



UNIVERSITI TEKNOLOGI MARA

CHM256: BASIC ANALYTICAL CHEMISTRY

Course Name (English)	BASIC ANALYTICAL CHEMISTRY APPROVED
Course Code	CHM256
MQF Credit	3
Course Description	An introductory course to a quantitative analytical chemistry covering both theoretical and practical aspects of good laboratory procedures including sampling, pre-treatment of sample prior to analysis, volumetric, gravimetric, basic chromatographic methods, and statistical evaluation of the experimental data. The outcomes will be assessed through paper examination, tests and quizzes, laboratory exercises and written laboratory reports.
Transferable Skills	Qualities and transferable skills necessary for employment related to chemistry Skills necessary for the exercising of personal responsibility
Teaching Methodologies	Lectures, Lab Work, Tutorial
CLO	<p>CLO1 Explain the terms, concepts and principles involving volumetric analysis, gravimetric analysis and basic chromatography.</p> <p>CLO2 Apply the correct steps involving analytical techniques such as mass and volume measurement, sampling, treatment of samples, preparation of standards and reagents.</p> <p>CLO3 Report a scientific experiment based on the acid-base titration, gravimetric analyses, thin layer chromatography, paper chromatography and column chromatography.</p> <p>CLO4 Evaluate the reliability of chemical analysis based on the calculation on accuracy, precision, deviation and error, and statistical methods.</p>
Pre-Requisite Courses	No course recommendations
Topics	
1. Introduction: Analytical Chemistry 1.1) Types and steps in analysis 1.2) Review the terms: moles, molarity and concentration. Other expressions of concentration: % (w/w), % (w/v), % (v/v), ppm, ppt, ppb. 1.3) Calculations involving different expressions of concentrations	
2. Evaluation of experimental data 2.1) Significant figures, rules applied to significant figures in reporting measurements and results 2.2) Types and sources of error: determinate (systematic) and indeterminate (random) 2.3) Precision and accuracy; mean, median, deviation, standard deviation, relative standard deviation 2.4) Q-test and confidence limit	
3. Apparatus, Techniques and Reagents 3.1) Analytical balances: types, care and usage 3.2) Types of glassware: pipette, burette and volumetric flask 3.3) Calibration of volumetric glassware 3.4) Heating apparatus: burners, hotplates, ovens, furnace, water baths 3.5) Desiccators : care and usage 3.6) Titration apparatus & techniques 3.7) Filtration apparatus & techniques 3.8) Reagents: class based on purity & usage 3.9) Cleaning solutions	

4. Basic requirements for analysis

- 4.1) Treatment of samples prior to chemical analysis (Techniques of sampling, drying and weighing of samples)
- 4.2) Dissolution of samples inclusive of both dry and wet methods
- 4.3) Elimination of interferences
- 4.4) Standards (Properties of primary and secondary standards, Preparation of standard solutions: primary and secondary, Calculations of required amount of reagents/standards)
- 4.5) Storage and dilution of stock solution.

5. Volumetric analysis

- 5.1) Types of volumetric analysis
- 5.2) Acid – base titration (i) Principles of titration : equivalence and end points, indicators,ii) Direct titration and Back titration – calculations related to laboratory works)
- 5.3) Acid – base titration curves (i) Titration curves of strong acid and strong base, strong acid and weak base with buffer region, strong base and weak acid with buffer region & weak base and weak acid, ii) Calculation of pH change during strong acid-strong base titration, iii) Acid-base indicators and choice of indicators for acid-base titration)

6. Gravimetric Analysis

- 6.1) Principle of gravimetric analysis - Terms used: co-precipitation, post-precipitation, relative supersaturation, solubility product, K_{sp}
- 6.2) Types of gravimetric analysis: i) Precipitation ii) Volatilization
- 6.3) Gravimetric calculations
- 6.4) Steps in gravimetric analysis: Examples of determination of Fe^{2+} and SO_4^{2-}
- 6.5) Applications of gravimetric analysis

7. Basic Chromatography

- 7.1) Principle of chromatography - Terms used: stationary phase, mobile phase, adsorption, partition, elution
- 7.2) Types of chromatography and techniques (i) Planar (Paper & TLC) chromatography – calculation of R_f value, ii) Column chromatography)
- 7.3) Applications of planar and column chromatography

Assessment Breakdown		%	
Continuous Assessment		100.00%	

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Lab Exercise	Online Lab Report	15%	CLO3
	Practical	Online Lab Case Study	25%	CLO2
	Test	Online Test 1	30%	CLO1
	Test	Online Test 2	30%	CLO4

Reading List	Recommended Text	<ul style="list-style-type: none"> Douglas Skoog, Donald West, F. Holler, Stanley Crouch 2014, <i>Fundamentals of Analytical Chemistry</i>, Cengage Learning [ISBN: 0495558281]
	Reference Book Resources	<ul style="list-style-type: none"> Douglas, A. Skoog 2000, <i>An Introduction of Analytical Chemistry</i>, 7 Ed., , Saunders College Publishing, New York [ISBN:] Harris D. C. 2003, <i>Quantitative Chemical Analysis</i>, 6 Ed., , W.H. Freeman and Company, New York [ISBN:] Kho C. H., Zaharah A., Masterton W. L. and Hu 2005, <i>Physical Chemistry for STPM</i>, Ed., , Thomson Learning [ISBN:] Christian, G. D 2004, <i>Analytical Chemistry</i>, 6 Ed., John Wiley & Sons, Inc., New Jersey, USA

Article/Paper List	This Course does not have any article/paper resources
Other References	This Course does not have any other resources