



Department of Chemistry

College of Science

University of Salahaddin

**Subject: Principle of analytical chemistry &
Volumetric analysis**

Course Book – (Year 1)

Lecturer's name: Dr. Hunar Yasin Muhammad

Academic Year: 2021/2022

Course Book

1. Course name	Principle of Analytical chemistry & Volumetric analysis																										
2. Lecturer in charge	Dr. Hunar Yasin Muhammad																										
3. Department/ College	Chemistry/Science																										
4. Contact	e-mail: Hunar.Muhammad@su.edu.krd																										
5. Time (in hours) per week	Theory: 2																										
6. Office hours	Monday: 10:30 – 11:30 Tuesday: 10:30 – 11:30 Wednesday: 10:30 – 11:30 Thursday: 10:30 – 11:30																										
7. Course code																											
8. Teacher's academic profile	<p><u>Academic achievements and Qualifications:</u></p> <table border="1"> <thead> <tr> <th>From-To</th> <th>Degree</th> <th>College-University</th> <th>Country</th> </tr> </thead> <tbody> <tr> <td>2009-2011</td> <td>M. Sc. in Analytical Chemistry, Department of Chemistry</td> <td>College of Science-University of Salahaddin</td> <td>Iraq</td> </tr> <tr> <td>2001-2006</td> <td>B.Sc. Chemistry, Department of Chemistry,</td> <td>College of Science-University of Salahaddin</td> <td>Iraq</td> </tr> <tr> <td>2015-2020</td> <td>PhD. In Analytical Chemistry, Department of Chemistry</td> <td>College of Science-University of Salahaddin</td> <td>Iraq</td> </tr> </tbody> </table> <p><u>Teaching Activities</u></p> <table border="1"> <thead> <tr> <th>From-To</th> <th>Subject</th> <th>Stage-College</th> <th>University</th> </tr> </thead> <tbody> <tr> <td>2011 to 2015</td> <td>Analytical Chemistry- Gravimetric Analysis/prac.</td> <td>2nd - stage / Chemistry Department- College of Science</td> <td>Salahaddin University</td> </tr> </tbody> </table>			From-To	Degree	College-University	Country	2009-2011	M. Sc. in Analytical Chemistry, Department of Chemistry	College of Science-University of Salahaddin	Iraq	2001-2006	B.Sc. Chemistry, Department of Chemistry,	College of Science-University of Salahaddin	Iraq	2015-2020	PhD. In Analytical Chemistry, Department of Chemistry	College of Science-University of Salahaddin	Iraq	From-To	Subject	Stage-College	University	2011 to 2015	Analytical Chemistry- Gravimetric Analysis/prac.	2 nd - stage / Chemistry Department- College of Science	Salahaddin University
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2011 to 2015	Analytical Chemistry- Gravimetric Analysis/prac.	2 nd - stage / Chemistry Department- College of Science	Salahaddin University																								

	2013 to 2016	Information technology (word-Chemoffice program)	1 st - stage/ Chemistry- Department- College of Science	Salahaddin University
	2011 to 2013	Analytical Chemistry	2 nd - stage / dept. of science/Basic School/Faculty of Education	Soran Universty
	2016 to 2018	Analytical Chemistry	1 st and 2 nd - stage / Chemistry Department- College of Science	Soran Universty
	2014- 2015	Instrumental analysis/prac.	4 th - stage / Chemistry Department- College of Science	Salahaddin University
	2016 to 2021	Separation method	3 rd - stage / Chemistry Department- College of Science	Salahaddin University
	Now	Principle of Analytical chemistry & Volumetric analysis	1 st - stage / Chemistry Department- College of Science	Salahaddin University
9. Keywords	Properties of solution, Concentration, Equilibrium, pH Calculation, Titrations			
10. Course overview:	The course examines Principle of Analytical chemistry & Volumetric analysis from a unified point of view. The course is not a compilation of all. It provides a framework of Principle of			

Analytical chemistry & Volumetric analysis. The idea is to classify all solution properties, Concentration, Equilibrium, pH Calculation and Titrations.

Analytical chemistry is a measurement science consisting of a set of powerful ideas and methods that are useful in all fields of science and medicine. Analytical chemistry deals with methods for the identification, determination and separation of compounds in a mixture.

11. Course objective:

The aim of the course is to provide the students with the needed tools so that they can understand all of principles of analytical chemistry including all solution properties, Concentration, Equilibrium, pH Calculation and Titrations.

