MOHAWK

COLLEGE OF APPLIED ARTS AND TECHNOLOGY

CHEMICAL, ENVIRONMENTAL, AND BIOTECHNOLOGY DEPARTMENT

EDTA Titrations 1: Standardization of EDTA and Analysis of Zinc in a Supplement Tablet

by Professor David Cash

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Contact information for Mohawk College will be found on the following page.

This Experiment is a 3 hour Analytical Chemistry laboratory exercise. It is designed for students in a common second term course of a 2-year diploma program (Biotechnology, Environmental, or Health Technician).

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Experiment 5

Complexometric Titration (1): Standardization of an EDTA Solution with Zinc Ion Solution and Analysis of Zinc Supplement Tablets

OBJECTIVE

Complexometric volumetric titrations with **EDTA** (**e**thylene**d**iamine**t**etraacetic **a**cid) will be performed. The comprehension and skills learned will be transferable to other laboratory and workplace situations.

- A primary-standard zinc ion solution will be prepared from primary-standard zinc metal.
- A supplied EDTA solution will be standardized using the primary-standard zinc ion solution.
- The secondary standard EDTA solution will be employed to determine the zinc content of a dietary supplement.

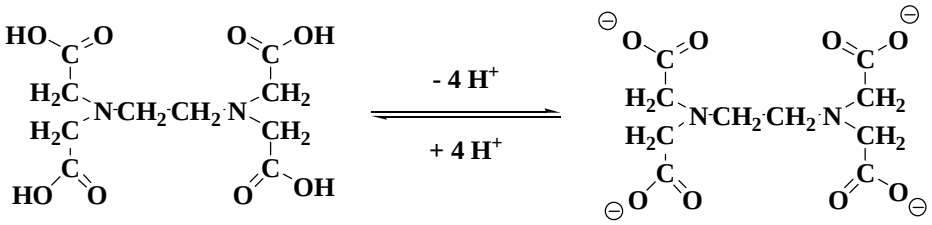
REFERENCE

Harris, Chapter 3, pages 265-281.

INTRODUCTION

Ethylenediaminetetraacetic Acid (EDTA)

EDTA, the molecular structure of which is shown to the left below, is the most useful member of a class of compounds called aminopolycarboxylic acids. EDTA undergoes successive acid dissociations to form a negatively charged ion, shown below to the right below.



This ion has the ability to "wrap" itself around positive metal ions in water solution. This process is called **chelation** or **complex formation**. The chelation reaction between EDTA and many metal ions has a very large equilibrium constant. The reaction is always **1 mol of EDTA to 1 mol of metal ion**.

Applications of EDTA Chelation (Complexation)
EDTA has many uses:

- Chemical Analysis of Metals
- Medical Removal of Heavy Metals in Accidental Poisonings
- Boiler Water Softening by Chelation
- Removal of Hard Water Scale by Cleaning Agents
- Addition to Shampoo to Soften Water
- Addition to Prepared Food to Prevent Spoilage by Metal Ions
- Solubilization of Metal Ions in Fertilizers and Vitamin Supplements

EDTA is not used in residential water softening or home laundry products because it is too expensive and because it is so effective, it would remove calcium from our bodies if it got into the drinking water supply.

Reaction of EDTA with Metal Ions
Except for the alkali metal ions of charge +1, most metal ions in aqueous solution react with EDTA to form complex ions in solution. The three-dimensional shape of one such complex ion is illustrated in **Harris**, page 265.

All metal ions react with EDTA in the mol ratio of 1 to 1. For zinc ions in water:

$$\mathbf{Zn^{2+}\,(aq) + EDTA^{4-}\,(aq) \rightarrow Zn(EDTA)^{2-}\,(aq) \quad K_f = 3.2 \times 10^{16}}$$

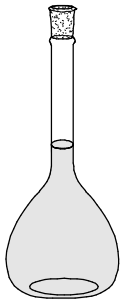
pH Dependence of EDTA Equlibriums (Equilibriums = Equilibria)
Since EDTA is an acid substance with four weak acid dissociations, the reactions with metal ions are pH dependent. The metal ions that react most strongly with EDTA can be titrated in acidic solution. **Zinc** is an example of a metal ion that is titrated in acidic solution.

