TRANSPORT PHENOMENA: CONDUCTIVITY OF ELECTROLYTIC SOLUTIONS. KOHLRAUSCH'S LAW AND OSTWALD'S LAW.

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1. AIM

- Determine the conductivity of different electrolytic solutions.
- Verify the validity of different theories for the case of strong and weak electrolytes.
- Obtain the dissociation constant for a weak electrolyte.

2. THEORETICAL BACKGROUND

- Electrolytes: substances that separate when in a solution (ions).

- If an electric field is applied, ions move towards the electrodes that have an opposite sign:
  - Cations   -
  - Anions   +

- Solutions of diluted electrolytes meet:

ley de Ohm: $\vec{j} = k.\vec{E}$

Electric field

Conductivity

Density

- Molar conductivity: $\Lambda = \frac{k}{c}$

- Kohlrausch's law (strong electrolytes): $\Lambda = \Lambda^0 - b\sqrt{c}$

  → Limiting molar conductivity: $\Lambda^0 = \nu_+\lambda_+^0 + \nu_-\lambda_-^0$

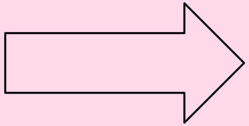
- Ostwald's law of dilution : (weak electrolytes) $\frac{1}{\Lambda} = \frac{1}{\Lambda^0} + \frac{c\Lambda}{K_c(\Lambda^0)^2}$ or $\Lambda^0_{HAc} = \Lambda^0_{KAc} + \Lambda^0_{HCl} - \Lambda^0_{KCl}$

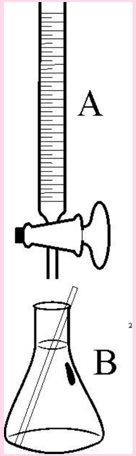
Different equations because of the dissociation of ions:
-Strong electrolytes → dissociate completely
-Weak electrolytes → dissociate partially. The degree of dissociation is given by: $\alpha = \frac{\Lambda}{\Lambda^0}$

3. EXPERIMENTAL PROCEDURE

1. Prepare NaOH solution:

100 cm3 NaOH
0,1 M





Normalise with KHFt (0.1 M)

2. Prepare the water

Conductivity meter

Measure the specific conductivity of the water that will be used to prepare the electrolyte solutions.

3. Prepare electrolyte solutions:

250mL
acetic acid
0,1M

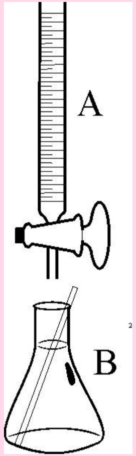
100 mL	100 mL	100 mL	100 mL	100 mL
0,05 M	0,03 M	0,02 M	0,01 M	0,005M

250mL HCl
0,1M

100 mL	100 mL	100 mL	100 mL
0,05 M	0,03 M	0,02 M	0,01 M

3. Measure specific conductivity and normalise with NaOH:

Start from the most diluted solution.



A. NaOH

B.
1. Acetic acid 0,1M
2. HCl 0,1M

4. Prepare KCl and CH_3CO_2K solutions:

100 mL	100 mL	100 mL	100 mL
0,05 M	0,025 M	0,01 M	0,005 M

250mL KCl
0,1M

100 mL	100 mL	100 mL	100 mL
0,05 M	0,025 M	0,01 M	0,005 M

250mL
CH3CO2K
0,1M

5. Measure conductivity

Of all the KCl and CH3CO2K solutions.

4. BIBLIOGRAPHY

1. https://egela.ehu.eus/mod/resource/view.php?id=2016822