GLOBAL Question for Neural Engineering (Spring 2006):
All these questions are ‘open game’ for quizzes during the semester; students will only be expected to address these questions using material previously discussed in class or assigned homework/reading material.

You stick a pin into two sockets of an outlet – what happens? Does it kill you?
You stick a pin into one socket of an outlet while either a) standing in a building or 2) standing outside, bare-foot, on wet dirt. What happens?

How do you (can you) electrocute someone (you don’t like) in a bathtub?

Why does electricity “hurt”? Does pain from electricity necessarily mean you will experience long-term problems afterwards? Does electricity need to burn you to hurt?

How do you get electrocuted in a pool (where does the current come from and go to and why does it flow through/kill the person)?

You grab unto a metal wire carrying 1 ampere of current with both hands separated by 1 foot (a location inside your lab) – what happens?

Should utility companies be concerned about people being electrocuted in the street? (Should you be?) Are women or children at higher risk?

Can electricity cause cancer? Can electricity cause hair loss (the case of the ‘dog and the drinking bowl’)?

Can electricity ‘kill’ cells? Does electricity need to ‘kill’ cells to kill you?

Literature Analysis: Do you believe the low lethal voltages reported in Peng paper? (Should it be used to establish regulatory standards?). The paper will be provided.

Is legal electrocution “cruel and unusual” or “humane”?

Is it really ‘current’ and not ‘voltage’ that kills you?

Can a uniform field (one with a zero second derivative) affect cells?

What are situations where electricity is ‘good for you’?

Are you more in danger of electrocution in the pool or in the ocean (considering only the salt content of the water)?

Why does ohms law seem to fail when relating current effects to voltage levels in humans (for example we can perceive 1 mA but not 1 V through the human body resistance can be 1 K)? What is the lowest perceptible voltage threshold?
**POTENTIALS QUESTION FOR FINAL PROJECT**

**All projects must be specifically approved for each student.**

(Modification of a question from above)

What is the lowest temperature that can affect brain/neuronal function? Literature/experimental review OR theoretical considerations?

Taking all relevant reports together: how many fatalities per year in the US (current state) are due to low voltage? – Carefully consider sources (overlapping data), relevant changes over time to present

Numerical or analytical model for single neuron/endothelial cell electroporation by DBS or other exogenous electric field.

Why is ohms law used in determining electrical safety thresholds? Is this a valid approach (sometimes)? If it is, with what limitations, what considerations must be taken into account?

What are the mechanisms of Deep Brain Stimulation? Does it matter?

What is the patent history of DBS technology? What is protected? Where is there to go?

How does the brain regulate its temperature? (Review and/or bio-heat model)

What is the lowest extracellular field strength (mV/mm) that can affect cells? Theoretical and/or experimental studies?

Which individual are more ‘susceptible’ to electricity? Men/Women. Children/Adults

Is a Retinal prosthesis practical (artificial vision)?

Do cell phone ‘stimulate our brain’?