The metals that react more weakly with EDTA must be titrated in alkaline solution.
Calcium and **Magnesium** are examples of metal ions that must be titrated in alkaline solution.

To ensure consistent results of titrations, the pH of the solutions must be controlled by using **buffer** solutions.

Sample Calculations

Example 1



A primary-standard zinc metal ion solution was prepared by dissolving **0.2619 g** of primary-standard-grade zinc metal in dilute HCl and adding distilled water to the mark in a **250 mL** (**0.2500 L**) volumetric flask. **Zn MW = 65.37 g / mol**

Calculate the **molarity** of the zinc metal ions in the solution.
State the value to 5 places after the decimal point.

Answer

$$\textbf{Molarity (M)} = \frac{\textbf{solute concentration in moles per litre (mol / L)}}{} = \frac{\textbf{amount of solute (mol)}}{\textbf{total solution volume (L)}}$$

$$\textbf{Molarity (M)} = 0.2619\ \text{g Zn} \times \frac{1\ \text{mol Zn}}{65.37\ \text{g Zn}} \times \frac{1}{0.2500\ \text{L}}$$

Molarity of Zinc Ion = 0.0160257 mol / L Zinc Ion = <u>0.01603</u> M

Example 2

An EDTA solution of unknown molarity was standardized by titration of **10.00 mL** (**0.01000 L**) samples of the standard zinc ion solution of **Example 1** by the method of this experiment.
The mean corrected titration volume of the EDTA solution was **16.25 mL** (**0.01625 L**).
The reaction between EDTA and all metal ions is 1 mol to 1 mol.Calculate the molarity of the EDTA solution. State the value to 5 places after the decimal point.

Answer

$$\underset{\text{EDTA (mol / L)}}{\textbf{Molarity}} = \underbrace{\textbf{Volume Zinc (L)} \times \textbf{Molarity Zinc (mol / L)}}_{\textbf{Calculates mol of Zinc}} \times \underbrace{\frac{\textbf{1 mol EDTA}}{\textbf{1 mol Zinc}}}_{\textbf{Converts to mol of EDTA}} \times \underbrace{\frac{\textbf{1}}{\textbf{Volume EDTA (L)}}}_{\textbf{Converts to mol / L EDTA}}$$

$$\underset{\text{EDTA (mol / L)}}{\textbf{Molarity}} = 0.01000\ \text{L} \times 0.01603\ \text{mol / L} \times \frac{1\ \text{mol EDTA}}{1\ \text{mol Zinc}} \times \frac{1}{0.01625\ \text{L}}$$

Molarity of EDTA = <u>0.00987</u> M

This Section Continues on the Next Page →

Sample Calculations (Cont.)

Example 3

A zinc supplement tablet containing (nominally) about **10 mg** of zinc ion was added to water and titrated with **0.01000 M** (**= 0.01000 mmol / mL**) **EDTA** solution by the method of this experiment. The corrected titration volume of the EDTA solution was **14.65 mL**.

Calculate the zinc content of the tablet in **mg** units.
State the value to 2 places after the decimal point.

Answer

$$\text{Mass of Zinc (mg)} = \underbrace{\text{Volume EDTA (L)} \times \text{Molarity EDTA (mol / L)}}_{\text{Calculates mol of EDTA}} \times \underbrace{\frac{\text{1 mol Zinc}}{\text{1 mol EDTA}}}_{\text{Converts to mol of Zinc}} \times \underbrace{\frac{\text{65.37 g Zinc}}{\text{1 mol Zinc}}}_{\text{Converts to g of Zinc}} \times \underbrace{\frac{\text{1000 mg}}{\text{1 g}}}_{\text{Converts to mg of Zinc}}$$

