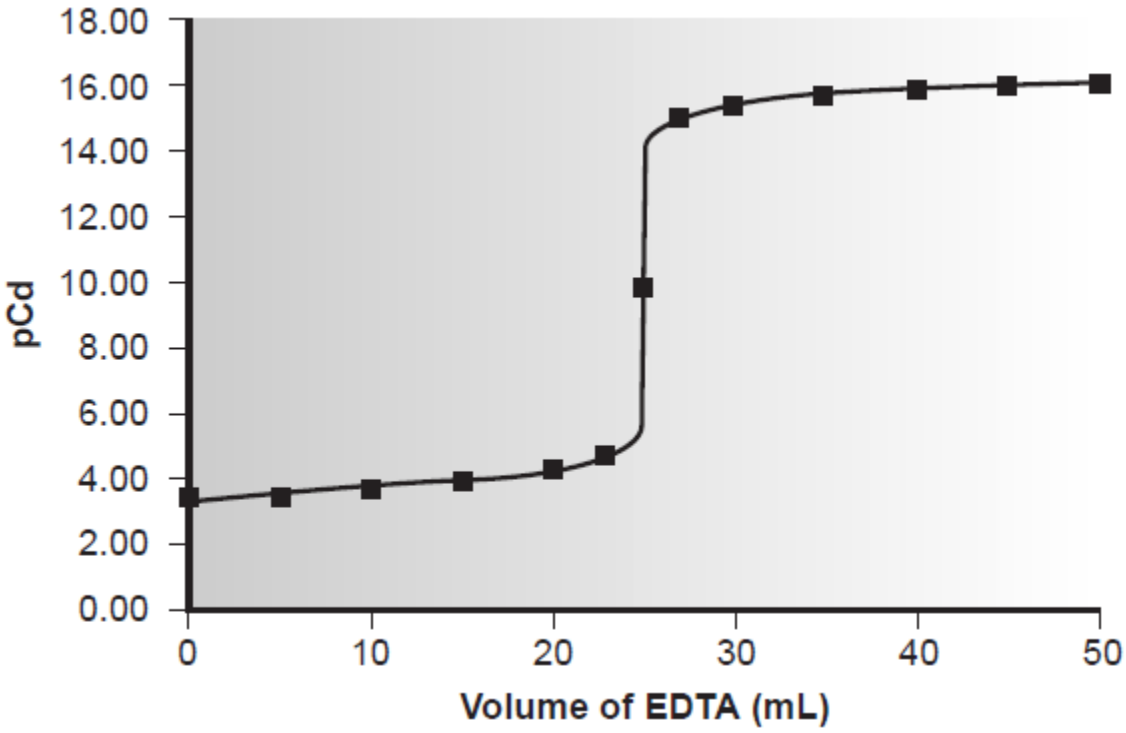
Volume of EDTA (mL)	pCd
0.00	3.36
5.00	3.49
10.00	3.66
15.00	3.87
20.00	4.20
23.00	4.62
25.00	9.77
27.00	14.91
30.00	15.31
35.00	15.61
40.00	15.78
45.00	15.91
50.00	16.01



pH	$\alpha_{Y^{4-}}$	pH	$\alpha_{Y^{4-}}$
2	3.7×10^{-14}	8	5.4×10^{-3}
3	2.5×10^{-11}	9	5.2×10^{-2}
4	3.6×10^{-9}	10	0.35
5	3.5×10^{-7}	11	0.85
6	2.2×10^{-5}	12	0.98
7	4.8×10^{-4}	13	1.00

$[NH_3]$ (M)	α_{Ag^+}	$\alpha_{Ca^{2+}}$	$\alpha_{Cd^{2+}}$
1	1.00×10^{-7}	5.50×10^{-1}	6.09×10^{-8}
0.5	4.00×10^{-7}	7.36×10^{-1}	1.05×10^{-6}
0.1	9.98×10^{-6}	9.39×10^{-1}	3.51×10^{-4}
0.05	3.99×10^{-5}	9.69×10^{-1}	2.72×10^{-3}
0.01	9.83×10^{-4}	9.94×10^{-1}	8.81×10^{-2}
0.005	3.86×10^{-3}	9.97×10^{-1}	2.27×10^{-1}
0.001	7.95×10^{-2}	9.99×10^{-1}	6.90×10^{-1}

