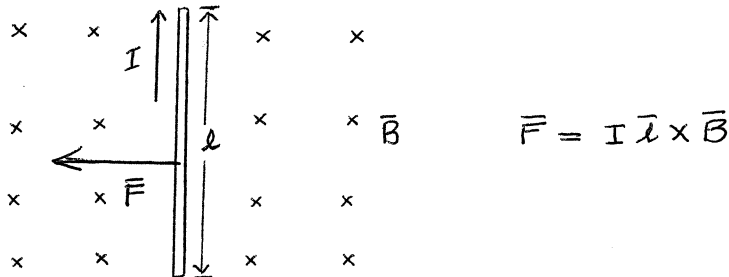


PHY 212 General Physics II - Electricity, Magnetism and Light
Summer 2007

Quiz 6 Thursday, July 26

Name: WORKED OUT COPY

1. (3 points) A wire of length l is carrying a current I is in a region permeated by a uniform magnetic field of magnitude B as shown in figure below. What is the direction of force on the wire due to the magnetic field?



2. (4 points) The Biot-Savart law states that

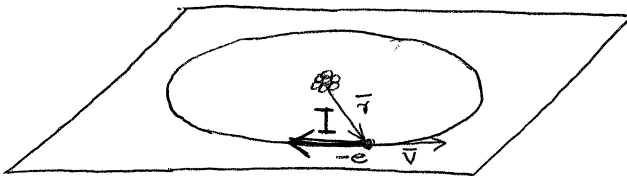
$$\vec{B} = \frac{\mu_0}{4\pi} I \int_{\text{wire}} \frac{d\vec{l} \times \hat{r}}{r^2} \quad (1)$$

Write the units of μ_0 using SI units Tesla (T), meter (m) and Ampere (A).

$$[\vec{B}] = [\mu_0] \frac{A \cdot m}{m^2}$$

$$T = [\mu_0] \frac{A}{m} \quad \therefore [\mu_0] = \frac{T \cdot m}{A}$$

3. (8 points) An electron is in a circular orbit about the nucleus of an atom, as indicated in figure below (not to scale!). Find the magnitude and direction of the magnetic dipole moment. (*Hint*: magnetic dipole moment $\mu = IA$.)



The direction of magnetic dipole moment is perpendicular to the loop pointing downward (using right hand rule).

$$\text{Current, } I = \frac{e}{T}$$

$$T = \frac{2\pi r}{v}$$

$$\therefore I = \frac{ev}{2\pi r}$$

$$\begin{aligned} \mu &= IA \\ &= \left(\frac{ev}{2\pi r} \right) (\pi r^2) \\ &= \frac{evr}{2} \end{aligned}$$

