



Pharmaceutical Instrumental Analysis

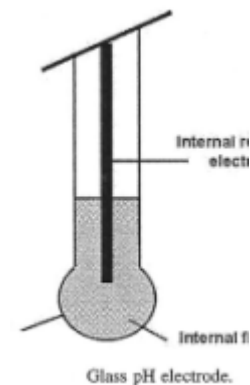
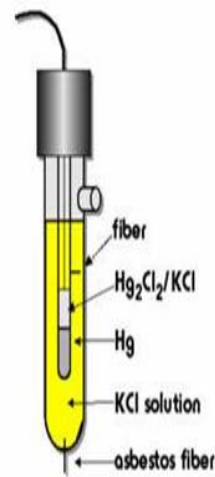
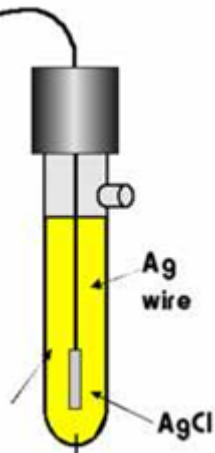
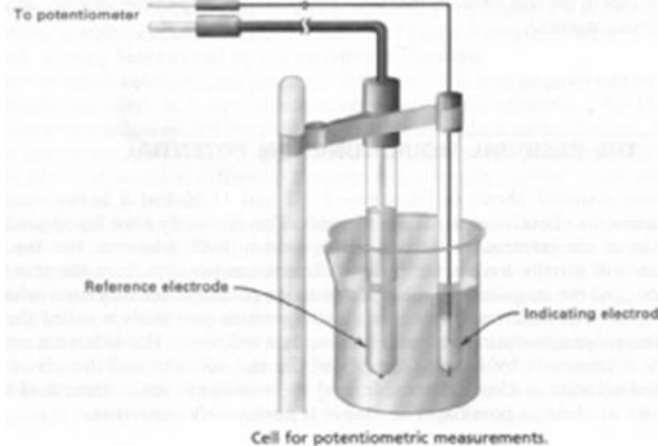
الأستاذ الدكتور جمعة الزهوري (دكتوراه صيدلة-ألمانيا 1991)

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An Introduction to Electroanalytical Chemistry (Potentiometry)

Reference

Indicator



Electroanalytical chemistry

- Potentiometry
- Coulometry
- Voltammetry (Polarography)

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Potentiometry

Potentiometric methods of analysis are based upon measurements of the potential of electrochemical cells in the absence of appreciable currents.

Since the beginning of the twentieth century, Potentiometric techniques have been used for the location of end points in titrimetric methods of analysis.



Azelastine Hydrochloride

Assay: Dissolve 0.3 g in 5 ml of anhydrous formic acid, add 30 ml of acetic anhydride and carry out Method I for non-aqueous titration, Appendix VIII A, determining the end-point

Potentiometrically. Each ml of 0.1M Perchloric acid VS is equivalent to 41.84 mg of $C_{22}H_{24}ClN_3O, HCl$.

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Trazodone Hydrochloride

Assay:

Dissolve 0.3 g in 60 ml of glacial acetic acid, add 5 ml of mercury (II) acetate solution and carry out Method I for non-aqueous titration, Appendix VIII A, determining the end point

***Potentiometrically.** Each ml of 0.1M Perchloric acid VS is equivalent to 40.83 mg of $C_{19}H_{22}ClN_5O$, HCl.*

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Amprolium Hydrochloride

Assay :

Carry out Method I for **non-aqueous titration**, Appendix VIII A, using 0.3 g and 1-naphtholbenzein solution as indicator. Each ml of 0.1M Perchloric acid VS is equivalent to 15.77 mg of $C_{14}H_{19}ClN_4, HCl$.

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Sulfaguanidine

ASSAY :

Dissolve 0.175 g in 50 ml of dilute hydrochloric acid R. Cool the solution in iced water. Carry out the determination of primary aromatic amino-nitrogen (2.5.8), determining the end-point **electrometrically**.

1 ml of 0.1M sodium nitrite is equivalent to 21.42 mg of C₇H₁₀N₄O₂ S.

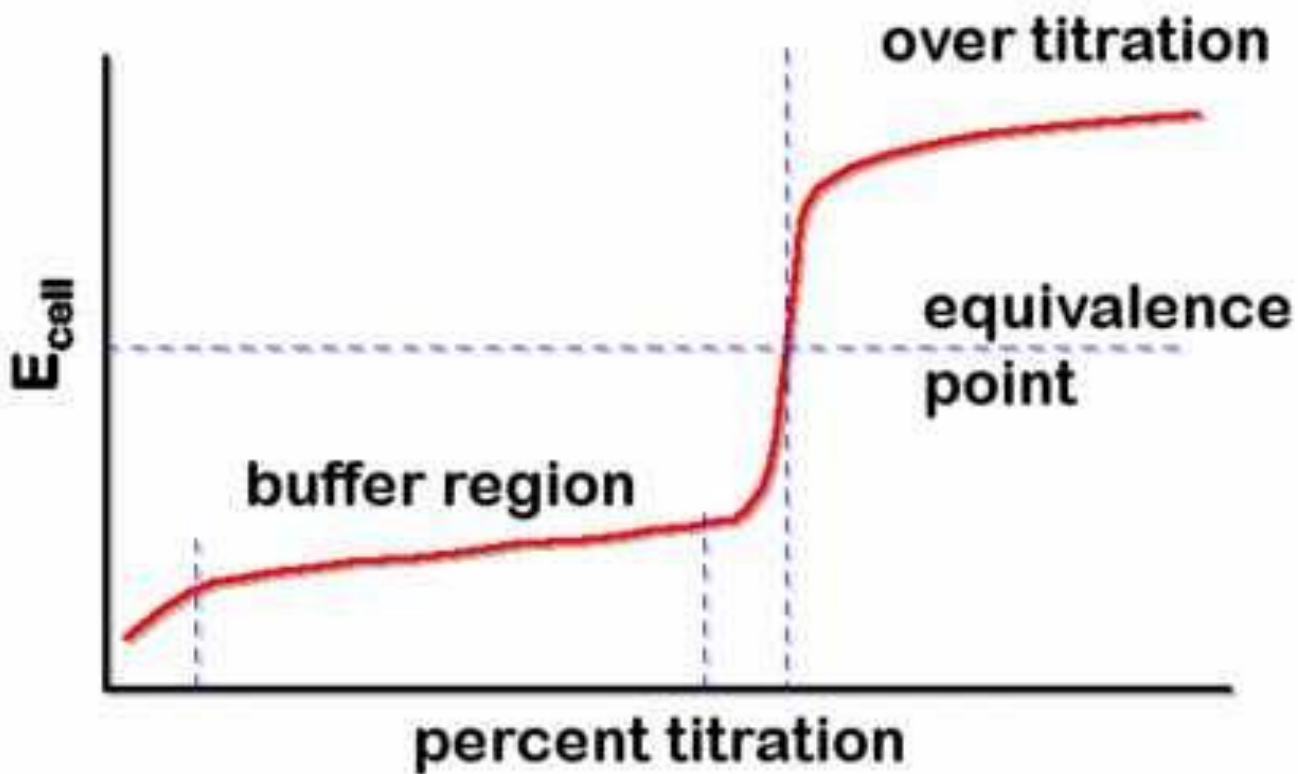
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Titration curves



