

## Hall Effect Pre-Lab

1. Read Melissinos pp63-75.
2. Why are there electron energy bands in solid materials? What is a valence band? A conduction band? A band gap?
3. How do metals, insulators, and semiconductors differ in their energy-band structures?
4. Three semiconducting samples have the same shape. One of them is n-type, the second is p-type and the third is intrinsic. Compare the relative magnitude and sign of the Hall voltage in the three samples, under identical experimental conditions.
5. Compare the magnitude of the electric field  $E$  due to the Hall effect with the field due to sample resistance, at right angles. For what magnetic field  $B$  would the two be comparable? Is this achievable in the lab?
6. Suppose you measure  $R_H / t$ , where  $t$  is sample thickness, for a fixed magnetic field and three different currents through the sample. Suppose you know  $B$  and  $I$  to 1% relative precision, and each  $V_H$  also to 1%. What is the relative precision of  $R_H / t$ ? How much of this is random, and how much is systematic?