



**FACULTY OF HEALTH SCIENCES AND SPORTS**  
**BACHELOR OF SCIENCE IN BIOMEDICAL TECHNOLOGY**  
**(MEDICAL LABORATORY TECHNOLOGY)**  
**LEARNING MODULE OUTLINE**

Academic Year	2023-2024	Semester	1
Module Code	BSGC1101		
Learning Module	General Chemistry		
Pre-requisite(s)	Nil		
Medium of Instruction	Chinese & English		
Credits	3	Contact Hours	45 hrs
Instructor	Dr TONG H.Y. Henry Dr LO V.M. Richard Dr. YI T. Aaron	Email	<a href="mailto:henrytong@mpu.edu.mo">henrytong@mpu.edu.mo</a> <a href="mailto:vmlo@mpu.edu.mo">vmlo@mpu.edu.mo</a> <a href="mailto:yitao@mpu.edu.mo">yitao@mpu.edu.mo</a>
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**MODULE DESCRIPTION**

This is a fundamental subject. Basic knowledge in chemistry will be introduced.

**MODULE INTENDED LEARNING OUTCOMES (ILOS)**

On completion of this learning module, students will be able to:

M1.	Understand basic chemistry theory
M2.	Understand how daily life is related to chemistry
M3.	Equip with the knowledge to understand advanced subjects in organic chemistry, analytical chemistry, biochemistry, and etc.

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs	M1	M2	M3
P1. To demonstrate understanding of a range of subjects, fields, principles and approaches relevant to medical laboratory technology	✓		
P2. To demonstrate understanding of theories, analytical approaches and practices that underpin medical laboratory operations and management	✓		
P3. To demonstrate understanding of major trends and issues related to medical laboratory technology		✓	
P4. To apply professional knowledge and skills to analyse, interpret and solve problems, challenges and risks in medical laboratory practice			
P5. To critically appraise and interpret scientific and clinical literature and apply evidence-based practice	✓		



P6. To acquire and apply research skills in medical laboratory technology			
P7. To demonstrate effective communication and teamwork skills	✓		
P8. To maintain professional and ethical standards in medical laboratory practice and research	✓		

### MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage (Class A)	Contact Hours
1-14	Lectures	18
3-15	Laboratory sessions	27

### TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	M1	M2	M3
T1. Lectures	✓		
T2. Laboratory sessions		✓	✓

### ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

### ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	ILOs to be Assessed
A1. Class activities	10	M1
A2. Class assignment	15	M2, M3
A3. Laboratory reports	75	M1, M2, M3

This learning module is graded on a 100-point scale, with 100 being the highest possible score and 50 being the passing score.

The assessment will be conducted following the University's Assessment Strategy (see [www.mpu.edu.mo/teaching\\_learning/en/assessment\\_strategy.php](http://www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php)). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

The resit exam will not be arranged for this module



## MARKING SCHEME

CLASS ACTIVITIES		
Areas of Assessment	Marking criteria	Weight
1. Content	- $\pm 1000$ words (main contents)	Required
2. Introduction the topic	- Most information from oral presentation	10%
3. Literature review	- Complete information	20%
	- At least three professional journals	10%
4. Responses to questions from oral presentation	- Key information included and Points concise	10%
	- Reasonable explanation	10%
5. Conclusion	- Rational analysis of factors affecting the public health	20%
6. Reference	- Proper acknowledgement of sources, complete information, accurate format of citations, quotations and listing reference used	10%
7. Style of writing	- Correct format, appropriate organization, concise writing	10%
Total		100

CLASS ASSIGNMENT		
Areas of Assessment	Marking criteria	Weight
8. Responses to questions	- Key information included and Points concise	50%
	- Reasonable explanation	50%
Total		100

LABORATORY REPORTS		
Areas of Assessment	Marking criteria	Weight
9. Content	- $\pm 1000$ words (main contents)	Required
10. Introduction the topic	- Most information from oral presentation	10%
11. Literature review	- Complete information	20%
	- At least three professional journals	10%
12. Responses to questions from oral presentation	- Key information included and Points concise	10%
	- Reasonable explanation	10%
13. Conclusion	- Rational analysis of factors affecting the public health	20%
14. Reference	- Proper acknowledgement of sources, complete information, accurate format of citations, quotations and listing reference used	10%
15. Style of writing	- Correct format, appropriate organization, concise writing	10%
Total		100

## REQUIRED READINGS

There is no specific required textbook for this course.



