



Jordan University of Science and Technology
Faculty of Pharmacy
Pharmacy Department

PHAR225 Pharmaceutical Analytical Chemistry

First Semester 2021-2022

Course Catalog

3 Credit Hours. Jordan University of Science and Technology Faculty/College of Pharmacy Department of Medicinal Chemistry and Pharmacognosy First Semester 2021/2022 Course Specifications Title & Instructor: Prof. Adnan M. Massadeh Course Title Pharmaceutical Analytical Chemistry Course Number Pharm 225 Prerequisites Chem. 103 Course Website Lecture notes, news and updates?.etc. will be posted on <https://elearning.just.edu.jo/> which is the primary method by which information will be disseminated to everyone in the class. Please check it on a regular basis. Instructor Prof. Adnan M. Massadeh Office Location Faculty of Pharmacy - L4 P1 Office number: 415 Office Phone 00962-2-7201000 ext. 23545 Office Hours 9: 00- 10:00 Sunday, Monday, Tuesday, Wednesday 11:30-12:30 Sunday, Wednesday Any time is available E-mail massadeh@ just.edu.jo Teaching Assistant NA Course Aims and Objectives The aim of this course is to explain the fundamental analytical methods of analysis including the theoretical background and the calculations needed with their applications in pharmaceutical analysis. The conventional analytical methods are discussed in this course with the relative terms used and all the mathematical calculations required including the statistical evaluation of the analytical data obtained and as it is required by the official methods of analysis stated in the pharmacopeias. Course objectives 1) To set up good knowledge about the fundamental pharmaceutical methods of analysis applied in all pharmaceutical. 2) To introduce and discuss in details the main conventional methods used in pharmaceutical assays. 3) To understand all the analytical terms & expressions used in pharmaceutical analytical methods. 4) To interpret and evaluate all the results and data obtained . 5) To learn about all types of chemical reactions and the mathematical steps involved in quantitative analytical methods. 6) To obtain information about the Pharmacopeias and their uses in pharmaceutical labs. Objectives Weights 1) To provide a strong background in chemical principles that are important in analytical chemistry. 20% 2) To show the importance of application of statistical methods in analytical chemistry. 15% 3) To introduce a wide range of techniques that are useful in modern analytical methods. 15% 4) To develop the skills needed to solve analytical problems in a quantitative manner. 25% 5) To teach the students the laboratory skills that will give students confidence in their ability to obtain high quality analytical data. 15% 6) To show the importance of analytical chemistry in agriculture, medicine, industry and other aspects in our life. 10% Course Description Analytical Chemistry is concerned with the chemical characterization of matter. Chemical make up everything we use or consume, and knowledge of the chemical composition of many substances is important role nearly in nearly all aspects of chemistry, for example pharmaceutical, clinical, forensic, environmental chemistry. This course deals with methods for determining the chemical composition of samples matter. A qualitative method yields information about the identity of atomic or molecular species or the functional groups in the sample. A quantitative method provides numerical information as to the relative amount of one or more of these components. For more details see below the course content. Program competencies Domain 1: Foundational Knowledge 1.1 Learner (Learner): apply knowledge from the foundational sciences (i.e. pharmaceutical, Analytical Chemistry, method of analysis, validation of analytical methods Active Learning Strategies 1. STBE: Evaluation cases within group discussion. 2. Problem solving formulated in exam type questions 3. Argumentative discussions between student groups Text Book & References Title Analytical Chemistry Author(s) Gary D. Christian Publisher Wiley and Sons Year 2013 Edition 7th Edition Book Website References D. Skoog, D. West, F. Holler and S. Grouch, Analytical Chemistry: An introduction, 7th ed., Sanders College Publishing, New York, 2000. Intended Student Learning Outcomes (ISLOs) Upon successful completion of this course, students should be able to: ISLOs Related Objective(s) Reference(s) 1) Set up principles of conventional analysis 1,2 mentioned above Chapter 1/ Text 2) Identify all requirements for quantitative analysis 2,3,4 mentioned above Chapter 1/ Text 3) Have good mathematical skills in expressing solutions 2,3,4 mentioned above Chapters 1+ 2/ Text 4) Solve problems related to quantity of unknown compounds 3,4, 5, 6 mentioned above Chapters 2+3/ Text 5) Interpret data and results and give statistical evaluation 2,3,4 mentioned above Chapters 1+3+4/ Text Deal with the pharmaceutical official methods of analysis Chapters 4+5/ Text Teaching and learning methods are designed to achieve the course objectives. Those methods include: 1. Lecture notes and handouts 2. Data show and computer in lectures 3. Problem solving 4. Group discussion 5. Overview the lectures using the overhead projector. 6. Illustrate the importance concepts on the board. 7. Solve the problems that are related to the course. 8. Discuss and ask the students some question in order to activate the lecture by participating the students to answer the questions. 9. Give a summary for the lecture. 10. Encourage the students to prepare an assignment related to the course using the internet. 11. Encourage the student to ask any question during the

