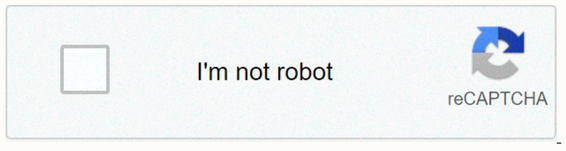
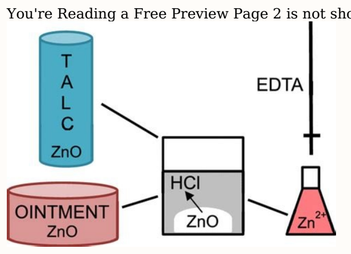



I'm not robot!

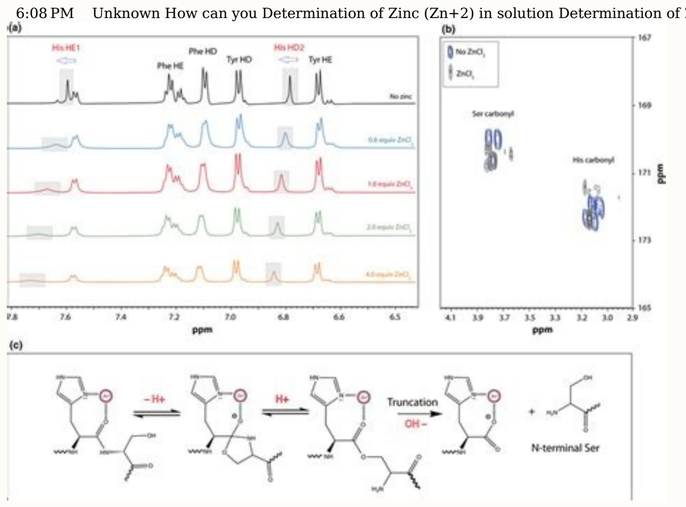
# Zinc titration with edta

**Edta used in titration.  What is zinc edta.  Zinc edta formula.  Complexometric titration of zinc with edta lab report.  Complexometric titration of zinc with edta calculations.  Determination of zinc by complexometric titration with edta.  Determination of zinc by titration with edta.  Complexometric titration of zinc with edta.  Zinc edta uses.  Estimation of zinc using edta viva questions.**






6:08 PM  Unknown How can you Determination of Zinc (Zn+2) in solution Determination of Zinc ion by Direct Titration using Eriochrome Black T as indicator Zinc content in a sample can be determined quantitatively by complexometric direct titration with EDTA at pH 10.




The effective formation constant of the Zn-EDTA complex is ≥ 106 above pH 4. Eriochrome black T is used as an indicator; it is Blue when it is free (Hln2-) and wine-red when complexed with Zinc. Initially, when the pH of the medium maintained at pH 7–11, the Zinc ions combine with indicator molecules to form Zn-indicator complex which appear as a winered color. Near the end point, EDTA breaks the Zn-indicator complexation, resulting in the formation of Zn-EDTA complex. Hence at the end point, the liberated free indicator yields a blue color to the solution.  1- Zinc ion solution (analyte)  3- Eriochrome black T indicator  1- Pipette 25.0 mL of Zinc ion solution into a 250.0 mL conical flask and dilute to  about 200.0 mL with distilled water 2- Add 1 to 2 mL of pH10 buffer and 3 to 4 drops of Eriochrome Black T indicator to 3- Titrate with 0.01 M EDTA until the color changes from wine-red to pure blue.  Record the used volume (as VEDTA).
4- Repeat the titration twice. Atomic weight of Zinc = 65.41 g/mol -Complexometric Titration of Zn(II) with EDTA To determine the amount of Zinc present in a given solution by titrating it with EDTA. EDTA (Ethylenediaminetetraacetic acid) is a chelating agent that forms stable complexes with metal ions. The stability constants of these complexes are extremely high, so EDTA can be used to determine the concentration of metal ions in a solution. Zinc can form a complex with EDTA, and this reaction can be used to specify the amount of Zinc in a given sample. By adding a known amount of EDTA to the Zinc solution, we can determine the endpoint of the titration by employing an indicator. At the endpoint, all the Zinc ions will have reacted with the EDTA, and the color of the indicator will transform to signal that the reaction is complete. The titration of Zinc with EDTA is a complex metric type of titration.