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Potentiometry

- The equipment required for Potentiometric methods is simple and inexpensive and includes :
 - 1- a reference electrode (SHE , SCE , Ag/Ag Cl)
 - 2- an indicator electrode (glass)
 - 3- and a potential measuring device

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Potentiometric Methods

Basis of method

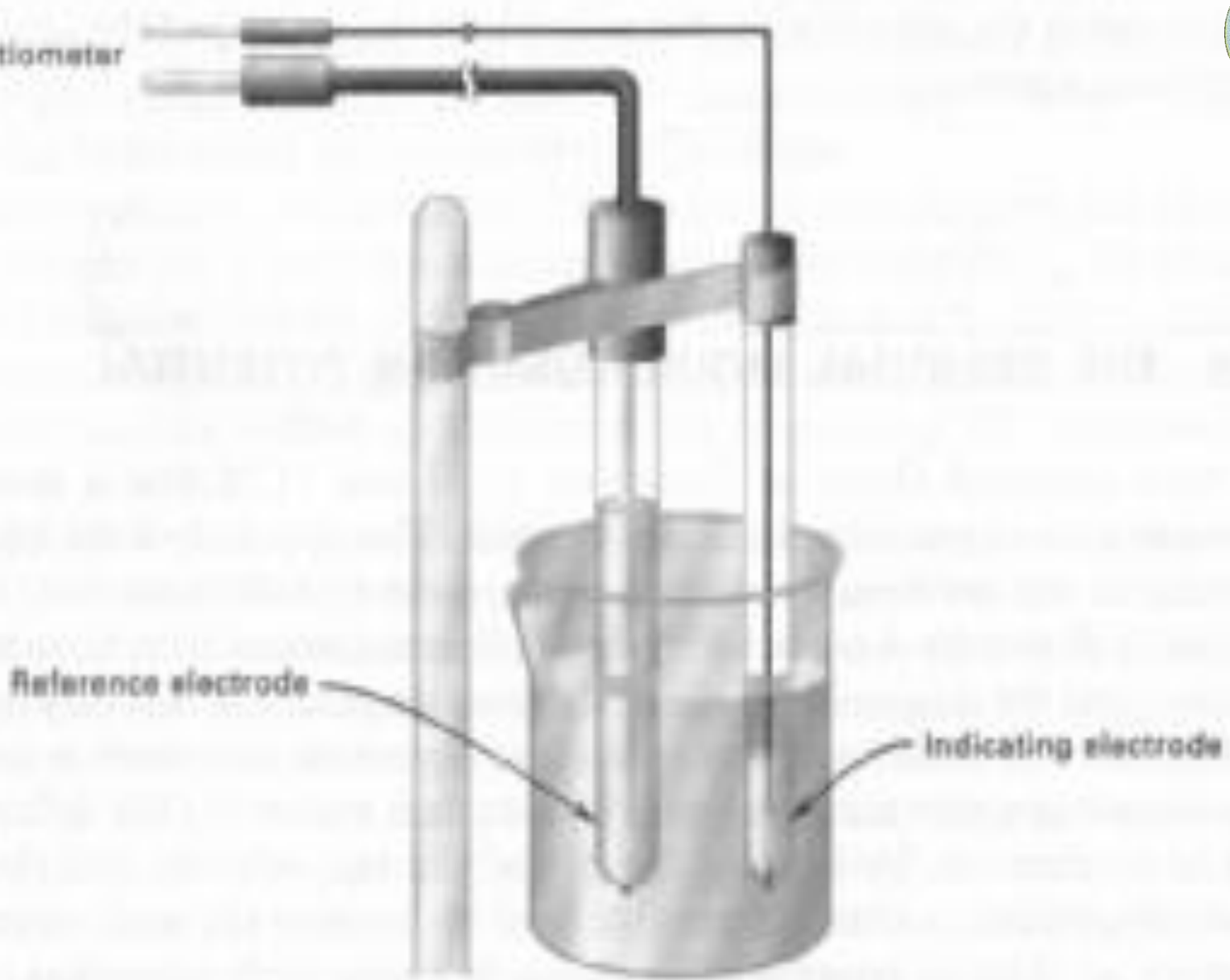
The difference between the E values for two halves of a cell give rise to E_{cell} .

If one half reaction is known and held constant, we can measure the concentration of species on the other side.

