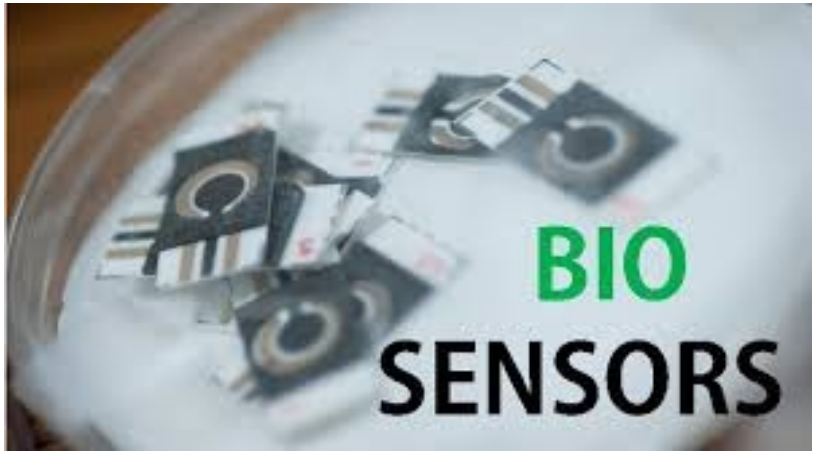
UNIT – 3

BIOPOTENTIAL ELECTRODES & CONFIGURATION

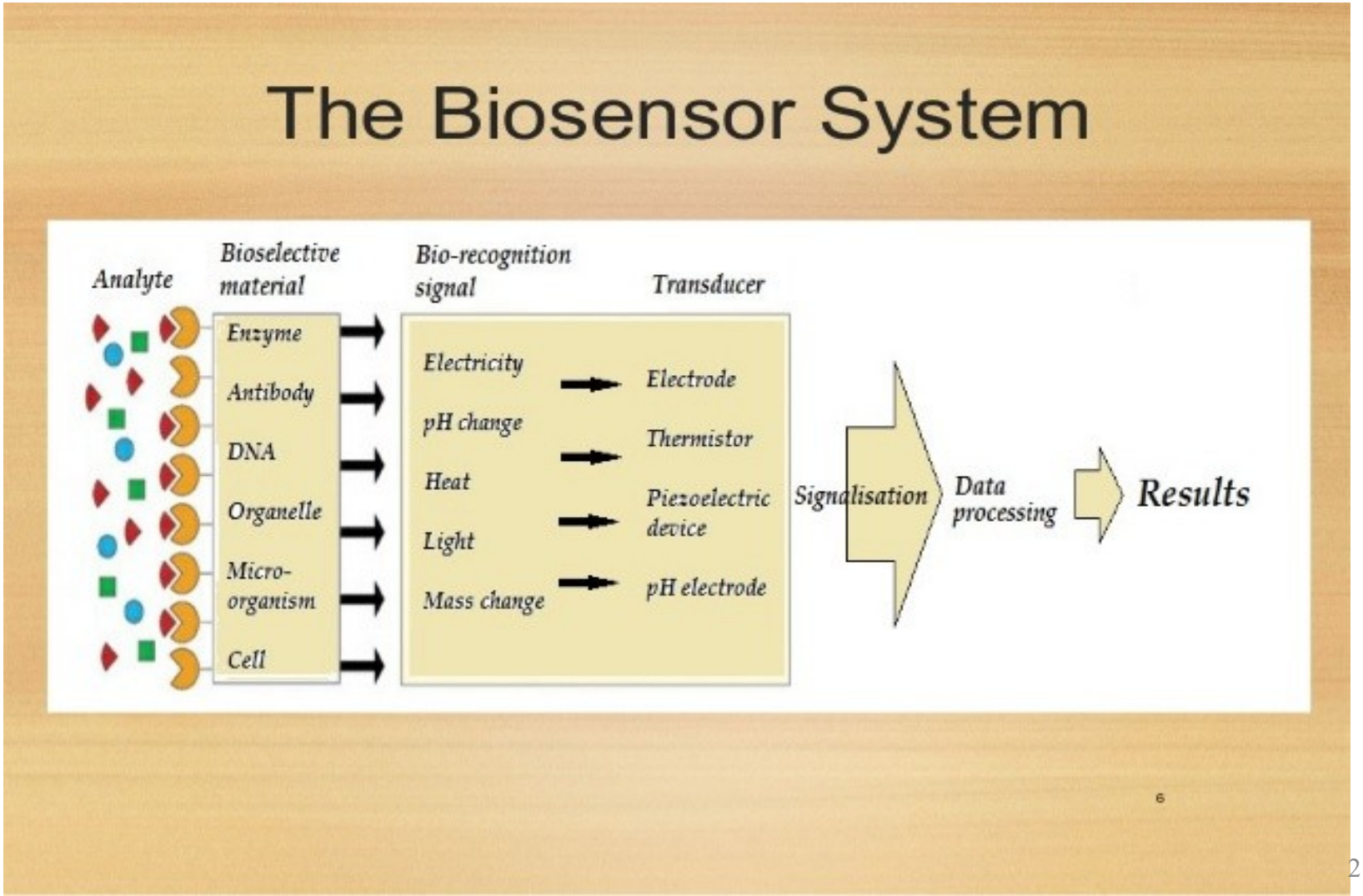
Ion sensitive Field Effect Transistor (ISFET)

