

**Week 15 Lecture 38a and 38b Quiz:
Non-local Transport**

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) What is meant by the term, “non-local” semiclassical transport.
 - a) Transport that cannot be described by a DD equation with a field-dependent mobility and diffusion coefficient.
 - b) Transport in an electric field that varies more rapidly in space than the energy relaxation length, where T_e is the electron temperature.
 - c) Transport in an electric field that varies more rapidly in time than the energy relaxation time.
 - d) All of the above.
 - e) None of the above.

- 2) Under what conditions does velocity overshoot occur for a rapidly varying electric field?
 - a) When transport is ballistic .
 - b) When transport is quasi-ballistic.
 - c) When the momentum relaxation time is much shorter than the energy relaxation time.
 - d) When the momentum relaxation time is much longer than the energy relaxation time.
 - e) When the momentum relaxation time is nearly equal to the energy relaxation time.

- 3) Assume that a strong electric field is switched on at $t = 0$. Which of the following statements is true about the velocity vs. time transient?
 - a) The drift velocity overshoots its steady-state value.
 - b) The carrier energy overshoots its steady-state value.
 - c) The drift velocity and carrier energy overshoot their steady-state values.
 - d) The drift velocity overshoots its steady-state value and the carrier energy undershoots its steady-state value.
 - e) The drift velocity undershoots its steady-state value and the carrier energy overshoots its steady-state value.

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- 4) Which of the following statements is true about the drift and thermal energies during a velocity vs. time transient like that in questions 3)?
- a) The drift energy overshoots its steady-state value.
 - b) The thermal energy overshoots its steady-state value.
 - c) The drift energy and thermal energy overshoot their steady-state values.
 - d) The drift energy overshoots its steady-state value and the thermal energy undershoots its steady-state value.
 - e) The drift energy undershoots its steady-state value and the thermal energy overshoots its steady-state value.
- 5) When comparing velocity vs. time transient to a steady-state velocity vs. position transient, which of the following is true?
- a) Temporal velocity overshoot is stronger than s.s. spatial velocity overshoot.
 - b) Diffusion effects are much stronger in steady-state than in transient situations.
 - c) Ensemble effects are much stronger in steady-state than in transient situations.
 - d) All of the above.
 - e) None of the above.
- 6) **What question do you have about this lecture?**

You will NOT need to turn this quiz in