

Macao Polytechnic Institute
School of Health Sciences and Sports
Bachelor of Science in Biomedical Technology
(Medical Laboratory Technology & Pharmacy Technology)
Module Outline

Academic Year 2021/ 2022 Semester 1

Learning Module	Analytical Chemistry		Class Code	BSAC2101
Pre-requisite(s)	Nil			
Medium of Instruction	Chinese / English		Credit	3
Lecture Hours	33 hrs	Lab/Practice Hours	12 hrs	Total Hours 45 hrs
Instructor	Veng Meng , Richard Lo		E-mail	vmlo@ipm.edu.mo
Office	Rm M714 Meng Tak Building, Main Campus		Telephone	85993450

Description

This module is one of the fundamental subjects of biomedical program. There includes lecture hours and demonstration/experiment classes.

This module is designed to provide of basic principles and applications of current analytic chemistry topics.

Learning Outcomes

After completing the learning module, students will be able to:

1. Understand background knowledge of analytical chemistry
2. Understand the application of analytical chemistry.
3. Understand the operation procedure of chemical analysis.
4. Study successive subjects; Clinical chemistry, clinical immunology, pharmaceutical analysis, etc.

Content

Theory (33 hours)

1. Introduction to Analytical Chemistry (1 class hour)

(COMPREHEND : The students obtain the basic concept of analytical chemistry)

2. Quantitative Analysis (5 class hours)

2.1 Gravimetric Analysis

2.2 Volumetric Analysis

2.2.1 Acid Base titration

2.2.2 Precipitation titration

2.2.3 Compleximetric titration.

2.2.4 Reduction Oxidation titration

2.3 Automation in Titrimetric methods

(UNDERSTAND : The students memorize the methods of quantitative analysis.)

3. Separation methods (6 class hours)

3.1 Introduction to Chromatography

3.1.1 Thin Layer Chromatography

3.1.2 Column Chromatography

3.1.3 High Performance Liquid Chromatography

3.1.4 Gas Chromatography

3.2 Gas Chromatography

3.3 High Performance Liquid Chromatography

3.4 Solid Phase Extraction (sample pretreatment)

3.5 Electrophoresis

(UNDERSTAND : The students memorize the methods of separation.)

4. Electrochemical methods (4 class hours)

4.1 Potentionmetry

4.1.1 Principle of potentionmetry; Nernst Equation

4.1.2 Structure of a potentionmetric cell.

4.1.3 pH meter and applications

4.2 Voltammetry

4.2.1 Principle of voltammetry; Faraday's law of eletrolysis.

4.2.2 Structure of voltammetric cell.

4.2.3 Applications

4.3 Conductimetry

(UNDERSTAND : The students memorize the electrochemical methods)

5. Spectroscopic Analysis (8 class hours)
 - 5.1 Introduction to Spectroscopic Analysis
 - 5.2 Basic theory
 - 5.3 Spectrophotometer
 - 5.4 Molecular Spectroscopy
 - 5.4.1 Ultra Violet and Visible spectroscopy.
 - 5.4.2 Principles and applications of UV spectroscopy
 - 5.4.3 Fluorescence spectroscopy
 - 5.4.4 Scattering spectroscopy
 - 5.4.5 Infrared spectroscopy
 - 5.5 Atomic spectroscopy
 - 5.5.1 Atomic Absorption
 - 5.5.2 Atomic Emission
 - 5.5.3 Atomic Fluorescence
 - 5.5.4 Sample preparation for Atomic Spectroscopy

(UNDERSTAND : The students memorize the Spectroscopic methods)

6. Mass Spectroscopy (4 class hours)
 - 6.1 Introduction to Mass Spectroscopy
 - 6.2 Instrumentation
 - 6.3 Applications

(UNDERSTAND : The students memorize the Mass Spectroscopy)

7. Oral Presentation (3 hours)

8. Final Examination (2 hours)

Practice (12 hours)

Laboratory Practice: 3-5 students per group

1. Gravimetric Analysis of Chloride (2 hour)
(MASTER : The students can master the techniques of gravimetric analysis. The students are able to carry out the gravimetric analysis on different materials (e.g. Chloride).
2. Acid & Base Standardization & Volumetric Analysis of Antacid (2 hour)
(MASTER : The students can master the whole procedure of Acid & Base titration method The students are able to carry out the Acid & Base titrimetric analysis on different materials(e.g. Antacid.)
3. Determination of the concentration of chlorine by Iodimetric titration (1.5 hours)
(MASTER : The students can master the whole procedure of Iodimetric titration method The

students are able to carry out this kind of Redox titrimetric analysis on different materials(e.g. Chlorine in Bleach solution)

4. Determination of the concentration of chloride by silver nitrate titration. (1.5 hour)

(MASTER : The students can master the whole procedure of precipitation titration method The students are able to carry out this titrimetric analysis on different materials (e.g. Chloride).

5. Thin Layer Chromatography(TLC) , Column Chromatography (demo) (1 hour)

(MASTER : The students can master the whole procedure of these method chromatographic methods. The students are able to carry out TLC & Column Chromatographic separation..

6. High Performance Liquid Chromatography (demo) (1 hour)

(MASTER : The students can master the whole procedure of HPLC operation procedure).

7. pH meter & Determination of Acid Dissociation Constant by titration (1 hour)

(MASTER : The students can master the whole procedure of pH meter operation. The students are able to use pH meters.

8. UV Spectrophotometer (1 hour)

(MASTER : The students can master the whole procedure of UV / visible Spectrophotometer operation. The students are able to use these kind of Spectrophotometer.

9. Infrared Spectrophotometer & other chemical analysis instruments (demo) (1 hour)

(MASTER : The students can master the whole procedure of Infrared Spectrophotometer operation.

Teaching Method

Lectures, discussion, videos

Attendance

Attendance of the learning module is in accordance with the attendance stated in the “Academic Regulations Governing Bachelor’s degree programmes of Macao Polytechnic Institute”. Students are not eligible to attend the final examination and resit examination, moreover, an “F” will be given as the final grade to students who have less than the stated attendance for the enrolled learning module.

Assessment

This learning module is graded on a 100 point scale, with 100% being the highest possible score and 50% being the passing score (and also the final examination must be over 35%, “F” grade will be given for the module even if the overall score is 50% or higher).

To enter the resit examination, the total score of the module must be over 35%. The resit passing score is also 50% and the final grade of this module is 50% (even the score of the resit examination is over 50%).

Notice: *No makeup lab(s) or class activities for any rational or irrational absence(s) (except rational absent for final examination). Zero mark will be given to the students with late submission of reports, or absence in laboratory sessions or class activities, without any formal justification according to MPI regulations.*

	Item	Description	Percentage
1.	Examination	All chapters	58%
2.	Presentation	Topics in Chemical Analysis	8%
3.	Report	Topics in Chemical Analysis	16%
4	Laboratory Reports	Experiment Reports	18%
Total Percentage:			100%

All laboratory reports have to submit one week after the lab class. Topic report has to submit the day of presentation.

Teaching Material(s)

Text book and reference books, Power point notes, related videos, laboratory equipments & reagents, ... etc.

Textbook(s)

1. Francis Rouessac and Annick Rouessac, 2007 Chemical Analysis (Modern Instrumentation Methods and Techniques). 2nd ed. John Wiley & Sons Ltd

Reference Books:

1. Douglas A. Skoog, Stanley R. Crouch, F. James Holler, F. James Holler, Stanley R. Crouch, Belmont, CA, 2006, Principles of Instrumental Analysis, 6th ed. Thomson-Brooks/Cole.