Alternately, use the simplified expression:

$$\text{Mass of Zinc (mg)} = \underbrace{\text{Volume EDTA (mL)} \times \text{Molarity EDTA (mmol / mL)}}_{\text{Calculates mmol of EDTA = mmol Zn}} \times \underbrace{\frac{\text{65.37 mg Zinc}}{\text{1 mmol Zinc}}}_{\text{Converts to mg of Zinc}}$$

Note: The units of the molarity of the EDTA solution may be taken either as **mol / L** or as **mmol / mL**. The latter unit is more convenient for this calculation.

$$\text{Mass of Zinc (mg)} = 14.65 \text{ mL} \times 0.01000 \text{ mmol / mL} \times \frac{\text{65.37 mg Zinc}}{\text{1 mmol Zinc}}$$

Mass of Zinc (mg) = 9.45 mg Zinc

Name		Day		Start Time	

PRE-LABORATORY PREPARATION

To be completed before the laboratory session.
To be submitted before beginning the experiment (10 points).

Questions: Answer in the space provided. **Show work**.
Your Mohawk College ID Number is **nnnnnnXYZ**.

Preparation of a Primary Standard Zinc Ion Solution
A primary standard solution of zinc ion was prepared by dissolving **0.25YZ g** of primary-standard-grade zinc metal in dilute HCl and adding distilled water in a **250 mL** (**0.2500 L**) volumetric flask.
Zn MW = 65.37 g / mol

Q-1. Calculate the **molarity** (**mol / L**) of the zinc ion solution in the volumetric flask. (3 points) State the value to 5 places after the decimal point. Show work. See **Example 1** on page 3.

0.25YZ g = _____ **g**

Zinc Ion Molarity = _____ mol / L

The PRE-LABORATORY PREPARATION Continues on the Next Page →

PRE-LABORATORY PREPARATION (Cont.)

Standardization of an EDTA Solution
Repeats of **10 mL** samples of the primary standard zinc ion solution of **Question 1** were titrated with an EDTA solution of unknown molarity by the method of this experiment.
The mean corrected titration volume was **15.X5 mL** (**0.015X5 L**).
The reaction between EDTA and all metal ions is 1 mol to 1 mol.

Q-2. Calculate the molarity (**mol / L**) of the EDTA solution unknown. (4 points)
State the value to 5 places after the decimal point. Show work. See **Example 2** on page 3.

Zinc Ion Molarity (**Q-1**) = _____ **mol / L 0.015X5 L** = _____ **L**

EDTA Solution Molarity = _____ mol / L

Analysis of a Zinc Supplement Tablet
A diet supplement tablet containing (nominally) **10 mg** of zinc ion was added to water and titrated with a **0.01000 mmol / mL** EDTA solution by the method of this experiment.
The corrected titration volume was **14.Y5 mL**.

Q-3. Calculate the zinc content of the tablet in **mg** units. (3 points)
State the value to 2 places after the decimal point. Show work. See **Example 3** on page 3.

14.Y5 mL EDTA = _____ **mL EDTA**

Zinc Content of the Tablet (mg) = _____ mg

PRE-LABORATORY PREPARATION Total = / 10

PROCEDURE

Ensure that the fume hood fans are switched **ON** and are operating.

There are no special disposal instructions for this experiment. All solids and solutions may safely be disposed of by way of the municipal solid waste containers or the sinks. When using a sink for disposal of zinc ion solution or EDTA solution, run the cold municipal tap water at the same time.

