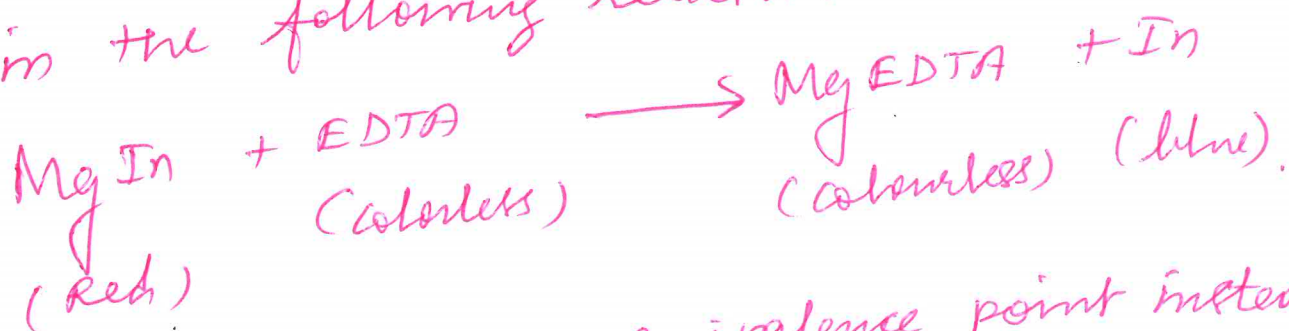


Metal Ion Indicators

①

11-23. Explain why the change from red to blue in the following reaction



Occurs suddenly at the equivalence point instead of gradually throughout the entire titration.

Ans :-

Only a small amount of indicator is employed. Most of the Mg^{2+} is not bound to indicator.

The free Mg^{2+} reacts with EDTA before MgIn reacts. Therefore the concentration of MgIn is constant until all of the Mg^{2+} has been consumed.

only when MgIn begins to react does the colour change.

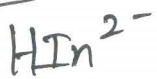
11-24 ~~10-24~~. List four methods for detecting the end point of an EDTA titration. (2)

Ans:-

1. with metal ion indicators.
2. with a mercury electrode.
3. with an ion-selective electrode.
4. with a glass electrode.

11-25 ~~10-25~~ calcium ion was titrated with EDTA at pH 11, using calmagite as indicator (Table 13-3). which is the principal species of calmagite at pH 11? what color was observed before the equivalence point? After the equivalence point?

Ans:-



Before the equivalence point = wine Red

After the equivalence point = Blue.

calmagite	
H_2In^-	red
$\text{pK}_2 = 8.1 \rightarrow \text{HIn}^{2-}$	blue
$\text{pK}_3 = 12.4 \rightarrow \text{In}^{3-}$	orange

Colours of the metal ion complex
wine Red.

11-26 ~~10-25~~ Pyrocatechol violet (Table 13-3) is to be used as a metal ion indicator in an EDTA titration. The procedure is as follows:

1. Add a known excess of EDTA to the unknown metal ion.
2. Adjust the pH with a suitable buffer.
3. Back-titrate the excess chelate with standard Al^{3+} .

From the following available buffers, select the best buffer, and then state what color change will be observed at the end point. Explain your answer.

- (a) pH 6-7 (c) pH 8-9
 (b) pH 7-8 (d) pH 9-10.

Ans:.

$pK_1 = 0.2$	H_4In red
$pK_2 = 7.8$	H_3In^- yellow
$pK_3 = 9.8$	H_2In^{2-} violet
$pK_4 = 11.7$	HIn^{3-} red purple

Color of metal ion complex = Blue

(A)

~~Q2 Q3 Q4~~

Buffer (a) (pH 6-7) will give a

Yellow \rightarrow Blue colour change that will be easier to observe than the violet \rightarrow blue change expected with the other buffers.