## REFERENCES

### Text book:

General, organic, and biological chemistry 7<sup>th</sup> ed./2010 K. J. Denniston, J. J. Topping and R. L. Caret McGraw-Hill, c2010 ISBN 978-0-07-122187-0

### Reference Books:

Chemical Nomenclature Hong Kong Examinations Authority updated version

### Timetable:

### Content (1) - (19 hours):

Dr. Lo Veng Meng, Richard's session

1	9/10/2023 14:30-17:30 Class Introduction Basic concept in Chemistry Chemistry Nomenclature of simple inorganic compounds	3hrs
2	16/10/2023 14:30-17:30 Laboratory & Analytical Balance Class activity - Questions Answering Competition Lab: Basic Lab. Techniques & Weighing	3hrs
3	30/10/2023 14:30-17:30 Volumetric Glassware Lab: Volumetric Glassware	3 hrs
4	6/11/2023 14:30-17:30 Solution Preparation Lab: Solution Preparation	3 hrs
5	13/11/2023 14:30-17:30 Filtration & Recrystallization Lab: Filtration	3 hrs
6	20/11/2023 14:30-18:30 Distillation Extraction and Titration Lab : Acid /Base titration	4 hrs



**Theory (13 hours) Practice (6 hours)**

**Theory (13 hours)**

**Laboratory Principles and Instrumentation**

1. Basic concept in Chemistry (0.5 hours)  
Areas of chemistry and its application.

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

2. Nomenclature of simple inorganic compounds (3 hours)
  - 2.1 Binary compounds
  - 2.2 Oxides
  - 2.3 Hydroxides
  - 2.4 Acids
  - 2.5 Salts

*(Master: Through Lecture and class activity practice, students master the naming system of simple inorganic compounds )*

3. Chemistry Laboratory (1 hour)
  - 3.1 Basic Equipment
  - 3.2 Basic Laboratory Operation
  - 3.3 Laboratory Safety

*(UNDERSTAND : Students memorize the basic equipment, basic operation and concept of Laboratory Safety. Students can work safely and effectively in Chemistry Laboratory)*

4. Analytical Balance (1 hour)
  - 4.1 Classification of Balance
  - 4.2 Unpacking and set up of balance
  - 4.3 Weighing
    - 4.3.1 Direct and Indirect weighing
    - 4.3.2 Accurate weighting
  - 4.4 Sources of error
  - 4.5 Calibration of balance
  - 4.6 Performance Inspection

*(Master: Through Lecture and Laboratory practice, students master the skill to operate analytical balance )*

5. Volumetric Glassware (1 hour)
  - 5.1 Common feature Volumetric Glassware
  - 5.2 Operation of Volumetric Glassware
    - 5.2.1 Pipettes
    - 5.2.2 Burette
    - 5.2.3 Volumetric Flask
  - 5.3 Cleaning of Volumetric Equipment
  - 5.4 Calibration of Volumetric Glassware

*(Master: Through Lecture and Laboratory practice, students master the skill to operate volumetric glassware )*



6. Solution Preparation (1 hour)

- 6.1 Different definition of solution concentration
- 6.2 Concentration Calculation
- 6.3 Solution preparation
- 6.4 Buffer Solution Preparation

(Master: Through Lecture and Laboratory practice, *students master the skill of solution preparation* )

7. Filtration and filter paper (1 hour)

- 7.1 Basic concept of Filtration
- 7.2 Filter Paper and Kinds of filter paper
- 7.3 Preparation of a filter Paper
  - 7.3.1 Quadrant folded
  - 7.3.2 Pleated (Fluted) folded
- 7.4 Gravity Filtration
- 7.5 Vacuum Filtration
- 7.6 Washing Precipitates

(Master: Through Lecture and Laboratory practice, *students master the skill of Filtration*)

8. Titration (1 hour)

- 8.1 Basic concept of Titration
- 8.2 Analytical Standards
- 8.3 Equivalence Point and End Point
- 8.4 Indicators
- 8.5 General procedure for Titration

(Master: Through Lecture and Laboratory practice, *students master the skill of Titration*)

9. Recrystallization (0.5 hour)

- 9.1 Basic concept of Recrystallization
- 9.2 Procedure for Crystallization
- 9.3 Treatment of the Crystal

(Master: Through Lecture, *students master the technique of Recrystallization*)

10. Distillation (1 hour)

- 10.1 Basic Concept of Distillation
- 10.2 Set Up a Distillation
- 10.3 Fractional Distillations
- 10.4 Vacuum Distillations
- 10.5 Steam Distillation

