

BIOSENSORS

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WHAT IS A BIOSENSOR?

It is a device that detects an analyte in a biological or chemical reaction and converts this response into an electrical signal. It is applied in a large variety of fields like medicine (which allows the detection, diagnose and treatment of different pathologies), environment (measuring, for example, the O₂ concentration of the air), food, etc.



TYPES

- **Electrochemical biosensors** are based on the reaction of an enzymatic catalysis that consumes or generates electrons (Redox).
- **Optical biosensors** detect the changes on the basis of absorption, fluorescence or light scattering.
- **Piezoelectric biosensors** measure the electric charge that gets accumulated in solid materials in response to applied mechanical stress.



COMPONENTS

Bioreceptor: it's designed to interact with the specific analyte of interest to produce an effect measurable by the transducer.



Transducer: where the biological response is converted into an optical, thermal or electrical signal.



Amplifier: amplifies the biological signal, which is generally very low



Electronics: it processes the measurements



Interface: presentation of the results

MEASUREMENT

- **Potentiometric biosensors:** use ion selective electrodes to determine changes in the concentration of chosen ions.
- **Amperometric biosensors:** measure the electric current (changes in voltage) associated with electron flow resulting from redox reactions.
- **Conductometric biosensors:** measure changes in the conductivity of a medium as a result of enzyme reactions that change its ionic composition.




THE POTENTIOSTAT

It is the electronic interface to a large category of amperometric chemical sensors which are capable of managing many biologically and environmentally important analyses.

ELECTROCHEMICAL CELL

The conductors of an electrochemical cell are called **electrodes**. They are used in trios in order to avoid the polarization effect:



 **Reference electrode:** is an electrode which has a stable and well-known electrode potential and it is used as a point of reference in the electrochemical cell for the potential control and measurement.

 **Working electrode:** where the electrochemical reaction takes place

 **Counter or auxiliary electrode:** supplies the current required for the electrochemical reaction