A. Preparation of Glassware and Apparatus

The following **clean** glassware and laboratory apparatus is required for the experiment:

For each student:

- □ a **50 mL** buret and its stand
- □ a plastic buret funnel
- □ a weighing bottle and its lid*****
- □ a **10 mL** transfer pipet
- □ a glass stirring rod
- □ a small funnel
- □ two small beakers
- □ a spatula
- □ all available erlenmeyer flasks
- □ a **250 mL** volumetric flask and its stopper
- □ a small watch glass to fit a small beaker
- □ a rubber pipet squeeze bulb

***** The instructor may direct you to use a clean, dry weighing boat instead of the weighing bottle.

A-1. Clean the glassware and apparatus if necessary with a 1 % solution of detergent in warm water. See **Cleaning and Drying of Glassware** on page **Error! Bookmark not defined.**. Rinse the cleaned glassware and apparatus with tap water and then with distilled water. To avoid breakage, do not leave any glassware standing in an unstable position.

A-2. Dry the spatula (and the weighing bottle and its lid if used) in the oven at 110 or 120 ºC for 15 minutes. Do not allow the bottle and lid to vacuum seal.

A-3. **Carefully** remove your spatula, your weighing bottle, and its lid from the oven on to a heat proof pad. Take them to your bench position and allow them to cool to room temperature before using them.

B. Preparation of a Primary Standard Solution of Zinc Ions

B-1. **Label** one of your clean small beakers in such a way that you will be able to identify it later in a crowd of other beakers.

B-2. Use a **top-loading balance** to place **0.22 - 0.28 g** of primary-standard zinc metal into your clean dry container. **Do not transfer solid over any balance**.

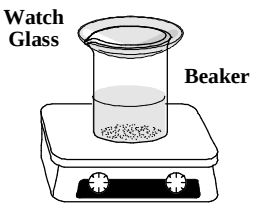
B-3. Use an **analytical balance** to weigh the container plus the zinc metal. Transfer as much as possible of the zinc metal into your labeled beaker. Reweigh the container and solid residue o the analytical balance.

B-4. Record the **initial** and **final** mass values **in ink** to **four places** after the decimal point in **Table B** in the **DATA TABLES AND REPORT** section. This is a weighing by difference.

B-5. Add distilled water to about the **20 mL** mark of the labeled beaker with the zinc metal in it.

B-6. **Be sure the fume hood fan is operating**. **In the fume hood** use a graduated cylinder or a dispenser as instructed to measure about **10 mL** of **6 M** hydrochloric acid (dilute HCl) and carefully add this to the zinc metal in your beaker. (**Caution: hazardous**).

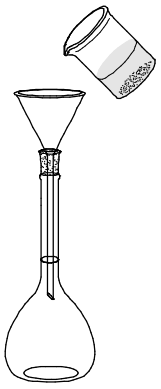
B-7. **Stay in the fume hood**. A reaction will occur, and bubbles of hydrogen gas will be seen. **Cover the beaker with your clean watch glass**.



Set the covered beaker and its contents to heat gently on one of the hot-plates set **in the fume hood**. The heat control must be on a **low** setting. **Do not boil away all of the liquid**.

B-8. If the zinc metal does not fully dissolve or ceases to react with the acid (if gas bubbling stops), add **small** portions (**2 to 3 mL**) of acid until it is all dissolved. The resulting solution of zinc ions may then be removed from the fume hood. (**Caution:** hot beaker.)

B-9. Use a clean funnel and a wash bottle to transfer the solution **quantitatively** from the beaker, into your clean **250 mL volumetric flask**. Rinse the beaker and the funnel with distilled water, adding the wash water to the volumetric flask.



B-10. Add distilled water to the flask to about one cm below the mark line. Fill the flask to the mark line using a dropper pipet.

B-11. Stopper the flask with a clean stopper. Hold the stopper in place with one hand. Turn the flask over **slowly** at least **17 times** to ensure that the solution is completely uniform.

B-12. Clean your small beaker if necessary for the next part of the procedure.

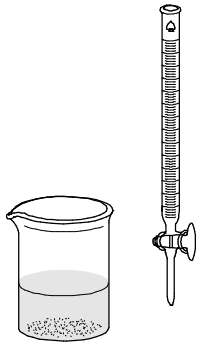
C. Buret Preparation

C-1. Take your buret stand and your **50 mL** buret to your bench station. You should also have a clean **10 mL** volumetric transfer pipet, a plastic buret funnel if needed, two small beakers and at least three erlenmeyer flasks. Dry the outside of the buret, the pipet, the beakers and the flasks.

