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# **CLASSIFICATION OF ACID BASE TITRATIONS AND THEORY INVOLVED IN TITRATIONS**

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**ACID BASE TITRATIONS** are classified into basically **4 types**,

- 1. strong acid and strong base.**
- 2. Weak acid and a strong base.**
- 3. Weak base and strong acid**
- 4. Weak acid and weak base**



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## **1. STRONG ACID AND STRONG BASE.**

**For 0.1M or more concentrated solutions, any indicator may be used which has a range between the limits pH 4.5 and pH 9.5. With 0.01M solutions, the pH range is somewhat smaller (5.5-8.5). If carbon dioxide is present, either the solution should be boiled while still acid and the solution titrated when cold, or an indicator with a range below pH 5 should be employed.**



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## 2. WEAK ACID AND A STRONG BASE.

The pH at the equivalence point is calculated from the equation:  $\text{pH} = \text{p}K_w + \text{p}K_a - \text{p}C$  The pH range for acids with  $K_a > 10^{-5}$  is 7-10.5; for weaker acids ( $K_a > 10^{-6}$ ) the range is reduced (8-10). The pH range 8-10.5 will cover most of the examples likely to be encountered; this permits the use of thymol blue, thymolphthalein, or phenolphthalein.



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### 3. WEAK BASE AND STRONG ACID.

The pH at the equivalence point is computed from the equation:  $\text{pH} = \text{p}K_w - \text{p}K_b + \text{p}C$  The pH range for bases with  $K_b > 10^{-5}$  is 3-7, and for weaker bases ( $K_b > 10^{-6}$ ) 3-5. Suitable indicators will be methyl red, methyl orange, methyl yellow, bromocresol green, and bromophenol blue.



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## 4. WEAK ACID AND WEAK BASE.

**There is no sharp rise in the neutralisation curve and, generally, no simple indicator can be used. The titration should therefore be avoided, if possible. The approximate pH at the equivalence point can be computed from the equation:  $\text{pH} = \text{pK}_w + \text{pK}_a - \text{pK}_b$  It is sometimes possible to employ a mixed indicator (see Section 10.9) which exhibits a colour change over a very limited pH range, for example, neutral red-methylene blue for dilute ammonia solution and acetic (ethanoic) acid.**



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