

CS Conductivity of Solution for Ka

Objective

The objective of this experiment is to determine the pK_a for acetic acid in water at infinite dilution by performing conductivity measurements on solutions of HAc (acetic acid) and using literature values of Λ_0 for HCl, KCl and sodium acetate KAc.

Materials

1.0M acetic acid
NaOH 1.0M
potassium chloride (0.4 g)
distilled water
phenolphthalein

Equipment and Supplies

YSI conductivity bridge model 34
thermostated bath
conductivity probe
conductivity cell
pipettes 1, 2, 4, 5, 10, 25, and 50ml
volumetric flasks 100ml, 250ml, 1000ml
buret and flask for titration
100 ml beaker
thermometer
500 ml plastic bottles (8)
analytical balance

Special Instructions

Use standard solution of 1.0N acetic acid (recall 1.0N = 1.0M for monoprotic acid) as starting point and do careful dilutions to produce a series of dilutions as indicated above and determine conductivity.

When preparing the solutions in volumetric flasks add deionized water in small amounts and mix thoroughly between additions.

Run samples in order from most dilute to most concentrated.

Turn bath stirring mechanism off when taking readings from the conductivity bridge. Thoroughly rinse, with deionized water, pipettes, cells, probe, and volumetric flasks between uses.

Allow sufficient time for samples to reach the temperature of the water bath.

Concentration of exactly 0.02000 M is required for KCl standard.

Concentrations of acetic acid of approximately 0.05, 0.0125, 0.003125, 0.00078125 M are needed. You need to span this range, but don't need these exact values but do need to know values exactly.

You can use graduated cylinders for cells: read one solution and have next several in bath reaching the needed bath temperature. Clamp or use weights to hold in water bath.

Use units $\text{ohms}^{-1} \text{ m}^2 \text{ eq}^{-1}$ for equivalent conductance at infinite dilution Λ_0 .

Use literature values of Λ_0 for KCl, KAc, and HCl.

Refer to selected information on web taken from pages of out of print text *Experiments in Physical Chemistry 5th* by D. P. Shoemaker, C. W. Garland, and J. W. Nibler. This information gives directions for experiment and for analysis.