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THEORIES OF ACID BASE INDICATORS

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There are 2 theories of indicator,

1. Ostwald theory

2. Resonance theory

1. Resonance THEORY

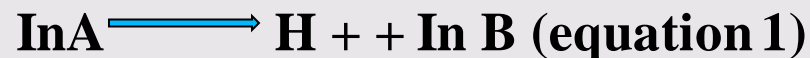
- was suggested by W. Ostwald based upon the concept that indicators are very weak organic acids or bases.
- The simple theory of the colour change of indicators has been revised, and the colour changes are believed to be due to structural changes, including the production of resonance forms; these may be illustrated by reference to phenolphthalein, the changes of which are characteristic of all phthalein indicators:



e.g- In the presence of dilute alkali the lactone ring in opens and the triphenylcarbinol structure undergoes loss of water to produce the resonating ion which is red. If phenolphthalein is treated with excess of concentrated alcoholic alkali the red colour first produced disappears owing to the formation of a new complex.

2. OSTWALD THEORY

- Based upon the charge types of the acid and alkaline forms of the indicator. The equilibrium between the acidic form InA and the basic form In B may be expressed as,





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➤ The observed colour of an indicator in solution is determined by the ratio of the concentrations of the acidic and basic forms. This is given by:

$$[\text{InA}] / [\text{InB}] = Q_w \times Y_{\text{In}} / K_{\text{In}} \times Y_{\text{InA}}$$

- The value of the ratio $[\text{InB}]/[\text{InA}]$ (i.e. [Basic form j/jAcidic form]) can be determined by a visual colour comparison or, more accurately, by a spectrophotometric method.
- The colour-change interval is accordingly $\text{pH} = \text{pK}; n \pm 1$, i.e. over approximately two pH units. Within this range the indicator will appear to change from one colour to the other.



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