Phys 132 - Fund Phys 2 - Homework 16
Due: Monday, April 9, 2007

Name: Solutions

1. Chapter 21, Problem 10 (Hint, determine the electric and magnetic forces separately, including direction. Draw them and add the vectors.)
   A) 1.2×10^{-3} N B) 1.6×10^{-3} N C) 6.7×10^{-3} N D) 8.2×10^{-3} N (E) 1.1×10^{-2} N

2. Chapter 21, Problem 12a
   A) positive (B) negative

3. Chapter 21, Problem 12b
   A) 6.4×10^{-4} kg B) 8.0×10^{-4} kg C) 1.8×10^{-3} kg (D) 2.7×10^{-3} kg E) 5.3×10^{-3} kg

4. Chapter 21, Problem 18
   A) 0.707 B) 2.00 C) 1.73 D) 1.50 (E) 1.41

5. Chapter 21, Problem 22
   A) 0.50 m (B) 0.71 m C) 0.87 m D) 1.0 m E) 1.2 m

6. Chapter 21, Problem 26
   A) 1.4×10^{-5} T B) 2.0×10^{-5} T C) 3.7×10^{-5} T (D) 5.1×10^{-5} T E) 8.8×10^{-5} T

7. Chapter 21, Problem 36
   A) zero A B) 0.44 A C) 0.92 A D) 1.7 A (E) 2.2 A

8. Chapter 21, Problem 46
   A) 0.060 m (B) 0.12 m C) 0.16 m D) 0.18 m E) 0.22 m

9. Chapter 21, Problem 48
   A) 0.018 m B) 0.027 m (C) 0.042 m D) 0.054 m E) 0.086 m

10. Chapter 21, Problem 50a
    Choose the direction of the magnetic force. Assume the following: the current in the wire is directed toward the right and the charge is moving toward the left.
    A) upward
    B) downward
    (C) perpendicular to the wire and directed away from it
    D) perpendicular to the wire and directed toward it
    E) perpendicular to the wire and directed toward the right

11. Chapter 21, Problem 50b
    (A) 1.21×10^{-4} N B) 3.80×10^{-4} N C) 4.84×10^{-4} N D) 2.42×10^{-4} N E) zero N

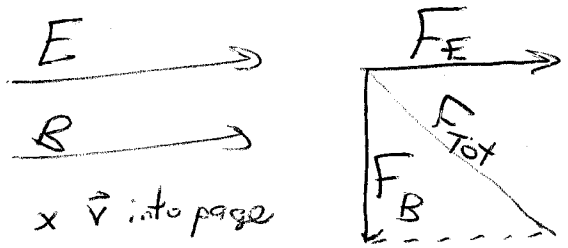
12. Chapter 21, Problem 56
    A) 0.50 m, on the same side as wire B
    (B) 0.50 m, on the side away from wire B
    C) 0.25 m, on the same side as wire B
    D) 0.33 m, on the side away from wire B
    E) 0.33 m, on the same side as wire B

21.10) $E = 4.6 \times 10^3$ N/C $F = qE = 8.28 \times 10^{-3}$ N

$q = 1.8\ \mu C$

$B = 1.2 \times 10^{-3}$ T $F = qvB = 6.70 \times 10^{-3}$ N

$v = 3.1 \times 10^6$ m/s



$$F_{Tot} = \sqrt{(8.28 \times 10^{-3})^2 + (6.70 \times 10^{-3})^2}$$

$$= 10.65 \times 10^{-3} \text{ N}$$

21.12) $v = 140$ m/s $r = \frac{mv}{qB}$

$B = 0.48$ T

$r = 960$ m $m = \frac{rqB}{v} = 2.7 \times 10^{-3}$ kg

$q = 8.2 \times 10^{-4}$ C

21.18) $m = \left(\frac{qr^2}{2V}\right)B^2$ q doubles, so r^2 cut in half.

r cut by $\sqrt{2}$, so $\frac{r_1}{r_2} = \sqrt{2} = 1.41$

21.22) $KE = \frac{1}{2}mv^2$ $v = \sqrt{\frac{2\,KE}{m}} = 6.63 \times 10^6$ m/s

$r = \frac{mv}{qB} = 0.71$ m

21.26) $F = ILB\sin\theta$ $B = \frac{F}{IL\sin\theta} = \frac{0.15\text{ N}}{(75\text{ A})(45\text{ m})\sin 60^\circ} =$

$= 5.13 \times 10^{-5}$ T

21.36) $N = 1200$

$A = 1.1 \times 10^{-2}\ m^2$

$\tau = 5.8\ N \cdot m$

$B = 0.20\ T$

$\tau = \underbrace{NIAB}_{\tau_{max}} \sin\phi$

$I = \frac{\tau_{max}}{NAB} = 2.2\ A$

21.46) $I = 48\ A$

$B = 8.0 \times 10^{-5}\ T$

Straight Wire

$B = \frac{\mu_0 I}{2\pi R}$

$R = \frac{\mu_0 I}{2\pi B} = 0.12\ m$

21.48) $B = 1.8 \times 10^{-4}\ T$

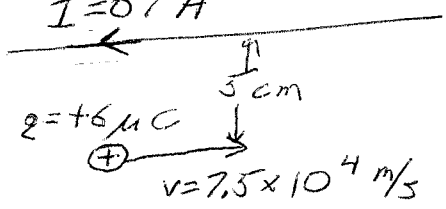
$I < 12\ A$

Circular Loop

$B = \frac{\mu_0 I}{2R}$

$R = \frac{\mu_0 I}{2B} = 0.042\ m$

21.50)

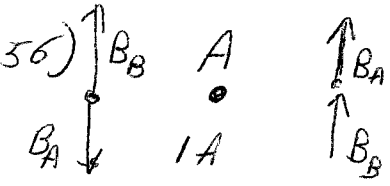


$B = \frac{\mu_0 I}{2\pi R} = 2.68 \times 10^{-4}\ T$

B out of page F_B away from wire

$F = qvB = 1.21 \times 10^{-4}\ N$

21.56)



$B = \frac{\mu_0 I}{2\pi R}$ $\quad \frac{I_B}{I_A} = 3$ $\quad \frac{R_B}{R_A} = 3$

So, the distance from A is 0.5 m ✓

dist from B is 1.5 m