

课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1. 课程名称 Course Title	化学原理实验 A A General Chemistry Laboratory A
2. 授课院系 Originating Department	化学系 Department of Chemistry
3. 课程编号 Course Code	CH102-17
4. 课程学分 Credit Value	1.5
5. 课程类别 Course Type	通识选修课程 General Education (GE) Elective Courses
6. 授课学期 Semester	春季 Spring
7. 授课语言 Teaching Language	中英双语 English & Chinese
8. 授课教师、所属学系、联系方式 (如属团队授课, 请列明其他授课教师) Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	<p>何绮婷, 化学系, 工程师 Dr. HE Qi-Ting, Department of Chemistry, Teaching Engineer 第一教学楼 537 室 Rm.537, Lecture Hall 1 heqt@sustech.edu.cn 0755-88018741</p> <p>李晓华, 化学系, 工程师 Dr. LI Xiao-Hua, Department of Chemistry, Teaching Engineer 第一教学楼 537 室 Rm.537, Lecture Hall 1 lixh3@sustech.edu.cn 0755-88018738</p> <p>汤小菊, 化学系, 工程师 Dr. TANG Xiao-Ju, Department of Chemistry, Teaching Engineer 第一教学楼 532 室 Rm.532, Lecture Hall 1 tangxj@sustech.edu.cn 0755-88018730</p> <p>王春燕, 化学系, 工程师</p>

	<p>Dr. WANG Chun-Yan, Department of Chemistry, Teaching Engineer 第一教学楼 536 室 Rm.536, Lecture Hall 1 wangcy@sustech.edu.cn 0755-88018740</p> <p>刘华伟, 化学系, 工程师 Dr. LIU Hua-Wei, Department of Chemistry, Teaching Engineer 第一教学楼 536 室 Rm.536, Lecture Hall 1 liuhw@sustech.edu.cn</p> <p>颜璠珩, 化学系, 实验员 YAN Ai-Hui, Department of Chemistry, Teaching Technician 第一教学楼 533 室 Rm.533, Lecture Hall 1 yanah@sustech.edu.cn 0755-88018733</p> <p>刘星, 化学系, 实验员 LIU Xing, Department of Chemistry, Teaching Technician 第一教学楼 535 室 Rm.535, Lecture Hall 1 liux@sustech.edu.cn 0755-88018739</p>										
<p>9. 实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact</p>	<p>无 NA</p>										
<p>10. 选课人数限额(可不填) Maximum Enrolment (Optional)</p>	<p>最多 200 人, 每班最多 20 人, 最多 10 个班。 Max. 200 students; 20 students/class; max. 10 classes.</p>										
<p>11. 授课方式 Delivery Method</p> <p>学时数 Credit Hours</p>	<table border="1"> <thead> <tr> <th>讲授 Lectures</th> <th>习题/辅导/讨论 Tutorials</th> <th>实验/实习 Lab/Practical</th> <th>其它(请具体注明) Other (Please specify)</th> <th>总学时 Total</th> </tr> </thead> <tbody> <tr> <td>4</td> <td>0</td> <td>40</td> <td>4 for LAB safety test</td> <td>48</td> </tr> </tbody> </table>	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other (Please specify)	总学时 Total	4	0	40	4 for LAB safety test	48
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4	0	40	4 for LAB safety test	48							
<p>12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements</p>	<p>化学原理 A (CH101A)</p>										
<p>13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite</p>	<p>化学原理实验 B (CHEMS002)</p>										
<p>14. 其它要求修读本课程的学系 Cross-listing Dept.</p>	<p>其它非化学专业学生如果想学习化学实验的基本方法、基本操作与常见仪器, 也可选修本课程。</p> <p>This course may also be suitable for non-specialists, i.e. for all those students who wish to take a laboratory course in chemistry to gain a certain amount of familiarity with fundamental methods, skills and facilities widely used in chemical experiments.</p>										

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

本课程系统讲解化学实验的基本方法、基本操作与常见仪器，涵盖化学实验的原理与应用，面向化学与非化学专业学生。主要内容包括：化学物质的提取/制备、分离/纯化、定性/定量分析，仪器分析（可见分光光度计、阿贝折射仪），数据处理与误差分析等。

This course is open to students who are/aren't majored in chemistry, it systematically introduces fundamental methods, necessary skills and common instruments of chemical experiments, and it covers the principles and applications of chemical experiments. The contents include: extraction/preparation, separation/purification, and qualitative/quantitative analysis of chemical materials, instrumental analysis (Visible spectrophotometer, Abbe refractometer), data processing and error evaluation, etc.

