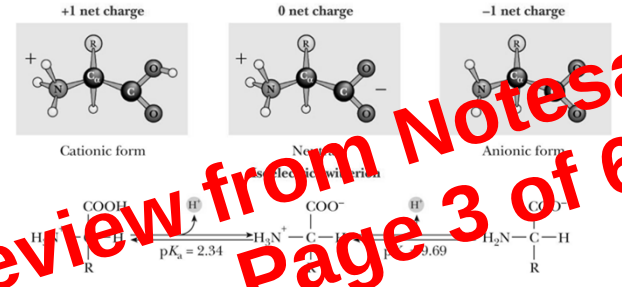
Ionization of Amino Acids

- Remember, amino acids without charged groups on side chain exist in neutral solution as **zwitterions** with no net charge



A The ionic forms of the amino acid shown without consideration of any ionizations on the side chain. The cationic form is the low-pH form, and the titration of the cationic species with base yields the zwitterions and finally the anionic form.

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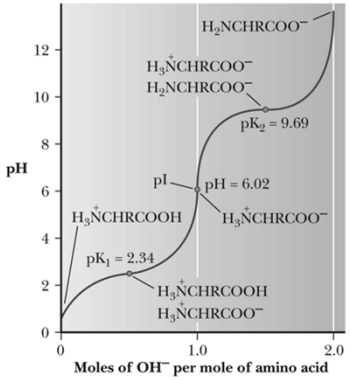
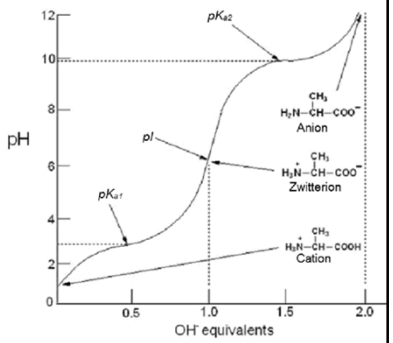
Titration of Amino Acids

- When an amino acid is titrated, the titration curve represents the reaction of each functional group with the hydroxide ion.



Titration of alanine with NaOH

- The curve shows two buffering regions i.e. pK_{a1}, the pH at which the carboxyl group loses its hydrogen and pK_{a2}, the pH at which the protonated amine loses its hydrogen.
- The cationic and anionic form of the amino acid is predominant at pK_{a1} and pK_{a2}, respectively.
- The inflection point between $pK_{a1}$and pK_{a2}, is the *pI*, the isoelectric point.



Titration of alanine with NaOH