12. Student's obligation

The students must be done at least One examination and some quizzes or daily questions during each semester

- All exams will be given at the posted dates (after selection) and times only. If you encounter an unforeseen case and cannot take the exam on its scheduled date and time, please contact me immediately to discuss your situation.

13. Forms of teaching

Data show and white board

14. Assessment scheme

The students must be done at least One examination and some quizzes or daily questions during the year; and the marks distribute as the following:

1 st Exam	6.5 Marks
2 nd Exam	6.5 Marks
Quizzes or daily questions	2 Marks
Final	50 Marks
=====	
Total	65 Marks
Make-up Exams	

- All exams will be given at the posted dates (after selection) and times only. If you encounter an unforeseen case and cannot take the exam on its scheduled date and time, please contact me immediately to discuss your situation.

15. Student learning outcome:

Students should know the basic principles and have actual practice with the operational techniques of a wide variety of analysis. In addition, they should be familiar with a great many other things in analysis such as different concentration expression that may be useful in the future.

On successful completion of these semesters, students should be able to:

1. Understand the different concentration expression

2. Relation between Concentrations, pH calculating for different acid-base solutions, equilibria and Titrations in detail.
 3. Able to calculating pH for each point in a titration and constructing curve for each titration

16. Course Reading List and References:

1. Fundamental of analytical chemistry by Douglas A. Skoog and Donald M. West, 4th, 8th edition.
2. Modern analytical chemistry by David Harvey.
3. Principles and Practice of Analytical Chemistry, F.W. Fifeild & D. Kealey
4. A Text Book of Quantitative Analysis; By: Vogel
5. Chemical Analysis Modern Instrumentation Methods and Techniques: by F. Rouessac and A. Rouessac.
6. Quantitative Chemical Analysis: By D. C. Harris

17. The Topics:

Lecturer's name

The chemical composition of aqueous solutions

1st week

- Electrolytes, Acids and bases.
- Amphiprotic species
- Autoprotolysis, Strength of acids and bases

2nd week

- Units of concentrations
- Methods for the expression of concentration:
- Mole, M.Wt. and Molar concentration

3rd week

- Normal concentration
- Preparation of solutions from solid materials

4th

-Preparation of solutions from liquids

5th

Molality
 Mole fraction (X), Mole percent (n/n%) and Mole ratio (r):
 Formality
 Normality

6th

Percentage concentrations
 Parts-per notation

7th

Relation between Concentrations	8 th
p-Function (p-Value) Chemical Stoichiometry	9 th
Introduction to Volumetric analysis	10 th
Chemical Equilibria Ion-product constant for water (K _w)	11 th
Calculation of pH for different acid-base solution Calculation of pH for strong acid or base (not very dilute) Calculation of pH for strong acid or base (very dilute) Calculation of pH for salt of strong acid & strong base	12 th
Dissociation Equilibria for weak acids and bases Dissociation Constants for Conjugate Acid/Base Pairs Calculation of pH for weak acid or base	13 th
Calculation of pH for salt of Strong acid-Weak base Calculation of pH for salt of Weak acid-Strong base Calculation of pH for salt of Weak acid-Weak base	14 th
Buffer solutions Calculation of pH for acidic buffer solution Calculation of pH for basic buffer solution	15 th
Equilibrium Constant for slightly soluble salts The effect of a common ion on the solubility of a precipitate	16 th

<p>Types of titrations 1- Neutralization titration (Acid-base titration) Acid-Base Indicators Strong Acid-Strong Base Titration Curve</p>	<p>17th</p>
<p>Titrating a Weak Acid with a Strong Base Titrating a Weak Base with a Strong Acid</p>	<p>18th</p>
<p>2- Precipitation titration 1-Mohr's method Titration Curve in precipitation titration</p>	<p>19th</p>
<p>2-Volhard method 3-Fajan method</p>	<p>20th</p>
<p>3-Reduction-oxidation titration (Redox titration). Calculating the Redox Titration Curve</p>	<p>21th</p>
<p>4- Complex Formation Titration (Complexometry)</p>	<p>22th</p>
<p>19. Examinations: <i>Q : Define the following terms with a proper example</i> 1. Molarity 2. Titration 3. End Point <i>Q : What are Factors affecting solubility of solids?</i> <i>Q : How many (Fe) are contained in patient's serum? if the amount of (Fe) in serum equal to 2500 μg. At.Wt Fe = 55.8 g/mol</i></p>	
<p>20. Extra notes:</p>	
<p>21. Peer review</p>	<p>پیداچوونہوی ھاوہل</p>