ENGINEERING CHEMISTRY

Department of Science and Humanities

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Electrochemical Sensors-Biosensor- Glucose Sensor

Class Content :

BIOSENSORS

GLUCOSE SENSOR

Components of glucose biosensor

Working of glucose biosensor

Limitations

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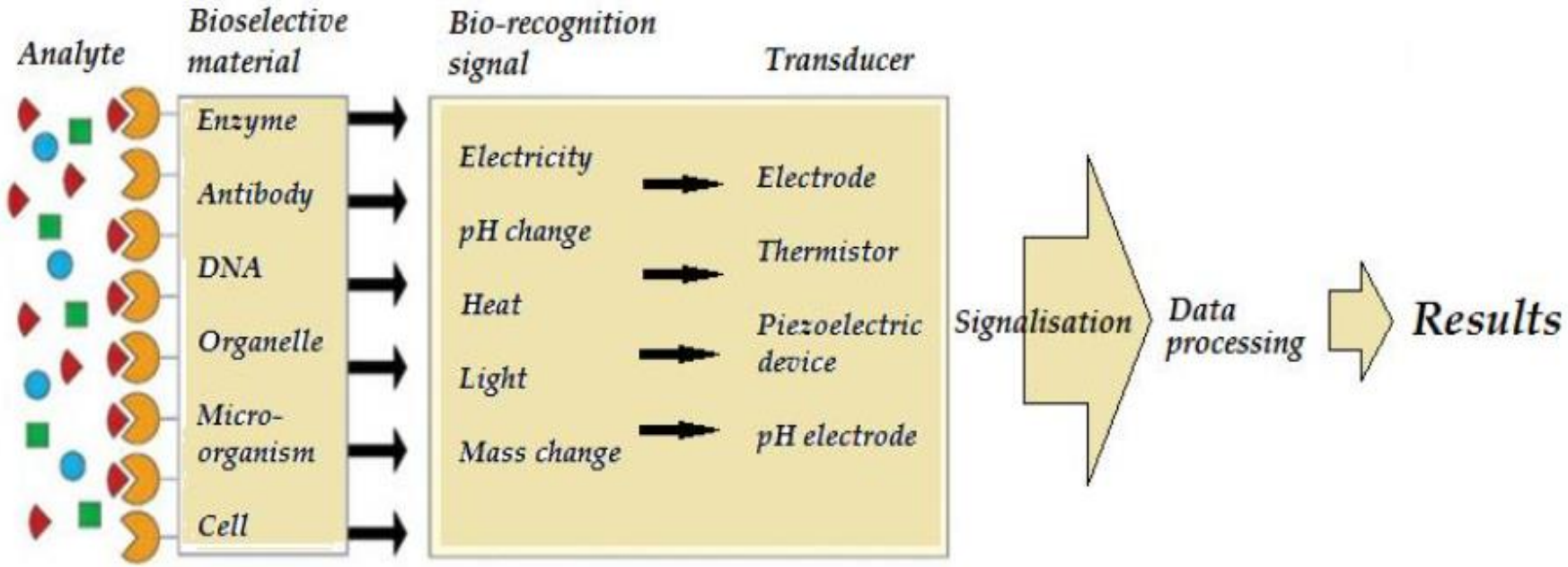
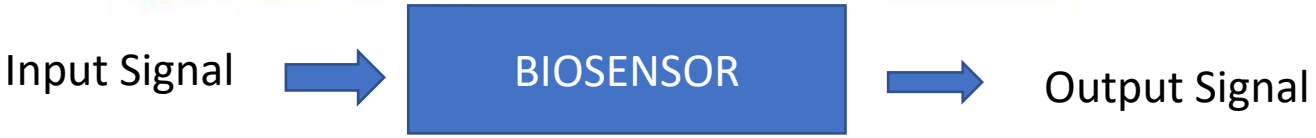
Biosensors

A biosensor is an analytical device which is used to determine the presence and concentration of a specific substance in a biological analyte.





