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**Department of Chemistry**

**College of Education**

**University of Salahaddin**

**Subject: Separation Methods**

**Course Book: *2nd year (2nd semester)***

**Lecturer's name: Lec. Hawraz Sami Khalid**

**Academic Year: *2022-2023***

**Course Book**

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| **1. Course name** | Separation methods | |
| **2. Lecturer in charge** | Hawraz Sami Khalid | |
| **3. Department/ College** | Department of Chemistry / College of Education | |
| **4. Contact** | [Hawraz.khalid@su.ed.krd](mailto:Hawraz.khalid@su.ed.krd)  Tel: 07504654460 | |
| **5. Time (in hours) per week** | **Practical: 6 hours (3 groups x 2 hours)** | |
| **6. Office hours** | **Saturday; 8:30 AM – 2:30 PM** | |
| **7. Course code** |  | |
| **8. Teacher's academic profile** | Hawraz is a lecturer, Ph.D. student and has many types of research that belong to the environment. He is also an active instructor in the area of academic debate skills.  He studied his first degree at the University of Salahaddin with a BSc (Hons) in chemistry. In 2011, he attended an MSc course in the School of Applied Science/ University of Huddersfield –UK (Full time, 2011-2012). He got the degree of Master of Science with distinction in Analytical Chemistry in the UK through the HCDP program. His thesis is entitled "Microwave Induced Plasma for the Destruction of Organic Pollutants." | |
| **9. Keywords** | Motivation, Learning, Professional, New Technique, Application, Effective, Improvement, Academic Skills, and Good Assessment | |
| **10. Course overview:**  Lectures during the second course focus on separation methods. General introduction on separation methods will be given to the students. In addition, advanced separation techniques are going to be explained in detail. Moreover, application of separation methods will be discussed during this course. There are various methods that can be used to separate analyte in samples by chromatography such as, ion exchange, paper, thin layer, HPLC, GC, and gel chromatography. Additionally, Liquid-Liquid extraction will be discussed in detail. | | |
| **11. Course objective:**  The objectives of this lecture are to learn basic theory of separation methods and advanced separation techniques like LC, PC, TLC, IEC, GC, and HPLC chromatography techniques. As a result, new techniques can develop student's ability during these courses. Students will learn more information on basic theory of separation. Thus, students will learn new methods to analysis and separate metals quantitatively in various samples. Additionally, they can find principles of separation like partition and adsorption. | | |
| **12. Student's obligation**  This module includes one writing exam. Students get many questions during this course as tutorials, quizzes and home works. Thus, it will help students to understand this course in detail and get information for the final examination. Students should be ready in class. | | |
| **13. Forms of teaching:**  Using more effective and interesting motivated learning method with examples, quizzes, reports and tutorials. Materials during lecture include effective power point slide, white board, different chalk and marker pen and data show. | | |
| **14. Assessment scheme**  **Grading for examinations, quizzes, reports, home works, activities in the lab and etc…**  **12** grades for exams (One Midterm EXAMINATION) pts  **3** grades for quizzes pts  **Note:** two extra mark for no absent class, one extra mark for one absent class (in final out)  There is no extra marks for more than one absent | | |
| **15. Student learning outcome:**  **Students will learn to:**   * Know different analysis method, such separation methods * Analyze analyte in various sample quantitatively * Work to find active/desired components percent in accurate & precision range * Solve their problems during the analysis * Assess and find ingredients sample * Separate and determine analyst in a mixture * Knows various simple and advanced separation technique | | |
