

Thursday Reading Assessment: Unit 3, Magnetic Forces and Fields

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1 Memory Bank

- $V_H = Blv$... The Hall voltage, given external B-field, height of conductor, l , and the drift velocity v .
- $V_H = (IBl)/(nqA)$... The Hall voltage, given external B-field, height of the conductor, l , the number density, n , the charge per carrier, q , and the conductor area A .
- $\vec{F} = I\vec{L} \times \vec{B}$... The Lorentz force on a current.

2 The Hall Effect

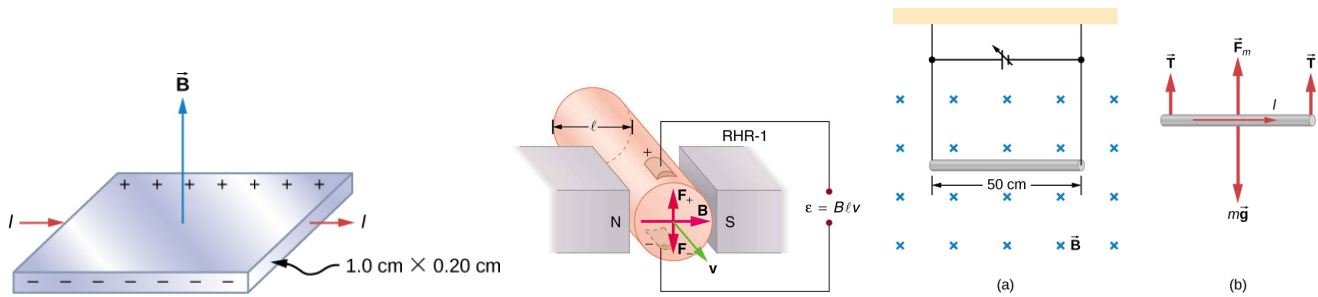


Figure 1: (Left) A geometry in which the Hall effect occurs. (Middle) A Hall-probe is used to measure fluid flow. (Right) A force is placed on a wire in a B-field.

1. Figure 1 (left) shows a silver ribbon whose cross section is 1.0 cm by 0.20 cm . The ribbon carries a current of 100 A from left to right, and it lies in a uniform magnetic field of magnitude 1.5 T . Using a density value of $n = 6 \times 10^{28}$ electrons per cubic meter for silver, find the Hall potential between the edges of the ribbon.
2. A Hall probe is used to measure fluid flow (Fig. 1, middle). Suppose a small tube carries fluid moving at velocity v , in a 0.8 T B-field, and the tube is 1 cm wide. The Hall voltage is $0.5 \times 10^{-6} \text{ Volts}$. What is v ?

3 Magnetic Forces on a Wire

1. Consider Fig. 1, right, in which a 0.5 T B-field suspends a 10 gram wire of length 0.5 meters . What is the current in the wire, and in which direction?