Assignment 7 solutions
PHGN361

Homework solutions

1. This applet illustrates the use of field energy density in determining motion as discussed in the Feb 25 lecture.

2. First you need to explain your limited knowledge of biophysics. Next, look for mechanisms which might generate an effect and then explain how to make a simple calculation of such an effect to see if it might be important. A rambling discourse follows.

   For example, water molecules (which have a permanent electric dipole moment) in the brain would be effected by electric fields generating torque or forces on these molecules. Section 4.1.3 deals with such torques and forces. You can find both the permanent dipole moment and the electric field from a cell by a easy google search. You would then have to compare these forces with those involved in moving water around cells. Maybe the permeability of cells to water molecules yields forces. But wait . . . the cell phone generates only AC fields . . . or does it?

   What effect does an AC field have? It heats up water by rotating dipoles. Is there a biological mechanism which requires water molecules to be aligned? What about the state of these molecules at body temperature? They must have thermal energy which causes translation and rotation of the molecules.

   Maybe the first quantity to determine is the size and characteristics of electric fields (AC at what frequencies, DC) in cells. Google it and compare it with the cell phone field.