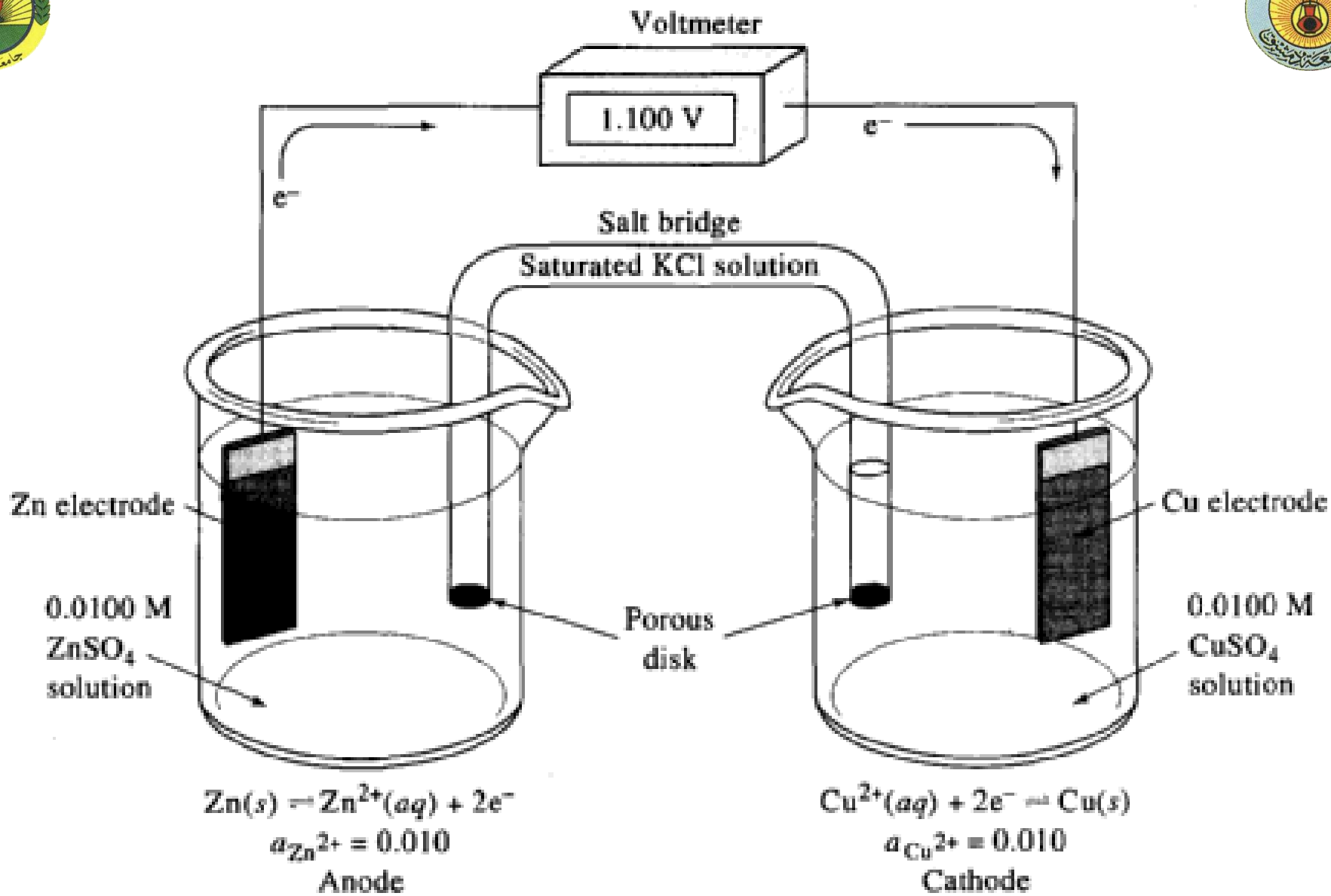


Acid-base titration in aqueous media

- When we measure the Potential = Potentiometric
- When we measure the pH = pH-meter.
- Reference electrode (SCE = Saturated Calomel electrode) pH = Constant (Dose not effect with proton concentration.
- Indicator electrode (= working electrode) glass electrode (ion selective electrode) pH = variable.



Cell for potentiometric measurements.



A galvanic electrochemical cell with a salt bridge.



