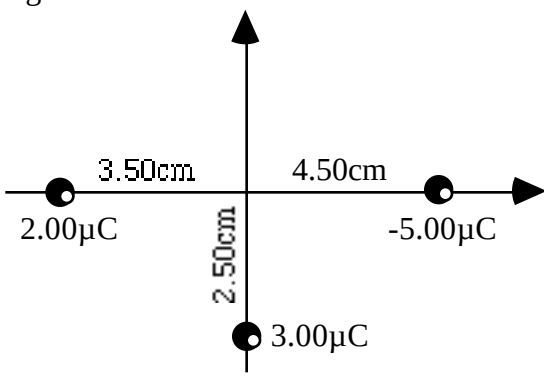
Physics 4B FINAL EXAM Chapters 23 - 34 Fall 1994

Name:_____ Posting Code _____ _____ _____

Solve the following problems in the space provided. Use the back of the page if needed. Each problem is worth 10 points. You must show your work in a logical fashion starting with the correctly applied physical principles which are on the last page. Your score will be maximized if your work is easy to follow because partial credit will be awarded.

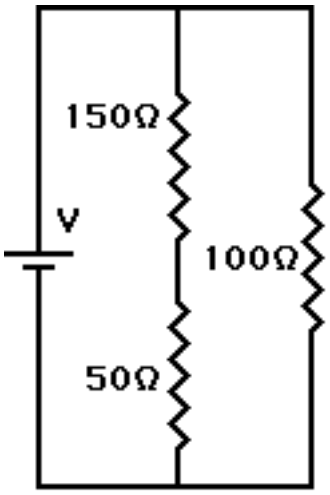
1. For the three charges shown at the right, find the electric field at the origin.



2. For the charge distribution of problem 1, find the total number of electric field lines that leave a sphere centered at the origin that has a radius of (a)2.00cm, (b)3.00cm, (c)4.00cm, and (d)5.00cm

3. An electron is accelerated from rest through a potential difference of 2000V. Find its speed.

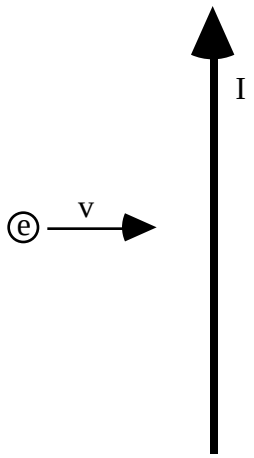
4. In the circuit at the right, the current through the 150Ω resistor is 20mA. Find (a)the current through the 50Ω resistor, (b)the battery voltage, (c)the current through the 100Ω resistor, and (d)the total current provided by the battery.



V(V)	I(mA)	R(Ω)
		50.0
	20.0	150
		100

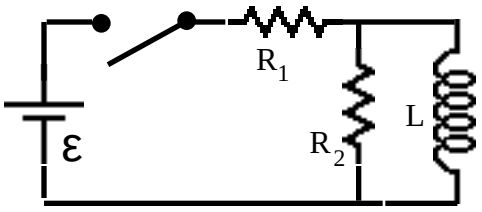
Battery: V= I=

5. A electron moves at 750km/s toward a wire carrying 150A as shown at the right. When the electron is 15.0cm from the wire, find the magnitude and direction of the force on the electron. If you want full credit on the direction, explain your reasoning.

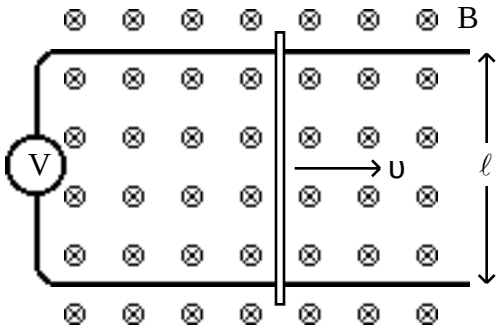


6. A long straight wire with a 5.00mm radius carries a uniform current of 8.00mA. Find the magnetic field (a)3.00mm from its center and (b)10.0mm from its center.

7. In the circuit shown at the right, R_1=5.00kΩ, R_2=1.00kΩ, L=100mH, and $\mathcal{E}$=30.0V. Find the current through R_2 (a)after the switch has been open for a long time, (b)just after the switch is closed, (c)after the switch is closed for a long time, and (d)just after the switch is opened again.



8. A bar rides along conducting rails a distance ℓ=10.0cm apart. The bar moves at a speed υ=3.00m/s as shown at the right. The conducting rails are connected to a voltmeter and the entire system is in a magnetic field B=2.00T into the page. Find the voltage reading on the meter and direction of the current through it.



9. A 20.0mH inductor is connected in parallel with a 5.00Ω resistor and a 60.0Hz - 15.0V rms power supply. (a)Draw the phasor diagram for this circuit. Find the rms voltage across (b)the power supply, (c)the inductor and (d)the resistor. Find the rms current (e)provided by power supply, (f)through the inductor and (g)through the resistor.

10. A 0.500mW laser beam has a wavelength of 633nm and a diameter of 2.00mm. This "ideal" laser beam has the same intensity regardless of the distance the beam travels. (a)Find the intensity of the beam. (b)Find the power output of a light bulb that distributes its light uniformly and produces the same intensity as the laser at a distance of 2.00m from the bulb.