Blood Glucose Monitoring

- Blood Glucose Monitoring is a way of checking the concentration of glucose in the blood using a glucometer.
- Provides quick response to tell if the sugar is high or low indicating a change in diet, exercise or insulin.
- Over time, it reveals individual of blood glucose changes.

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Why Monitor Blood Glucose?

- Reduces risk of developing complications with diabetes.
- Allows diabetics to see if the insulin and other medications they are taking are working.
- Gives diabetics an idea as to how exercise and food affect their blood sugar.
- May prevent hypoglycemia or hyperglycemia

BLOOD SUGAR LEVEL CHART

	FASTING	JUST ATE	3 HOURS AFTER EATING
NORMAL	80-100	170-200	120-140
PRE-DIABETIC	101-125	190-230	140-160
DIABETIC	126+	220-300	200+

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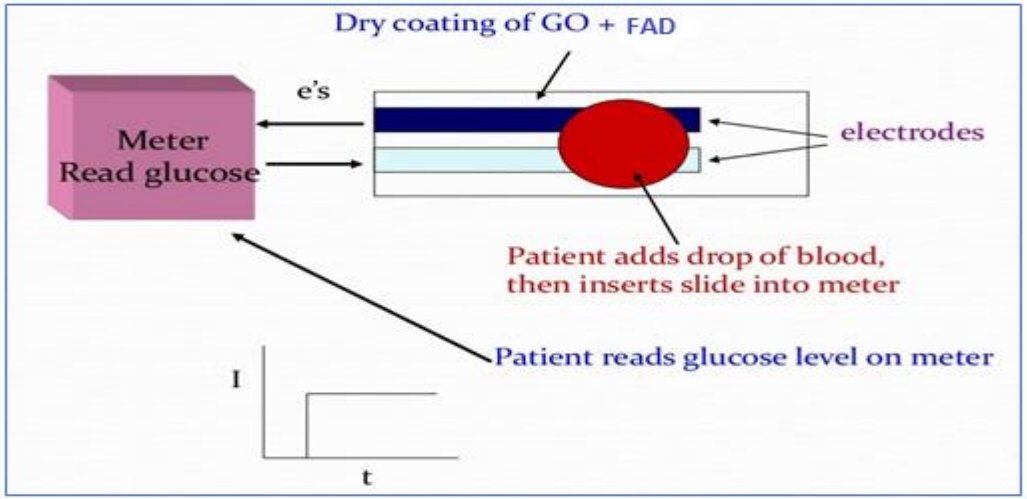
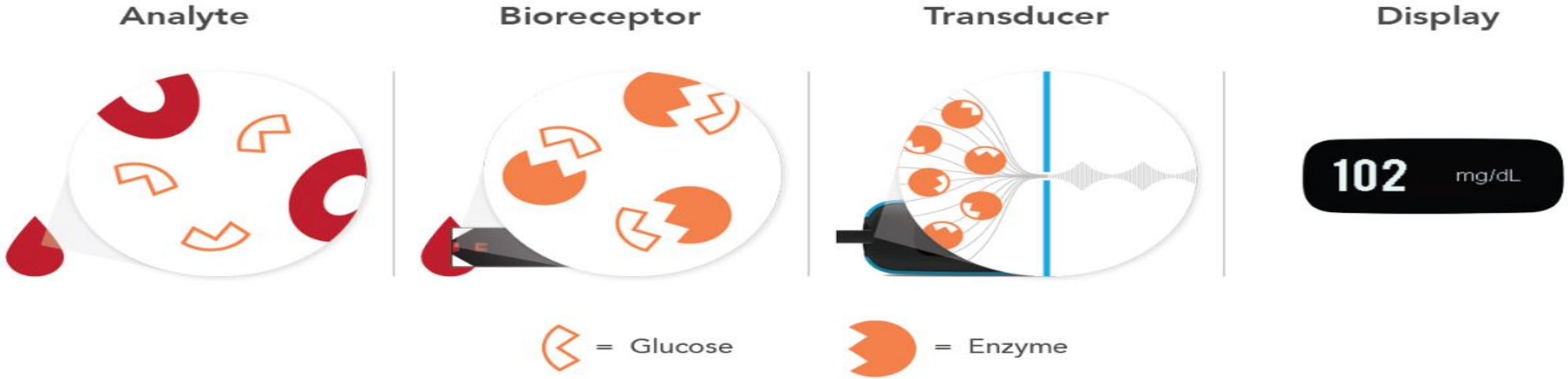
Components of Glucose Sensor

