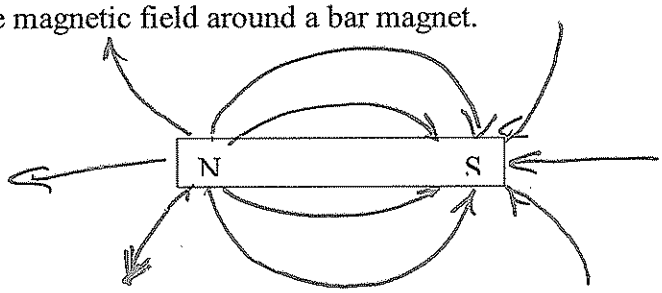
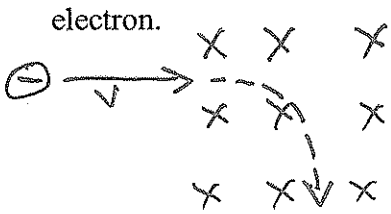
Name Key Date

AP Physics: Electromagnetism Quiz Review (2012)

1) Draw the magnetic field around a bar magnet.



2) A magnetic field of 600 T is directed into the page. An electron is shot through the field to the right at $2*10^4$ m/s. Find the magnitude and direction of the force on the electron.



Force: Down [RHR1 - negative charge]

Magnitude: $F = qvB = (1.6\times10^{-19}C)(2\times10^{4}\frac{m}{s})(600\,T)$

$= 1.92\times10^{-12}\,N$

3) How much work is done on the particle in question two during the time it is in the magnetic field? 0 J

$W = Fd\cos\theta$

$= Fd\cos 90 = 0$

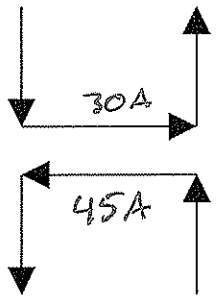
4) What is the velocity of the electron in question 2 as it exits the magnetic field?

$2\times10^{4}\frac{m}{s}$

$W = \Delta KE$

$0 = \frac{1}{2}m(v_f^2 - v_i^2)$ $\Delta v = 0$

5) Two wires are 0.25 m apart. The wires are parallel for 0.8 m, current in the top wire flows to the right at 30 A, and in the bottom wire it is 45 A to the left. What is the magnitude and direction of the force on the top wire?



$F = BIL$

$= (3.6\times10^{-5}T)(30A)(0.8m)$

$= 8.64\times10^{-4}\,N$

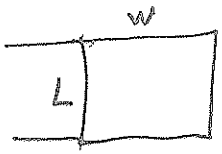
Magnitude: $8.64\times10^{-4}\,N$

Direction: UP (RHR1)

Hint: What is the strength of the magnetic field, *caused by the bottom wire,* where the top wire is?

$B = \frac{\mu_0 I_B}{2\pi r} = \frac{(4\pi\times10^{-7})(45A)}{2\pi(0.25)} = 3.6\times10^{-5}\,T$

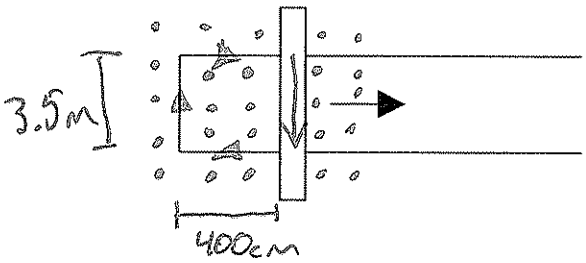
into the page (RHR2)



6) A 5 m long rod is moved to the right through a 40 T magnetic field at 6 m/s. What is the potential difference (EMF) created in the rod?

$$\mathcal{E} = \frac{B(\Delta A)}{\Delta t} = \frac{BL(\Delta w)}{\Delta t} = BLv = 40(5)(6) = 1200\,V$$

7) If the rod in question 6 is laid on a conducting, frictionless U what **direction** will the induced current move assuming that the magnetic field is directed **out of the page**?

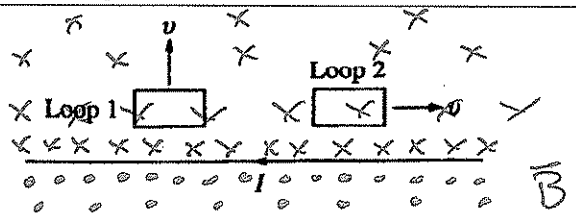


RHR2 → clockwise.

in the Rod: Down

8) Assuming that the parallel wires in question 8 are 350 cm apart, how much magnetic flux goes through the loop when the rod is 400 cm from the vertical wire?

$$\Phi = BA = \underbrace{(40T)}_{B}\underbrace{(3.5m)(4.0m)}_{A} = 560\,Wb.$$



9) Two conducting wire loops move near a very long, straight conducting wire that carries a current *I*. When the loops are in the positions shown above, they are moving in the directions shown with the same constant speed v. Assume that the loops are far enough apart that they do not affect each other. Which of the following is true about the induced electric currents, if any, in the loops?

C

Decreasing Flux into pg — No change in flux

Loop 1	Loop 2
~~a. No current~~	~~No current~~
~~b. No current~~	~~Counterclockwise direction~~
c. Clockwise direction — (oppose change in flux (RHR2))	No current
d. Clockwise direction —	~~Clockwise direction~~
~~e. Counterclockwise direction~~	~~Clockwise direction~~

10) What is the change in flux if a potential difference of 60 V is created in a coil of wire within 5 s of the magnetic field being turned on?

$$\mathcal{E} = \frac{\Delta\phi}{\Delta t} \rightarrow 60V = \frac{\Delta\phi}{5\,s}$$

$300\,Wb = \Delta\phi$