Al-Mustaqbal University-College

Department of medical physics

The Second Stage

Seventh lecture

Biosensors

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CHAPTER SEX

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Biosensors

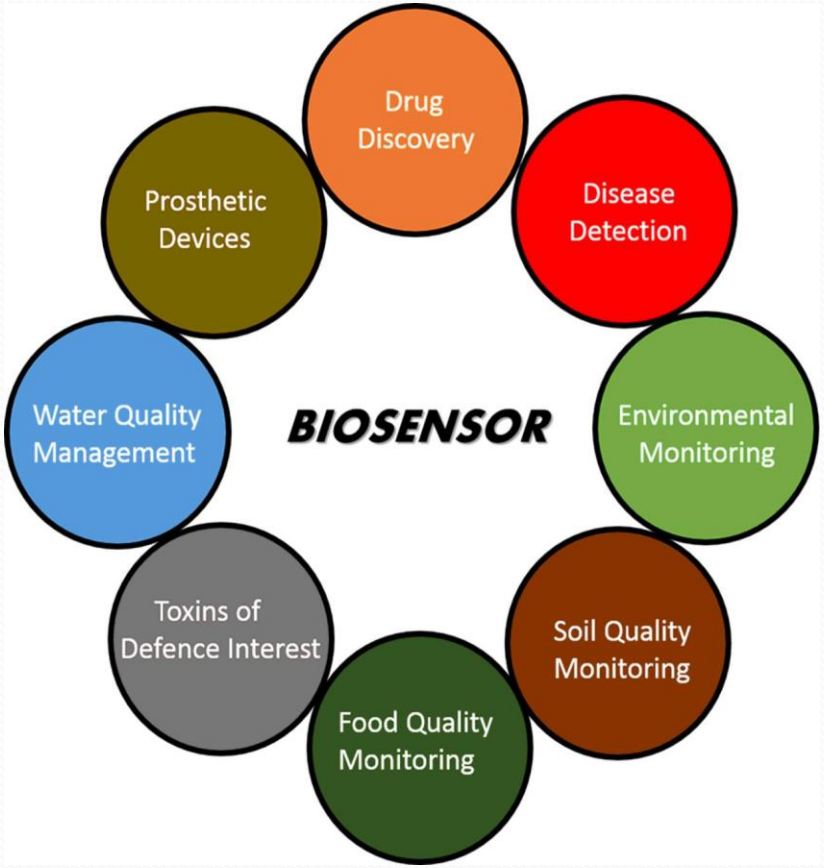
أجهزة الاستشعار البايولوجي (الحيوية)

Biosensors are analytical devices that convert a biological response into an electrical signal.

المستشعر البايولوجي (الحيوي): هو كاشف فيزيائي كيميائي وجهاز تحليلي للكشف عن المادة المتحللة التي تجمع بين العنصر البيولوجي مع كاشف فيزيائي كيميائي.

Applications of bio-sensors

- **Drug discovery**
- **Food quality estimation**
- **Environmental monitoring**
- **Disease detection**
- **DNA biosensors**
- **Water quality**
- **Diagnosis of clinical**



Bio-sensor (monitor blood oxygen levels, glucose sensor, skin analysis sensor, breath analysis sensor, enzyme based sensor, etc.

