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**Department of Chemistry**

**College of Science**

**University of Salahaddin**

**Subject: Analytical Chemistry**

**Course Book – *1stYear***

**Lecturer's name M.Sc. Pary Mahdi Arif**

**Academic Year: 2018/2019**

**Course Book**

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| **1. Course name** | **Analytical chemistry- practical**  |
| **2. Lecturer in charge** | **Pary Mahdi Arif** |
| **3. Department/ College** | **Environmental science/ College Science**  |
| **4. Contact** | **e-mail: pary.aref@su.edu.krd** |
| **5. Time (in hours) per week**  | **Practical: 12 hours (Monday and Tuesday)**  |
| **6. Office hours** | **Sunday: 8:30 – 11:30****Wednesday: 9:00 – 12:00** |
| **7. Course code** |  |
| **8. Teacher's academic profile** **Academic achievements and Qualifications: (starting from the most recent degree)**

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| From- To | Degree | College-University | Country |
|  2001-2004 | M. Sc. in Analytical Chemistry, Department of Chemistry | College of Science- University of Salahaddin | Iraq |
|  1989-1993 | B.Sc. Chemistry, Department of Chemistry,  | College of Science- University of Salahaddin | Iraq |

**Experiences: (starting from the most recent position), please mention Year, Position and Place**

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| From- To | Post  | Department -College  | University |
| 2004-2010 present | Assistant Lecture | Chemistry department-College of Science | Salahaddin University |
| 2012-2014-present | Assistant Lecture | Environmental science Department-College of Science+Biology Department-College of Science | Salahaddin University |
| 2016-2018 present | Assistant Lecture | Chemistry Department-College of Science . | Salahaddin University |
| 2018-2019 present | Assistant Lecture | Environmental science Department-College of Science | Salahaddin University |

