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**Physics Department**

**College of Science**

**University of Salahaddin**

**Subject: General Chemistry I**

**Course Book –2nd Year / Medical physics**

**Lecturer's name: Dr. Ibrahim Q. Saeed**

**Academic Year: 2022-2023**

**Course Book**

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| **1. Course name** | | **General Chemistry I** | |
| **2. Lecturer in charge** | | **Dr. Ibrahim Q. Saeed & Sara H. Assaf** | |
| **3. Department/ College** | | **Chemistry - College of Science** | |
| **4. Contact** | | **e-mail: ibrahim.saeed@su.edu.krd** | |
| **5. Time (in hours) per week** | | **Theory: 2**  **Practical: 2** | |
| **6. Office hours** | |  | |
| **7. Course code** | |  | |
| **8. Teacher's academic profile**  Academic achievements and Qualifications:   |  |  |  |  | | --- | --- | --- | --- | | From- To | Degree / Department | College-University | Country | | 2013 to 2017 | PhD in Analytical Chemistry, Department of Chemistry | School of Chemistry, Cardiff University | UK | | 2007-2009 | M. Sc. in Analytical Chemistry, Department of Chemistry | Garware College, University of Pune. | India | | 2001-2005 | B.Sc. in Chemistry, Department of Chemistry, | College of Science- University of Salahaddin | Iraq |  1. ***Teaching Activities***  |  |  |  |  | | --- | --- | --- | --- | | From- To | Subject | Stage-College | University | | 2019 to date | Analytical chemistry | 2nd year- Medical physics/ Physics department/ college of science | Salahaddin University | | 2017 to 2019 | Analytical Chemistry-  Gravimetric Analysis and Separation methods | 2nd- year students / Chemistry Department-Faculty of Science and health | Koya University | | 2010 to 2012 | Analytical Chemistry-  Gravimetric Analysis | 2nd year students / Chemistry-Department-College of Science | Salahaddin University | | 2005-2007 | Analytical Chemistry- Separation Methods-Practical | 3rd year students- College of Science | Salahaddin University |   **Published articles, papers and researches:**   |  |  |  | | --- | --- | --- | | ***Title of Abstract/Paper*** | ***Journal*** | ***Accepted?*** | | A novel cobalt complex for enhancing amperometric and impedimetric DNA detection. | Electrochimica Acta | yes | | The Structure of Linkers Affects the DNA Binding properties of Tethered Dinuclear Ruthenium(ii) Metallo-Intercalators. | Chemistry A European Journal | yes | | Homo- and heteroleptic phototoxic dinuclear metallo-intercalators based on RuII(dppn) intercalating moieties: synthesis, optical and biological studies. | Angewandte Chemie International Edition | yes | | Analysis of isothermal titration calorimetry data for complex interactions using I2CITC. | In book: Microcalorimetry of Biological Molecules, Vol. 1964 | yes |   ***Conferences and Scientific activities:***   |  |  | | --- | --- | | ***Date*** | ***Title of Meeting/Conferences*** | | 10-05-2013 | RCS POC postgraduate meeting / United Kingdom | | 0 6 –11/07/2014 | [Directed Assembly Network Summer School](http://beyondthemolecule.org.uk/d6/) / Cambridge University/United kingdom | | 11-12/5/2015 | 14th Annual Cardiff chemistry conference /Cardiff University/ United Kingdom | | | | |
| **9. Keywords** | Quantitative analysis, Gravimetric analysis, Gravimetric methods (Precipitation gravimetry, Volatilization, etc..), Separation methods. | | |
| **10. Course overview:**  General chemistry is a chemistry course that studies fundamental concepts, theories, and laws of   chemistry, as well as the structure, properties, and methods of obtaining the chemical elements  and major chemical compounds. The concepts taught in a typical general courses include stoichiometry, periodic table of elements, acid base chemistry, chemical bonding and chemical equilibria, which are mostly covered by analytical chemistry.  Analytical chemistry is a branch of chemistry which is both broad in scope and requires a specialized and disciplined approach. Its applications extend to all parts of an industrialized society. Analytical chemistry plays an essential role in many important fields such as biochemistry, clinical chemistry, environmental science, food and nutrition and pharmaceutical chemistry. Analytical chemistry touches every aspect of our daily lives.  This course gives fundamental concepts and principles of analytical chemistry and focuses especially on the quantitative analysis of important chemical species in aqueous and solid samples by titrimetric techniques. This course also presents fundamental concepts of solution preparation and unit expression for different types of solutions. The students will learn how to prepare different chemical solutions and design an analytical method, based on what information is needed, how to obtain a laboratory sample that is representative of the whole and how to prepare a sample solution for analysis. | | | |