Monitor blood oxygen levels

Glucose sensor

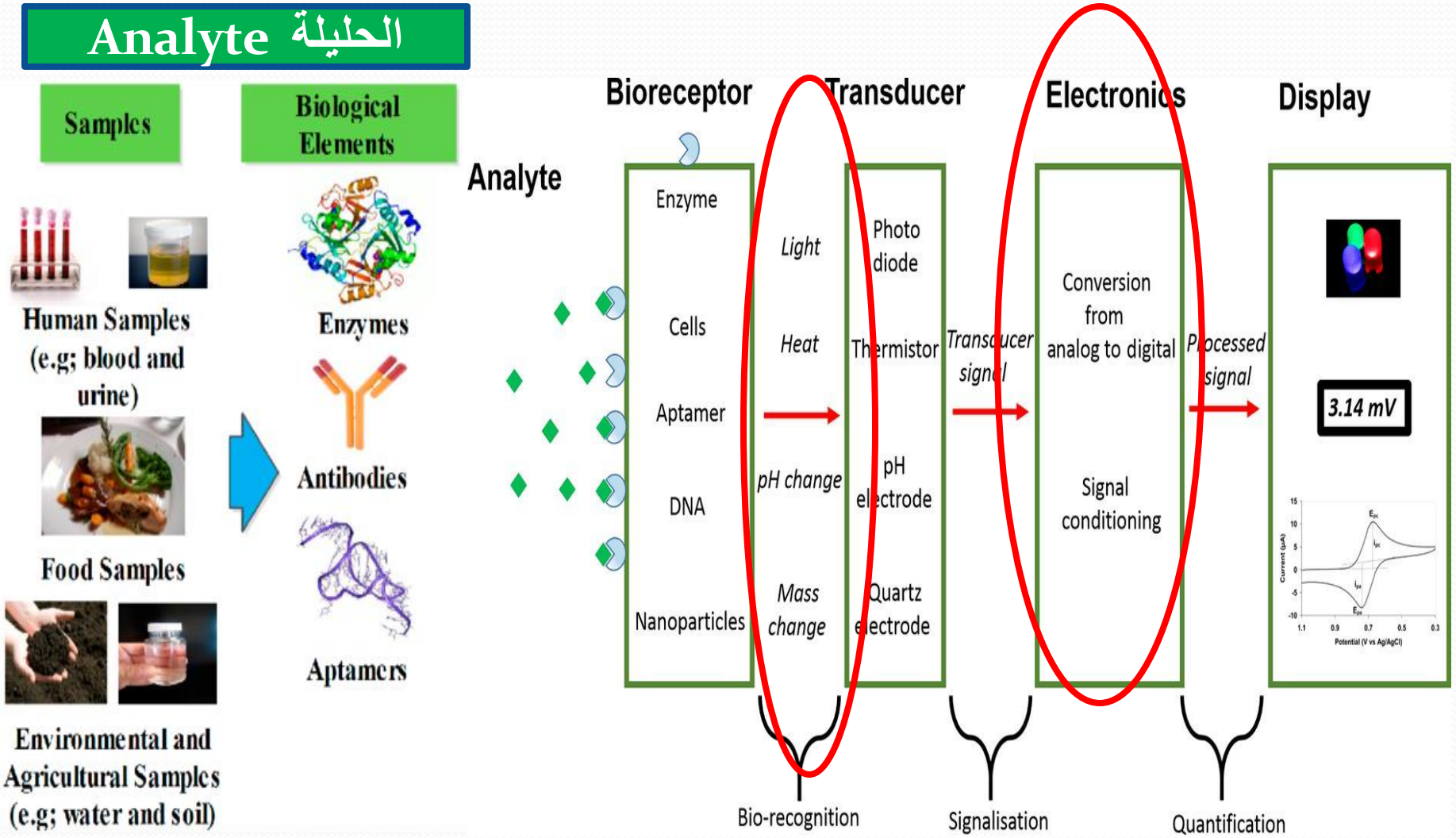
Skin analysis sensor

Electro analytical sensor

Enzyme based sensor

Breath analysis sensor

Biosensor Components



Biosensor Components

1. **Analyte (الحليلة):** It is a material of interest that needs detection. For example glucose.
2. **Bio-receptor (المستقبل البايلوجي) :** It is an analytical part, used for the detection of a chemical material (analyte) (such as enzymes, cells, DNA, and antibodies), that combines a biological component with a physico-chemical detector. The process of generation of a signal (in the form of light, heat, pH, charge or mass change, etc.) upon interaction of the bio-receptor with the analyte is describe as bio-recognition (التعرف الحيوي).
3. **Transducer (محول الطاقة) :** The transducer is an element that converts one form of energy into another. In a biosensor the role of the transducer is to convert the bio-recognition event into a measurable signal. Most transducers produce either optical or electrical signals.
4. **Electronics (الإلكترونيات) :** This is the part of a biosensor that processes the transduced signal and prepares it for being displayed.
5. **Display (العرض) :** The display consists of a user explanation system such as; i) crystal display of a computer. ii) or a direct printer that generates numbers iii) or curves understandable by the user.

Characteristics of a Biosensor

1) **Selectivity:** Selectivity is the ability of a bio-receptor to detect a specific analyte in a sample
2) **Reproducibility:** It is the ability of the biosensor to generate identical responses for a repeated experimental.
3) **Stability:** It is the degree of the sensitivity to ambient conditions in and around the biosensing system.
4) **Sensitivity:** The minimum amount of analyte that can be detected by a biosensor defines its limit of detection (LOD) or sensitivity.
5) **Linearity**: It is the attribute that shows accuracy of the measured response (for a set of measurements with different concentrations of analyte) to a straight line, mathematically represented as **y = mc**, where **c is the concentration** of the analyte, **y is the output signal** and **m is the sensitivity of the biosensor**.