112 學年「化學實驗一二」課程綱要

一、 教科書：

1. 國立臺灣大學化學系，化學實驗一暨實驗二，第五版，臺大出版中心，台北，2022.
2. Department of Chemistry, National Taiwan, University Experiments in General Chemistry, 3rd ed.; NTU Press: Taipei, 2020.
3. 實驗教學網頁：

   https://teaching.ch.ntu.edu.tw/gclab/

   https://teaching.ch.ntu.edu.tw/gclab/en/

二、成績評量方式：實驗精神（態度）佔 50%；實驗報告佔 50%。

三、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。

四、課程進度：

第一學期

週	實驗名稱	實驗核心內容與實驗技能
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、赫斯定律、卡計、酸鹼中和熱、溶解熱、氧化還原反應熱測定
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	平衡、沉澱反應、氧還反應、錯合反應、石蕊試紙、離心分離
7	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
8	C8 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
9	C10 微量鈷離子的定量	錯合物、比爾定律、介電常數、系列稀釋、分光光譜儀
10	C12 緩衝溶液	緩衝溶液、緩衝容量、藥品配製、pH計
11*	C18 有機分子模型	有機化學、結構式、異構物、構形異構物、立體異構物、球棍模型、填充模型、電腦模擬軟體

第二學期

週	實驗名稱	實驗核心內容與實驗技能
1	C0 化學實驗安全簡介	實驗安全講習
2	C11 導電塑膠聚苯胺	聚合物、電化學聚合法、化學聚合法、電致變色、導電性測試、三用電表使用
3	C13 電位滴定法之應用－酸鹼滴定	酸鹼標定與滴定、酸解離常數、藥品配製、pH計
4	C14 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
5	C16 溶度積之測定	難溶鹽之平衡、溶度積、沉澱滴定、計量化學、當量點與滴定終點
6	C17 高溫超導體之製備	高溫超導體、計量化學、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、氧還反應、膠體溶液、廷得耳效應、分光光譜儀、回流裝置
8*	C23 萃取	溶解度、酸鹼、減壓濃縮、過濾、分液漏斗
9*	C24 再結晶與熔點測定	再結晶、共熔點
10*	C25 簡單蒸餾與分餾	有機化學、沸點、蒸餾、分餾
11*	C26 層析法	萃取、薄層及管柱層析

Chemistry Lab. (I) (II) (2022-2023)

Textbook: Department of Chemistry, National Taiwan University, *Chemistry Laboratory (I), (II)*, 5th ed., Taipei, 2022.

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

Website: https://teaching.ch.ntu.edu.tw/gclab/

https://teaching.ch.ntu.edu.tw/gclab/en/

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 Chemistry Lab. Be familiar with lab skills. Hand in reports on time.

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	C6 Qualitative analysis of cation group 2
7	C7 Preparation of alum
8	C8 Iodine clock - the initial rate method
9	C10 Quantitative analysis of cobalt(II) ions
10	C12 Buffer solutions
11*	C23 Molecular modeling for organic compounds

Chemistry Lab (II)

Week	Experiments

1	Laboratory safety and work instructions
2	C5 Qualitative analysis of cation group 1
3	C11 Conducting polymer-polyaniline
4	C13 Potentiometric titration of acid-base
5	C16 Solubility product constant of silver acetate
6	C17 Synthesis of superconductor
7	C20 Synthesis and characterizations of gold nanoparticles
8	C22 Iodine clock - the integrated rate law
9*	C23 Extraction
10*	C24 Recrystallization and melting point determination
11*	C25 Simple and fractional distillation
12*	C26 Chromatography