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**Department of : Biology**

**College of : science**

**University of: Salahaddin**

**Subject: practical instrumental analysis**

**Course Book – 4th stage**

**Lecturer's name: Huda Ali Ibrahim**

**Academic Year: 2022/2023**

**Course Book**

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| **1. Course name** | Practical instrumental analysis |
| **2. Lecturer in charge** | Huda |
| **3. Department/ College** | Chemistry / Science |
| **4. Contact** | e-mail: huda.ibrahim@su.edu.krd |
| **5. Time (in hours) per week**  | Practical: 6 H  |
| **6. Office hours** |  |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | BSc. ( 2008) MSc. (2014) (assist lect. )  (Analytical chemistry- Spectrophotometric Analysis) |
| **9. Keywords** | Quantitative analysis , Spectrophotometry ,flame photometry ,PH-meter , potentimetry, separation ,conductometry . |
| **10. Course overview:** Chemical analysis includes the use of instrumentation to solve an analytical problem. The use of instrumentation has now become a part of chemical analysis and is applied for all areas of pure and applied science. Any single instrument could not solve an analytical problem; instead, several instrumental techniques are required to solve the problem to a maximum extent. Hence instrumentation plays an important role in the production and evaluation of new products and in the protection of consumers and the environment. |
| **11. Course objective:**Students who complete this class will understand that analytical instruments are not black boxes, but rather complex tools whose utility depends in detail on how analysts both configure and apply them. Towards that end there are three primary objectives. First, students will learn facts about major classes of instruments commonly used in chemical analysis. Their knowledge will be captured by the ability to block diagram these complex pieces of equipment, and tailor the specifications to the measurement needs. Second, the course will cover the basics of instrumental calibration and quality control. Analysts will develop the ability to apply calibration curves, internal standards and the method of standard addition as needed for various measurement problems. Finally, students must learn how to select and tailor the best instrumental method given a particular measurement need. This higher level skill involves critical evaluation of the strengths and limitations of the various method, and the ability to understand the context behind a measurement need. |
| **12. Student's obligation**The student are required to do at last two closed exam at the mid of each semester for practical course beside other assignments. For every experiment the student must prepare full text paper which includes theory , calculation and discussion ( report ).We have also do practical /practical examination .  |
| **13. Forms of teaching**Power point ,data show |
| **14. Assessment scheme** Report : 10  Theory / practical: 10 Practical / practical : 15Final exam: 35 % for practical.  |
| **15. Student learning outcome:** Any chemist has to understand how to analyze samples - whether they are water samples, soil samples or bits of a painting. Most often chemists do these using instruments of some sort. Machines like spectrophotometry or flame photometry , conductometry ….etc. can indicate both what's in a sample (qualitative) as well as how much of something there is(quantitative).  |
| **16. Course Reading List and References**1-Analytical Chemistry by Gary D.Christain, 5th edition2-Fundamental of Analytical Chemistry by Douglas A. Skoog3-Principles of instrumental Analysis third edition  Douglas A.Skoog4-Analytical Chemistry Principles by John H.Kennedy5-Chemistry Experimentals for Instrumental methods  Donald T.Sawyer6- Instumental method of chemical analysis third edition  Galen w.Ewing  |
| **17. The Topics:** | **Lecturer's name** |
|  / | Lecturer's nameex: (2 hrs)ex: 14/1/2023 |
| **18. Practical Topics (If there is any)** |  |
| Week 1:Explain the principle and theory of methods used in instrumental analysis such has potentiometric, conductometric and spectrophotometric method.Week 2 :Explain the theory and principle of each experimental.Week 3 :Spectrophotometric determination of copper sulfate.Week 4: Potentiometric titration of chloride & iodide mixture , calculation of KSP for AgCl & AgIWeek 5 :A simple spectrophotometric method for the determination of ascorbic acid in pharmaceutical preparations.Week 6 :Determination of acetyl salicylic acid by ultraviolet spectrophotometry Week 7 :Conductometric titration of HCl and CH3COOH with NaOH ,determination of Ka for acetic acidWeek 8 :Spectrophotometric determination of the PKa value of an indicator Week 9 :Determination of sodium and potassium by flame photometryWeek 10 : PH- Titration of H3PO4 , calculation of K1, K2 and K3 Week 11 :Spectrophotometric analysis of aspirinWeek 12:Determination of Ca +2 by flam photometry using standard addition method*Course program ( second semester ) :*Week 1 :Week 2 :Week 3 :Week 4 :Week 5 :Week 6 :Week 7 :Week 8 :Week 9 : Week 10 :Week 11: |  (2hrs)14/1/2023 |
| **19. Examinations:** University of Salahaddin Analytical Chemistry 4th Stage College of Science Practical Examination Date: 13/1/2023 Biology Department (2022-2023) Time: 60 min.**Q 1**- Write the chemical equation (structure) for the following. (4 M)1. Determination of iron in water.
2. Determination of sulphate ion

**Q2- (6M)** **a) -**  Give the reason for the following?1. Flame photometer used for the determination of alkali and alkali earth metals?
2. Using a quartz cell in UV spectroscopy?
3. Addition of reducing agent to the solution of sample for the spectrophotometric determination of iron (II) by reaction with 1, 10-phenanthroline?

b)-Write three applications of turbidimetry and nephelometry techniques. Q3- (4M)1- What is the concentration of a sodium (23g/mol), in parts per million, if 0.02 gram of Na3PO4 (98 g/mol) is dissolved in 1000 grams of water? 1. Prepare 100ml of 0.1N HCl from a concentrated solution that has a specific gravity of 1.18 and is 37% (w/w)HCl. Atomic weight (H=1, Cl=35.45) g/mol.

**Q4-** The following data were obtained for Ni+2 (A.Wt.58.69 g/mol) analyzed by reaction with Diethyleglyoxime reagent at pH 9 to product a red complex which is measured at the maximum wavelength by using 1-cm quartz cell. (6M)

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| --- | --- | --- | --- | --- | --- |
| Ni+2 ppm | 0 | 20 | 40 | 60 | 80 |
| Abs. | 0 | 0.23 | 0.44 | 0.67 | 0.92 |

1. Plot the calibration curve between absorbance and concentration?
2. Calculate the molar absorptivity (Ɛ) from the plot.
3. A 50ml sample of sewage water containing Ni+2 was treated by the same procedure above and it was found to have a percentage of transmittance (%T) of 33%. Calculate the molar concentration of Ni+2 in the sewage water.

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| **20. Extra notes:**Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks. |
| **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).*ئه‌م کۆرسبووکه‌ ده‌بێت له‌لایه‌ن هاوه‌ڵێکی ئه‌کادیمیه‌وه‌ سه‌یر بکرێت و ناوه‌ڕۆکی بابه‌ته‌کانی کۆرسه‌که‌ په‌سه‌ند بکات و جه‌ند ووشه‌یه‌ک بنووسێت له‌سه‌ر شیاوی ناوه‌ڕۆکی کۆرسه‌که و واژووی له‌سه‌ر بکات.هاوه‌ڵ ئه‌و که‌سه‌یه‌ که‌ زانیاری هه‌بێت له‌سه‌ر کۆرسه‌که‌ و ده‌بیت پله‌ی زانستی له‌ مامۆستا که‌متر نه‌بێت.‌‌  |