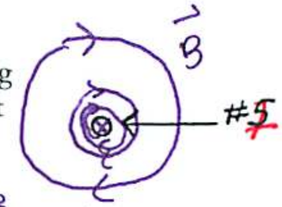
WS 10 EM and circuits review problems

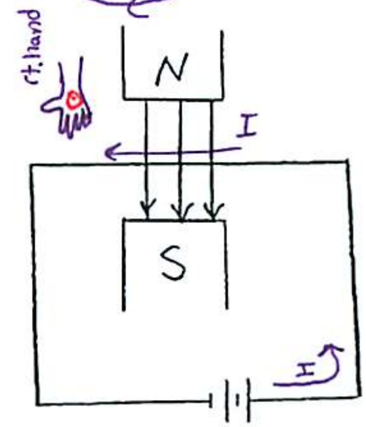
Name: KEY
Per:____

1. In the drawing, the circle represents the cross-section of a wire carrying conventional (+) current away from you. Draw a larger circle around it and put an arrow on it to show the direction of the magnetic field.



2. The arrows represent a magnetic field. A current-carrying wire crosses the field as shown. In which direction is the force on the wire? E

   a. no force   b. towards N
   c. towards S   d. to the left
   d. to the right   e. out of the paper
   f. into the paper

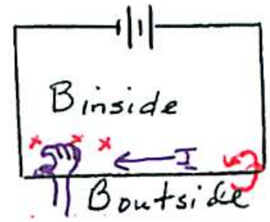


3. Find the magnitude of the force of I=6.38A, l=2.08cm, **B** = 0.50 N/A*m (or Tesla [T]).

$\vec{F}=\vec{B}I\vec{\ell}=(.5N/Am)(6.38A)(.0208m)=6.6\times10^{-2}N$

4. In the loop shown, the magnetic field inside the loop points D

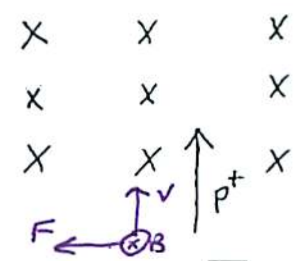
   a. toward the top of the page
   b. toward the bottom of the page
   c. out of the page
   d. into the page
   e. to the left
   f. to the right



5. Use the same answers as in number 4 to describe the direction of the field outside the loop: c.

6. Calculate the magnitude of the force on a proton moving at $8.00*10^7$m/s across a magnetic field of 1.80 T.

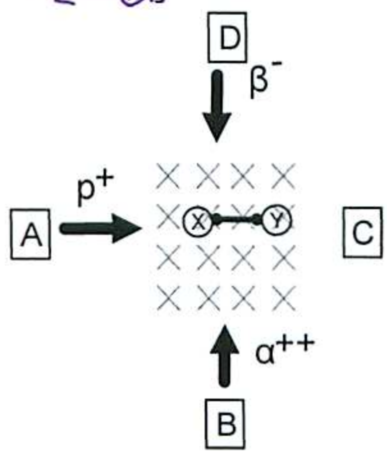
$F=qvB=1.6\times10^{-19}C\cdot8\times10^{7}m/s\cdot1.8T=2.3\times10^{-11}N$



7. The proton above is moving as shown across a magnetic field pointing into the paper. Use the answers to 4 to describe the direction of the force on the proton e.

8. In each case, indicate the direction of the force on the object. Use the answers:

   a. Toward A   b. Toward B
   c. Toward C   d. Toward D
   e. Out of paper   e. Into paper

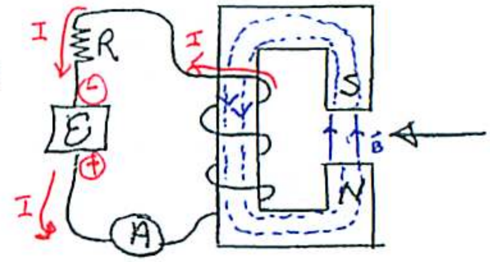


D 8.a The proton (p^+)
A 8.b The α^{++} particle
A 8.c The β^- particle
B 8.d The wire carrying electrons from **x** to **y**.
(Remember α^{++} stands for a Helium nucleus, β^- for an electron)

-over-

9. The North and South pole of a magnet make **B** fill in the space shown. The arrow represents a typical ion of (+2) Beryllium entering the field. The force on the ion is directed

a. up the page
b. down the page
c. toward the circuit
d. away from the circuit
e. out of the page
(f.) into the page



10. In (9.) above, if 'ε' represents a battery, which ends is positive?

a. the side toward R
(b) The other side

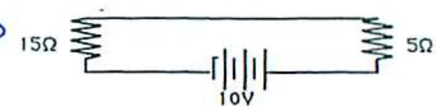
Be prepared to explain your answer (consider the circuit to be the 'cause' of the magnet.)

curled fingers ✓
current spiraling up coil gives rise to downward-facing enclosed field (as shown on Diagram / 1st R.H.R)

11. One coulomb of charge moves across a 100 V battery. How much work is done?

$W = \Delta E = qV = (1c.)(100J/c) = \boxed{100 J}$

12. How much current moves through the circuit?

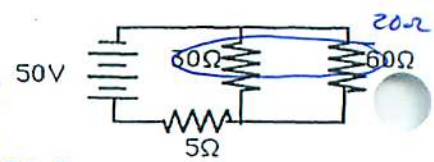


$I = V/R = 10v/(15\Omega + 5\Omega) = \boxed{0.5A}$

13. The voltage drop across the 15Ω resistor is $\boxed{7.5V}$.

$V = IR = (0.5A)(15\Omega) = 7.5V$ ✓ $P = I^2R = (.5A)^2(5\Omega)$

14. The power dissipated by the 5Ω resistor is $\boxed{1.25W}$.



15. What is the total equivalence resistance in the circuit? $R_{eq} = (1/30\Omega + 1/60\Omega)^{-1} = 20\Omega$

$R_T = 20\Omega + 5\Omega = 25\Omega$

16. How much current flows through the battery?

$I_T = V_T/R_T = 50v/25\Omega = 2A$

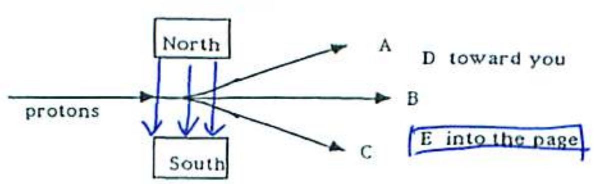
17. How much current flows through the 30Ω resistor? Twice as much as in 60Ω?

1) Find $V_{\parallel} = IR_{\parallel} = 2A \cdot 20\Omega = 40v$ Then $I_{30} = V_{30}/R_{30} = 40v/30\Omega = \boxed{1.3A}$ (leaving .66A for 60Ω) ✓

18. If the current in a wire is coming out of the center of a clock, the magnetic field is (1) clockwise ((2) Counterclockwise) (3) also out of the clock

19. If the current in the last problem is doubled, the magnetic field at any point around the wire is (1) the same ((2) doubled) (3) quadrupled (4) the factor depends on where you are

20. Which path is the beam most likely to take?



21. If the proton beam in #20 is replaced with alpha particles $^{4}_{2}He^{++}$ of the same speed, will the beam be deflected more or less?

less — Twice the Force (Twice the charge)
4x The mass
$\Rightarrow \frac{1}{2} a = \frac{2F}{4m}$