

Physics 2212 Spring 2014 Lab Quiz #2

Name: KEY Section \_\_\_\_\_

Please show all of your work and box your final answers for full credit.

The following program is intended to calculate and display the magnetic field at a specified observation location. Complete the program below by filling in the missing VPython code. When possible, please use the names already defined in the program.

```
from visual import *
## Constants
mu0 = 0.00000125663
qe = 1.6e-19

## Objects
proton = sphere(pos=vector(3e-10, 0, 0), radius=1e-11, color=color.red)
velocity = vector(-5.2e4, 0, 0) # Enter the proton's velocity
r_obs = vector(0.8e-11, 0) # The observation location
deltat = 1e-19 # Timestep

## Loop
while proton.x < 5e-10
```

1. (100 points) Calculate the magnetic field vector at the observation location

$$\mathbf{r} = \mathbf{r}_{\text{obs}} - \text{proton.pos}$$

$$\mathbf{r}_{\text{hat}} = \mathbf{r} / \text{mag}(\mathbf{r})$$

$$r_{\text{mag}} = \text{mag}(\mathbf{r})$$

$$\mathbf{b\_field} = \mu_0 / (4 * 3.14) * qe / r_{\text{mag}}^{**2} * \text{cross}(\text{velocity}, \mathbf{r}_{\text{hat}})$$

```
# Update the proton's position
proton.pos = proton.pos + velocity*deltat
```