C-2. Assemble the buret **securely**, and check that the buret tap is working. Drain the buret and pipet upside down in the buret stand. Check that the inner walls of the buret and the transfer pipet are clean and that the capillary tips are not broken or plugged. **It is not possible to do a good analysis with dirty glassware**.

C-3. **Label** one clean small beaker to be used for the supplied EDTA solution. Into this beaker, pour about **20 mL** of the EDTA solution, using the beaker volume markings. Record the code number of the EDTA solution in **Table E** in the **DATA TABLES AND REPORT** section.

C-4. Rinse the inside walls of the beaker with the EDTA solution. Pour the solution into the buret, rinsing the inner walls of the buret with the solution. Drain some of the solution out through the tip of the buret into a waste beaker or flask.



Rinse the small plastic buret funnel also, if it is to be used.

C-5. Repeat the entire rinse process and collect the rinse solution again. The third time, take a larger volume in the beaker and fill the buret to near the **0.00 mL** mark, **clearing the tip of air bubbles**.

Discard all of the rinse solution portions collected in the waste vessel into a sink with the cold water tap running.

D. Pipet Preparation and Pipetting of Portions of the Standard Zinc Solution

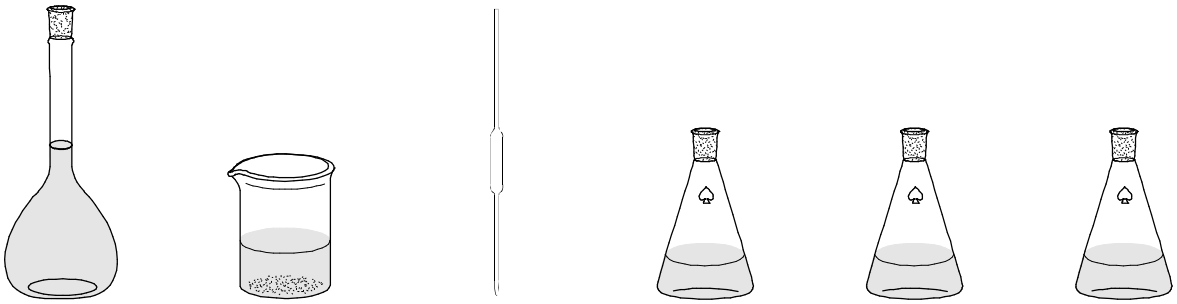
D-1. **Label** another clean small beaker to be used with your standard zinc solution from the **250 mL** volumetric flask. Rinse this beaker with about a **20 mL** volume of zinc solution from your volumetric flask. Use this portion of the solution to rinse out the **10 mL** transfer pipet as well. Collect these rinse portions in a waste beaker or flask.

D-2. Repeat the rinsing and collect the rinse portions again. On the third refill, take about **40 mL** to **50 mL** of the zinc solution into the beaker. Discard all of the rinse solution portions collected in the waste vessel into a sink with the cold water tap running.

D-3. The erlenmeyer flasks for the titrations must be clean but the insides need not be dry. **Check that your squeeze bulb is clean and dry inside**.

D-4. Transfer by pipet one **10.00 mL** portion of the standard zinc solution from its beaker into each of three clean erlenmeyer flasks. Remember to wipe off the tip of the pipet before the transfer. If you are unsatisfied with your pipetting technique in any transfer, discard the sample in that erlenmeyer flask, rinse the flask well with distilled water, and do it again.

Never transfer by pipet directly from a volumetric flask or a storage bottle. Always use a beaker or some other intermediate vessel.



