  if TR is 300 ms and TE = 15 ms.

5:

   (a) Given an RF pulse with a bandwidth of 1000 Hz (this is f, not omega) centered at the Larmor frequency for a 2.0 Tesla field,  what slice select gradient strength is needed in order to excite a 4-mm slice in a homogeneous water phantom?

   (b) How would you excite a 20 mm slice with the exact same RF pulse?

   (c) How would you excite a 20 mm slice with the exact same gradients (you can change the pulse sequence.

6. What is the maximum total bandwidth of the received signal from a 10 cm diameter sphere in a 3 G/cm gradient.

7. Specify values to give a T1 weighted image and a T2 weighted image in a standard spin echo sequence.   Specify TR and TE for both, in msec.

8. A set of blinds in your apartment has 20 slats in 3 feet.  What is the spatial frequency in radians/cm?

9. Why are there gradient coils in an MRI scanner?

10. If I remove the center of the raw data from an MR image, what does this do to the final, reconstructed image?