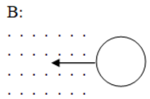
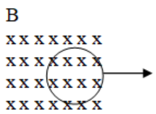
Group Work for 21ABCEF Name ___________________________

II. Simple solenoids moved relative to B field.

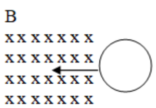
1. The 16.0 cm **diameter** loop below has 42 windings is pushed into the 8.70 T magnetic field in 0.0140 s. What is the average EMF, and what direction does the current flow? (525 V, CW)



2. The 15.0 cm **radius** loop below has 12 windings is pulled from the 7.20 T magnetic field generating an average EMF of 67.0 V. What time did this take, and which direction did the current flow? (91.2 ms, CW)

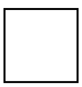


3. The loop below is put into the 6.30 T magnetic field in 0.0120 s generating an average EMF of 93.0 V. What is the **diameter** of the 56 winding loop and which direction does the current flow? (6.35 cm, ACW)

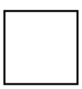


III. Magnet Approaches/Recedes

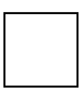
4. The recession of the South pole of a magnet from above the page changes the magnetic field from 9.50 T out of the page, to 3.20 T out of the page in 0.0130 s inside this 0.510 m x 0.510 m square. What is the induced EMF, and what <u>current</u> flows in <u>what direction</u> (CW or ACW) if the loop has a resistance of 2.70 Ω? (126 V, 46.7 A, ACW)



5. The motion of the North pole of a magnet from above the page changes the magnetic field by 2.70 T inside this 0.820 m x 0.820 m square. A current of 2.10 A flows CW in the loop with a resistance of 0.260 Ω, so what is the induced EMF, how much time did the magnet take to move, and did it approach or recede? (546 mV, 3.33 s, The magnet receded)

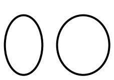


6. The approach of the South pole of a magnet from above the page changes the magnetic field from 0.105 T out of the page, to 3.60 T out of the page in 0.0150 s inside this 0.480 m x 0.480 m square. The current in the wire is 12.5 A. What is the induced EMF, what is the resistance of the wire, and what direction did the current flow? (53.7 V, 4.29 Ω, CW)

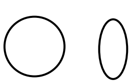


IV. Loop rotation $\Delta\Phi_B = (BA\cos\theta_1 - BA\cos\theta_2) = BA(\cos\theta_1 - \cos\theta_2)$

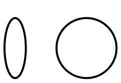
7. A single loop of wire with a **diameter** of 0.210 m starts at an angle of 54.0° with the page, and is rotated to an angle of 23.0° with the page. If there is a 12.0 T magnetic field into the page, and the rotation takes 0.0150 s, what is the average EMF generated? Which way does it flow? (9.22 V, ACW)



8. A single loop of wire with a **radius** of 0.650 m is in the plane of this page, and is rotated so that the loop forms a 65.0° angle with the page. If there is a 6.50 T magnetic field into the page, and this generates an average EMF of 18.0 V, in what time did the loop undergo the rotation, and which way did the current flow? (CW or ACW) (0.277 s, CW)



9. A single loop of wire with a **diameter** of 0.780 m starts at an angle of 78.0° with the page, and is rotated to the plane of the page. If there is a voltage of 32.0 V making current go clockwise, and the rotation takes 0.0160 s, what is the magnetic field (assume it is perpendicular to the page), and which way is it, into or out of the page? (1.35 T, out of the page)



V. Moving Conductors

10. A 25.6 cm long horizontal wire in the plane of the page is traveling down the page at 12.5 m/s through a 2.50 T magnetic field into the page. What is the EMF from one end to the other? Which end is positive, the right or the left? (8.00 V, right is positive)

11. A vertical wire 13.5 m long in the plane of the page traveling to the right through a 1.10 T magnetic field out of the page. What is its velocity if there exists a potential of 64.0 V from one end to the other? Which end is positive, the top or the bottom? (4.31 m/s, bottom is positive)

12. A vertical wire in the plane of the page is 15.0 m long, and is traveling to the left at 22.0 m/s through a magnetic field perpendicular to the page. There exists a potential of 1.35 V between one end and the other. The bottom is positive. What is the magnitude of the magnetic field, and is it into or out of the page? (4.09 mT, into the page)

VII. Transformers

13. A transformer has 5200. primary windings, and 208 secondary windings. What is the voltage in the secondary if there is a voltage of 125 V (AC) in the primary? What is the secondary current if the primary is 12.0 mA? (5.00 V, 300 mA)

14. A transformer has 412. primary windings, and 6700. secondary windings. What is the voltage in the primary if there is a voltage of 112 V (AC) in the secondary? What is the primary current if the secondary is 140. mA? (6.89 V, 2.28 A)

15. You want to step 120. VAC down to 9.60 VAC with a transformer. What should be the number of primary windings if you have 120. secondary windings? What is the secondary current if the primary is 220. mA? (1,500 windings, 2.75 A)

VIII. Transmission of Power

16. If you transmit 1300. W of power at 700. VAC, how much power is lost if the lines have a resistance of 7.20 Ω? (24.8 W)

17. If you wanted to transmit 1700. W of power over 3.20 Ω power lines, what voltage would you need to use to waste only 6.50 W? (1193 V)

18. You transmit 19,000. W of power at 15,800 VAC and waste only 3.40 W. What is the resistance of your transmission lines? (2.35 Ω)