

Quiz Week 13
ECE 656: Electronic Conduction In Semiconductors
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Answer the **multiple choice questions** below by choosing the **one, best answer**. Then **ask a question** about the lecture.

- 1) When simulating trajectories, $(\vec{r}(t), \vec{p}(t))$, in phase space, which of the following is true?
 - a) $\vec{r}(t)$ is continuous and $\vec{p}(t)$ is continuous.
 - b) $\vec{r}(t)$ is discontinuous and $\vec{p}(t)$ is continuous.
 - c) $\vec{r}(t)$ is continuous and $\vec{p}(t)$ is discontinuous.
 - d) $\vec{r}(t)$ is discontinuous and $\vec{p}(t)$ is discontinuous.
 - e) None of the above

- 2) What is “self scattering”?
 - a) A many body effect in which an electron interacts with itself.
 - b) An electron-electron scattering event in which an electron scatters from another electron.
 - c) An electron-electron scattering event in which an electron scatters from the entire plasma of all the electrons.
 - d) A mathematical technique that simplifies the computation of free-flight times.
 - e) A mathematical technique that simplifies the computation of the final scattering state.

- 3) How does the self-scattering rate vary with energy?
 - a) It is independent of energy.
 - b) It increases monotonically with energy.
 - c) It increases monotonically with energy.
 - d) It depends on the energy dependence of all the other scattering processes.
 - e) As energy to the power of a characteristic exponent, s .

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- 4) To simulate a carrier trajectory by Monte Carlo simulation, we choose four random numbers. What do these four random numbers determine?
- a) The position, momentum, energy, and velocity just before a collision.
 - b) The position, momentum, energy, and velocity just after a collision.
 - c) The duration of the free flight, the scattering event that terminated the free flight, and the two angles that describe the direction just after scattering.
 - d) The duration of the free flight, the scattering event that terminated the free flight, the energy just after scattering, and the direction just after scattering.
 - e) The duration of the free flight, the scattering event that terminated the free flight, the energy just after scattering, and the position just after scattering.
- 5) Which of the following is true?
- a) Monte Carlo simulation is a numerical technique to solve the BTE.
 - b) Monte Carlo simulation is a numerical technique to solve the near-equilibrium BTE.
 - c) Monte Carlo simulation is a numerical technique to solve the balance equations.
 - d) Monte Carlo simulation is a numerical technique that can go beyond the BTE by including e-e correlations.
 - e) Monte Carlo simulation is a numerical technique that can go beyond the BTE by including quantum transport effects.