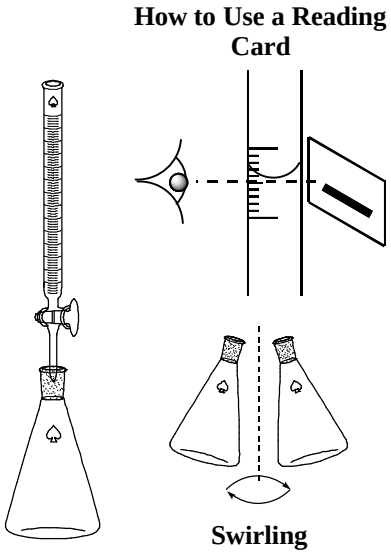
Standard Solution of Zinc Ion (250 mL) | **Intermediate Vessel** | **10 mL Transfer Pipet** | **Three Clean (But not Dry) Erlenmeyer Flasks**

D-5. Add to each erlenmeyer flask:
   a. Distilled water approximately to the **20 mL** mark.
   b. About **5 mL** of **pH 5.5** buffer solution.
   c. Three (**3**) drops of **xylenol orange** indicator solution.

D-6. **Mix well**. The indicator colour should be **red** at this point. Xylenol orange is **red** when complexed with zinc at pH 5.5. It is **yellow** when it has been displaced from the zinc by EDTA at the end-point of the titration.

E. Standardization of an EDTA Solution.

E-1. Using a buret reading card, or otherwise, read the starting volume in the buret to 2 places after the decimal point to the nearest **0.05 mL**. Record the value in **Table E** in the **DATA TABLES AND REPORT** section (**Start Volume** of **Trial 1**).



E-2. Titrate the first sample flask slowly with small addition volumes of the EDTA solution. Place the tip of the buret 1 or 2 cm down into the opening of the flask to avoid any accidental loss of solution. Swirl the flask gently to mix the solutions.

E-3. When a **yellow** colour begins to appear in the flask, decrease the volumes of the additions. Add solution slowly, one or two drops at a time, washing down the inside walls of the flask and the buret tip with a stream of distilled water from your wash bottle from time to time.

The end-point colour of the titration is when the **red** colour changes to **yellow**.

E-4. Record the final volume reading to 2 places after the decimal point to the nearest **0.05 mL** in **Table E** (**Final Volume** of **Trial 1**). Determine the titration volume of **Trial 1** and record this in **Table E**.

E-5. Repeat titrations are expected to have the same titration volume to the end-point. In the following trials you can add all but the final **1 mL** rapidly, using the first titration volume as a guide. Record all volumes in **Table E**.

Continue doing trials until you have **three** acceptable trial titration volumes within a range of no more than **<u>0.20</u> mL**.

F. End-Point Indicator Correction

F-1. Determine an end-point indicator volume correction (**indicator blank**) as follows. Add **25 mL** of distilled water to a clean erlenmeyer flask. Add five (**3**) drops of indicator solution and **5 mL** of the buffer solution without any zinc being present. **If** the solution is **yellow** (end-point colour), the indicator blank is zero, **0.00 mL**.

If the solution is **red**, possibly due to impurity metal ions, determine by a titration, the volume of EDTA solution required to produce the same **yellow** colour you used for your end-point recognition during the procedure. This should be a very small volume; e.g. **0.05 mL** or **0.10 mL**. Record the indicator blank volume measurements to 2 places after the decimal point in **Table E**.

F-2. **When you have completed titrating but before you begin the next section**, show the instructor your titration values and have your data table initialled by the instructor.

Leave the EDTA solution in the buret. It will be used for **Part G**.

G. Quality Control Analysis of Zinc in a Supplement Tablet

The instructions are based on a target of **10 mg** of zinc per supplement tablet (**Jamieson Brand**). If the samples differ from this zinc in content, amend the procedure accordingly.

Jamieson brand tablets are convenient for this analysis because they disintegrate rapidly in cold water. Tablets of other brands that have been investigated do not disintegrate rapidly, and are difficult to titrate.

G-1. Record the brand name, nominal zinc content (mg) and a brief description of the tablets in **Table G** in the **DATA TABLES AND REPORT** section.