16. 预达学习成果 Learning Outcomes

了解化学实验的基本原理，掌握基本操作，熟悉常见仪器，增强实验安全意识。学生将熟悉一系列无机实验、有机实验与分析实验，理实交融，掌握解决实际生活中简单化学问题的基本方法。

After completing this course, students should master a few basic methods, necessary skills, and instrument operation related to experimental chemistry. They should be also familiar with laboratory safety rules. After learning a series of inorganic, organic, and analytical chemistry experiments, they should have a conceptual and practical understanding of a range of chemical principles, and master the basic methods for solving simple chemical problems in real life.

17. 课程内容及教学日历（如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人）

Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

SECTION 1 (WEEK 1)

绪论：何绮婷主讲课程设置、实验内容、评分标准和科普（3学时），颜瑗珩主讲实验安全（1学时）。共计4学时。

Introduction: He Qi-Ting, course setting, experimental contents, grading rules and popular science (3 credit hours); Yan Ai-Hui, Lab safety (1 credit hour). Totally 4 credit hours.

SECTION 2 (WEEK 2)

实验室安全考核：机考，100道单选或判断题，每题1分，总分100分。（4学时）

Lab safety test: computer-based, 100 multiple-choice or true/false questions, 1 point/question, and the full mark is 100 points. (4 credit hours)

SECTION 3 (WEEK 3-12)

实验一 硝酸钾的制备：学习利用各种易溶盐在不同温度时溶解度的差异来制备易溶盐的原理和方法；学习重结晶法提纯物质的方法；巩固溶解、过滤、重结晶的实验操作原理。（4学时）

Experiment 1 Synthesis of Potassium Nitrate: To learn the principle and method to synthesize the soluble salts due to the differences of solubility of a variety of soluble salts at different temperatures. To learn the recrystallization method of purification of substances. To consolidate the principles of experimental operation of dissolution, filtration and recrystallization. (4 credit hours)

实验二 化学平衡及其移动：加深对有关电离平衡、氧化还原平衡、配位平衡及其移动理论的认识；掌握缓冲溶液的配制

和性质。(4 学时)

Experiment 2 Shifts in Chemical Equilibrium: To deepen the understanding of ionization equilibrium, redox equilibrium, coordination equilibrium and the theory of their shifts. To master the preparation method and the property of buffer solution. (4 credit hours)

实验三 化学反应速率与活化能的测定: 了解浓度、温度和催化剂对化学反应速度的影响。测定 $(\text{NH}_4)_2\text{S}_2\text{O}_8$ 与 KI 反应的速率、反应级数、速率系数和反应的活化能; 测定 $(\text{NH}_4)_2\text{S}_2\text{O}_8$ 与 KI 反应的速率、反应级数、速率系数和反应的活化能。(4 学时)

Experiment 3 Determination of Chemical Reaction Rate and Activation Energy: To understand the influence of concentration, temperature and the catalyst on the reaction rate. To determine the reaction rate, reaction series, rate coefficient and the reaction activation energy of $(\text{NH}_4)_2\text{S}_2\text{O}_8$ and KI. (4 credit hours)

实验四 薄层层析与柱层析: 了解偶氮苯的光学异构反应, 加深对光化学反应的理解; 掌握薄层层析的基本操作; 薄层层析分离顺、反式偶氮苯; 了解柱层析分离有机化合物的原理; 初步掌握层析柱装填和洗脱的操作方法; 柱层析分离甲基橙与亚甲基蓝。(4 学时)

Experiment 4 Thin-Layer Chromatography and Column Chromatography: To understand the optical isomerization of azobenzene. To master the principles and procedure of thin-layer chromatography (TLC). To separate cis- and trans-azobenzene by TLC and calculate their R_fs. To understand the principles of column chromatography. To master the method of packing and elution of the column. To separate methyl orange and methylene blue by column chromatography. (4 credit hours)

实验五 莫尔法测定可溶性氯化物中的氯含量: 掌握用莫尔法进行沉淀滴定的原理和方法; 学习 AgNO_3 标准溶液的配制和标定。(4 学时)

Experiment 5 Determination of Chloride Content in Soluble Chloride-Mohr Method: To master the principle and method of precipitation titration by Mohr method. To learn the preparation and calibration of AgNO_3 standard solution. (4 credit hours)

