

109 學年「化學實驗一二」課程綱要



一、課程編號：203-11510-01, 02

二、教科書：

- 國立台灣大學化學系，化學實驗一暨實驗二，第四版（修訂再刷），臺大出版中心，台北，2018.
- Department of Chemistry, National Taiwan, University Experiments in General Chemistry, 3rd ed.; NTU Press: Taipei, 2020.
- 實驗教學網頁：<http://www.ch.ntu.edu.tw/~genchem99/index.htm>
<https://ceiba.ntu.edu.tw/921edtech>

三、成績評量方式：實驗精神（態度）佔 50%；實驗報告佔 50%。

四、預修課程：先修或併修普通化學一、二，停修普化課程者實驗需一併停修。

五、課程進度：

第一學期

週	實驗名稱	實驗核心內容
1	C0 化學實驗安全簡介	實驗安全講習
2	C1 化合物化學式的決定	計量化學、氧還反應及氫氣製備
3	C2 氮氣之莫耳體積	計量化學、限量試劑及理想氣體方程式
4	C3 反應熱之測定	熱化學、卡計、酸鹼中和熱、溶解熱、氧化還原反應熱及赫斯定律
5	C4 維生素 C 之定量	氧還反應、計量化學、滴定
6	C5 第一組陽離子定性分析	沉澱反應、氧還反應、錯合反應、石蕊試紙、離心分離
7	C6 第二組陽離子定性分析	沉澱反應、氧還反應、錯合反應、石蕊試紙、離心分離
8	C7 從廢鋁罐製備明礬	氧還反應、兩性化合物、計量化學、結晶與過濾
9	C8-1 碘鐘實驗—碘鐘交響曲	化學動力學、反應速率測定、初期反應速率法
10	C10 微量鈷離子的定量	錯合物、比爾吸收定律、介電常數、系列稀釋、分光光譜儀
11	C12 緩衝溶液	藥品配製、緩衝溶液、緩衝容量、pH 計
12	C13 電位滴定法之應用—酸鹼滴定	酸鹼之濃度標定與滴定、藥品配製、酸解離常數、pH 計

第二學期

週	實驗名稱	實驗核心內容
1	C0 化學實驗安全簡介	實驗安全講習
2	C8-2~4 碘鐘實驗—反應級數與活化能	化學動力學、反應速率、積分作圖法、活化能、觸媒催化
3	C11 導電塑膠聚苯胺	電化學聚合法、化學氧化聚合法、電阻量測
4	C14 過錳酸鉀氧化還原滴定	氧化還原反應、劑量化學、滴定
5	C16 溶度積之測定	溶度積、沉澱滴定、當量點、計量化學
6	C17 高溫超導體之製備	高溫超導體、固態反應法、麥斯納效應
7	C20 金奈米粒子之合成及吸收光譜鑑定	奈米材料、表面電漿共振波帶、氧化還原反應、膠體

		溶液、廷得耳效應、光譜儀
8	C23 有機分子模型	有機化學、結構式、異構物、構形異構物、球棍模型、填充模型
9	C24 簡單蒸餾與分餾	有機化學、沸點、蒸餾、分餾
10	C25 萃取	溶解度、酸鹼、減壓濃縮、過濾、分液漏斗
11	C26 再結晶與熔點測定	再結晶、共熔點
12	C27 層析法	萃取、薄層及管柱層析

參考書：Harris, D. C. *Quantitative Chemical Analysis*, 5th ed., 1999, W. H. Freeman and Co.: New York.

Chemistry Lab. (I) (II) (2020-2021)

Textbook: Department of Chemistry, National Taiwan University, *Chemistry Laboratory (I), (II)*, 4th ed. (reprint), Taipei, 2018.

Department of Chemistry, National Taiwan, University Experiments in General Chemistry, 3rd ed.; NTU Press: Taipei, 2020.

Website: <http://www.ch.ntu.edu.tw/~genchem99/index.htm>

<https://ceiba.ntu.edu.tw/921edtech>

Objective:

Chemistry Laboratory (I) and (II) are Integrated Laboratory courses to fulfill the requirements of Chemistry-majored students. The objectives are to demonstrate the principles of chemistry, teach the students various techniques used by chemists, and train the students to familiar with scientific methods.

Course descriptions:

The contents of Chemistry Laboratory (I) and (II) includes: stoichiometry, thermochemistry, acid-base, equilibrium, buffer solution, titration, electrochemistry, chemical kinetics, coordination compounds, spectrophotometry, materials science, and basic organic chemistry skills.

Course requirements:

Review the experiment before class. Follow the safety guidelines of Lab. Be familiar with Lab skills. Hand in reports on time. Attend the final exam at the end of semester.

Grading: Attitude: 50%; Report: 50%.

Contents:

Chemistry Lab (I)

Week	Experiments
1	C0 Laboratory safety and work instructions
2	C1 Determination of the chemical formula of a compound
3	C2 Molar volume of nitrogen gas
4	C3 Heat of reactions
5	C4 Quantitative analysis of vitamin C

6	C5 Qualitative analysis of cation group 1
7	C6 Qualitative analysis of cation group 2
8	C7 Preparation of alum
9	C8-I Iodine clock - the initial rate method
10	C10 Quantitative analysis of cobalt(II) ions
11	C12 Buffer solutions
12	C13 Potentiometric titration of acid-base

Chemistry Lab (II)

Week	Experiments
1	Laboratory safety and work instructions
2	C8-II Iodine clock - the integrated rate law
3	C11 Conducting polymer-polyaniline
4	C14 Oxidation/reduction titrations with potassium permanganate
5	C16 The solubility product constant of silver acetate
6	C17 Synthesis of superconductor
7	C19 Synthesis of thermochromic materials
8	C20 Synthesis and characterizations of gold nanoparticles
9	C23 Molecular modeling for organic compounds
10	C24 Simple and fractional distillation
11	C25 Extraction
12	C26 Recrystallization and melting point determination
13	C27 Chromatography