



Department of ...General ...science.....

College of ...Basic Education.....

University of ...Salahaddin.....

**Subject:Course Book of
Practical Analytical Chemistry for Second
Stage**

Lecturer's name Gulkhater Hammad Sharif

Academic Year: 2022 - 2023

Course Book

1. Course name	Practical Analytical Chemistry
2. Lecturer in charge	Gulkhater Hammad Sharif
3. Department/ College	General Science /Basic Education
4. Contact	e-mail: gulkhater.sharif@su.edu.krd Tel: 07504750226
5. Time (in hours) per week	12
6. Office hours	30
7. Course code	
8. Teacher's academic profile	<p>1985-1986 BSc in Chemistry</p> <p>1991 published a research in Journal of the Iraqi chemical society ,subject of the research (The stability constants and thermodynamic functions of Palladium II (Pd II) complexes with Salicylic acid its derivatives</p> <p>1986-2001 assistant chemist</p> <p>2001 – 2004 MSc in Analytical Chemistry</p> <p>2004 till now Lecturer in General Science</p> <p>Have been teaching these subjects:</p> <ul style="list-style-type: none"> • Analytical chemistry (theory lectures of second stage) • Analytical chemistry (practical of second stage) • Organic chemistry (theory lectures of third stage) • Industrial chemistry (theory lectures of third stage) • Scientific debate (theory lectures of first stage) <p>Had a training course about Methods of teaching , a course about PowerPoint , Excel , Microsoft word,Moodle ,Google Application.</p>
9. Keywords	Analytical chemistry, titration, preparation, standardization, indicator, neutralization, oxidation reduction titration, precipitation titration, complex formation titration.
10. Course overview:	<p>This course provides an introduction to the fundamental principles of chemical measurements used in research studies, it will teach the students how to do :</p> <ol style="list-style-type: none"> 1. Neutralization titration : one of the examples of this type of titration is using dilute Hydrochloric acid solution against Sodium carbonate solution and Methyl orange as an indicator, one of the applications of this experiment in our daily life is determination of Acetic acid in vinegar. 2. Redox titration : an example of this type of titration is using Potassium permanganate solution against Sodium oxalate solution without using any indicator because Potassium permanganate is self-indicator, application of this

experiment is determination of Ferrous ion in Ferrous salt.

- Precipitation titration : one of the examples of this type of titration is using Silver nitrate solution as a precipitating agent against Sodium chloride solution, application of this experiment is determination of concentration of Chloride ion in tap water.
- Complex formation titration : an example of this type of titration is using Ethylene diamine tetra acetic acid disodium salt against Zinc sulfate solution, application of this type of experiment is determination of both types of hardness of water which are temporary hardness and permanent hardness of water.

11. Course objective:

The purpose of this course to :

- ❖ Learn the student to prepare the solutions
- ❖ Be able to correctly prepare standard solution
- ❖ Teaching the Titration method
- ❖ Understand the difference between Equivalence point and End point
- ❖ Be able to determine the concentration of any unknown solution using titrations
- ❖ Be familiar with correct use of volumetric glassware to prepare solutions and perform titration.

12. Student's obligation

- ❖ In each practical session a quiz will be done.
- ❖ Homework will be given to the students and bring it next session.
- ❖ The students should prepare a report after each practical session after doing any experiment.
- ❖ The students are not allowed to enter the laboratory without wearing the white coat.

13. Forms of teaching

The data show and whiteboard are used

14. Assessment scheme

Semester	Practical degree %	Theory		
		Seasonal Exam.	Quizzes	Dailey Activities
1 st semester	35			
2 nd semester				
Final Exam.				
Total 100%				

15. Student learning outcome:

- Through the practical sessions the students will learn the difference between tap water, mineral water and distilled water.

- The students learn to determine Equivalence mass of acids, bases, reducing agents, oxidizing agents, salts, precipitating agent.
- The students will be able to do titration of any solution and determining concentration of the analyte.
- The students will be able to estimate the concentration of acetic acid acid in any sample of vinegar which are present in markets.
- The students will be able to determine ferrous ion in any ferrous salt.
- The students will be able to determine chloride ion in tap water using Mohr method.
- The students will be able to determine both types of hardness of water(temporary hardness and permanent hardness) that is equal to total hardness of water.

