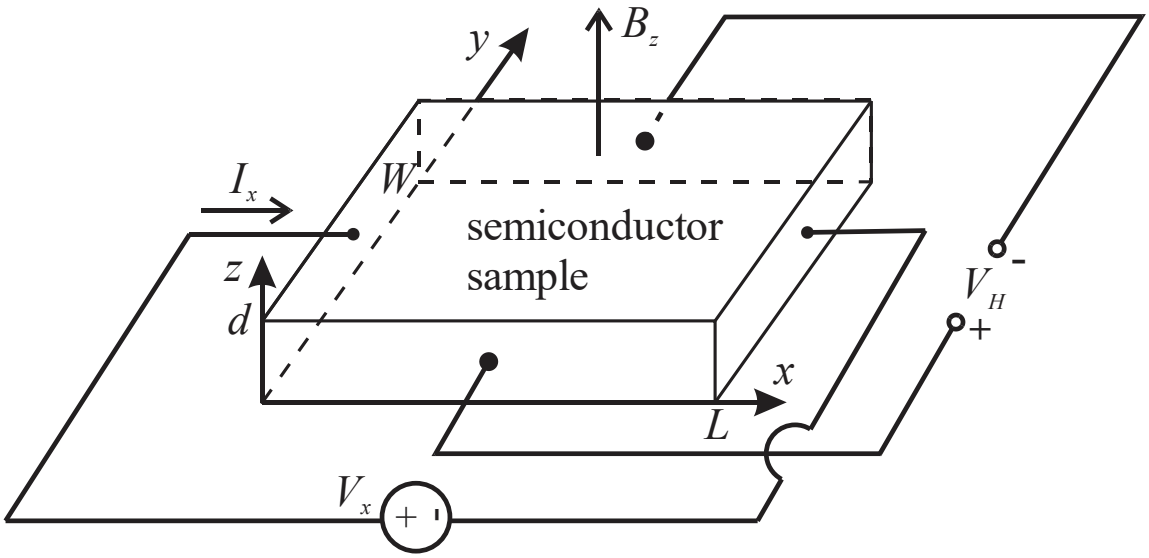
Example- A semiconductor sample undergoes a Hall effect test. The sample has dimensions- L = 0.5 mm, W = 0.2 mm, and D = 4 μm. A voltage V_x = 5.1 V and magnetic flux density B_z = 40 mT are applied to the sample. A Hall effect voltage V_H = 4.4 mV and current I_x = 4 mA are measured. Determine the type of doping, majority carrier concentration, and majority carrier mobility.



➢ Since, V_H = **4.4 mV > 0** is positive ⇒ **p-type semiconductor**!

➢ Using (5.54), $p = \dfrac{I_x B_z}{e d V_H} = \dfrac{4\times10^{-3}(40\times10^{-3})}{1.602176634\times10^{-19}(4\times10^{-6})4.4\times10^{-3}}$

⇒ **p = 5.6741×10^{22} #/m^3 = 5.6741×10^{16} #/cm^3.**

➢ Using (5.59),

$$\mu_p = \frac{I_x L}{e p V_x W d}$$

$$= \frac{4\times10^{-3}(0.5\times10^{-3})}{1.6021766\times10^{-19}(5.6741\times10^{22})5.1(0.2\times10^{-3})4\times10^{-6}}$$

⇒ **μ_p = 0.0539216 m^2/V-s = 539.22 cm^2/V-s.**