G-2. Place **one** (**1**) zinc tablet into a clean erlenmeyer flask. Add about **20 mL** of distilled water, using the beaker volume markings. Heat the contents gently on a warm (not hot) hot plate if necessary for a few minutes until the tablet disintegrates. The tablet will not dissolve totally.

Note: It might be thought that a filtration of the solution would be useful here. However, trials performed in 2007 showed that the titration results after a filtration step were much lower in volume and more variable. The reason for this observation is unknown.

G-3. Add **5 mL** of the **pH 5.5** buffer solution and **three** (**3**) drops of **xylenol orange** indicator solution to the flask. Mix well. The solution in the flask should be **red** in colour.

G-4. Refill your buret with EDTA solution as necessary. Record the start volume reading to 2 places after the decimal point to the nearest **0.05 mL** in **Table G** (**Start Volume** of **Trial 1**).

G-5. Titrate as in **Part E**, to the **red**-to-**yellow** end-point colour change. Record the final volume reading to 2 places after the decimal point to the nearest **0.05 mL** in **Table G** (**Final Volume** of **Trial 1**).

G-6. Repeat until you have are confident that you have satisfactory titration results for three (**3**) tablets. Save the final flask as a comparison in order to determine an indicator blank correction.

There is no way to predict whether the tablets have the same zinc content, so setting an acceptable range is not possible.

G-7. Determine an end-point indicator volume correction (**indicator blank**) as in **Part F**. Add enough insoluble, inert solid calcium sulphate to the flask to make it look like the amount of solid in your final tablet titration flask. Record the indicator blank volume measurements to 2 places after the decimal point in **Table G**.

G-8. Have your data table initialled by the instructor. Clean up. All solutions may be discarded into the sink with the cold water tap running.

REPORT

Table B

R-1. Enter the mass data for weighing the zinc metal.

R-2. Calculate the **molarity** (**mol / L**) of the zinc ion solution in the volumetric flask.
State the value to 5 places after the decimal point. Show work. See **Example 1** on page 3.
Enter the value in **Table B**.

Table E

R-3. Determine and enter the titration volume and the corrected titration volume for each trial.

R-4. Calculate the mean corrected volume **for three acceptable trials**. **Circle** the three acceptable trial volumes. Determine and enter the range of the three values.

R-5. Calculate the molarity (**mol / L**) of the EDTA solution unknown.
State the value to 5 places after the decimal point. Show work. See **Example 2** on page 3.
Enter the value in **Table E**.

Table G

R-6. Determine and enter the titration volume and the corrected titration volume for each trial.

R-7. Calculate the zinc content of each tablet in **mg** units. **Use <u>0.01000</u> M for the EDTA**.
State the values to 2 places after the decimal point. Enter the values in **Table G**.
Show work for one trial. See **Example 3** on page 3.

R-8. Calculate and enter in the Table the mean experimental zinc content of the three tablets (**mg**).
State the value to 2 places after the decimal point.

Name		Day		Start Time	

DATA TABLES AND REPORT

The following **Tables** are to be used for recording observations and measurements. Measured values are to be recorded in the heavily shaded cells **IN INK**. Leave this page open on your bench during the experiment period. Have it initialed by the instructor on completing each section.

The completed and initialed **DATA TABLES AND REPORT** section must be handed in along with any additional pages you may submit as your report.

Table B: Preparation of a Primary Standard Solution of Zinc Ions

Target Mass: 0.22 - 0.28 g Volume of Flask: 250 mL (0.2500 L)

Weighings of Zinc Metal (In Ink) to Four Places After the Decimal Point

Weighing Bottle + Solid (g)	Weighing Bottle + Residue (g)	Mass of Zinc Metal (g)

Instructor's Initials: _____ (5 points)

Calculate the experimental molarity (**mol / L**) of the zinc ion solution in the volumetric flask. (5 points) State the value to 5 places after the decimal point. Show work.
See **Example 1** on page 3.

