e=1.60x10-19 C
m=9.11x10-31 kg
μ0=4πx10-7 Tm/A

Name:

Quiz for March 18th 2005 - Physics 151-001 - Prof. Thomson

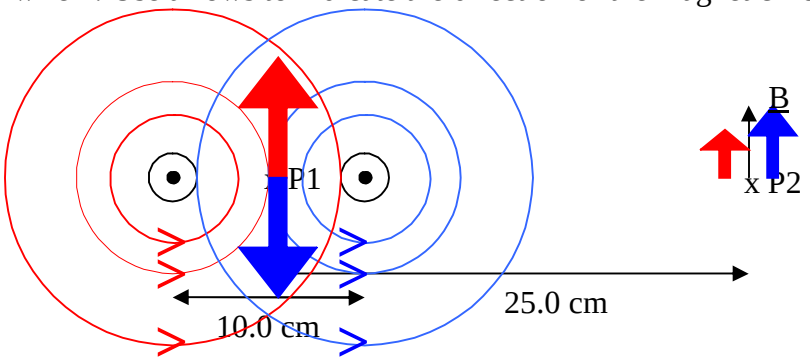
(2 pts) 1) An electron in the beam of a TV picture tube moves with velocity $3x10^7$ m/s and passes through a region of transverse magnetic field, where it moves in a circular arc with a radius of 0.180 m. What is the magnitude of the magnetic field?

$F=qvB=mv^2/R$

Magnitude: $B=9.48x10^{-4}$ T

2) Two long straight parallel wires 10.0cm apart carry equal 5.00A currents in the same direction.

(2 pts) a. Draw on the diagram the magnetic field lines from the current flowing in wire 1 only. Now, draw on the diagram the magnetic field lines from the current flowing in wire 2. Use arrows to indicate the direction of the magnetic field.



(2 pts) b. Find the magnitude and direction of the magnetic field at a point P1 midway between the wires.

At midway point between wires, by symmetry, field from wire 1 exactly cancels field from wire 2.

Magnitude: 0

Direction: none

(2 pts) c. Find the magnitude and direction of the magnetic field at a point P2 25.0cm to the right of P1.

$$B_{Total} = \frac{\mu_0 I}{2\pi r_1} + \frac{\mu_0 I}{2\pi r_2} \quad where \quad r_1 = 25.0 + 5.0 = 30.0cm$$

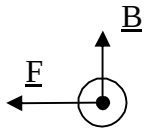
$$B_{Total} = \frac{\mu_0 I}{2\pi}\left(\frac{1}{r_1} + \frac{1}{r_2}\right) \quad where \quad r_2 = 25.0 - 5.0 = 20.0cm$$

$$B_{Total} = \frac{4\pi x10^{-7} x5.00}{2\pi}\left(\frac{1}{0.3} + \frac{1}{0.2}\right)$$

Magnitude:B=8.33x10-6 T

Direction: Straight up

(2 pts) d. What is the force per unit length on a third wire at point P2 carrying current 5.00 A in the same direction as the first two wires?



P2 I out of page

$$\vec{F} = I\vec{L}x\vec{B}$$

$$\frac{F}{L} = IB = 5.00x8.33x10^{-6}$$

Magnitude: F/L = 4.16x10-5 N

Direction: Attractive, to the left.