实验六 分离酸性、碱性和中性的有机物: 通过检验每次萃取中有机相中的成分, 理解萃取法和可视化分离多达四组分混合物的过程。(4 学时)

Experiment 6 Separation of Acidic, Basic and Neutral Organic Compounds: To understand the chemical basis of separation of up to a four-component mixture using extraction techniques and visualizing the separation by checking the composition of the organic layer after each extraction. (4 credit hours)

实验七 金纳米团簇模拟酶分光光度法测定污水中的 H_2O_2 : 掌握金纳米团簇模拟酶测定 H_2O_2 的原理和实验操作方法; 学习使用可见分光光度计; 掌握标准曲线法, 测定污水中 H_2O_2 的浓度。(4 学时)

Experiment 7 Gold Nanoclusters as an Enzyme Mimic for Determination of H_2O_2 in Sewage by Spectrophotometry: To master the principle and experimental operation of H_2O_2 determination with gold nanoclusters (Au NCs) as enzyme mimics. To learn the use of visible spectrophotometer. To master the standard curve method for determining H_2O_2 in sewage. (4 credit hours)

实验八 纳米银的制备及稳定性: 掌握还原法制备纳米颗粒的方法; 掌握分光光度计的原理, 了解光谱吸收峰位置与颗粒大小的关系; 了解胶体银的介稳性和聚沉效应。(4 学时)

Experiment 8 Synthesis and Study of Silver Nanoparticles: To synthesize the silver nanoparticles by reduction. To characterize the silver nanoparticles (colloidal silver) with visible spectrometer and study the relationship between aggregation and optical properties. To understand the stability and aggregation of colloidal silver. (4 credit hours)

实验九 乙酸乙酯的制备: 熟悉和掌握酯化反应的基本原理和基本操作; 掌握液体有机化合物的纯化方法, 熟悉蒸馏、萃

取、干燥等操作；熟悉和掌握阿贝折光仪的原理及使用方法。（4学时）

Experiment 9 Preparation of Ethyl Acetate: To master the esterification principles and method for preparing ethyl acetate from acetic acid and ethanol. To know the purification of organic liquids, and master basic operations such as distillation, separation and drying. To learn the principles and operation of an Abbé refractometer. (4 credit hours)

实验十 铁(III)-磺基水杨酸配合物的组成及其稳定常数的测定: 了解分光光度法测定配合物组成与稳定常数的原理和方法；测定当 pH<2.5 时，磺基水杨酸合铁的组成及其稳定常数；练习并掌握分光光度计的使用。（4学时）

Experiment 10 Determination of Composition and Stability Constants of Iron (III)-Sulfosalicylic Acid Complexes: To understand the principle and method of stability constants of complexes by spectrophotometry. To determine the composition and stability constant of the sulfosalicylic acid and iron when pH<2.5. To master the use of the spectrophotometer. (4 credit hours)

18. 教材及其它参考资料 Textbook and Supplementary Readings

指定教材：《化学原理实验 A》，南方科技大学，化学教学实验室主编。

Students' Book: General Chemistry Laboratory A, SUSTech, edited by Chemistry Experiment Teaching Center.

推荐参考资料：

《普通化学实验》，同济大学化学系，杨勇主编，同济大学出版社。

《实验化学》（上册）（第二版），陈虹锦主编，科学出版社。

《无机化学实验》（第二版），大连理工大学无机化学教研室，高等教育出版社。

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		5		病假须有医院的有效病假条，事假须提供生活导师签字的请假条。学生必须在实验开始前向指导教师说明。统一时间补做实验。 A valid sick leave must be issued by the hospital. A leave of absence is required and signed by the student's life tutor. The student must explain to the instructor before the experiment begins. The lab will arrange a unified time for the students to complete the experiments.
课堂表现		40		

Class Performance			
小测验 Quiz	10		
课程项目 Projects			
平时作业 Assignments	45		预习报告 10 分，实验报告 35 分。 Preview report 10', Experimental report 35'.
期中考试 Mid-Term Test			
期末考试 Final Exam			
期末报告 Final Presentation			
其它（可根据需要 改写以上评估方式） Others (The above may be modified as necessary)			

20. 记分方式 **GRADING SYSTEM**

- A. 十三级等级制 **Letter Grading**
 B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 **REVIEW AND APPROVAL**

21. 本课程设置已经过以下责任人/委员会审议通过
This Course has been approved by the following person or committee of authority

化学系教学指导委员会
 Teaching committee of the chemistry department