(Master: Through Lecture, *students master the technique of Distillation*)

11. Extraction (1 hour)

- 11.1 Basic Concept of Extraction
- 11.2 Multiple Extractions
- 11.3 Extraction Procedure
- 11.4 Solid Phase Extraction

(Master: Through Lecture, *students master the technique of Extraction*)



12. Concentrating Solute, Drying Organic Solvent, Heating and Cooling in Chemistry Laboratory (1 hours)
- 12.1 Concentrating Solutes: Different methods to Remove Solvents from Samples
  - 12.2 Drying: Different methods to Remove Water from Organic Solvent
  - 12.3 Heating: Different heating methods in Chemistry Laboratory
  - 12.4 Cooling: Different cooling methods in Chemistry Laboratory
- (Master: Through Lecture, students master the technique of Concentrating Solute, Drying Organic Solvent, Heating & Cooling in Chemistry Laboratory)*

**Practice (6 hours)**

Laboratory Practice: 4 - 8 students per group

1. Class activity in Nomenclature of simple inorganic compounds (1 hour)  
*(Master: Students master the naming system of simple inorganic compounds)*
2. Basic Laboratory Operation (0.5 hour)  
*(Master: Students master the basic skills in Chemistry laboratory)*
3. Analytical Balance (0.5 hour)  
*(Master: Students master the skill to operate analytical balance)*
4. Volumetric Glassware (1 hour)  
*(Master: Students master the skill to operate volumetric glassware)*
5. Solution Preparation (1 hour)  
*(Master: Students master the skill of solution preparation)*
6. Filtration (1 hour)  
*(Master: Students master the skill of Filtration)*
7. Titration (1 hour)  
*(Master: Students master the skill of Titration)*



**Content (2) - (14 hours):**

Dr. Tong Hoi Yee, Henry's session

Date	Time	Topic	Lecturer
2023.08.25	14:30-16:30	<ul style="list-style-type: none"> <li>Understanding chemical properties via MSDS (Lecture - 2 hours)</li> </ul>	Henry
PT class 2023.08.28	PT class 14:30-18:30	<ul style="list-style-type: none"> <li>Fragrance &amp; essential oil chemistry (Lecture &amp; Practical - 2 hours)</li> </ul>	Henry
MLT class 2023.08.29	MLT class: 14:30-18:30	<ul style="list-style-type: none"> <li>Novice perfumer (Practical - 2 hours)</li> </ul>	
PT class 2023.09.04	PT class 14:30-18:30	<ul style="list-style-type: none"> <li>Measurement of aqueous solubility data in berberine chloride (Practical - 4 hours)</li> </ul>	Henry
MLT class 2023.09.05	MLT class: 14:30-18:30		
PT class 2023.09.11	PT class 14:30-18:30	<ul style="list-style-type: none"> <li><i>In-vitro</i> evaluation of cosmetic whitening activity in selected compounds (Practical – 4 hours)</li> </ul>	Henry
MLT class 2023.09.12	MLT class: 14:30-18:30		

**Content (3) - (12 hours):**

Dr. Yi Tao, Aaron's session

**Theory (4 hours)**

Date	Time	Content
09/01/2023	14:30-18:30	<p>Lecture 1: Solution</p> <ul style="list-style-type: none"> <li>● Basic Terms of Solution</li> <li>● Solubility of Solution</li> <li>● Solution Concentration</li> <li>● Colligative Properties of Solutions</li> </ul> <p>(Master : The students master the basic concept of solution)</p> <p>Lecture 2: Colloidal System</p> <ul style="list-style-type: none"> <li>● Colloidal Dispersions</li> <li>● Formation of Colloidal Particles</li> <li>● Properties of Colloidal Dispersions</li> </ul> <p>(Master : The students master the basic concept of colloidal system)</p>





**Practice (8 hours)**

Date & Time	Practice Item	Title	Students / Group	Mode of Practice	Requirement
2023/09/08 14:30-18:30	Weighing, mixing, dissolution, crystallization and observation of compounds	Principle and preparation of Storm Glass	Grouping	Operating in the laboratory	Each group should complete the preparation of one bottle and submit the experimental report.
2023/09/15 14:30-18:30	Preparation of nanoemulsions and gel beads, content determination and particle size analysis	Preparation and characterization of self-emulsifying enteric gel beads	Grouping	Operating in the laboratory	Each group should complete the experiment and submit the experiment report.

### STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

### ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at [www.mpu.edu.mo/student\\_handbook/](http://www.mpu.edu.mo/student_handbook/).