	وزارة التعليم العالي والبحث العلمي **جامعة المستقبل** كلية العلوم قسم الكيمياء الحياتية	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Quantitative Analytical chemistry			**Module Delivery**	
Module Type	Basic			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	UOMU036121				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Dept. of Biochemistry		**College**	College of Science	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**	1.0	

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	

Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. Enabling students to obtain knowledge and understanding the methods of expressing solution's concentration and quantitative calculations 2. Enabling students to obtain knowledge and understanding the chemical equilibrium, the importance of equilibria, equilibria involving weak electrolyte solutions, ionization of water, acids and bases. 3. Enabling students to acquire knowledge and understanding the equilibrium of poorly soluble solids and formation of complexes 4. Enabling students to obtain knowledge and understanding the chemical equilibrium of polyprotic acids, systematic treatments of equilibrium, mass and charge balance equations 5. Enabling students to obtain knowledge and understanding the ionic strength, activity and activity coefficient 6. Enabling students to obtain knowledge about solutions and solubility of sediments, dissolution yield, factors affecting precipitation, common ion, and estimation of acid function. 7. Enabling students to obtain knowledge about solubility of metal hydroxides, solubility and formation of ionic complexes, effect of ionic strength, separation of ions 8. Enabling students to obtain knowledge about hydrolysis of salts and calculation of acid functions for different types of salts Enabling students to obtain knowledge about buffer solutions, Henderson-Hasselbalch equation, Buffer capacity
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding of analytical chemistry, its classifications, and its importance in daily life 2. Laws related to concentration calculations and how to convert from one unit to another 3. The importance of chemical balances and their industrial and laboratory applications 4. Identify the laws related to the equilibria of poorly soluble substances and the formation of complexes 5. Identify the equilibrium constants for acidic, basic, and polyprotic acids solutions and how to extract the acidity function. 6. Recognizing the importance of ionic strength of different solutions 7. Identify the types of solutions, distinguish between them, sediments, and factors affecting the sedimentation process 8. Distinguish between neutral, acidic, basic, and amphoteric salts and calculate the acidity function for each type. Understanding the meaning of buffer solutions, their types, how to prepare them, and choosing the preferred solution for a specific application in chemical analysis.
Indicative Contents المحتويات الإرشادية	- what is analytical chemistry, history of analytical chemistry, what do analytical chemist do, application of analytical chemistry, the two main parts of analytical chemistry, classifying of analytical chemistry technique, steps of chemical analysis

	- methods of expression of concentration, molarity, normality, molality, percentage ratio, part per thousand, part per million, part per billion, dilution, dilution law - Chemical equilibrium, chemical reactions, reversible reaction, irreversible reaction, equilibrium molarity, equilibrium constant, p-function - volumetric analysis (titration analysis), standard solution, classification of titration analysis, acid-base equilibrium, acid-base theories, acid-base equilibrium in water - classification of solutions according to amount of solute, classification of solutions based on solute particle size, electrolytes, strong electrolytes, weak electrolytes, pH-calculations of electrolytes - Monoprotic and Polyprotic acids and bases, ionization constant.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The primary approach we will employ in delivering this module is to promote active student engagement during exercises, simultaneously fostering and enhancing their critical thinking abilities. We will accomplish this through a combination of interactive classes, engaging tutorials, and the inclusion of simple experiments that involve sampling activities, specifically chosen to capture students' interest and curiosity.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	111	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative	**Quizzes**	2	5% (10)	5, 10	LO #3,4, 8 and 9

assessment	**Assignments**	5	10% (10)	2, 12	LO # 2,11and 12
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	11	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction in analytical chemistry
Week 2	Methods of expressing solution concentration and quantitative calculations
Week 3	Chemical equilibrium, the importance of equilibria, equilibria involving weak electrolyte solutions, ionization of water, acids and base
Week 4	Balancing poorly soluble solids and forming complexes, examples and exercises
Week 5	Calculations of equilibrium constants, ionization constants for weak acids and bases, the degree of ionization, and the acidity function of their solutions
Week 6	Equilibrium constant for polyhydric acids with illustrative examples
Week 7	Systematic treatments of equilibrium, mass and charge balance equations, solved exercises**.**
Week 8	Ionic strength of solutions, effectiveness and potency coefficient, illustrative problems and exercises
Week 9	Mid exam 1**.**
Week 10	Solutions and solubility of sediments, dissolution yield, factors affecting precipitation, common ion, **. .**and estimation of acid function
Week 11	Solubility of metal hydroxides, solubility and formation of ionic complexes, effect of ionic strength, **. .**separation of ions, exercises
Week 12	Hydrolysis of salts and calculation of acid functions for different types of salts**.**
Week 13	Multi exercises **.**
Week 14	Buffer solutions, calculating the acid function, the Henderson-Hilzbach equation, Buffer capacity, **.**various applications with various examples
Week 15	Mid exam 2**.**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Laboratory instructions, safety rules, equipment.
Week 2	Lab 2: Preparation of different types of solution. percentage sol (W/V%, V/V%, W/W%)
Week 3	Lab 3: Normal solution, molar solution, dilution.
Week 4	Lab 4: Preparation and standardization of 0.1M(HCl) hydrochloric acid solution.
Week 5	Lab 5: Preparation and standardization of 0.1 N sodium hydroxide solution using direct titration.
Week 6	Lab 6: Determination of acetic acid content vinegar.
Week 7	Lab 7: Identification of cations group (I) "Lead (II), Mercury (I), and Silver (I)"
Week 8	Unknown
Week 9	Identification of cations group (II) "Lead (II), mercury (II), Bismuth (III), Copper (II), Cadmium (II)"
Week 10	Unknown.
Week 11	Determination of melting point.
Week 12	Determination of boiling point.
Week 13	Preparation and standardization of 0.1 N AgNO3 solution with sodium chloride (Mohr salt)
Week 14	Puffer solution preparation and pH determination.
Week 15	Pre-final preparation

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Lectures Note (part one) - handout Skoog D.A, West D. M, Holler F.J and Crouch S.R "Fundamentals of analytical chemistry", 8thEd. Thomson, USA, 2004.	Yes

Recommended Texts	Harris D.C. "Quantitative chemical Analysis ", 6 th Ed. Freeman and Company , New York, 2003	Yes
Websites	https://chem.libretexts.org/Bookshelves/Physical and Theoretical Chemistry Textbook Maps/Supplemental Modules (Physical and Theoretical Chemistry)/Acids and Bases/Monoprotic Versus Polyprotic Acids And Bases/Polyprotic Acids And Bases https://www.collegesidekick.com/study-guides/introchem/complex-ion-equilibria-and-solubility	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.