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Chemistry 41

***Complex-Formation Titration***

***Determination of Zinc using EDTA***

Zinc ion forms a stable water-soluble 1:1 complex with EDTA, which is the basis for the determination of Zn in this experiment. EDTA titrant and a standard $Zn^{2+}$ solution are prepared. The EDTA solution is standardized by titration of aliquots of the standard zinc solution. The titration is carried out at pH 10 and uses the Eriochrome Black T indicator which changes color from "purple" to "pure blue" at the endpoint. Chapter 14 in the text should be studied in preparation for this experiment.

PREPARATION OF SOLUTIONS.

- *EDTA solution.* A 0.01 M EDTA solution is prepared from disodium ethylenediamine tetraacetate dehydrate ($Na_2H_2T{\cdot}2H_2O$; FW 372). Weigh about 3.7 g of EDTA, transfer it to a 1.5 L beaker, fill to the 1.0 L mark. The salt dissolves slowly. Gently warm the solution using a hot plate and provide magnetic stirring. When all the salt is dissolved, transfer the solution to a 1.0 L bottle for storage.
- *Standard $Zn^{2+}$ solution.* A standard solution of $Zn^{2+}$ is prepared from the pure metal, which is provided as pieces of about 0.25 g. Weigh a piece accurately, transfer it to a 250 mL volumetric flask, add 10 mL of 3.0 M $HNO_3$ and warm on a hot plate (in the hood) for a few minutes. When all zinc is dissolved, dilute with deionized water to exactly 250 mL. Be sure to mix the solution thoroughly. Transfer this solution to a plastic bottle. Carefully rinse your volumetric flask and submit it to the instructor for preparation of your unknown.

STANDARIZATION OF THE EDTA SOLUTION.

- Pipet a 25 mL aliquot of the standard zinc solution (about 0.4 millimole $Zn^{2+}$) into a 250 mL Erlenmayer flask and add 25 mL of deionized water with a graduate cylinder.
- Adjust the pH of the solution to 10 using concentrated ammonia and pH test paper. Add the ammonia dropwise to avoid an excess which can decrease the sharpness of the end point.
- Add 7 drops of the Eriochrome Black T indicator solution.
- Titrate with EDTA until the color of the solution changes from "purple" to "pure blue" (the description of these color change depends on the observer).

ANALYSIS OF THE UNKNOWN.

- The unknown is a piece of zinc metal similar to the standard. It is supplied in a volumetric flask with 10 mL of 3.0 M $HNO_3$ already added to it. Complete the preparation of this solution (see standard $Zn^{2+}$ solution) and analyze 25 mL aliquots in exactly the same way as the standards.

REPORT.

- Report the weight of the unknown Zn sample in milligrams.

Zn_EDTA.doc  mc 11/18/98

In complexometric titration, a complexing agent like EDTA is added to the solution encompassing the analyte. The chelation reaction between the analyte and the titrant forms a stable complex which can be readily detected by utilizing an an applicable indicator. The reaction between Zinc and EDTA can be represented as follows:- Zn2+ + EDTA4- ⇌ Zn(EDTA)2-  Burette. Pipette. Conical flask. Funnel. Weighing balance. Volumetric flask. Beaker.  Zinc solution. EDTA solution. Distilled water. Eriochrome Black T solution. Weigh 2.17 g of Zinc powder using analytical weighing balance. Transfer the weighed Zinc powder to a 250 ml volumetric flask. Add distilled water to the volumetric flask until the mark is reached. Shake the flask to confirm that the Zinc powder is fully dissolved. Pipette 25 ml of the Zinc solution into a conical flask. Add 25 ml of distilled water to the conical flask. Add a small amount of Erichrome Black T indicator to the flask. Titrate the Zinc solution with 0.01 M EDTA solution until the color of the indicator changes from red to blue.

**Experiment 2**

**Complexometric Titration of Zinc**

**A. Purpose**

1. To learn the concepts of complexometric titration.
2. To standardize an EDTA solution.
3. To determine the amount of zinc (present as zinc ions $Zn^{2+}$) in an unknown solution.