Definition

- A **biosensor** is an analytical device, used for the detection of an analyte, that combines a biological component with a physicochemical detector.



Biosensor system



Glucometer

- Current glucometers use test strips containing glucose oxidase, an enzyme that reacts to glucose in the blood droplet,
- When the strip is inserted into the meter, the flux of the glucose reaction generates an electrical signal
- The glucometer is calibrated so the number appearing in its digital readout corresponds to the strength of the electrical current

Bio-element

- It is a typically complex chemical system usually extracted or derived directly from a biological organism.
- **Types**
- Enzymes
- Oxidase
- Polysaccharide
- Antibiotics
- Tissue
- Nucleic acid

Conti…

- **Function**
- To interact specifically with a target compound i.e compound to be detected.
- It must be capable of detecting the presence of a target compound in the test solution.
- The ability of a bio-element to interact specifically with the target compound (specifically) is the basis for biosensor.

Response From Bio-element

- Heat absorbed (or liberated) during the interaction.
- Movement of electrons produced in a redox reaction.
- Light absorbed (or liberated) during the interaction.
- Effect due to mass of reactants or products.

Types Of Biosensors

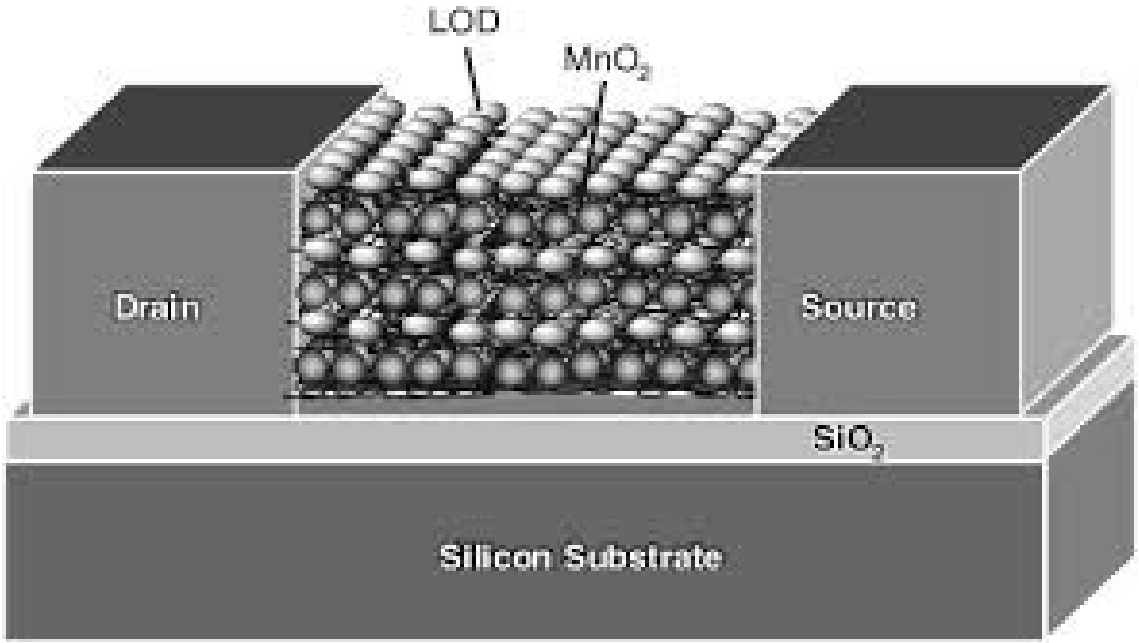
- Electrochemical biosensor
- Optical biosensor
- Thermal biosensor
- Resonant biosensor
- Ion-sensitive biosensor

