

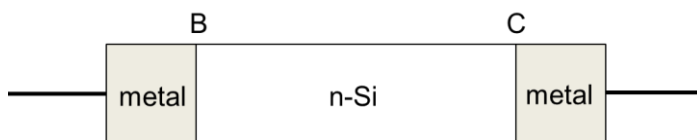
### Assignment 6.2

**Question 1:** Consider an  $n$ -type Si sample doped with  $10^{16}$  donors per  $\text{cm}^3$ . The length  $L$  is  $100\text{ }\mu\text{m}$ ; the cross-sectional area  $A$  is  $10\text{ }\mu\text{m} \times 10\text{ }\mu\text{m}$ . The two ends of the sample are labeled as B and C. The electron affinity ( $\chi$ ) of Si is  $4.01\text{ eV}$  and the work functions of four potential metals ( $\Phi_m$ ) for contacts at B and C are listed in the table below:

**Table 5.5** Work functions in eV

Cs	Li	Al	Au
1.8	2.5	4.25	5.0

- a) Which metals will result in a Schottky contact? Draw the energy band diagram **after** contact.



- b) Sketch the I-V characteristics when both B and C are Ohmic contacts. What is the relationship (gradient) between  $I$  and  $V$ ? (Hint: conductivity of  $n$ -type Si)
- c) Sketch the I-V characteristics when both B and C are Schottky contacts. What is the relationship between  $I$  and  $V$ ?
- d) Sketch the I-V characteristics when B is Ohmic and C is a Schottky junction. What is the relationship between  $I$  and  $V$ ?