- Analyte
- Bioreceptor
- Transducer
- Electronics and display





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Working of Glucose Biosensor

- Developed by Updike and Hicks
- Enzyme Glucose oxidase(GOx) catalyze the oxidation of glucose by molecular oxygen producing glucolactone and hydrogen peroxide.
- In order to work as a catalyst, GOx requires a redox cofactor –flavin adenine dinucleotide (FAD), works as an initial electron acceptor and is reduced to $FADH_2$.
- Glucose + GOx –FAD → Glucolactone + GOx – $FADH_2$

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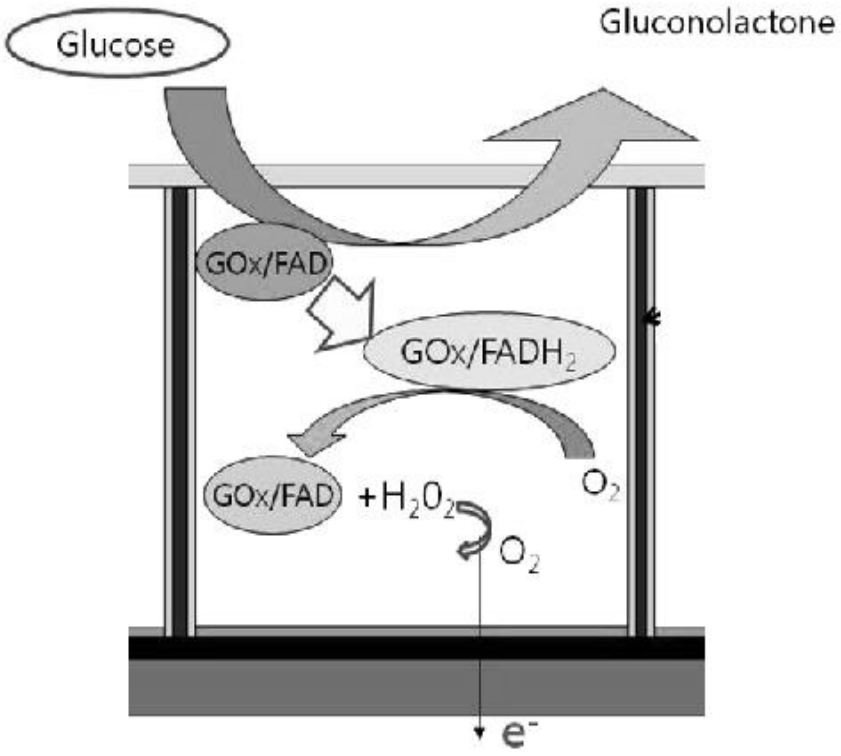
Working of Glucose Biosensor

- The cofactor is regenerated by reacting with oxygen, leading to the formation of hydrogen peroxide
- $GOx - FADH_2 + O_2 \rightarrow GOx - FAD + H_2O_2$
- Hydrogen peroxide is oxidized at a platinum electrode.
- The number of electron transfers, at electrode surface is directly proportional to the number of glucose molecules present in the blood.
- $H_2O_2 \rightarrow 2H^+ + O_2 + 2e^-$



