

Biosensors EEL3050

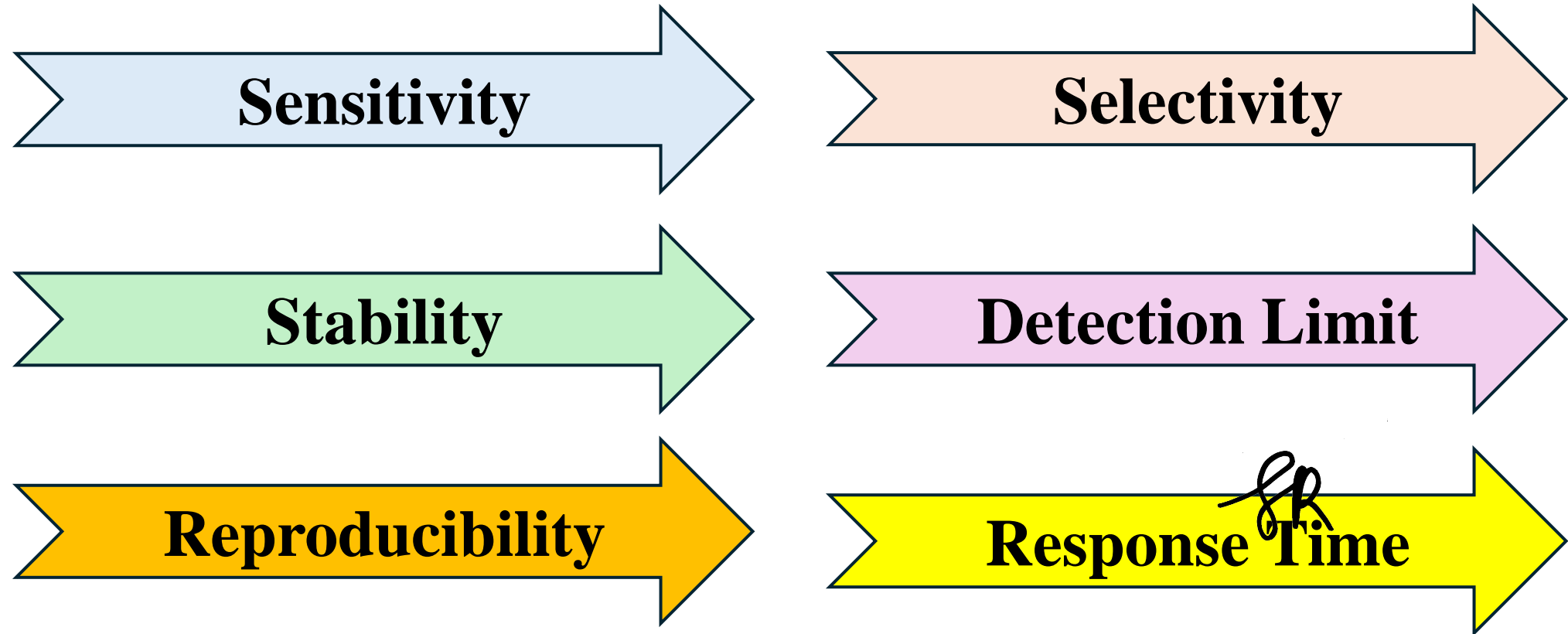


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Sensor Key Parameters

Owing to the nature of the applications in which biosensors are used in, several characteristics or parameters have to be met when a biosensor is designed. These characteristics define the performance and usefulness of a biosensor.



Numerical Problems on Biosensor's Key Parameters

Problem 1: A biosensor is designed to detect a specific analyte. When exposed to the analyte, the sensor's response increases according to the equation $R(t) = R_{\text{final}} \times (1 - e^{-t/\tau})$ where $R(t)$ is the sensor output at time t , R_{final} is the final response, and τ is the time constant. If the sensor reaches 80% of its final response in 10 seconds, calculate the time constant τ of the sensor.

Problem 2: Two biosensors, A and B, have time constants of 6 seconds and 15 seconds, respectively. Determine the time required for each sensor to reach 90% of its final response.

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Problem 3: A biosensor is tested multiple times under identical conditions and gives the following results: 1.02 μM , 1.03 μM , 1.01 μM , 1.04 μM , and 1.02 μM . Compute the reproducibility of the biosensor in terms of the standard deviation and the coefficient of variation (CV).

Numerical Problems on Biosensor's Key Parameters

Problem 4: A biosensor has a standard deviation of the blank measurements (no analyte) of 0.4 mV and a sensitivity of 0.8 mV/ μ M. Calculate the Limit of Detection (LOD).

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Problem 5: A biosensor has a dynamic range of 250 and can measure up to a maximum concentration of 2000 μ M. Determine the lower limit of detection (LOD) for this biosensor.