# Workshop module 6 - Physics 142, Fall 2014

1. A dielectric slab is inserted halfway into a charged capacitor, is the force on the slab
   a) zero, b) directed to pull the slab into the capacitor, or c) directed to push the slab
   out of the capacitor? Why? What is the amount of work done by inserting the slab
   into the capacitor?

2. Find the capacitance of the parallel-plate capacitor (area A and separation d) shown in
   the figure.
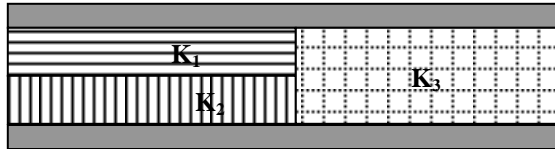
3. In which 120-V light bulb does the filament have the greater resistance … a 60-Watt
   bulb or a 120-Watt bulb? If the two bulbs are connected to a 120-V line in series,
   across which bulb will there be the greater voltage drop? What if they are connected
   in parallel?

4. When the switch in the diagram below is open, the voltmeter V reads 1.56 V. When
   the switch is closed, the voltmeter reading drops to 1.45 V, and the ammeter A reads
   1.3 A. Find the emf and internal resistance of the battery. Assume that the two meters
   are ideal, so they don't affect the circuit.
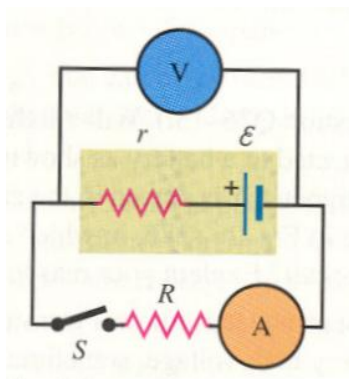
5. When a capacitor, battery and resistor are connected in series, does the resistor affect
   the maximum charge stored on the capacitor? Why or why not? What purpose does
   the resistor serve?

6. A resistor with R=86.0 kΩ is connected to the plates of a charged capacitor with capacitance C=4.5 μ F. Just before the connection is made, the charge on the capacitor is 0.0636 C. What is the energy initially stored in the capacitor? What is the electrical power dissipated in the resistor just after the connection is made? What is the electrical power dissipated in the resistor at the instant when the energy stored in the capacitor has decreased to half the initial value?

7. Spaceman Spiff takes off from Earth in his trusty spacecraft and moves at a speed 0.99c toward the planet Zorgon which is 26 light years distant. How much time will have elapsed by Earth clocks when Spiff arrives at Zorgon? According to Spiff, how much older is he when he arrives at Zorgon than he was when he left Earth. *(Ignore any non-inertial effects in the problem).*