**B. Theoretical Background**

Metal ions such as $Zn^{2+}$ may form many complexes in solution, such as $Zn(NH_3)_4^{2+}$, for example. Such complexation reactions can serve as a means of determining ion concentration; however, as several complexing molecules must be added, one at a time, the equivalence point in such a titration would not in general be sharp enough to be readily determined. An ingenious way around this problem is the incorporation of several complexing entities (called "ligands") into one molecule. This would ensure that the reaction take place in one step. Ethylene diamine tetraacetic acid (EDTA) is such a molecule. In buffered solution at pH = 10, it is fully ionized and has the formula ($^-OOCCH_2)_2NCH_2CH_2N(CH_2COO^-)_2$. Both N atoms and four of the O atoms can act as ligands (EDTA is thus a hexadentate complexing agent: hexa = 6, dentate = "toothed"- reference to the fact that it surrounds the metal ion like a mouthful of teeth surrounding a pistachio nut) and EDTA can therefore form an immensely stable 1:1 complex with $Zn^{2+}$:

$$Zn^{2+} + EDTA^{4-} \longrightarrow [Zn\,(EDTA)]^{2-} \qquad K_e = 3.2 \times 10^{16}$$

The criteria needed to allow a reaction to be used for titrimetric analysis are: 1. goes to completion, 2. is stoichiometric, 3. proceeds rapidly, and 4. allows for easy end-point detection. EDTA satisfies the first three of these very well, but an indicator must also be sought. Another complexing agent, Eriochrome T (or Erio T), forms metal complexes and changes color when it does so. The form of the indicator and its color changes are pH dependent, since Erio T is in fact a triprotic organic acid. At pH = 10, the red complex $ZnE^-$ exists at $Zn^{++}$ concentrations greater than $10^{-8}$ M, whereas at lower concentrations, the blue uncomplexed acid anions $HE^{2-}$ is the stable from. Thus, as the $Zn^{2+}$ is titrated by EDTA at pH = 10, in the presence of Erio T, the free $Zn^{2+}$ concentration steadily decreases, and at the equivalence point, the solution color changed from *red* to *blue*.

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In complexometric titration, a complexing agent like EDTA is added to the solution encompassing the analyte. The chelation reaction between the analyte and the titrant forms a stable complex which can be readily detected by utilizing an an applicable indicator. The reaction between Zinc and EDTA can be represented as follows:- Zn2+ + EDTA4- ⇌ Zn(EDTA)2-  Burette. Pipette. Conical flask. Funnel. Weighing balance. Volumetric flask. Beaker.  Zinc solution. EDTA solution. Distilled water. Eriochrome Black T solution. Weigh 2.17 g of Zinc powder using analytical weighing balance. Transfer the weighed Zinc powder to a 250 ml volumetric flask. Add distilled water to the volumetric flask until the mark is reached. Shake the flask to confirm that the Zinc powder is fully dissolved. Pipette 25 ml of the Zinc solution into a conical flask. Add 25 ml of distilled water to the conical flask. Add a small amount of Erichrome Black T indicator to the flask. Titrate the Zinc solution with 0.01 M EDTA solution until the color of the indicator changes from red to blue. Repeat the titration two more times. Pipette 25 ml of the Zinc solution into a conical flask. Add 25 ml of distilled water to the conical flask. Add a small amount of Erichrome Black T indicator to the flask. Titrate the Zinc solution with 0.01 M EDTA solution until the color of the indicator changes from red to blue. Repeat the titration two more times. SrNo.Volume of Zinc (in ml)Volume of EDTA (in ml)Burette readingEndpoint1.100.005 M2.5Yellow to violet 2.100.005 M3.0Yellow to violet3.100.005 M2.75Yellow to violet •The balanced chemical equation for the reaction between Zinc and EDTA is as follows: Zn2+ + EDTA4- → ZnEDTA2- As per the stoichiometry of the reaction, 1 mole of Zinc reacts with 1 mole of EDTA. The molar mass of Zinc is 65.38 g/mol and that of EDTA is 292.24 g/mol.

