

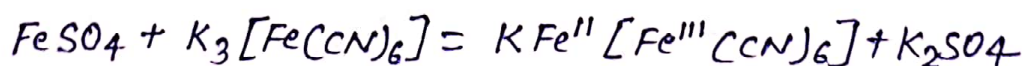
Q. What are indicators? How are they classified?

Ans. Indicators are such chemicals which indicate the end-point in volumetric analyses by colour change of the titrating solutions. Depending upon the method of their uses, we have three types of indicators:

1. External indicators
2. Auto or self indicators
3. Internal indicators.

External indicators:

These indicators are not added to the volumetric flask in which the titration is carried out, rather they are used externally i.e. outside the flask in which titration is carried out. Freshly prepared $K_3[Fe(CN)_6]$ solution is used as external indicator in the titration of $Fe(II)$ by $Cr_2O_7^{2-}$ solutions. Near the end-point, a drop of titrating mixture is brought in contact with a drop of indicator on the spot-plate. When the drop fails to give blue colour, it indicates the end-point -



Pot. ferricyanide

deep blue

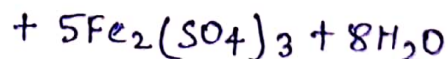
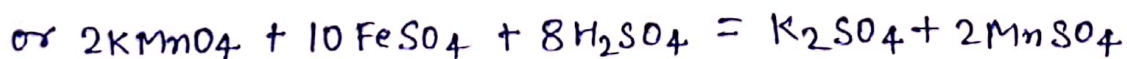
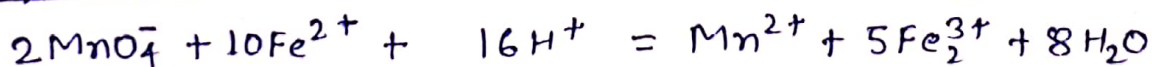
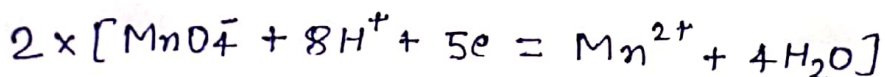
The dichromate solution is run down from a burette into a $FeSO_4$ solution. A drop of titrating mixture is occasionally taken out and touched with a drop of indicator on a porcelain plate. In the beginning, the colour produced with a drop of indicator is intense blue and this goes on

fading with the further addition of dichromate solution and when the reaction is over, the blue colour is not visible with the series of titrations, the correct end-point is marked. External indicators are being superseded by the more satisfactory internal indicators.

Auto-indicators:

If a strongly coloured reagent solution is decolourised by the substance that is being determined, the end-point is marked by the colour of slight excess of the reagent itself.

For example, KMnO_4 functions as an auto-indicator. One drop of excess of KMnO_4 solution imparts a pink colouration to several hundred ml. of the solution even in the presence of slightly coloured ions such as Fe^{3+} . So there is no need at all to use any indicator in such titrations. KMnO_4 solution can be titrated against FeSO_4 , oxalic acid etc. solution on the basis of above mechanism.



Internal indicators:

If an indicator is added to the titrating solution, it is called internal indicator. Depending upon the type of reaction in which indicators are used, we have following types of internal indicators —

1. Acid-base indicators
- (2) Redox indicators.
3. Precipitation indicators
- (4) Adsorption indicators.