| **11. Course objective:**  This course provides fundamental principles of volumetric analysis. The main objective which this course offers to the students is complete understanding of the most aspects of volumetric analysis. It will also help students how to correctly handle and interpret experimental measurements; the students will also learn how to establish and perform an analytical procedure of volumetric Analysis. | | | |
| **12. Student's obligation**  Students must attend classes punctually and regularly. The students must also submit all assignments by the set deadline and attend any exams that are part of their course. | | | |
| **13. Forms of teaching**  Data show and white board. A power point lecture will be given to all students before lecture day in order to have their own hard copy. | | | |
| **14. Assessment scheme**  The students are required to do two closed exams during the course period. So that the final grade will be based upon the following criteria:  Exams (closed and optional): 12%  Quiz tests and homework, Classroom participation: 3%  Practical Course 35%  Final Exam: 50% theoretical only | | | |
| **15. Student learning outcome:**  Students will be able to design and carry out titrimetric experiments, as well as accurately record and analyze the results of such experiments. In addition, students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems. The students will also be prepared to perform careful, reproducible and accurate laboratory work: Important practical skills that the student will ultimately need in order to perform well in any laboratory environment. | | | |
| **16. Course Reading List and References‌:**  The student can find additional information and examples in the following references  *1-Fundamental of analytical chemistry by Douglas A. Skoog and Donald M. West*  *2-Quantitative\_Chemical\_Analysis by Vogel,\_Arthur 5th edition*  *3-Quantitative Chemical Analysis by Daniel C. Harris* | | | |
| **17. The Topics:** | | | **Lecturer's name** |
| Course Program for the first semester (Analytical Chemistry)  **Week 1:**  1- Periodic table of the elements  2- Trends in the Periodic Table  **Weeks 2**  1- Introduction to analytical chemistry  2- The Chemical Composition of Aqueous Solutions  3- Acids and Bases  **Week 3 & 4**  1-Different methods for expressing concentration  2- Preparation of chemical solutions  3- Some problems  **Week 5&6:**  1- Volume-volume percent (% v/v)  2- Weight-to-Volume percent (% w/v):  3- Parts per million (ppm) and parts per billion (ppb)  **Week 7&8:**  1- Chemical Stoichiometry  2- Chemical equilibriums  3-The effect of a common ion on the solubility of a precipitate  **Week 9:**  1- Dissociation Equilibria for weak acids and bases  2- Buffer solutions  **Week 10 &11:**  1- Gravimetric methods of analysis  2-Classification of gravimetric analysis  3- Steps of gravimetric analysis  4- Calculation in gravimetric analysis  **Week 12:**  1- The solubility of precipitate  2- Factors that affect the solubility of precipitates  **Week 13:**  1- Mechanism of precipitate formation  2- Types of precipitating agents  **Week 14:**  First closed exam | | | Lecturer's name: Dr Ibrahim Q. Saeed.  2.00 Hours |
| **18. Practical Topics (If there is any)**  **Week 1:**  Introduction to laboratory safety  **Week 2:**  Preparation of solutions  **Week 3:**  Introduction to volumetric analysis  **Week 4&5:**  Preparation and standardization of 0.1N hydrochloric acid (HCl) using standard sodium carbonate (Na2CO3)  **Week 6&7:**  Preparation and standardization of approximately 0.1N sodium hydroxide (NaOH) using standardized hydrochloric acid (HCl)  **Week 8:**  Preparation and standardization of approximately 0.1N acetic acid solution (CH3COOH) by using standardized sodium hydroxide (NaOH)  **Week 9:**  Application of Neutralization Titration (Acid – Base Titration): Determination of *Acetic Acid* in Vinegar  **Week 10 &11:**  Standardization of silver nitrate (AgNO3) solution & determination of chloride ion (Cl-) using potassium chromate as indicator (Mohr method)  **Week 12:**  Preparation and standardization of 0.01N KMnO4 solution by standard sodium oxalate (Na2C2O4**)**  **Week 13:**  First Practical Exam | | | Lecturer's name:  1-Dr Ibrahim Q. Saeed  2- M.SC. Sara Assaf  2.00 Hours |
| **19. Examinations**  ***1- Explain the following:***   1. **Why organic precipitating agents are more favorable than inorganic agents?**   Answer:  1- The chelate compound obtained by the reaction between metal ions and organic precipitant are  generally, highly insoluble.  2- The organic precipitant often has a high molecular weight. Thus a small amount of metal may yield a large weight of precipitate, minimizing weighing errors.  3- Many organic precipitants are quite selective, they form chelate compounds with only a few ions. Therefore, these ions can be determined gravimetrically in the presence of other ions.  4- The precipitates obtained with organic reagents are often coarse and bulky and hence can be easily filtered. | | | |
| **20. Extra notes:** | | | |
| **21. Peer review پێداچوونه‌وه‌ی هاوه‌ڵ**  This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.  *(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject)* | | | |