| **16. Course Reading List and References‌:**  **There are some recommended references that can be used for furthermore information:**   * D. A. Skooge and D.M. West, Fundamental of Analytical Chemistry, 9th edition * D. A. Skooge and N. Holrer, Principles of Instrumental Analysis, 5th edition * Gary D. Christian, Analytical Chemistry, 5th edition * Harvey, D., (2000), Modern Analytical Chemistry. * Kermer, R., Mermet, M., Otto, M., Valcarce, M. and Widmer, H. M. (2004), *Analytical Chemistry: A Modern Approach to Analytical Science.* 2nd edition. * Jeffery, G., Bassett, J., Mendham, J., and Denney, R., (1989), *VOGEL’S: Text book of Quantitative Chemical Analysis*, 5th edition, New York. * Pandey, O. P., Bajpai, D. N., and Giri, S., (2009), *Practical Chemistry (For B.Sc. I, II & III Year Student)*, New Delhi. * Kar, A. (2005). *Pharmaceutical drug analysis*. 2nd edition, New Delhi. | | |
| **17. The Topics: Theory** | | **Lecturer's name** |
| **Syllabus of second semester Program:**  **Expecting number of weeks with lecture syllabus:**  1- Aim of separation study:  Liquid-Liquid separation by simple and fractional distillation Principle.  2- Solvent extraction, Distribution coefficient, and extracted percent.  3- Solvent extraction of methods, Analytical separations, and there applications  4- Principle theory & classification techniques of separation by chromatography  5- Vandeemter equation  6- Column Resolution, and Mathematical calculations  7- Plane chromatography  8- Open column chromatography, Ion exchange, and gel chromatography.  9- Principle theory of Gas chromatography.  10- Schematic diagram of general gas chromatography.  11- Priciple theory of Detectors, types of Detectors.  12- Principle theory, and advantage of high performance liquid chromatography | | Mohammad Salim Abdullah |
| **18. Practical Topics (If there is any)**  **Part (II): Separation methods**  Exp. **1**: Separation of Fe(III) from Al (III) by precipitation Exp. **2**: Separation of Barium as Chromate from Calcium Exp. **3**: Separation of Pb as chromate from Ag, Zn, Cu and Ni  Exp. **4**: Distribution Coefficient KD of iodine between tetrachlorocarbon and water & aqueous solution of potassium iodide  Exp. **5**: Extraction of Elements  Exp. **6**: Calculation of Ion –Exchange capacity  Exp. **7**: Determination of the total cations in water  Exp. **8**: Determination and Separation of Zn and Mg on anion  exchanger  Experiment **9**: Jones redactor (Reduction of ferric ion to ferrous ion with amalgamated zinc)  Exp. **10**: Separation of Pb2+, Ag+, Hg2+ by paper chromatography  Exp. **11**: Separation of some amino acids by paper chromatography  Exp. **12**: TLC and separation of amino acid derivatives  Exp. **13**: Determination of analgesics by thin layer chromatography  Exp. **14**: Separation of sodium chloride by dialysis | | **Mohammad Salim**  **and**  **Lec. Hawraz Sami Khalid** |
| Nothing practical experiment | | **Nothing** |
| **19. Examinations:**  ***1. Compositional:*** includes various questions and most of them are calculations as problems.  **Ex: Answer all of the following:**   1. Prove that Wn = Wo (V1 / KDV2+V1)n, if KD = [solute]extracted/[solute]remained ? 2. What mass in grams of CO2 is evolved in the complete decomposition of a 2.300-g sample that is 38.0% MgCO3 and 42.0% K2CO3 by mass? 3. In the determination of crystallization water, 2 g of FeSO4.XH2O was heated in 125 for 1h. Find the number of X (number of crystalline hydride molecule) in the salt if the practically %H2O and %E are equal to 43.15% and -4.85%, respectively? 4. A 0.8102-g sample of impure Al2(CO3)3 decomposed with HCl; the liberated CO2 was collected on calcium oxide and found to weigh 0.0515 g. Calculate the percentage of aluminium in the sample?   ***2.******True or false type of exams:* Answer the following by True (or False ( ?**   1. Quantitative [analysis](https://www.thoughtco.com/definition-of-qualitative-analysis-604626) tells 'what' is in a sample, while qualitative analysis is used to tell 'how much' is in a sample. 2. In TLC, short-wave or long-wave UV-light is used for detection of coloured substances. 3. In gravimetric methods, we determine the volume of the analyte or some compound chemically related to it.   ***3. Multiple choices:***   1. Convert an analyte to its elemental form for weighing.   a- organic precipitating agent b- inorganic precipitating agent c- reducing agent   1. Inorganic precipitating agents form .............................. or ............. with the analyte.   a- slightly soluble salts or hydrous oxides b- acids or bases c- liquids or solids  **4. Explain the difference between:**   * Specific precipitating agent **and** selective precipitating agent * Precipitation **and** co-precipitation * Nucleation **and** particle growth | | |
| **20. Extra notes:** There is no any suggestion.  **21. Peer review پێداچوونه‌وه‌ی هاوه‌ڵ** | | |