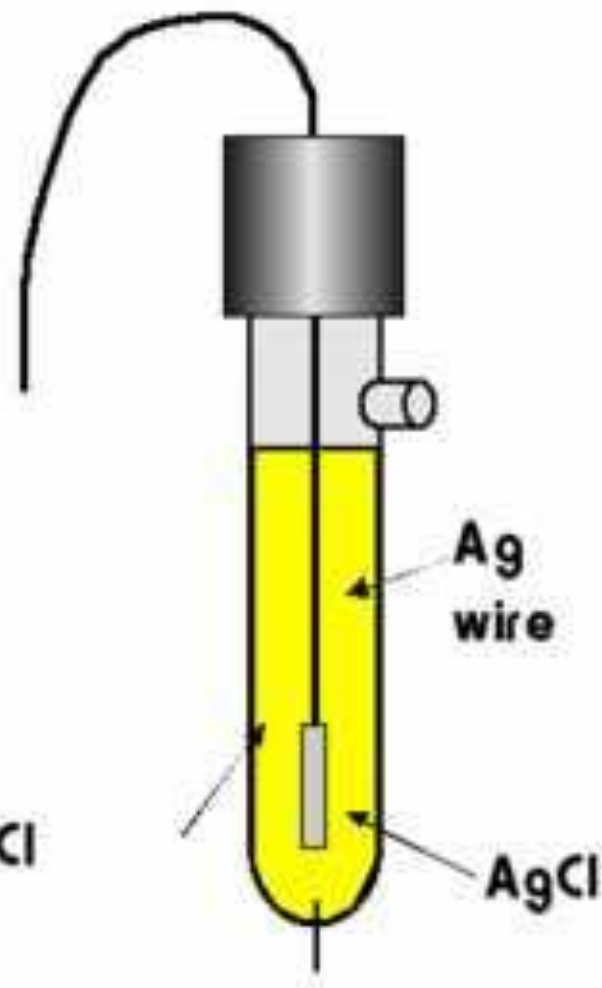
Reference electrodes

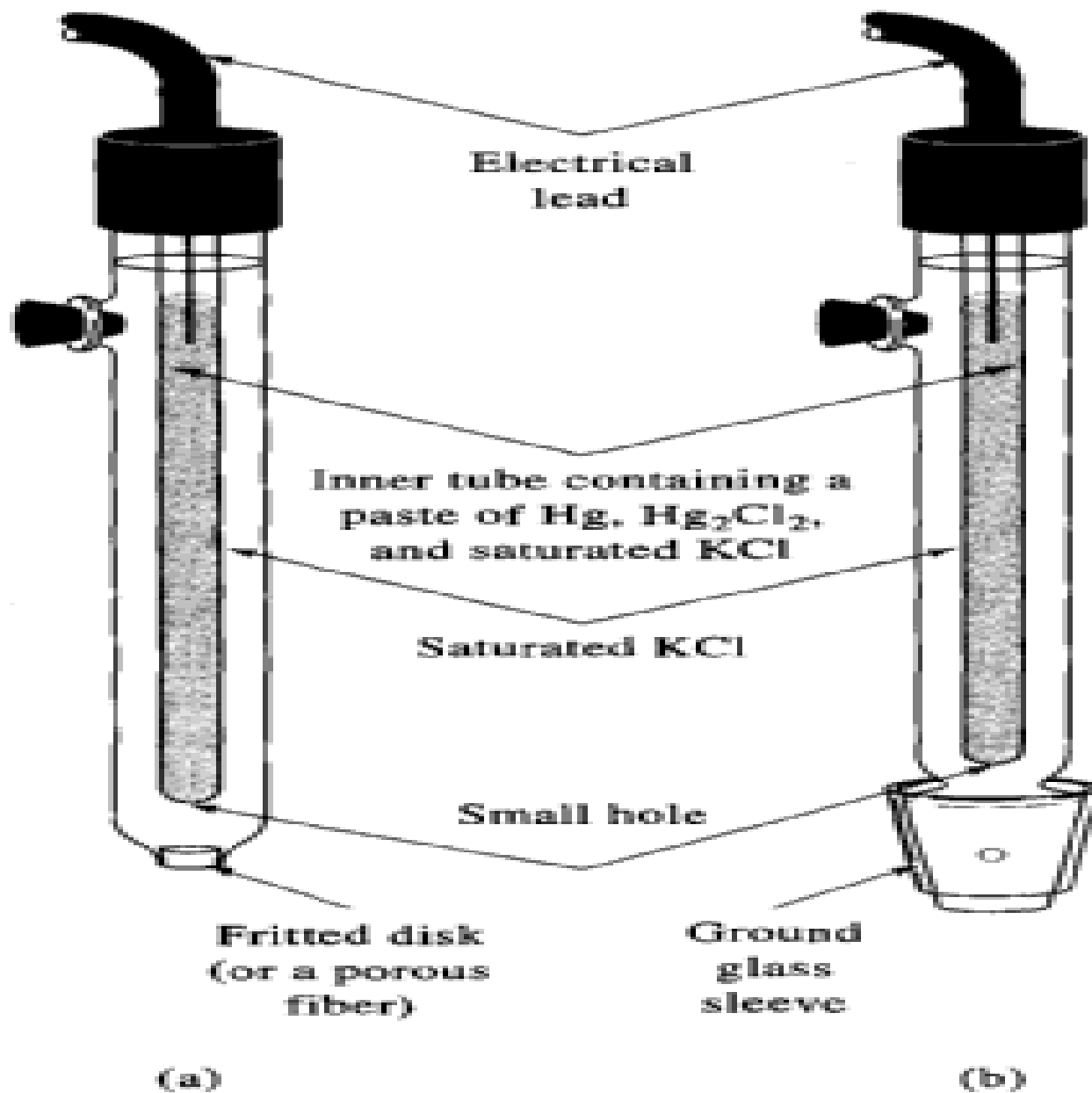
Ag/AgCl

Another common reference electrode.

Easier to produce a combination electrode.

