## Physics 10164 - Exam 2A

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted
if you don't show your work even if you get the right answer. Clearly indicate your answer with a circle or a box and remember to include correct units and significant figures.

1. (35 pts) For the circuit below, the switch $S$ is initially open. Each resistor is a light bulb that shines with a brightness equal to the power dissipated by the resistor.
a) When the switch S is closed, what happens to the brightness of bulb $R_{1}$ ? Does it get brighter, dimmer, remain the same or go completely dark? Justify your answer qualitatively or mathematically.
b) What is the power dissipated by bulb $R_{3}$ both before and after the switch S is closed?

2. (30 pts) A proton is accelerated from rest through a potential difference of 1200 Volts. Once the proton achieves its final velocity $v$, it moves at that velocity into a region with a uniform electric field of $560 \mathrm{~V} / \mathrm{m}$ that points into the page as shown below.

If the proton's velocity is to remain constant in this region, what must be the magnitude and direction of the uniform magnetic field in this region?

| $\mathbf{x}$ | $\mathbf{x}$ | $\mathbf{x}$ | $\mathbf{x}$ |
| :--- | :---: | :---: | :---: |
| $\mathbf{X}$ | $\mathbf{x}$ | $\mathbf{x}$ | $\mathbf{x}$ |
| $\mathbf{x}$ | $\mathbf{X}$ | $\mathbf{x}$ | $\mathbf{x}$ |
| $\mathbf{X}$ | $\mathbf{X}$ | $\mathbf{x}$ | $\mathbf{x}$ |

\#3. (35 pts) Wires A, B and C are all infinitely long and perpendicular to the $x y-p l a n e$. Wire A passes through the origin. Wire $B$ passes through $x=1.5 \mathrm{~cm}$. Wire $C$ has a current of 5.5 Amps out of the page and passes through $y=2.0 \mathrm{~cm}$.

Determine the magnitude and direction of the magnetic force on a 1.0 meter long section of wire $C$ due to wires $A$ and $B$.


