Practice Problems Midterm 3.
These are only a SAMPLE of the kinds of problems.
They do not represent all topics to be covered.

Quantitative
Black body:

1. If I could increase the temperature of filament of a light bulb by 20% (new temperature = old temperature × 1.2), by what factor do I increase the emitted power?
   a. 1.2
   b. 1.4
   c. 1.7
   d. 2.1
   e. 2.5

2. I increase the temperature of the light bulb filament by 20%. By what factor do I have to increase the electrical power going into the bulb to achieve this? (You can assume that all the power lost from the bulb is by EM radiation)
   a. 1.2
   b. 1.4
   c. 1.7
   d. 2.1
   e. 2.5

3. Electric Charge:
   I have 2 ions (atoms with unequal numbers of electrons and protons). Ion A has 15 protons and 18 electrons. Ion B has 12 protons and 11 electrons. What is the net charge on ion A
   a. -3 C
   b. $+3$ C
   c. -1.6×10^{-19} C
   d. $+1.6 \times 10^{-19}$ C
   e. -4.8×10^{-19} C

Conceptual:

4. When we talk about an EM or light wave say travelling to earth from the sun, what exactly is waving en route?
   a. Air pressure
   b. Electrons
   c. Atoms
   d. Electric field
   e. Earth's atmosphere.

5. When I decrease the temperature of the filament of a standard incandescent light bulb, how does the efficiency of the bulb change? (Efficiency = Power out in visible range/Electrical power in)
   a. Increases
   b. No change
   c. Decreases
   d. Can't tell without further information

5. Light coming from three different stars is observed and analyzed. Star A has a peak wavelength at yellow light, Star B has a peak wavelength at blue light, star C has a peak wavelength in the IR. Which star is the coolest?
   a. A
   b. B
   c. C
   d. Can't tell without further information

6. The power company's generator is malfunctioning and so it provides 130 V electricity to your house, rather than the usual 120 V. As you will learn later in the course, this means that there is more electrical power going into all your light bulbs, and so they run hotter. What are the implications of this?

Your light bulbs now:

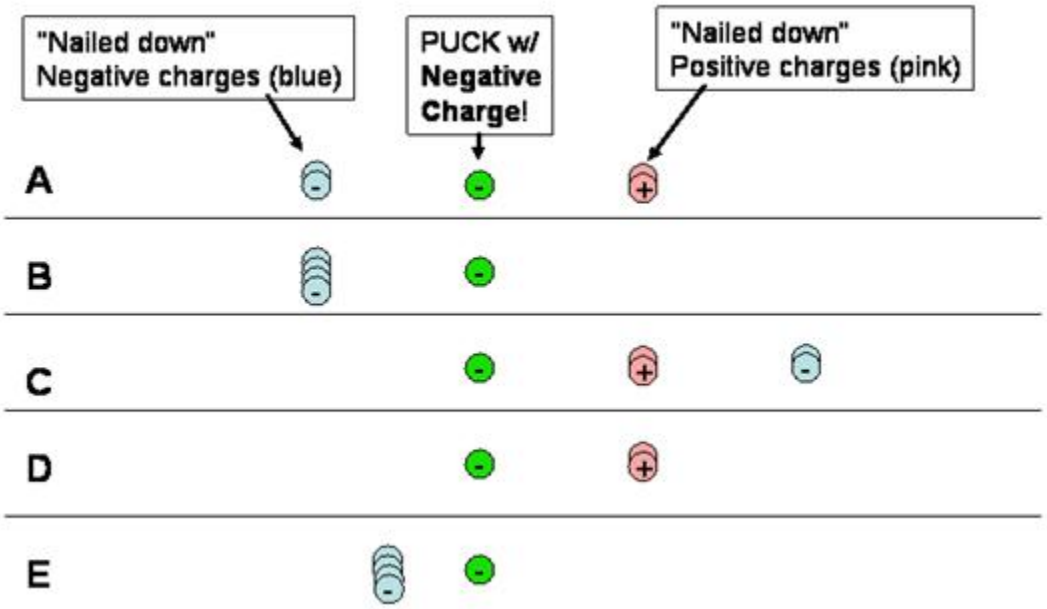
a. Produce more light, are redder in color, are more efficient, last longer.
b. Produce more light, are whiter, are more efficient, don't last as long.
c. Produce less light, are redder in color, are less efficient, last longer.
d. Produce more light, are whiter, are less efficient, don't last as long.

6. Many electronic components can be damaged by small electric shocks. Why do people working on such components attach a grounded wire to their wrists?
   a. You can accumulate excess charge by moving around and rubbing on different objects. These excess charges could cause an electric shock. The wire provides an easy conducting path for the excess charge to escape safely to ground.
   b. Humans tend to be very slightly negatively charged. These excess electrons can escape via the wire to ground and prevent a shock.
   c. Humans tend to be very slightly positively charged. Electrons are attracted from ground up the conducting wire to neutralize these positive charges and prevent a shock.
   d. The conducting wire repels electrons
   e. The wire electrically insulates the person from excess charges available in the earth.

6 . You have two light bulbs, Ace "A" and Cheapo "C". The bulbs are identical in every way, except bulb "A" operates at a temperature of 5000 Kelvin and bulb "C" operates at 2500 Kelvin. How does the amount of power radiated by "A" compare to the power radiated by "B"?

A. Bulb "A" and "B" radiate the same power.
B. Bulb "A" radiates 2 times more power.
C. Bulb "A" radiates 4 times more power.
D. Bulb "A" radiates 16 times more power.
E. Bulb "A" radiates 32 times more power.

Questions 1-4 below: Consider the following 5 arrangements of charges. It may help to use the Electric Field Hockey Simulation (http://phet.colorado.edu/en/simulation/electric-hockey) to consider these arrangements, **but notice that here the puck has a negative charge (!) You can CHANGE the charge on the puck in the simulation by checking the box at the bottom**. When thinking about these arrangements, you should be sure you understand how Coulomb's Law works to tell you how the force the puck feels under each of the circumstances will differ.



Consider the following statements about these configurations.

1.) (0.5pt) True / False: All of the pucks feel a force to the right.
2.) (0.5pt) True / False: The puck in C feels a greater force to the right than the puck in D.
3.) (0.5pt) True / False: The puck in E feels a force to the right that is four times greater than that felt by the puck in B.
4.) (0.5pt) True / False: The net force on the puck in A is zero.