

Quiz: Lecture 2.7
Principles of Electronic Nanobiosensors
Muhammad A. Alam, nanoHUB-U Fall 2013

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

- 1) A sensor based on the concept of diffusion in multiple dimensions would work only if the diffusion along the nanowire (D_1) is related to the diffusion in the fluid (D_3) in the following way.
 - a) $D_1 \sim D_3$.
 - b) $D_1 \gg D_3$**
 - c) $D_1 \ll D_3$
 - d) None of the above.

- 2) The Peclet number compares the following two quantities
 - a) Convective vs. diffusive flows.**
 - b) Inertial vs. dissipative flows.
 - c) Viscous diffusion vs. thermal diffusion.
 - d) Ballistic vs. diffusive flow.

- 3) In the context of a nanobiosensor, a large Peclet number implies
 - a) Larger flow rate.
 - b) Smaller boundary layer.
 - c) More effective overlap between the sensor and the fluid flow.
 - d) All of the above.**

- 4) Peclet number is inversely proportional to the diffusion coefficient of the biomolecule. Does it mean that increasing the diffusion coefficient of DNA by reducing its polymer chain length would
 - a) Reduce the sensor performance.
 - b) Increase the sensor performance.**
 - c) Keep the sensor performance about the same.
 - d) Does not matter, because diffusion is irrelevant in a fluidic channel.

5) If the size of the disk sensor reduces from 100 μm to 1 μm , the total flux captured by the smaller sensor will be smaller by a factor of (approximately)

- a) 10
- b) 100
- c) 1000
- d) 1000000