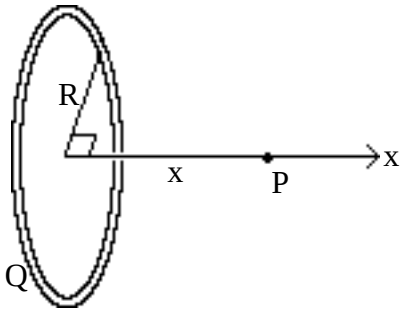
Name:_____

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.

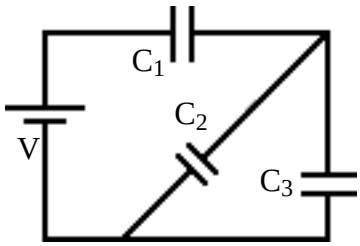
1. A 5.00μC charge is 25.0cm from a second charge. The electric field created by these charges is zero at a point in between the two that is 15.0cm from the 5.00μC charge. Find the size of the second charge.

2. State Gauss's Law in words (Don't just "write the equation" with words and don't use the word "flux" unless you explain what it means.). Explain why it works. Discuss the conditions that must be met to use it to find the electric field due to a charge distribution.

3. Find the potential due to a ring of total charge Q and radius R at the point P a distance x from the center of the ring along the axis as shown at the right.



4. The charge on C_3 shown in the circuit at the right is 12.0μC. Find (a)the potential difference across each capacitor, (b)the charge on each capacitor, (c)the energy stored in each capacitor and (d)the voltage of the battery (C_1=2.00μF, C_2=3.00μF and C_3=6.00μF).



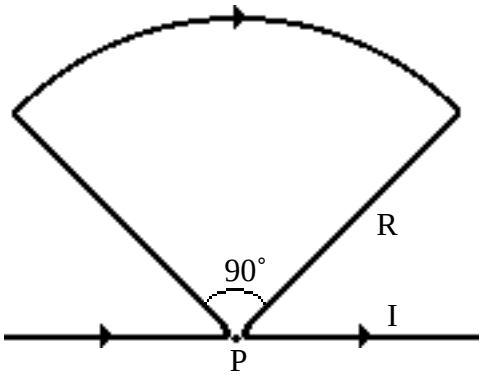
Q(μC)	C(μF)	V(V)	U(μJ)
	2.00		
	3.00		
12.0	6.00		

$V_{battery}$ =

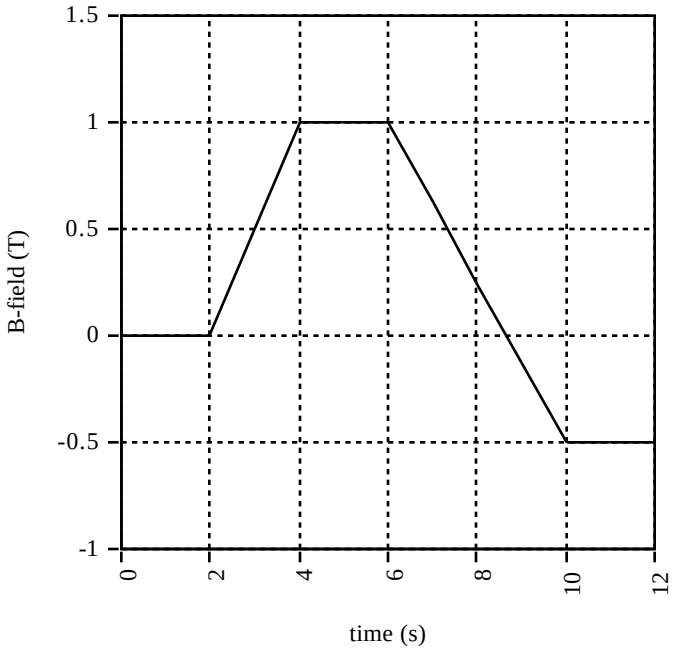
5. An uncharged capacitor is connected to 1.50V battery that has a 25.0Ω internal resistance. After 1.00s has elapsed the current is 2.00mA. Find (a)the initial current, (b)the final current and (c)the capacitance of the capacitor.

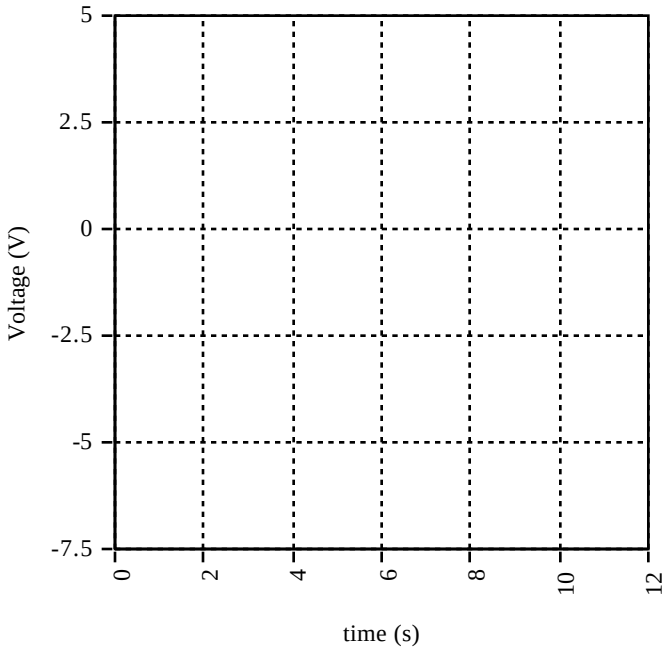
6. Find the radius of orbit for an electron traveling at 3.00×10^6m/s perpendicular to Earth's magnetic field of 52.0μT.

7. Find the magnetic field at the point P caused by the current I in the 90˚ circular arc of radius R.



8. A square coil of 1000 turns has sides that are 10.0cm long. The coil is in a magnetic field that changes with time according to the graph below. Sketch the voltage induced in the coil as a function of time on the axes below.





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

10. A laser beam has a wavelength of 633nm, a diameter of 2.00mm, and an intensity of 0.500mW. Find (a)the peak electric field, (b)peak magnetic field and (c)the total energy in 20.0cm of the beam.