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Indicators :-

Indicators are weak organic acids or weak organic bases, changes their colour with the change on the medium.

Methyl Orange, Phenolphthalene, Methyl red, etc are the indicators employed generally to detect the end point. They changes their colour with the change in the pH of the solution.

Methyl orange gives full acid colour (red) when added to a solution the pH of which is 3 or below and full basic colour (yellow) in a solution whose pH is 4.4 or above.

Thus, the pH range over which methyl orange can be used as an indicator lies between 3 to 5.

Phenolphthalein, another common indicator, gives acid colour (colourless) in a solution of pH 8.3 or less and full basic colour (Pink) in a solution of pH 10 or above. Thus, the pH range over which phenolphthalein can be used as indicator lies between 8 to 10.

Indicators	pH-range.
(1) Methyl orange	3 to 5
(2) Phenolphthalein	8 to 10.

Theory of Acid-Base Indicator :-

(1) Methyl orange is not used when weak acid is titrated against strong base.

When weak acid is titrated against strong base, the resulting solution at the end point becomes slightly alkaline. Therefore, the pH of the solution will be greater than 7, But the pH range for the colour change in methyl orange is in between 3 to 5. So, Methyl orange doesn't changes its colour in alkaline solution. So, Methyl orange is not a suitable indicator for the titration of weak acid against strong base.

Here, Phenolphthalein, will be a suitable indicator.

(2) phenolphthalein is not used when weak base is titrated against strong acid.

When weak base is titrated against strong acid the resulting solution at the end point becomes slightly acidic. Therefore, the pH of the solution will be smaller than 7, But the pH of ~~methyl~~ phenolphthalein ranges between 8 to 10. So, phenolphthalein does not change its colour in acidic solution. So, phenolphthalein is not a suitable indicator for the titration of weak base against strong acid.

Here, Methyl orange will be a suitable indicator.

choice of Indicators :-

(1) Strong acid Vs strong base

OR

Strong base Vs strong acid

In these titration phenolphthalein and methyl orange both can be used. But If the titrant is strong acid, more suitable indicator will be methyl orange (pH range 3 to 5) because the resulting solution at the end point will be slightly acidic.

If the titrant is strong base, the more suitable indicator will be phenolphthalein (pH range 8 to 10) because the resulting solution at the end point becomes slightly alkaline.

(2) Weak acid Vs strong base :-

In this titration, phenolphthalein is used as indicator. (pH range 8 to 10) because the resulting solution at the end point will be slightly basic (alkaline).

∴ phenolphthalein is a suitable indicator.

(3) Weak base Vs strong Acid :-

In this titration, Methyl orange is used as indicator. (pH range 3 to 5) because, the resulting solution at the end point will be slightly acidic.

∴ Methyl Orange is a suitable indicator.

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