

**Week 3 Lecture 7 Quiz:  
II Scattering: Part II**

**ECE 656: Electronic Conduction In Semiconductors**

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Purdue University, Fall 2013

**Student's name:** \_\_\_\_\_

Answer the **multiple choice questions** below by choosing the **one, best answer**. Then ask **a question** about the lecture.

- 1) What is the parameter,  $b$ , the impact factor?
  - a) Another name for the Debye length?
  - b) The average spacing of dopants.
  - c) The minimum distance between the carrier and the ionized impurity in a scattering event.
  - d) The maximum distance between the carrier and the ionized impurity in a scattering event.
  - e) The radius of the ionized impurity.
  
- 2) What is main difference between the Brooks-Herring (BH) and Conwell-Weisskopf (CW) treatments of II scattering?
  - a) BH assumes a screened Coulomb potential and CW an unscreened Coulomb potential.
  - b) BH uses Fermi's Golden Rule to compute the transition rate, and CW does not.
  - c) CW uses Fermi's Golden Rule to compute the transition rate, and BH does not.
  - d) BH assumes Fermi-Dirac statistics and CW does not.
  - e) CW assumes Fermi-Dirac statistics and BH does not.
  
- 3) Which of the following is true of the Brooks-Herring approach to ionized impurity scattering **but not true** about the Conwell-Weisskopf approach?
  - a) It strongly favors small angle scattering.
  - b) It assumes that the scattering potential is screened.
  - c) It assumes that scattering from different impurities is phase incoherent.
  - d) It is elastic.
  - e) It gets weaker as the energy of the carrier increases.

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- 4) How does one decide whether to use the BH approach or the CW approach?
- a) Use CW when the maximum impact parameter is greater than the Debye length.
  - b) Use CW when the maximum impact parameter is less than the Debye length.
  - c) Use CW for low temperatures and BH for high temperatures.
  - d) Use CW for high temperatures and BH for low temperatures.
  - e) Use CW for electrons and BH for holes.
- 5) What is (are) key limitations for the Fermi's Golden Rule treatment of II scattering?
- a) It assumes parabolic energy bands.
  - b) It assumes low temperatures.
  - c) It assumes that the scattering rate does not depend on the sign of the II charge.
  - d) All of the above.
  - e) None of the above.
- 6) What question do you have about this lecture?**

**Turn in to Prof. Lundstrom in class on Wednesday, Sept 11.**