Experimental Molarity of the Zinc Ion Solution (mol / L) = _____ mol / L

The DATA TABLES AND REPORT Section Continues on the Next Page →

DATA TABLES AND REPORT (Cont.)

Table E: Standardization of an EDTA Solution

Code of EDTA Solution: _____ Zinc Ion Molarity (Table B): = _____ M

Portion Volume of Zinc Solution = 10.00 mL = 0.01000 L

End-Point Indicator Volume Correction (Indicator Blank)

Final _____ mL - Start _____ mL = _____ mL

Titration Volumes (In Ink to 2 places after the decimal point)

	At Least Three Trials are Mandatory Additional Trials Only if Necessary					
	Trial 1	**Trial 2**	**Trial 3**	**Trial 4**	**Trial 5**	**Trial 6**
Final Volume (mL)						
Start Volume (mL)						
Titration Volume (mL)						
Indicator Blank Volume (mL)						
Blank Corrected Titration Volume (mL)						

Instructor's Initials on Completion of Titrations: _____ (10 points)

Mean Corrected Titration Volume of **Three** Acceptable Trials (Within a Range of **0.20 mL**)
Circle the Acceptable Trials. State to 2 Places After the Decimal Point.

Mean Volume = _____ mL Range = _____ mL

Calculate the experimental molarity (**mol / L**) of the EDTA solution unknown. (5 points)
State the value to 5 places after the decimal point. Show work. See **Example 2** on page 3.

Experimental Molarity of the EDTA Solution = _____ mol / L

The DATA TABLES AND REPORT Section Continues on the Next Page →

Name		Day		Start Time	

DATA TABLES AND REPORT (Cont.)

Table G: Quality Control on Zinc Supplement Tablets

Description of the Zinc Supplement Tablet Unknown

Brand Name and Description of the Zinc Supplement Tablet Unknown	Nominal Zinc Content (mg)

EDTA Solution Molarity For Calculation = 0.01000 M

End-Point Indicator Volume Correction (Indicator Blank)

Final _____ mL - Start _____ mL = _____ mL

Titration Volumes and Calculated Zinc Content

	At Least Three Tablet Titrations are Mandatory Additional Tablets Only if Necessary					
	Tablet 1	Tablet 2	Tablet 3	Tablet 4	Tablet 5	Tablet 6
Final Volume (mL)						
Start Volume (mL)						
Titration Volume (mL)						
Indicator Blank Volume (mL)						
Blank Corrected Titration Volume (mL)						
Calculated Experimental Zinc Content (mg) (to 2 places after the decimal)						

Instructor's Initials on Completion of Titrations: _____ (5 points)

Mean Zinc Content (State to 2 Places After Decimal Point) = _____ mg

The DATA TABLES AND REPORT Section Continues on the Next Page →

DATA TABLES AND REPORT (Cont.)

Table G: Quality Control on Zinc Supplement Tablets (Cont.)

Sample Calculation. Trial _____
Calculate the zinc content of one tablet in **mg** units. (5 points) **Use <u>0.01000</u> M for the EDTA**.
State the value to 2 places after the decimal point. Show work. See **Example 3** on page 3.

Experimental Zinc Content of the Tablet (mg) = _____ mg

Mark Sheet for Experiment 5 **Total = 100 points**

Category	**Points**
Pre-Laboratory Preparation	**/ 10**
Attendance: Punctuality, Diligence, Clean-Up.	**/ 25**
Data Acquisition and Recording In Ink /5 Proper Number of Digits /5 Results Initialed Weighings /5 EDTA Titrations /10 Tablet Titrations /5	**/ 30**
Calculations	**/ 15**
Analytical Result for EDTA Molarity Result Correct Within: ± 0.0002 = 40 ± 0.0004 = 32 ± 0.0007 = 24 ± 0.0014 = 16 ± 0.0026 = 8	**/ 40**
Comments: **Total =** **/120**	