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**Biosensors and Biochips**

**Synopsis**

**1.Bio-electronics**

**2. Biosensors**

**3. Working principle of a biosensor**

**4. Biochips**

1. **Bio-electronics**

**Recently biomoklecules hav attracted the instrument designers to build equipments using electrical properties of molecules or cells. This aspect of science is known as Bio-electronics**

**It deals wuith electrical properties of biomembranes, reactants, enzymes and whole cells and with making use of these properties I making biosensors and biochips**

1. **Biosensors**

**A biosensor is a sensitive an alytical tool which converts biological signals provided by the analyte in to electrical signals**

**It consists of an immobilized layer of biological material coupled with a transducer**

**The biological material may be an enzyme or an antibody or an organelle or a hormone or entire cells**

**Biosensors are used as alternatives for chemical sensors used to detect changes in chemical concentration**

1. **Working principle of a biosensor:**
2. **When the immobilized layer is kept in con tact with an analyte, the substance passes through the membrane and interacts with the biological material**
3. **As a result, a product, a complex, ions, electrons or gas is formed depending upon cells or enzymes or hormone immobilized in the sensor**
4. **The product passes through another membrane and reaches the transducer.**
5. **The transducer converts the product signals into electrical signals which can be amplified, read out and recorded**
6. **Types of Biosensors**
7. **ISFET based biosensor**
8. **Enzyme electrodes**
9. **Immobilized cell biosensors**
10. **Bioaffinity sensors**
11. **Thermal biosensors**
12. **Optical biosensors**
13. **ISFET based biosensor (Ion-Sensitive Field Effect Transistor based biosensors)**

* **This type of biosensors has a semiconducting device called Field effect transistor (FET)**
* **The FET consists of silicon crystals**
* **It has high electrical resistance unless the electric field is modified**
* **Whenn an analyte is kept in contact wuith FET, some ions in the analyte adsorb onto the silicon crystal and create an electric charge**
* **This electric charge switches on the FET to conduct the electric charge to the transducer**
* **From the transducer, electric signals are amplified, read out and recorded**
* **If Enzyme immobilized membrane is used, uch FET is called Enzyme FET**
* **Here, the immobilized enzyme converts the test molecules intom ionic forms**
* **Electric charge of the ions are conducted to the transducer**
* **The FET based biosensors are also called Electro-chemical biosensors**
* **They are used for monitoring ion concentration in many fermentation processes**

1. **Enzyme electrodes**

* **In this type of biosensors, an enzyme is immobilized ontothe surface of an electrode**
* **The enzymecatalyses itsspecific reaction and thus transfers electrons from the reactants to the electrode**
* **Current generated on the electrode is amplified, read out and recorded**
* **They are of two types such as**
* **Amperometric biosensors**
* **Potentiometric biosensors**

**Amperometric biosensors: Current generated in the electrodeis measured with amillivolt-ammeter**

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