

# CHEM 200

ALL EMAILS SENT TO  
[CHEM200@SDSU.EDU](mailto:CHEM200@SDSU.EDU)

OFFICE HOURS HELD  
VIRTUALLY THROUGH THE  
MSLC.

**TUES 9.00 AM TO 11.00 AM**

# UPCOMING IMPORTANT DATES

- Pre-Assignment: Qualitative Analysis **Sunday, February 12th at 11:59 pm**
- Achieve Extra Credit: Laboratory Skills **Sunday, February 12th at 11:59 pm**
- Qualitative Analysis Prelab due **Sunday, February 12th at 11:59 pm**
- Volumetric Lab Report due **Sunday, February 12th at 11:59 pm**
- Chapter 1-4 Chapter Problem Sets in OWL Lecture due **Thursday, February 9th at 11:59 pm (Start Now)**
- Chapter 1-4 Chapter Assessments in OWL Lecture is **Thursday, February 9th at 11:59 pm (Start Now)**; 2 chances, no time limit
- Exam 1 starts at **3 pm Friday, February 10th and will close on Saturday, February 11th at 3pm** in OWL Lecture; Chapters 1-4. You have 24hrs. *Only 2 hrs once you start; be sure to give yourself a full 2 hr time slot.*

# SUPPLEMENTAL INSTRUCTION (SI)

- Study sessions lead by former CHEM 200/202 students that excelled in the previous semesters class.
- Occur 15+ times a week.
- Free to access, no reporting to faculty.

# QUANTITATIVE CHEMICAL ANALYSIS

Determine the amounts or concentrations of chemical species in a sample

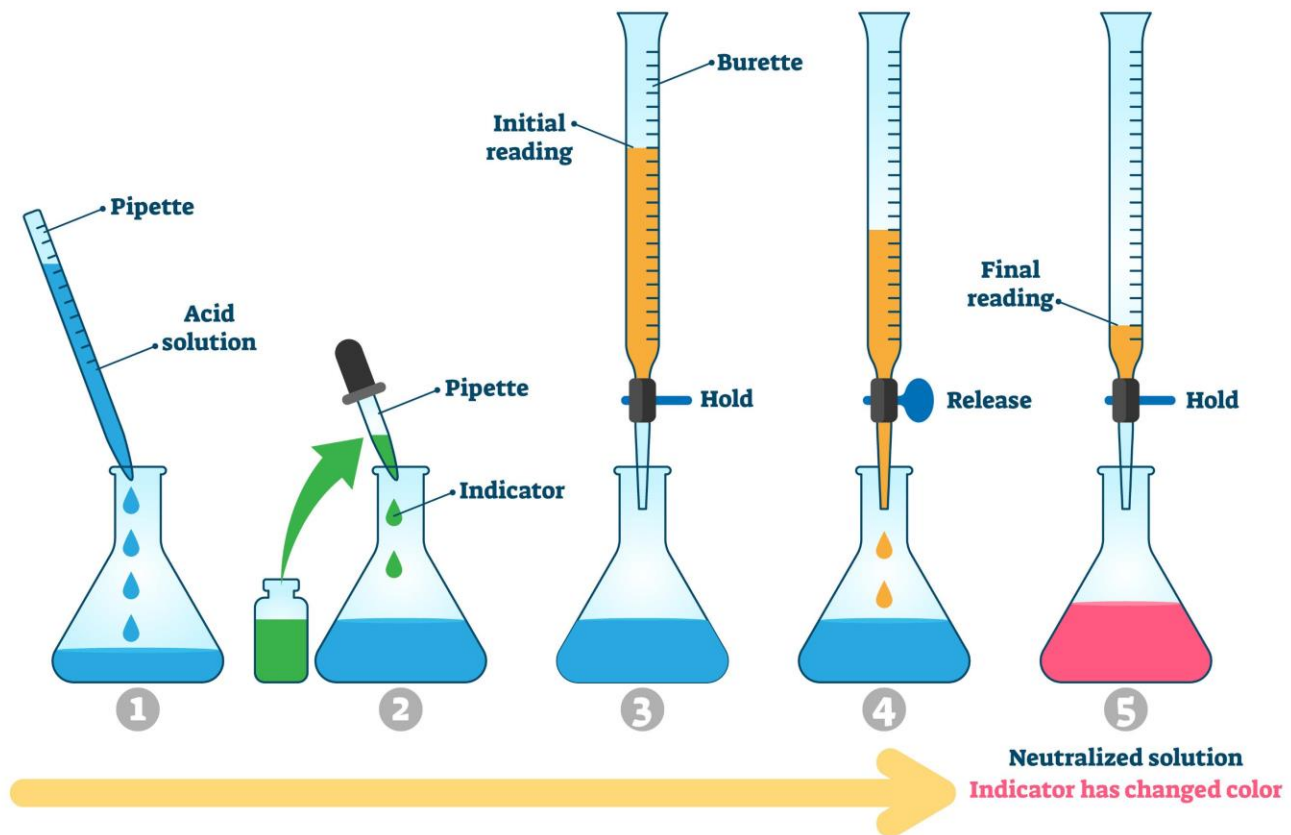
Examples:

Titration – determining the concentration of the analyte

Gravimetric analysis – physical change in the analyte allow for its separation from the other chemical components

# TITRATION

## TITRATION



## EXAMPLE: TITRATION

Use the data to determine the concentration of sulfuric acid

Volume of Acid (mL)	25.00
Molarity of NaOH (M)	0.9081
Initial Burette Reading (mL)	4.55
Final Burette Reading (mL)	39.85

## EXAMPLE: GRAVIMETRIC ANALYSIS

2.0 M silver nitrate was added to a 250.0 mL solution of calcium chloride. The precipitate was collected and dried. The precipitate had a mass of 35.920 g. Determine the concentration of the original calcium chloride solution. What volume of silver nitrate was used?

## EXAMPLE

A mixture consisting of only **chromium(II) chloride** ( $\text{CrCl}_2$ ) and **copper(II) chloride** ( $\text{CuCl}_2$ ) weighs **1.0307 g**. When the mixture is dissolved in water and an excess of silver nitrate is added, all the **chloride** ions associated with the original mixture are precipitated as insoluble **silver chloride** ( $\text{AgCl}$ ). The mass of the **silver chloride** is found to be **2.2924 g**. Calculate the mass percentages of **chromium(II) chloride** and **copper(II) chloride** in the original mixture.

Mass percent  $\text{CrCl}_2$  =  %

Mass percent  $\text{CuCl}_2$  =  %



## EXAMPLE: HYDRATES

A hydrate of copper (II) nitrate is 36.4% water by mass. Find the formula of the hydrate

## EXAMPLE: HYDRATES

What will be the mass that remains after 0.500 g of copper (II) nitrate decahydrate is dried completely??

## EXAMPLE: DECOMPOSITION OF POTASSIUM CHLORATE

The decomposition of solid potassium chlorate leads to the formation of potassium chloride and oxygen gas. Determine the mass of potassium chloride and oxygen that would be produced from the decomposition of 165.80 g of potassium chlorate

## EXAMPLE: GRAVIMETRIC ANALYSIS

An excess iodine gas reacts with 0.200 g of unknown metal M to form the water-soluble compound  $MI_2$ . The water in solution is evaporated and 0.900 g of precipitate is collected. Determine the molar mass of metal M.

## LECTURE PARTICIPATION

You want to perform a gravimetric analysis of a chromium (III) bromide solution to determine the concentration of  $\text{Cr}^{3+}$ . Which reagent should you choose??

Silver Nitrate

Sodium Hydroxide

Potassium Acetate

## EXAMPLE: GRAVIMETRIC ANALYSIS

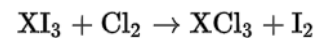
How many milliliters of your chosen solution (2.0 M) would be required to precipitate all of the  $\text{Cr}^{3+}$  ions out of 500.0 mL of a 3.5 M solution of chromium (III) bromide.

## EXAMPLE: COMBUSTION ANALYSIS

A compound containing C, H, N, and O is analyzed. When 1.2359 g of sample is burned in excess oxygen, 2.241 g of carbon dioxide is formed. 0.0648 g of Hydrogen are present. When the compound is analyzed for N content, the mass percent of nitrogen is found to be 28.84%. Determine the Empirical formula of the compound.

## EXAMPLE: FINDING ATOMIC MASS

An element **X** has a triiodide with the empirical formula **XI<sub>3</sub>** and a trichloride with the empirical formula **XCl<sub>3</sub>**. The triiodide is converted to the trichloride according to the equation



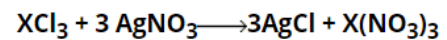
If the complete conversion of 1.163 g of **XI<sub>3</sub>** results in the formation of 0.528 g of **XCl<sub>3</sub>**, what is the atomic mass of the element **X**?

Atomic mass **X** =  g/mol



## EXAMPLE: FINDING ATOMIC MASS

A sample of a substance with the empirical formula  $\text{XCl}_3$  weighs **0.4374 g**. When it is dissolved in water and all its **chlorine** is converted to insoluble **AgCl** by addition of an excess of silver nitrate, the mass of the resulting **AgCl** is found to be **1.4102 g**. The chemical reaction is



(a) Calculate the formula mass of  $\text{XCl}_3$ .

Formula mass  $\text{XCl}_3 =$    $\text{g mol}^{-1}$

(b) Calculate the atomic mass of X.

Atomic mass X =   $\text{g mol}^{-1}$