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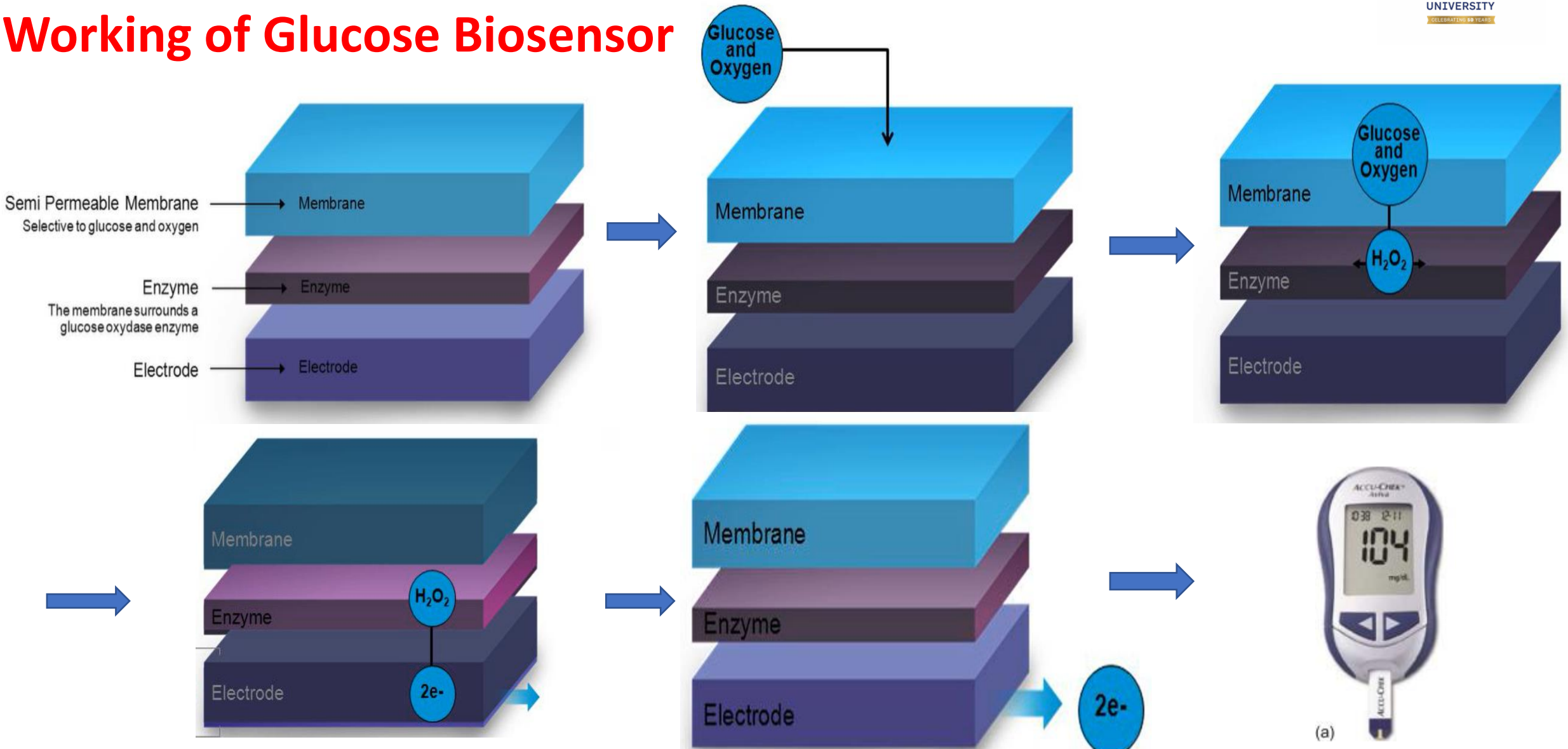
Working of Glucose Biosensor



Limitations of Glucose Sensors

- Extreme environmental conditions like haematocrit values, or medication interferences may potentially falsify blood glucose readings.
- **Limited selectivity-** interference from ascorbic acid and uric acid

THANK YOU

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