Selecting and Evaluating the End Point

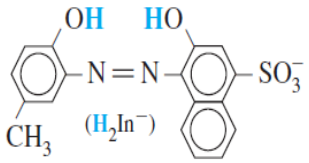
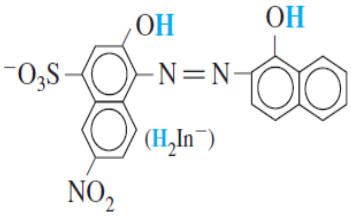
The equivalence point of a complexation titration occurs when stoichiometrically equivalent amounts of analyte and titrant have reacted.

For titrations involving metal ions and EDTA, the equivalence point occurs when C_M and C_{EDTA} are equal and may be located visually by looking for the titration curve's inflection point.

End-point detection methods:

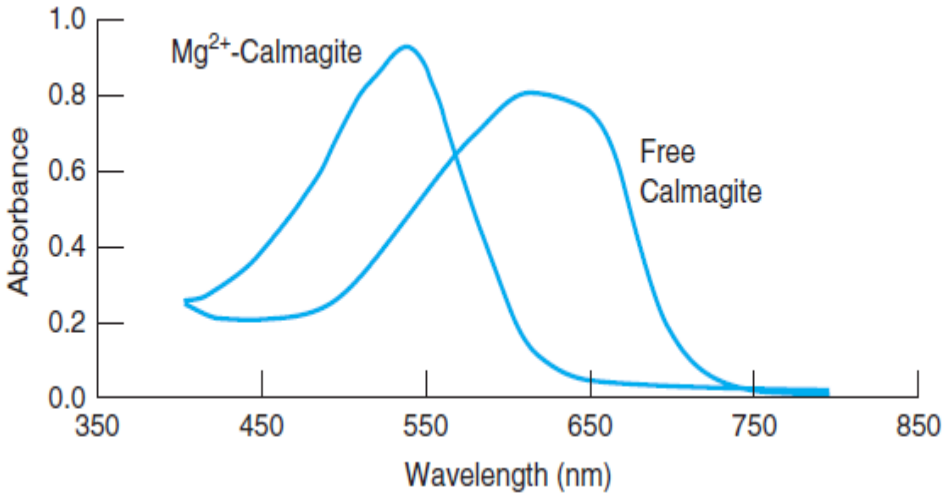
1. Metal ion indicators (Finding the End Point with a Visual Indicator): are compounds that change color when they bind to a metal ion.

Indicator	Useful pH Range	Useful for
calmagite	9–11	Ba, Ca, Mg, Zn
Eriochrome Black T	7.5–10.5	Ba, Ca, Mg, Zn
Eriochrome Blue Black R	8–12	Ca, Mg, Zn, Cu
murexide	6–13	Ca, Ni, Cu
PAN	2–11	Cd, Cu, Zn
salicylic acid	2–3	Fe

Name	Structure	pK_a	Color of free indicator	Color of metal ion complex
Calmagite		$pK_2 = 8.1$ $pK_3 = 12.4$	H_2In^- red HIn^{2-} blue In^{3-} orange	Wine red
Eriochrome black T		$pK_2 = 6.3$ $pK_3 = 11.6$	H_2In^- red HIn^{2-} blue In^{3-} orange	Wine red

2. Mercury electrode (sensors): Recording a potentiometric (potential) titration curve.
3. Ion-selective electrode (sensors): Recording a potentiometric (potential) titration curve.
4. Glass (pH) electrode (sensors): A pH electrode will follow the course of the titration in unbuffered solution, because H_2Y^{-2} releases $2H^+$ when it forms a metal complex.

5. Monitoring Absorbance: The equivalence point can be located by monitoring the absorbance of the analytical solution at a carefully selected wavelength.



$$A_{\text{corr}} = A_{\text{meas}} \times \frac{V_{\text{EDTA}} + V_{\text{Cu}}}{V_{\text{Cu}}}$$