•The concentration of the EDTA solution used is 0.005 M or 0.005 mol/L. The volume of EDTA used to reach the endpoint is as follows: A.)For the first trial: 2.5 mL = 0.0025 L B.)For the second trial: 3.0 mL = 0.0030 L C.)For the third trial: 2.75 mL = 0.00275 L •From the equation, we can calculate the number of moles of EDTA used to reach the endpoint using the following formula: Moles of EDTA = (concentration of EDTA) x (volume of EDTA used) Moles of EDTA used in the first trial = 0.005 x 0.0025 = 0.0000125 mol Moles of EDTA used in the second trial = 0.005 x 0.0030 = 0.000015 mol Moles of EDTA used in the third trial = 0.005 x 0.00275 = 0.00001375 mol •As per the stoichiometry of the reaction, the number of moles of Zinc is equal to the number of moles of EDTA used to reach the endpoint. Moles of Zinc used in the first trial = 0.0000125 mol Moles of Zinc used in the second trial = 0.000015 mol Moles of Zinc used in the third trial = 0.00001375 mol •The average number of moles of Zinc used can be calculated as follows: Average moles of Zinc used = (moles of Zinc used in the first trial + moles of Zinc used in the second trial + moles of Zinc used in the third trial) / 3 = (0.0000125 + 0.000015 + 0.00001375) / 3 = 0.00001375 mol •The weight of Zinc can be calculated using the following formula: Weight of Zinc = (average moles of Zinc used) x (molar mass of Zinc) = 0.00001375 x 65.38 = 0.0009 g The amount of Zinc by titration against EDTA was 0.0009 g. *[Note: The values provided here are for reference only.  Assuming a hypothetical sample, these values are given. These values may differ from actual results, it only reflects the process and is used as demo only.Take this as reference/ guidance, your values may be different.]*  The standardization of the EDTA solution should be done carefully to obtain accurate results. The titration should be performed under controlled conditions, with a constant temperature and a constant rate of addition of EDTA solution. The Zinc solution should be free from any impurities. The indicator used should be specific to the reaction being performed. The burette and pipette used should be calibrated and accurate.

The titration should be repeated several times to obtain accurate results. Q.What is the aim of titration of Zinc with EDTA? A:The aim of titration of Zinc with EDTA is to determine the concentration of Zinc in a given sample. Q.What is EDTA? A: EDTA is the abbreviation for Ethylenediaminetetraacetic acid, which is a chelating agent used in analytical chemistry to complex metal ions. Q.What is the reaction between Zinc and EDTA?

A: The reaction between Zinc and EDTA is a complexometric reaction. Zinc ions react with EDTA and form a stable, water-soluble complex with a 1:1 stoichiometry. Q.What is the indicator used in the titration of Zinc with EDTA? A: The indicator used in the titration of Zinc with EDTA is Eriochrome Black T. Q.Why is the solution buffered during the titration of Zinc with EDTA? A: The solution is buffered during the titration of Zinc with EDTA to maintain a constant pH, as the reaction between Zinc and EDTA is pH-dependent. Q.What is the purpose of standardizing the EDTA solution? A: The purpose of standardizing the EDTA solution is to determine its exact molar concentration, which is necessary for accurate and precise titration. Q.What is the endpoint in the titration of Zinc with EDTA? A: The endpoint in the titration of Zinc with EDTA is the point at which the color of the indicator changes, indicating that all of the Zinc ions have been complexed with EDTA. Q.What precautions should be taken during the titration of Zinc with EDTA? A: Precautions that should be taken during the titration of Zinc with EDTA include ensuring that the solution is well-mixed and the burette is properly calibrated, maintaining a constant pH with a buffer solution, and taking multiple titration readings to ensure accuracy.

Q.What is the significance of determining the concentration of Zinc in a given sample? A: Determining the concentration of Zinc in a given sample is significant because Zinc is an essential micronutrient for humans, and excessive or insufficient intake can have adverse health effects. Q. Can the titration of Zinc with EDTA be used to determine the concentration of other metal ions? A:Yes, the titration of Zinc with EDTA can be used to determine the concentration of other metal ions, as EDTA has a high affinity for many metal ions and can form stable complexes with them.