saturated AgCl/KCl

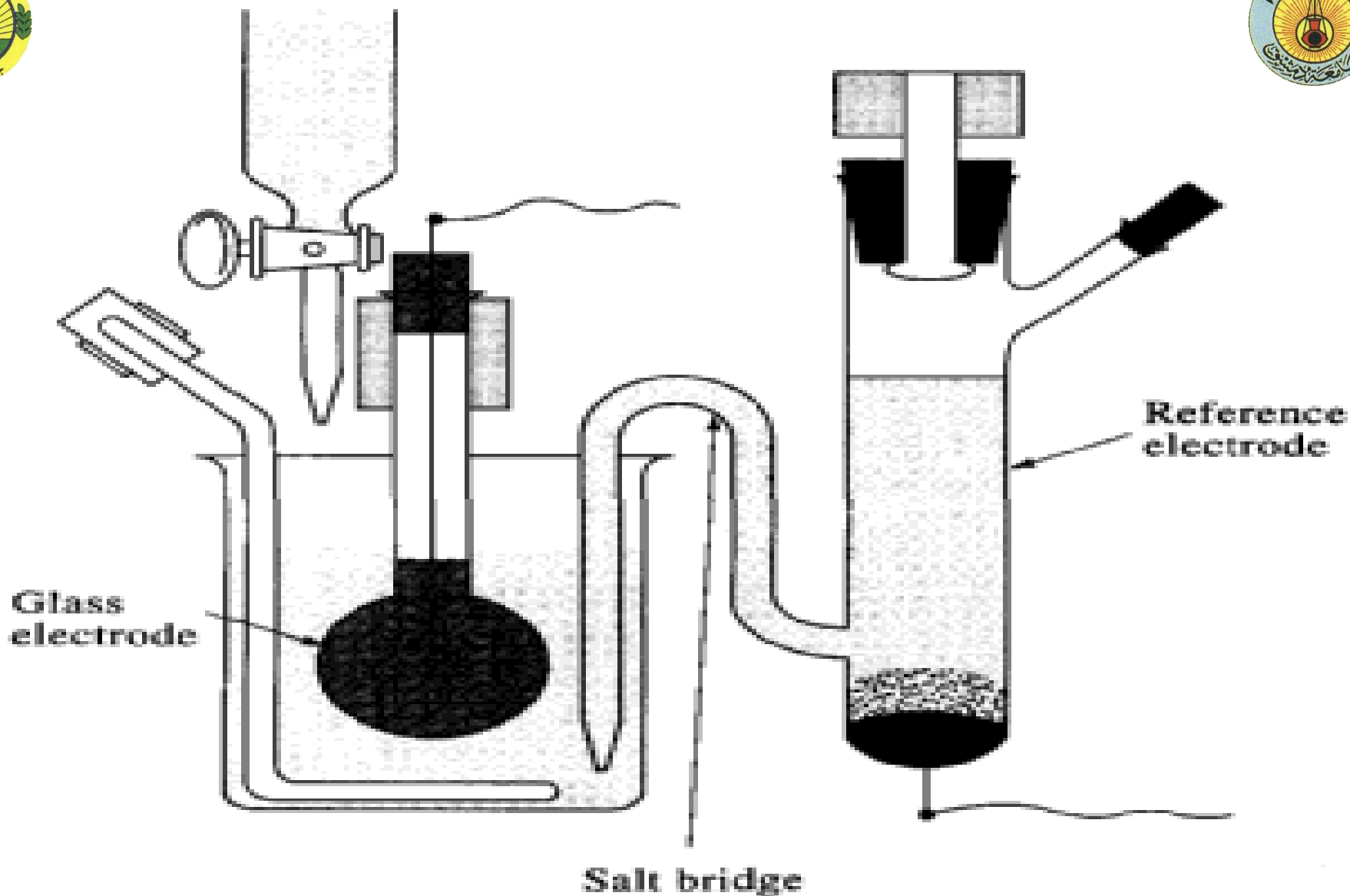




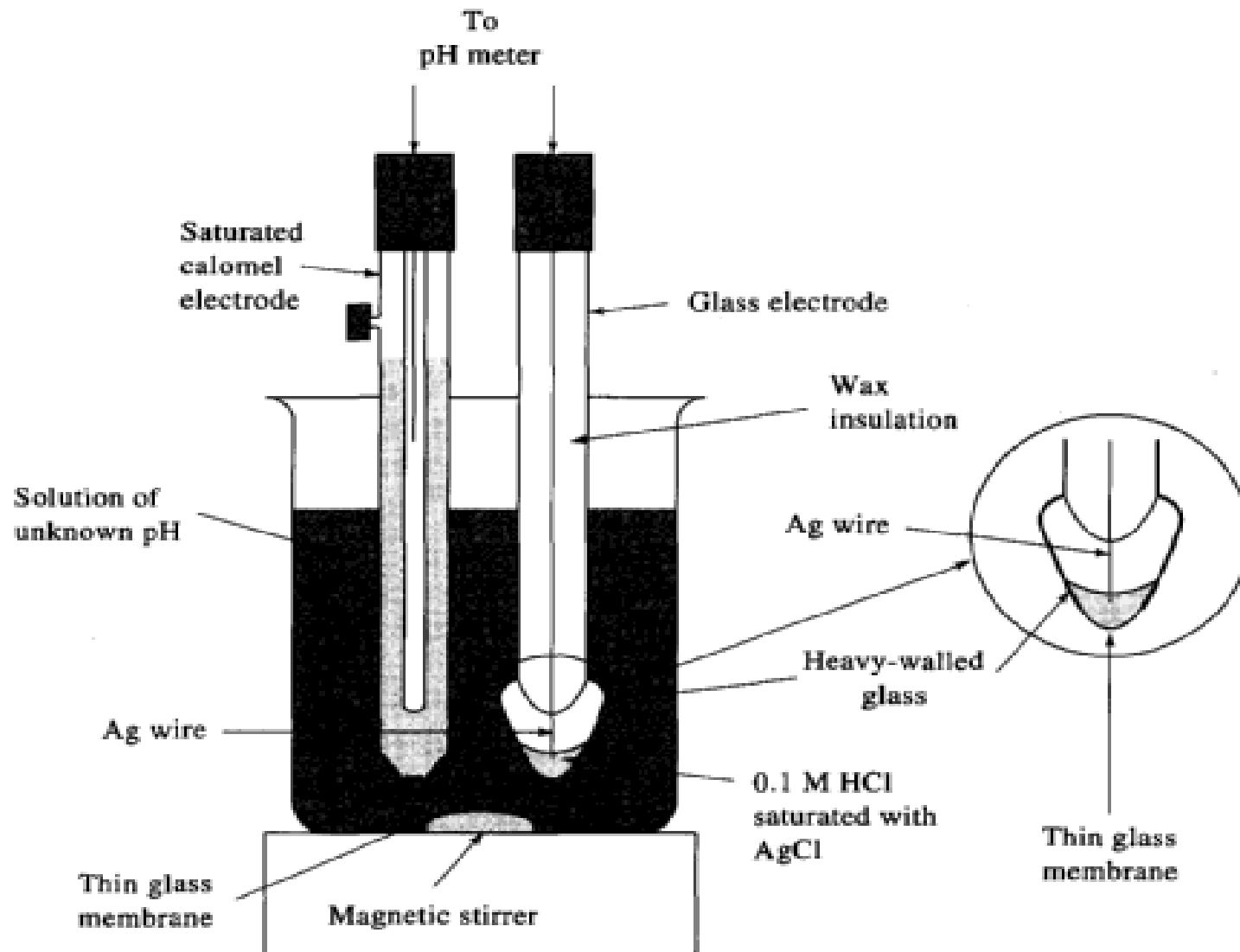
trodes.

Typical commercial calomel reference elec-

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An early glass/calomel electrode system for measuring pH.



Typical electrode system for measuring pH.

