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Week 6 Quiz: Device Fabrication and PN Diodes I

ECE 305: Semiconductor Devices

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Answer the multiple choice questions below by choosing the **one, best answer**.

- 1) Ion implantation is a technique to do what?
 - a) Dope a semiconductor.
 - b) Deposit an insulating layer on a semiconductor.
 - c) Deposit a metallic layer on a semiconductor.
 - d) Deposit an insulating layer on an insulator.
 - e) Deposit a metallic layer on an insulator.

- 2) What is "lithography" used for in semiconductor manufacturing?
 - a) To dope semiconductors.
 - b) To deposit amorphous films on semiconductors.
 - c) To deposit polycrystalline films on semiconductors.
 - d) To grow crystalline films on semiconductors.
 - e) To produce patterns in the films deposited on semiconductors.

- 3) What is the most common insulator used in silicon manufacturing?
 - a) Si_3N_4
 - b) Al_2O_3 .
 - c) SiO_2 .
 - d) HfO_2 .
 - e) Ta_2O_5 .

- 4) Which of the following statements is true about the magnitude of the electric field in the transition region of an NP junction?
 - a) It is constant in space.
 - b) It increases linearly from the N side to the P-side.
 - c) It decreases linearly from the N side to the P-side..
 - d) It first increases linearly, reaches a peak at the junction, then decreases linearly.
 - e) It increases quadratically from the N side to the P-side.

- 5) Which of the following is true about the electron density in the transition region $-x_n < x < x_p$ of an NP junction?
 - a) It is less than n_i everywhere.
 - b) It is zero everywhere.
 - c) It is much less than the doping density over most of the transition region.
 - d) It varies with space as $\exp(-x / L_n)$.
 - e) It varies with space as $\cosh(x / L_n)$.

- 6) The built-in potential of an NP junction is roughly equal to what in magnitude?
- a) The thermal voltage, $k_B T / q$.
 - b) $3k_B T / 2q$.
 - c) 110 V.
 - d) The bandgap of the semiconductor in eV.
 - e) The electron affinity of the semiconductor in eV.
- 7) What happens if we insert an intrinsic (undoped) layer between the N and P layers of an NP junction?
- a) The built-in potential decreases by about a factor of 2.
 - b) The built-in potential increases by about a factor of 2..
 - c) The built-in potential becomes zero.
 - d) The built-in potential becomes $k_B T / q$.
 - e) The built-in potential does not change.