1) Describe the working of an Amperometric, Voltametric/Conductometric and Potentiometric Biosensor (include block diagrams)

⇨ Amperometric, voltametric, and potentiometric biosensors are types of electrochemical sensors that use a biorecognition element to detect the presence or concentration of a specific target analyte in a sample. The biorecognition element can be an enzyme, an antibody, a nucleic acid, or other biomolecules that specifically binds to the target analyte.

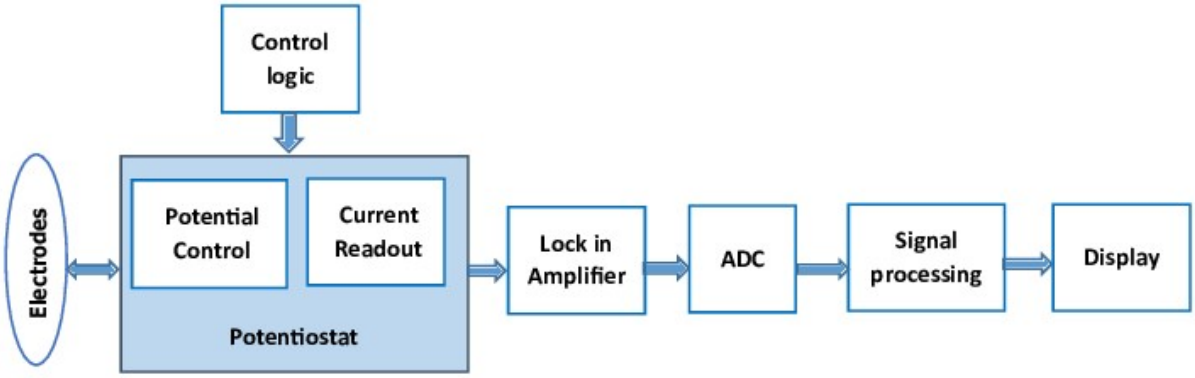

Fig: - Block diagram of Amperometric Biosensor

An ***amperometric biosensor*** is a type of sensor that measures the current generated by a chemical reaction at an electrode. This type of biosensor is commonly used for the detection of small molecules such as glucose, lactate, and oxygen. The reaction at the electrode is typically mediated by an enzyme that specifically recognizes and reacts with the target molecule. For example, in a glucose biosensor, the enzyme glucose oxidase catalyzes the oxidation of glucose to gluconic acid, generating hydrogen peroxide as a by-product. The current generated by the reduction of hydrogen peroxide at the electrode can be measured and used to determine the concentration of glucose in the sample.

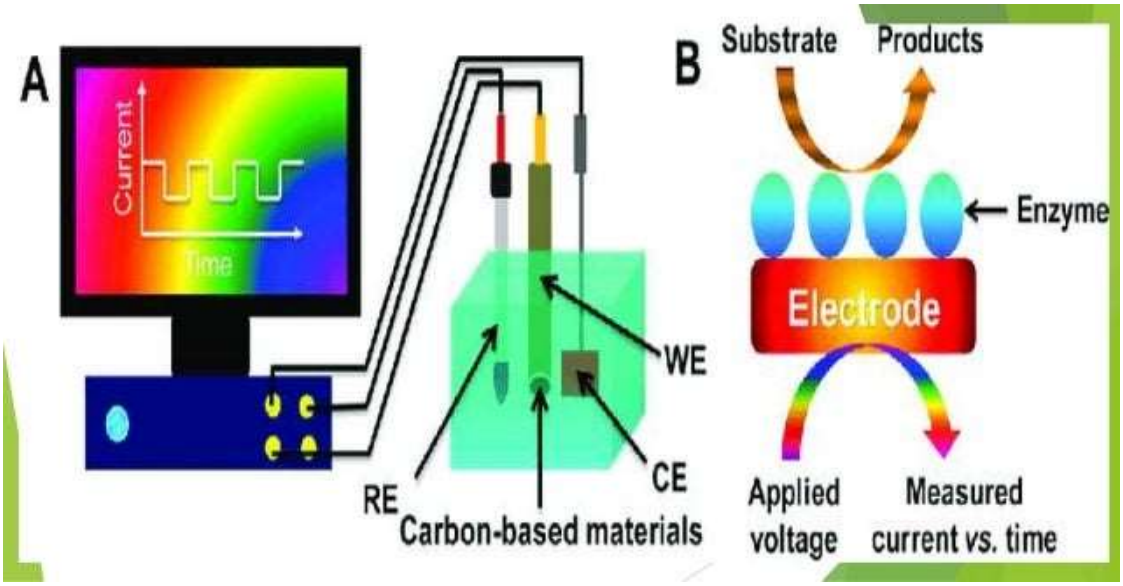

Fig: - Voltametric biosensor

A ***voltametric biosensor*** is similar to an amperometric biosensor, but it measures the voltage generated by the chemical reaction at the electrode rather than the current. This type of biosensor is often used for the detection of redox molecules, which are compounds that can be oxidized or reduced at the electrode.

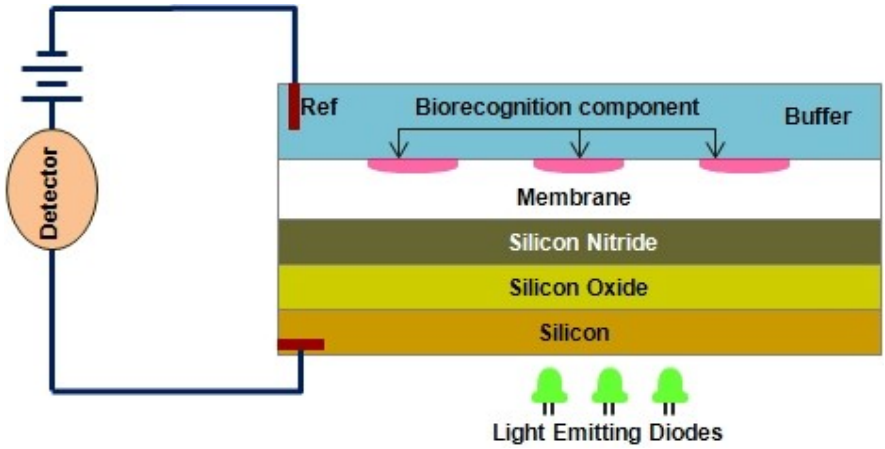

Fig: - Block diagram of the light addressable potentiometric biosensor

A ***potentiometric biosensor*** is a type of sensor that measures the potential difference, or voltage, between two electrodes. This type of biosensor is commonly used for the detection of ions, such as sodium, potassium, and calcium. The potential difference is typically measured using a reference electrode, which is a stable and known voltage, and a working electrode, which is responsive to the target ion. The concentration of the target ion can be determined by measuring the potential difference between the two electrodes.

All three types of biosensors rely on the specific binding of the biorecognition element to the analyte and can be used to detect a wide range of substances, including small molecules, proteins, and nucleic acids. Biosensors are widely used in a variety of applications, including medical diagnostics, environmental monitoring, and food safety.