Pr

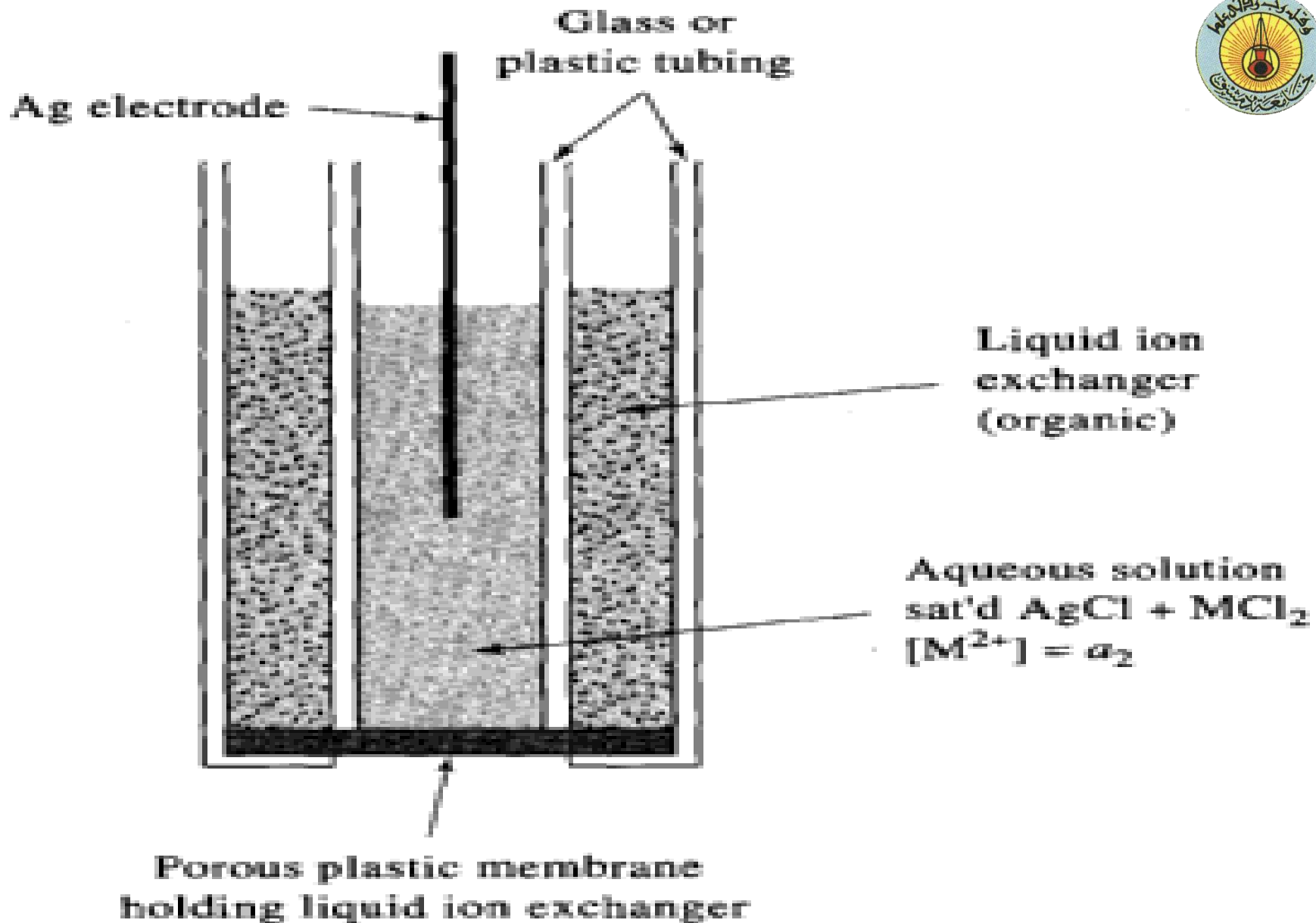
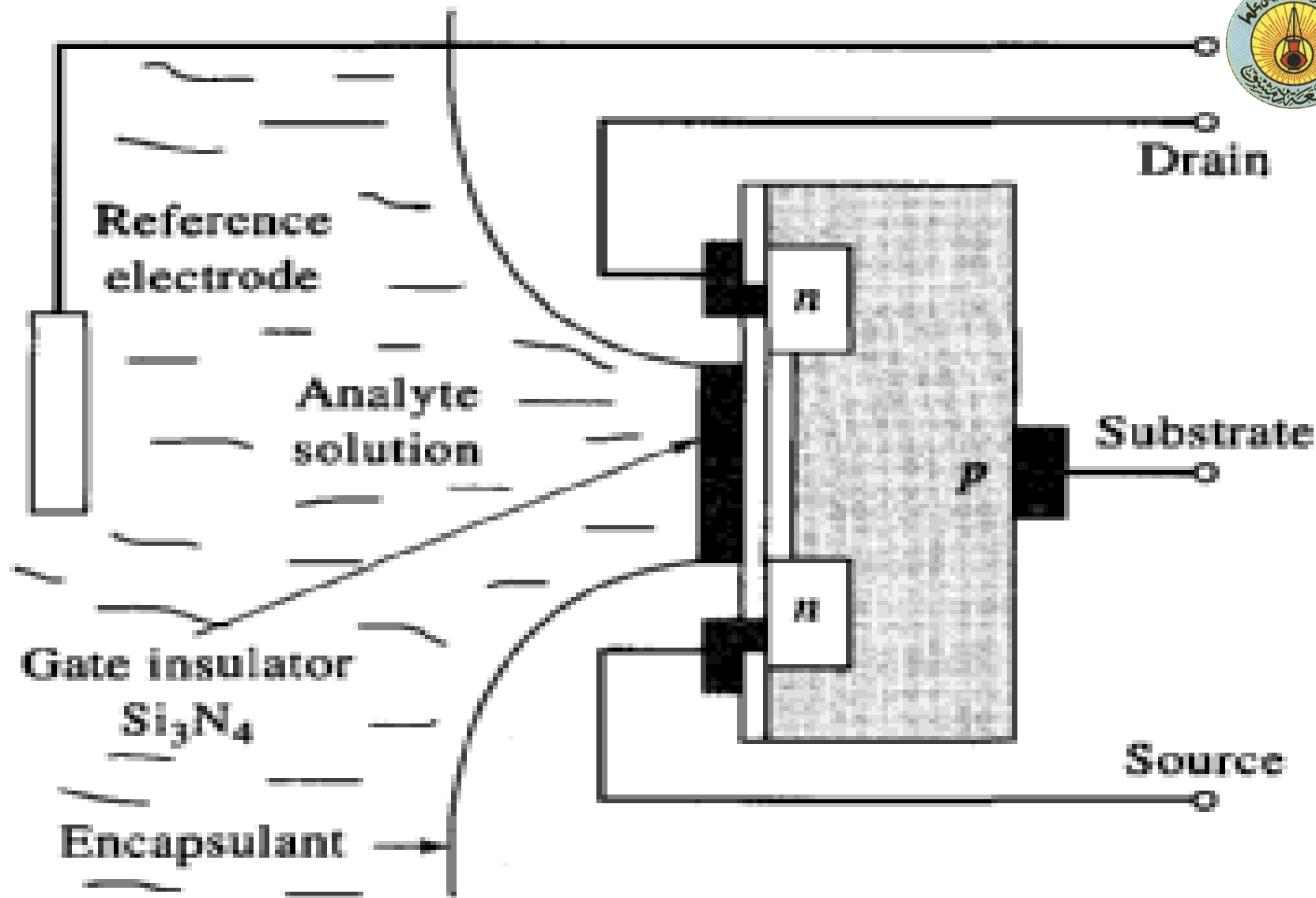


Figure . Liquid membrane electrode sensitive to M²⁺.



