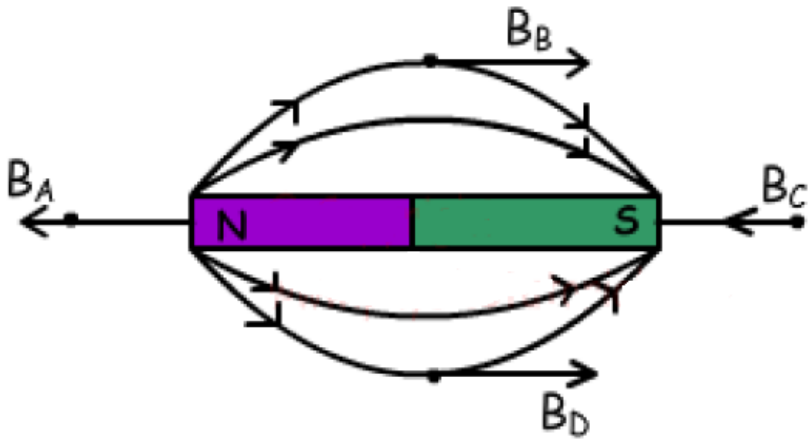
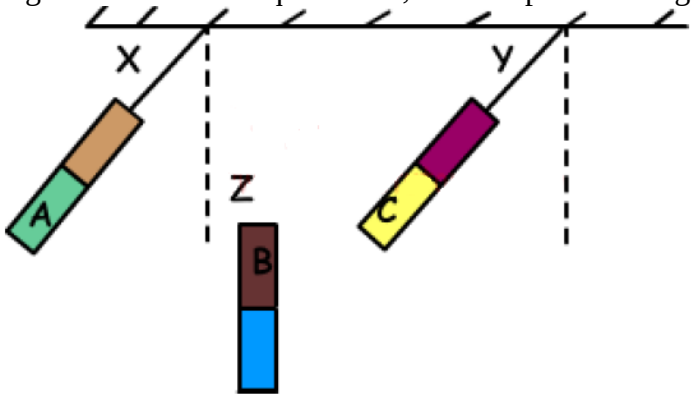
Problem Set 11
Physics, summer 2020/21

1) **(2p.)** Draw the directions of magnetic field lines at point A, B, C and D in the picture given below.



2) **(1p.)** If the system given below is in equilibrium, find the poles of magnets.



Answer:
B attracts C and repels A. Thus;
If B is N, then C must be S and A must be N
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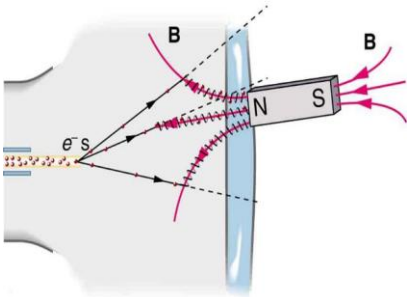
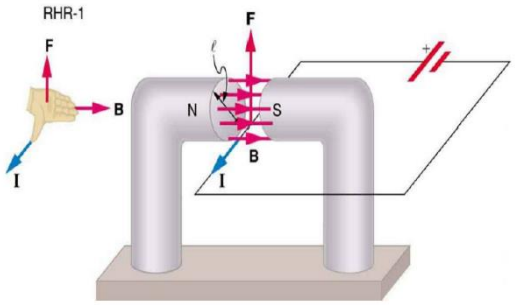
3) **(3p.)** A magnet brought near an old-fashioned TV screen such as in Figure severely distorts its picture by altering the path of the electrons that make its phosphors glow. To illustrate this, calculate the radius of curvature of the path of an electron having a velocity of 6.00×10^7m/s (corresponding to the accelerating voltage of about 10.0 kV used in some TVs) perpendicular to a magnetic field of strength B=0.500 T.



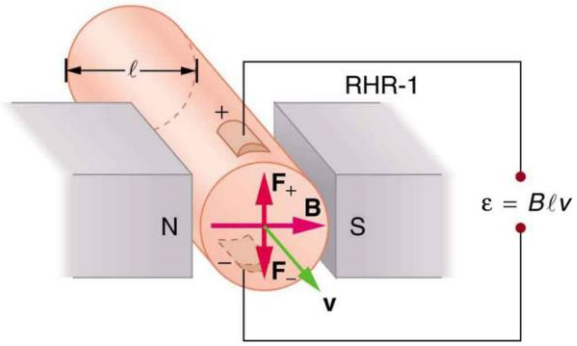
$$r = \frac{mv}{qB} = \frac{9.11 * 10^{-31} kg * 6.0 * \frac{10^7 m}{s}}{1.6 * 10^{-19} * 0.5\ T} = 0.683\ mm$$

4) **(2p.)** Calculate the force on the wire shown in picture, given B=1.50 T, l=5.00 cm, and I=20.0A.



$$F = IlBsin\theta = \\ = 20A * 0.05m * 1.5T \\ * \sin 90^o = 1.5N$$

5) **(2p.)** A Hall effect flow probe is placed on an artery, applying a 0.100 T magnetic field across it, in a setup similar to that in picture. What is the Hall emf, given the vessel's inside diameter is 4.00 mm and the average blood velocity is 20.0 cm/s?



$$\epsilon = U = Blv = \\ = 0.1T * 4 * 10^{-3}m * 0.2\frac{m}{s} \\ = 80 * 10^{-6}V \\ = 80\mu V$$

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