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| **9. Keywords** | **Analytical chemistry, Quantitative Analysis, Volumetric Analysis, Titration, Standardization method.** |
| **10. Course overview:** Analytical chemistry is a branch of chemistry which is both broad in scope and requires a specialised and disciplined approach. Its Analytical chemistry is designed to introduce students to the topics of chemical detection and measurements (qualitative and quantitative) as well as being a varied and important discipline in its own right. Analytical plays an essential role in many important fields (Biochemistry, Clinical Chemistry, Environmental science, Food and nutrition analysis and Pharmaceutical chemistry).Volumetric methods are based on on accurate measurements of volumes of a reagent solution of accurately known concentration taken for a reaction. The course provides fundamental principles of analytical chemistry, the correct procedure to handle, analyze, interpret and calculate experimental analysis. |
| **11. Course objective:**The student should take all explanation about Introduction to Analytical Chemistry as general, Analytical Chemistry Classification, Simple information about Qualitative Analysis, Quantitative Analysis, Volumetric Methods of Analysis, Types of Volumetric Methods, standard solutions, primary and secondary standard, standardization of non standard compounds, and determination of the concentration of a sample unknown.  |
| **12. Student's obligation**The students are required to do at least two closed exam for practical course besides other assignments. For every experiment the student must prepare full text paper which includes theory, calculation and discussion. All exams have marks, Full report also has marks, Quizzes also have mark, Activities in Lab. and working count marks and mark for attendance too. |
| **13. Forms of teaching**Our lecture is depending directly on showing the strong point in the lecture via data show depending on the power point program. More explanation and calculation with students by using white broad. Some time showing video for more explanation of experiments.  |
| **14. Assessment scheme**All exams have 5 marks which meaning summation of it equal to10 marks. Two marks on the reports and two marks on the quizzes and one mark for absence.**Theory / practical exam 1 : 12.5%****Theory / practical exam 2 : 12.5%****Classroom participation and assignments 10%****Which distributed as follows?****Report: 2.5****Quiz: 2.5****Absence: 2.5****Unknown: 2.5****Final Mark: 35% for practical.** |
| **15. Student learning outcome:**Analytical chemistry plays a very role in the chemistry field, all student after graduate they working in some labs, industrial companies, hospitals and in all these institution they need principles of analytical chemistry and they use all assessment of data. For this reason analytical chemistry is exists in all four stages in our department. Now if we see all labs which are randomly distributed in our community all of them are depending on analysis the samples which came from different sources.  |
| **16. Course Reading List and References‌:**1. Analytical Chemistry by Gary D. Christain, 5th edition3. Fundamentals of Analytical Chemistry by Douglas A. Skoog4. Quantitative Chemical Analysis by Kolthofe- Sanell5. Modern Analytical Chemistry by David Harvey6. Principles and Practice of Analytical Chemistry, F.W. Fifield7. Validation and Qualification in Analytical Laboratories, Ludwig Huber8. A Text Book of Quantitative Analysis; By: Vogel.9. Quantitative Chemical Analysis; By: Kolthoff.10. Quantitative Analysis; By: Alexeyev. |
| **17. The Topics:** | **Lecturer's name** |
|  1-Laboratory safety, An introduction to analytical chemistry, Laboratory glassware’s and apparatus.2- Methods of chemical preparation: preparation of solution from solid and liquid compounds.3- Introduction to volumetric analysis.4-Neutralization reactions(acid-base reaction), preparation and standardization of 0.1N HCl by standard Na2CO35- Preparation and standardization of approximate 0.1N NaOH by standardized HCl .6- Preparation and standardization of approximate 0.1N acetic acid by standardized NaOH.7- Determination of acetic acid in vinegar.8- seminar**9- First Lab Examination**10- Precipitation reactions, Standardization of AgNO3 by NaCl using Mohr method. 11- Determination of (Cl-) by standardized AgNO3 using Mohr method.12- Determination of (Cl-) using adsorption indicator (Fajan̛s method).13- Determination of (Br-) using adsorption indicator (Fajan̛s method).14- Determination of Ag+ by volhard method.15- Oxidation – Reduction Reactions: Preparation and standardization of potassium permanganate using Oxidation – Reduction titration16- Determination of Ferrous ion (Fe2+) by standardized KMnO4 in ferrous salt using Oxidation – Reduction titration.17- Determination of ferrous ion (Fe2+) using a standard K2Cr2O7 solution.18- Complex formation reactions: Preparation and standardization of ethylene diamine tetra acetic acid using complexometric titration.19- Determination of Zinc ion (Zn2+) using complexometric titration**20- Second Lab Examination**21- extraction of caffeine from tea22- Simple distillation23-Seminar**24- Optional exam**  | M.Sc. Bery Muhammed Rahman   Week 1Week 2 Week 3Week 4Week 5Week 6Week 7 Week 8Week 9Week 10Week 11Week 12 Week 13 Week 14Week 15Week 16Week 17Week 18Week 19 Week 20 Week 21Week 22Week 23Week 24 |
| **18. Practical Topics (If there is any)** |  |
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| **19. Examinations:*****1) Draw the shape of the following:*** ***Conical flask, Burette, Beaker, Cylinder.*****2) Complete the following sentences with an appropriate word or expression:** a- Analytical chemistry based on two principles: \_\_\_\_\_\_\_ , \_\_\_\_\_\_\_b- \_\_\_\_\_\_ is a chemical method from quantitative analysis.c- \_\_\_\_\_\_\_ is the point in a titration when the amount of added standard reagent is exactly equivalent to the amount of analyte.d-\_\_\_\_\_\_\_ Chemical compounds undergo change in color during titration which indicates the equivalence point.Typical Answer for a-Qualitative, Quantitativeb- Volumetric analysis. c- Equivalence point.d- Indicators.**3)Prepare the following:**a- Prepare 500ml, 2N HCl from concentrated HCl. 37% W/W and density (or Sp.gr.) 1.18 g/ml.b- Prepare 2 liter of 0.1M Na2CO3 from the solid material.Typical Answer for a-b- 0.1M = 0.1 mole Na2CO3 in one litter of solution  = 0.1 × 2 = 0.2 mole Na2CO3 in 2 litter of solution.  no. of mole = Wt. (g) / M.Wt. (g/mol).  Wt. g = no. of mole × M.Wt.  Wt. of Na2CO3 (g) = 0.2 × [(2×23) + (1×12) + (3×16)] = 21.2 g which is required to dissolved in 2 litter of water to obtain 0.1M Na2CO3 in this volume (2L). **4) Explain the followings**1. Sodium hydroxide is a non standard compound?
2. AgNO3 solution should be stored in a dark color bottle?
3. In the standardization of KMnO4 there is no need to use indicator?

Typical Answer for 1-Sodium hydroxide is extremely hygroscopic (because absorb humidity).NaOH + CO2 Na2CO3 + H2O2- Because the light reduce the Ag+ to Ag (the black ppt.)AgNO3 lightAg + NO + O2Ag+ + elight Ag (Reduction)3- - Because KMnO4 is a self indicator.**5) Write the name of the indicator that used in the following titrations process:** 1. Sodium oxalate with potassium permanganate.
2. Sodium chloride with silver nitrate
3. Hydrochloric acid with sodium carbonate.

Typical Answer for 1-KMnO42- K2CrO43-Methyl orange |
| **20. Extra notes:** |
| **21. Peer review**  |