Ion sensitive biosensor

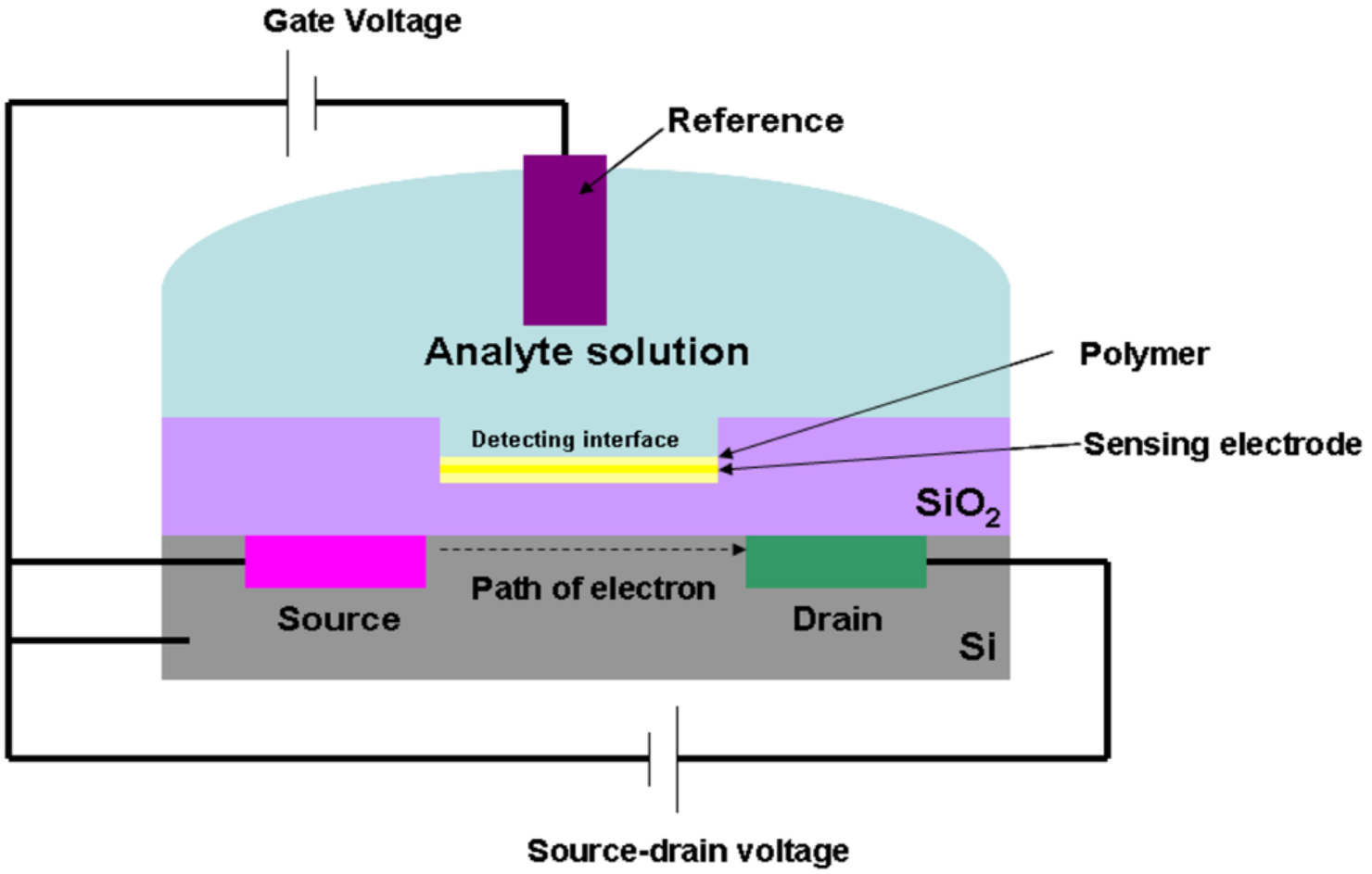
- These are semiconductor FETs having an ion-sensitive surface.
- The surface electrical potential changes when the ions and semiconductor interact. (This change in the potential can be subsequently measured).
- The Ion sensitive Fielf Effect Transistor (ISFET) can be constructed by covering the sensor electrode with a polymer layer. This polymer layer is selectively permeable to analyte ions. The ions diffuse through the polymer layer and in return cause a change in the FET surface potential.

Conti…

- This type of biosensor is also called an ENFET (Enzyme Field Effect Transistor) and is primarily used for pH detection.



Ion sensitive biosensors



Glucose biosensors

- Glucose reacts with glucose oxidase to form gluconic acid. Two electrons and two protons are also produced.
- Glucose mediator reacts with surrounding oxygen to form H_2O_2 and glucose oxidase.
- Now this glucose oxidase react with more glucose.
- Higher the glucose content, the higher the oxygen consumption.
- Glucose content can be detected by Pt-electrode.

Glucose biosensors