An ion-selective field-effect transistor (ISFET) for measuring pH.

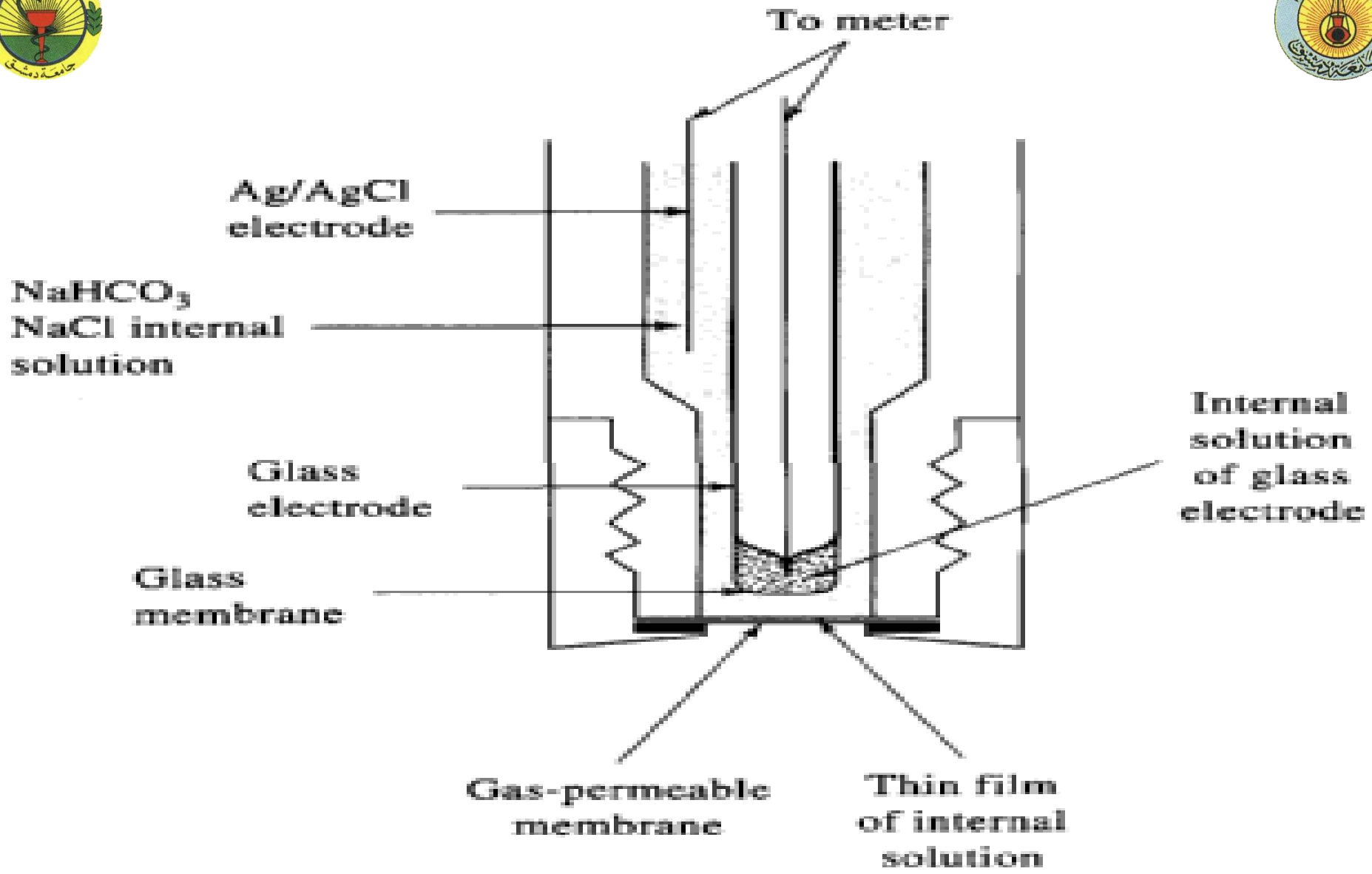
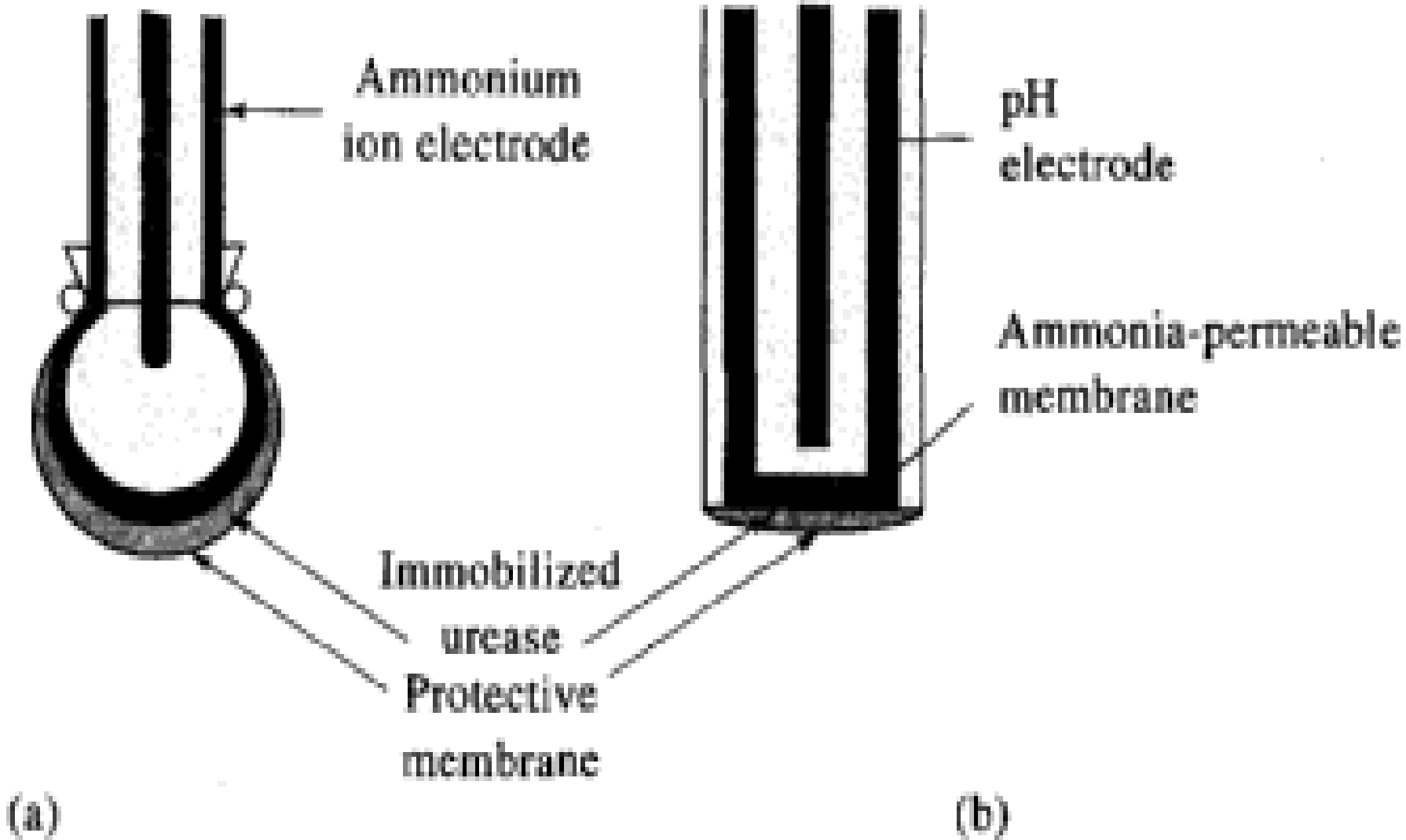