16. Course Reading List and References:

- Key references: Fundamentals of analytical chemistry
Douglas A. Skoog
Donald M. West
- Useful references:
http://en.wikipedia.org/wiki/Acid%E2%80%93base_titration#Alkalimetry_and_acidimetry
http://chemwiki.ucdavis.edu/Analytical_Chemistry/Quantitative_Analysis/Titration/Titration_Of_A_Strong_Acid_With_A_Strong_Base

17. The Topics:

Lecturer's name

18. Practical Topics (If there is any)

1. Instructions about safety in laboratory and names glass equipments and apparatus in analytical laboratory.
2. Detailed explanation about difference between tap water and distilled water.

Lecturer's name:
Gulkhater Hammad Sharif
(3 hrs)

<p>3. Preparation of approximately 0.1 N hydrochloric acid solution.</p>	<input type="text"/>
<p>4. Standardization of approximately 0.1 N hydrochloric acid solution against standard solution (0.1 N) sodium carbonate (Na_2CO_3).</p>	<input type="text"/>
<p>5-Preparation of approximately 0.1 N sodium hydroxide solution.</p>	<input type="text"/>
<p>6- Standardization of approximately 0.1 N sodium hydroxide solution against 0.1 N hydrochloric acid solution.</p>	<input type="text"/>
<p>7-Determination of Acetic acid in Vinegar.</p>	<input type="text"/>
<p>8-Preparation of approximately 0.1 N potassium permanganate solution.</p>	<input type="text"/>
<p>9-Standardization of approximately 0.1 N potassium permanganate solution against standard solution (0.1 N sodium oxalate).</p>	<input type="text"/>

10-Determination of Ferrous ion in Ferrous salt.

11- Preparation of approximately 0.01 N silver nitrate solution.

12- Standardization of approximately 0.01 N silver nitrate solution against standard solution (0.01 N sodium chloride).

13- Determination of concentration of Chloride ion in unknown solution by Mohr method.

14- Indirect method for determining the anions (Cl⁻ , Br⁻ and I⁻) - Volhard's Method -

15-Preparation of approximately 0.01 M of EDTA (Ethylene diamine tetra acetic acid).

16-Standardization of approximately 0.01 M of EDTA (Ethylene diamine tetra acetic acid) against (standard solution 0.01 M

zinc sulphate $ZnSO_4 \cdot 7H_2O$ solution).

17-Determination of Total hardness of water.

18- Determination of Permanent hardness of water

19-Refining Crude Table salt (NaCl)

20- Separation of ions

21-Determination of $K_2Cr_2O_7$ Solubility in Water at Different Temperatures

22- Preparation of Copper (I) Chloride (CuCl)

23-Preparation of Copper (I) Iodide(CuI)

24-Determination of Equivalent Weight of Zinc(Zn)

25-Preparation of Chromium alum(Double salt) $KCr(SO_4)_2 \cdot 7H_2O$

19. Examinations:

1. Compositional: for example:

Why aren't these substances primary standard substances?

1-Hydrochloric acid

2-sodium hydroxide

3-potassium permanganate

2. True or false type of exams: for example:

1-If the concentration of Acetic Acid in aqueous solution is more than 5% the solution is called vinegar.

2-When HCl reacts with NaOH the result is NaCl + H₂O

3-Potassium permanganate is powerful reducing agent.

3. Multiple choices: for example:

1- Titration between HCl with Na₂CO₃, which indicator is used :

a- methyl orange

b- phenolphthalein

c- methyl red

2-Temporary hardness caused by these salts :

a- Ca(HCO₃)₂

b- Mg(HCO₃)₂

c- a and b

3-Oxalate ion C₂O₄²⁻ when reacts with permanganate ion MnO₄⁻, loses :

a- one electron

b- two electrons

c- five electrons

20. Extra notes:

21. Peer review

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