office hours or any time if possible. Assessment Assessment Type Expected Due Date Weight Midterm 6th week 50 % Final Exam 14th week 50 % Useful Resources 1. Textbook, References., Class notes and Internet 2. A. H. Beckett and J. B. Stenlake: Practical Pharmaceutical Analysis, 4th ed., Part (I), The Athlone Press, London, 1988. 3. The British Pharmacopoeia, 2003. 4. K. A. Connors: A Textbook of Pharmaceutical Analysis, 3rd ed., John Wiley & Sons, Inc., New York, 1982. Course Content Week Topics Chapter in Text/handouts 1 I. An introduction to Analytical Chemistry Ch.1 (handouts) Classification: qualitative and quantitative analysis 2 Definitions and Basic Concepts The Analytical Process Choice of Analytical Methods for Chemical and Pharmaceutical Analysis 3 II. Data Handling CH.2 (handouts) Accuracy and Precision Significant Figures Rounding off Types of Errors 4 Ways of Expression Accuracy Ways of Expression Precision The Mean, Median, Standard Deviation, Standard Error of the Mean, Control Charts Confidence Limit Significant tests (Variance, F-test, t-test, Q-test). 5 III. Stoichiometric Calculations CH.3 (handouts) Review of Fundamental Concepts Concentrations of Solutions Expression of Analytical Results Volumetric Analysis Calculations Molarity Volumetric Concentrations Normality Volumetric Concentrations Formality Molality 6 Titer Weight Relationships: Gravimetric Analysis Overview of Some Analytical Methods: Titrimeric Methods of Analysis a. Acid-Base Titration b. Precipitation Titration c. Oxidation-Reduction Titrations d. Compleximetric Titrations e. Gravimetric Methods of Analysis 7 IV. General Concepts of Equilibrium CH. 4 (handouts) Chemical Reactions: The Rate Concept Types of Equilibria Gibbs Free Energy and Equilibrium Constant Le Châtelier's Principle Temperature Effects on Equilibrium Constant Pressure Effects on Equilibria Effect Concentrations on Equilibria Catalysts Completeness of Reactions 8 Equilibrium Constants for Dissociating or Combining Species Calculations Using Equilibrium Constants The Common Ion Effect Systematic Approach to Equilibrium Calculations Heterogeneous Equilibria Activity and Activity Coefficient The Diverse Ion Effect: The Thermodynamic Equilibrium Constant 9 V. Acid Base Equilibria CH. 5 (handouts) Acid-Base Theories Acid-Base Equilibria in Water The pH Scale Ph at Elevated Temperature: Blood pH Weak Acids and Bases 10 Salts of Weak Acids and Bases Buffer solutions and Physiological Buffers Applications in pharmaceutical analyses Polyprotic Acids and Their Salts 11 VI. Acid-Base Titrations CH. 6 (handouts Strong Acids Versus Strong Base Detection of End Point: Indicators Weak Acid Versus Strong Base Weak Base Versus Strong Acid 12 Titration of Sodium Carbonate Titration of Polyprotic Acids 13 VII. Mixtures of Acid and Bases (handouts) Titration of Amino Acids Kjeldahl Analysis Standard Acid and Base Solution Non Aqueous Solvents Titrations Additional Notes Exams ? The format for the exams is generally (but NOT always) as follows: Multiple-choice and short essay questions. ? Grades will not be given out via e-mail ? All exams are closed book and notes. The final exam is comprehensive (covers all the material). ? Instructor should return exam papers graded to students not after the week following the exam date. ? Incomplete exams should not be given unless there is a valid excuse and they need approval from the dean. ? Arrangements to take an exam at a time different than the one scheduled MUST be made prior to the scheduled exam time. Cheating The commitment of the acts of cheating and deceit such as copying during examinations, altering examinations for re-grade, plagiarism of homework assignments, and in any way representing the work of others as your own is dishonest and will not be tolerated. Standard JUST policy will be applied المادة 7: إذا ضبط الطالب أثناء الامتحان أو الاختبار متلبساً بالغش فتوقع عليه العقوبات التالية مجتمعة: أ- اعتباره راسباً Attendance ? في ذلك الامتحان أو الاختبار. ب- الغاء تسجيله في بقية المساقات المسجل لها في ذلك الفصل. ج- فصله من الجامعة لمدة فصل دراسي واحد يلي الفصل الذي ضبط فيه Excellent attendance is expected. ? JUST policy requires the faculty member to assign ZERO grade (35) if a student misses 10% of the classes that are not excused, and a total of 20% with approved valid excuses. ? If you miss class, it is your responsibility to find out about any announcements or assignments you may have missed. participation ? Students are expected be proactive and to be fully engaged in interactive class discussions. Laboratory ? Students should attend all the practical labs and participate in every practical laboratory experiments. Students should submit a report for every experiment He/she attend and he/she is subjected to quizzes and both practical and theoretical exams for evaluations. Drop Date (withdraw) ? Last day to drop the course is before the twelve (12th) week of the current semester. Workload ? Average work-load student should expect to spend is 3 hours/week Classroom Cell Phone Policy ? The use of cell phones, smart phones, or other mobile communication devices is disruptive, and is therefore prohibited during class without permission. ? Except in emergencies, those using such devices must leave the classroom for the remainder of the class period.

Instructor	
Name	Prof. Adnan Massadeh
Office Location	P1 L1
Office Hours	Sun : 08:30 - 10:00 Sun : 11:30 - 12:30 Mon : 08:30 - 10:00 Tue : 08:30 - 10:00 Wed : 08:30 - 10:00
Email	massadeh@just.edu.jo

Class Schedule & Room

Section 1:

Lecture Time: Sun : 10:00 - 11:30

Room: D4203

Section 2:

Lecture Time: Mon : 10:00 - 11:30

Room: P1102

Section 3:

Lecture Time: Tue : 10:00 - 11:30

Room: D4203

Section 4:

Lecture Time: Wed : 10:00 - 11:30

Room: P1102

Relationship to Program Student Outcomes (Out of 100%)

SO1.1	SO2.1	SO3.2	SO3.3	SO2.2	SO2.3	SO2.4	SO3.1	SO3.4	SO3.5	SO3.6	SO4.1	SO4.2	SO4.3	SO4.4

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