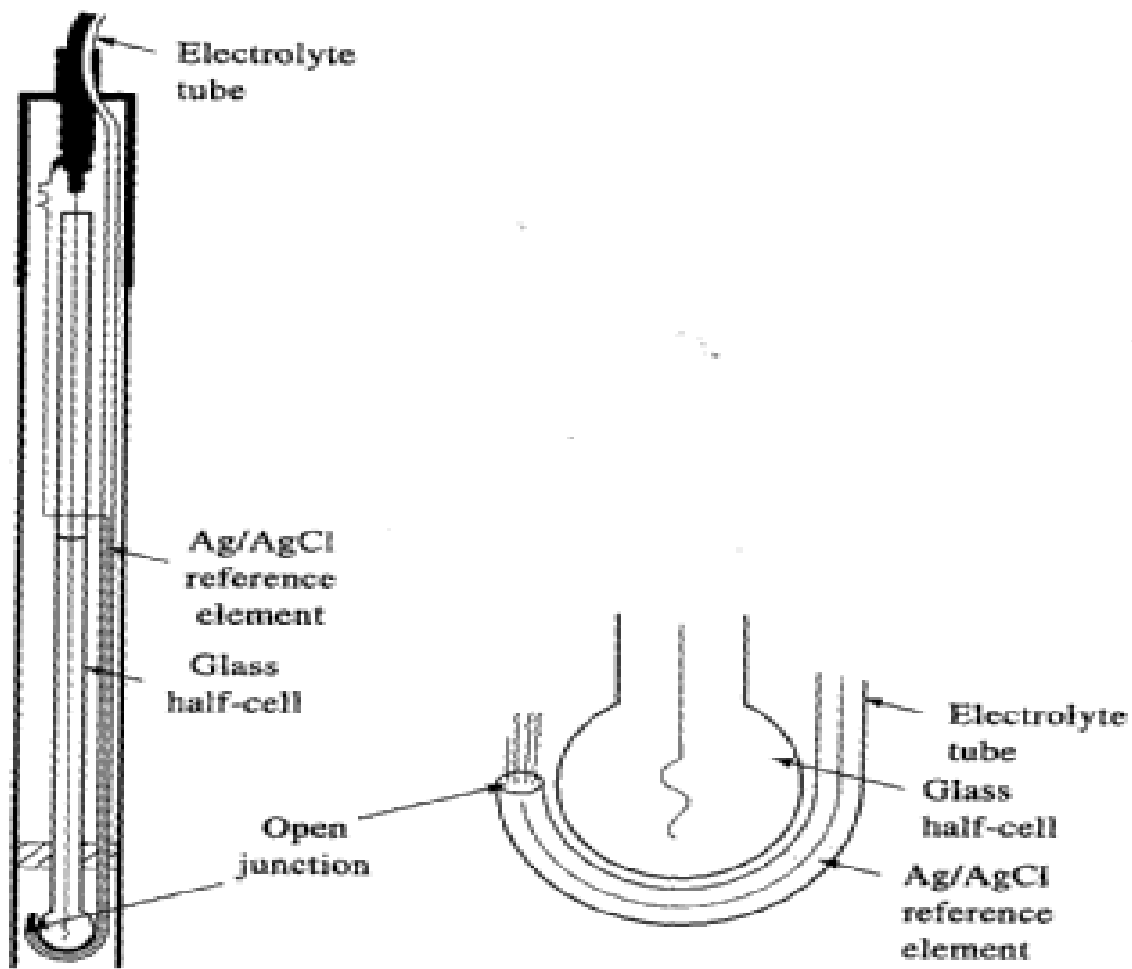
Figure Schematic of a gas-sensing probe for carbon dioxide.

Schematic of a gas-sensing probe for carbon dioxide.

Ion selective

Gas electrode





A combination pH electrode system with a free diffusion junction.

Prof