



UNIVERSITI TEKNOLOGI MARA

BMS481: BIOANALYTICAL CHEMISTRY

Course Name (English)	BIOANALYTICAL CHEMISTRY APPROVED
Course Code	BMS481
MQF Credit	3
Course Description	The course introduce various scientific instrumentation techniques typically used in biological science analysis. The theory and applications involving the use of chromatography, electrophoresis and various spectroscopy techniques in modern biological laboratories will be discussed.
Transferable Skills	At the end of this course, students will have fundamental knowledge on techniques typically used in molecular biology and biochemistry such as chromatography, electrophoresis and spectroscopy.
Teaching Methodologies	Lectures, Blended Learning, Practical Classes, Problem Based Learning (PBL), Collaborative Learning
CLO	<p>CLO1 Describe the fundamentals concepts of analytical techniques e.g. accuracy, concentrations, molarity</p> <p>CLO2 Illustrate the principles and applications of basic centrifugation, chromatographic and spectroscopic analytical techniques in the isolation and characterization of biological molecules.</p> <p>CLO3 Perform scientific experiments on biomolecules separation, characterization and analysis.</p>
Pre-Requisite Courses	No course recommendations
Topics	
1. Introduction to molecular biology laboratory 1.1) 1.1 Aseptic techniques 1.2) 1.2 Biosafety in the laboratory 1.3) 1.3 The micropipettor 1.4) 1.4 Accuracy and Precision 1.5) 1.5 Experimental error and data reproducibility 1.6) 1.6 Units of measurement 1.7) 1.7 Controls and standards in experimental design	
2. Buffers and Solutions 2.1) 2.1 Water for biological reactions and cell culture 2.2) 2.2 pH and buffer systems 2.3) 2.3 Commonly used buffers in molecular biology 2.4) 2.4 Concentration, Molarity and Normality 2.5) 2.5 Stock solutions 2.6) 2.6 Dilution factors and calculations 2.7) 2.7 Serial dilutions	
3. Centrifugation 3.1) 3.1 Basic principles and applications 3.2) 3.2 Differential centrifugation 3.3) 3.3. Density centrifugation 3.4) 3.4 Ultracentrifugation	

4. Spectrophotometry

- 4.1) 4.1 UV-Visible light spectrometer
- 4.2) 4.2 Absorbance
- 4.3) 4.3 Colorimetric measurements
- 4.4) 4.4 The 96 well microplate and reader
- 4.5) 4.5 Quantitation of DNA and RNA
- 4.6) 4.6 Quantitation of proteins
- 4.7) 4.7 Enzyme assays

5. Chromatographic separation of biomolecules

- 5.1) 5.1 Gel filtration
- 5.2) 5.2 Ion exchange
- 5.3) 5.3 Affinity
- 5.4) 5.4 Size exclusion
- 5.5) 5.5 Thin layer chromatography

6. High Performance Liquid Chromatography (HPLC)

- 6.1) 6.1 Principles
- 6.2) 6.2 Equipment
- 6.3) 6.3 Sample preparation
- 6.4) 6.4 Data analysis

7. Gas Chromatography (GC)

- 7.1) 7.1 Principles
- 7.2) 7.2 Equipment
- 7.3) 7.3 Sample preparation
- 7.4) 7.4 Data analysis

8. Polymerase Chain Reaction

- 8.1) 8.1 Principles and mechanism
- 8.2) 8.2 Thermocycling

9. Electrophoresis

- 9.1) 9.1 Principles
- 9.2) 9.2 Agarose gel electrophoresis
- 9.3) 9.3 Polyacrylamide gel electrophoresis
- 9.4) 9.4 Capillary electrophoresis

Assessment Breakdown	%
Continuous Assessment	50.00%
Final Assessment	50.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Practical	One practical test where student will conduct a simple experiment and the report the results to show ability in MQF 2 P3 "Guided Response".	20%	CLO3
	Test	One test on MCQ and/or structure questions to focus on MQF1 C1and C3 domain. The test will cover topics 1-5.	20%	CLO1
	Written Report	A report on mini project based on case study/situation given by the instructor	10%	CLO3

Reading List	Recommended Text	<ul style="list-style-type: none"> • K. Wilson and J. Walker 2010, <i>Principles and Techniques of Biochemistry and Molecular Biology</i>, 7th Ed., Cambridge University Press • S.R. Mikkelsen and E. Corton 2016, <i>Bioanalytical Chemistry</i>, 2nd Ed., Wiley & Sons, New Jersey
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	